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Sport Satelliten Konto

The contribution of sport towards the fulfilment of the WHO recommendations regarding physical activity

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Content

Summary

Physical activity has a positive effect on physical and mental health, promotes general well-being and improves the quality of life. In contrast, physical inactivity or lack of exercise leads to a number of negative individual concomitant symptoms, e.g. in the form of "lost" years of life (so-called "DALYs"). Negative consequences of physical inactivity are also evident at the macroeconomic level: direct costs in the form of expenditure on health services and health goods and indirect costs in the form of production losses are a burden primarily on the public sector, but also on private households and private cost units.

The World Health Organization (WHO) has published exercise recommendations or exercise criteria, whose compliance with can reduce the risk of developing a variety of diseases. According to these recommendations, adults aged 18 and over should either be moderately physically active for at least 2.5 hours per week, be intensively physically active for at least 1.25 hours, or exercise an equivalent combination of moderate and intensive physical activity. According to the Robert Koch Institute, 45% of the adult population in Germany meets the WHO recommendations - at least with regard to endurance activities in leisure time in general.

On the basis of primary data from a survey within the framework of the sports satellite account, it can be deduced what contribution sport or sporting activity makes to fulfilling the exercise recommendations of the World Health Organization (WHO). According to this, 34% of the population aged 16 and over achieves the WHO recommendations through sport or sporting activity alone. In relation to the 45% of the sufficiently active population as a whole, it can also be concluded that sport currently contributes approx. 75% to the endurance-related minutes. Despite the overall (purely normative) too low proportion of the population that is sufficiently physically or athletically active, sport plays an important role in activating the population.

Sometimes considerable differences in the achievement of the WHO recommendations through sport can be observed between different population groups - for example, clearly different levels of activity can be observed according to age or the phases of life associated with it, or according to socioeconomic characteristics.

Different types of sport contribute to varying degrees to the achievement of the WHO recommendations among adults. Cycling (with 15% of all endurance-related minutes) and fitness (with 14%) currently make the highest contribution to endurance activity, followed by running/jogging (9%), hiking (7%) and football (5%). Overall, however, the diverse character of the sports landscape in Germany becomes clear: another 56 sports contribute an additional 50% of the relevant endurance minutes.

Both for the "economic factor sport" and even more so for the "economic factor healthy population", it can be said that a higher degree of physical activity is desirable.

Excursus: Methodological background. Sports Satellite Account Germany (SSA)

Scientific support is of central importance for fact-based advice on sports policy and practice. In this sense, the Federal Institute for Sport Science (BISp) and the Federal Ministry of Economics and Energy (BMWi) pursue the goal of providing decision-makers in sports policy and sports practice with valid data material, also with regard to the economic significance of sport.

Since 2008, all expenditures made in Germany for sports purposes have therefore been summarized in a satellite account of the national accounts (VGR). Satellite accounts are prepared when the economic performance is not provided by one industry, but by many industries on the basis of an overarching theme. Examples besides sports are health and tourism.

The satellite accounts on sport (SSA) now available for the national accounts for the years 2008, 2010, 2012, 2014 and 2016 show the high relevance of the economic factor sport for the German gross value added (Ahlert et al. 2019).

Within the scope of the preparation and updating of the SSK, data on the sport-related consumption of the German population, the expenditures of companies for sport-related advertising and sports sponsoring as well as the funds flowing into Germany for sport-related media rights are continuously collected. In addition, the public and private investments for sports facilities as well as the construction and personnel operating costs of sports facilities and sports opportunities are surveyed. This provides a comprehensive database on the scope of sport-related activities and the associated expenditures and investments. The most recent publication on the sports satellite account is: " Die ökonomische Bedeutung des Sports in Deutschland - Sportsatellitenkonto (SSK) 2016" (Ahlert et al. 2019).

In addition, special publications on the SSK are published annually in the series "Current Data on Sports Economy". These special publications do not reflect the entire sports satellite account, its economic relevance and interrelationships, but are special evaluations on various topics from regular primary surveys.

To date the following special publications have been published:

2013: Winter sports as an economic factor *(English version available)*

2014: Sports betting as an economic factor

2015: Football as an economic factor

2016: Older people as the engine of the sports economy?

2017: Outdoor sports as an economic factor

2019: Sport inside or outside the sports club: sports activity and sports consumption by type of organization.

The primary statistical data in this thematic report are based on a representative population survey on sports activity and sports-related consumer spending of German private households in 2017. 1,222 persons aged 16 and over were interviewed by telephone. All publications can be found at www.sportsatellitenkonto.de.

Distinction between physical and sporting activity

The term "physical activity" covers all physical movements produced by the skeletal muscles that increase energy consumption beyond the basal metabolic rate (RKI 2015). Physical activity does not only mean sport, but in general movement in leisure time, at work, locomotion ("transport") such as walking or cycling, housework or gardening and other physical activities in the context of health-promoting activities (WHO 2010, Rütten & Pfeifer 2016). Sporting activity, i.e. movement in the context of sport, is accordingly to be understood as a subgroup or subset of physical activity. While the total physical activity cannot be reduced to sports activities, physical activity is always associated with sporting activity. One aim of the report is to determine what proportion of sport or sporting activity contributes to total physical activity. After an introductory presentation of the benefits of physical activity in general and the costs of physical (and thus also sporting) inactivity, the report then presents current figures on the physical activity of the population as a whole, based on studies by the Robert Koch Institute.

Benefits of physical activity and costs of inactivity

The positive influence of physical activity on physical and mental health is generally regarded as proven (e.g. WHO[1] 2010, Krug et al. and RKI[2] 2013, Rütten und Pfeifer 2016). According to the World Health Organization (WHO), physical activity promotes the following health functions, among others: Cardiorespiratory health (prevention of coronary heart disease and cardiovascular disease, stroke and hypertension), metabolic health (prevention of diabetes and obesity), musculoskeletal health (improved bone health, prevention of osteoporosis), cancer prevention (reduction of the risk of breast and colon cancer), functional health and fall prevention, prevention of depression (WHO 2010).

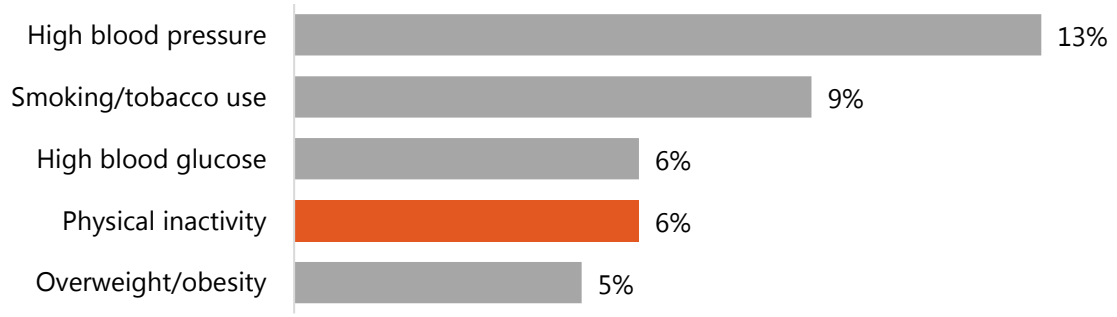
Additional psychological effects of physical activity concern general mental well-being, social resources and contacts, the increase of quality of life as well as mobility and independence, especially of older people (Krug et al. 2013), reduction of stress reactions, anxiety and depression and (possibly) the occurrence of Alzheimer's disease and other forms of dementia (WHO 2015a).

Conversely, physical inactivity has negative consequences: According to the WHO, 6% of global deaths are due to lack of exercise (Fig. 1). Physical inactivity is the fourth largest risk factor for premature mortality, after high blood pressure with 13%, smoking with 9% and about the same with high blood glucose with 6% (WHO 2009). Overweight or obesity is another major risk factor, accounting for 5% of deaths (ibid.).

[1] WHO: World Health Organization.

[2] RKI: Robert Koch-Institute.

Fig. 1: Deaths by risk factors (global).



Source: WHO 2009. Own illustration.

Physical inactivity is not a direct cause of death, but is a contributory and increasing factor in the risk of coronary heart disease, type 2 diabetes, cancer, overweight and obesity (WHO 2009).

In Europe, WHO estimates that lack of physical activity causes one million deaths annually, representing 10% of all deaths. The loss of DALYs[3] (years of life with full health-related quality of life) from physical inactivity is estimated to be up to 8.3 million years annually in Europe (WHO 2015b). Worldwide, physical inactivity is responsible for approximately 13.4 million DALYs (Ding et al. 2016). With regard to Germany only, this study does not include data on DALYs due to lack of exercise.

The negative effects of lack of exercise on the physical and mental state are accompanied by economic costs. Current studies on the economic costs of physical inactivity come to more or less comparable results, which are described below.

A recent study by Ding et. al. (2016) states[4] that under "conservative assumptions" physical inactivity causes costs of about US$ 67.5 billion worldwide[5] (Table 1). The majority of these costs are direct costs of US$53.8 billion. Direct costs should be understood as the consumption of resources for health services and health care goods, e.g. in the form of costs for treatment, rehabilitation or medication that arise due to inactivity or insufficient activity. Indirect costs are, for example, productivity losses due to sick leave. According to the authors of the study, these indirect costs amount to approx. 13.7 billion US-$ worldwide. Most of these costs are incurred in Europe (including non-EU countries), the Western Pacific and North America.

[3] DALYs, or disability-adjusted life years, are a measure for quantifying the burden of disease. DALYs express not only the number of years lost due to premature death, but also the years lived with illness or disability until recovery or death. A DALY stands for one year of "lost" health (Doc-Check 2020). The sum of these DALYs in the population can be seen as a measure of the gap between the current state of health and an ideal health situation in which the entire population lives free of illness and disability until old age (WHO 2020).

[4] The study is based on data from the "Global Burden of Disease Study", on data from the International Diabetes Association, the WHO, the World Bank and the International Labour Organization.

[5] This includes 142 countries or 93% of the global population (Ding et al. 2016).

Table 1: Direct and indirect costs of physical inactivity and "DALYs", worldwide and by WHO regions according to Ding et al. 2016.

	Economic burden				Disease burden	
	Direct Costs		Indirect Costs		DALYs	
	In Mio. US $	*% of global*	In Mio. US $	*% of global*	In 1.000 years	*% of global*
Global	**53,811**	***100%***	**13,697**	***100%***	**13,441**	***100%***
Africa	632	*1%*	556	*4%*	859	*6%*
Latin America and the Caribbean	3,250	*6%*	1,002	*7%*	1,157	*9%*
North America	25,680	*48%*	3,241	*24%*	1,080	*8%*
Eastern Mediterranean countries	2,355	*44%*	666	*5%*	1,174	*8%*
South East Asia	936	*2%*	894	*7%*	2,699	*20%*
Western Pacific	9,215	*17%*	3,509	*26%*	4,202	*31%*
Europe	11,743	*22%*	3,829	*28%*	2,270	*17%*
Germany	**2,150**	**4%**	**565**	***4%***	Not specified	

Source: Ding et al. 2016. Own illustration.

However, sensitivity analyses illustrate the uncertainty in this calculation and the possible range of costs: depending on the assumptions, total costs worldwide range between US$ 18.5 billion and US$ 182 billion (Ding et al. 2016, not shown in the table).

An equally recent study by the Centre for Economics and Business Research (Cebr) yields comparable costs of inactivity - at least in terms of direct costs: For the EU-28, €9.2 billion in direct costs are reported[6] (Centre for Economics and Business Research 2015). With regard to indirect costs, the Cebr study also takes the DALYs ("disability-adjusted life years") into account and puts them in monetary terms, which leads to €71.1 billion in indirect health costs. The total of €80.4 billion would correspond to 6.2% of all European health care expenditures (Cebr 2015).

For Germany, the costs of inactivity are estimated to total €2.4 billion (Ding et al. 2016). estimated. Of this amount, € 2.0 billion are direct costs and € 0.4 billion are indirect costs (excluding DALYs). The fluctuation range extends from €0.3 to €9.6 billion in total.

The Cebr study reports direct costs of €1.7 billion and indirect costs of €12.8 billion (including DALYs) for Germany. The total of €14.5 billion represents 4.8% of total health care expenditure (Cebr 2015).

While the study evidence is relatively uniform with regard to the direct costs of physical inactivity (Cebr 2015: €1.7 billion; Ding et al. 2016: €2.0 billion), the estimates of indirect costs vary widely in terms of definition and methodology (Cebr 2015: €12.8 billion including DALYS; Ding et al. 2016: €0.4 billion excluding DALYs).

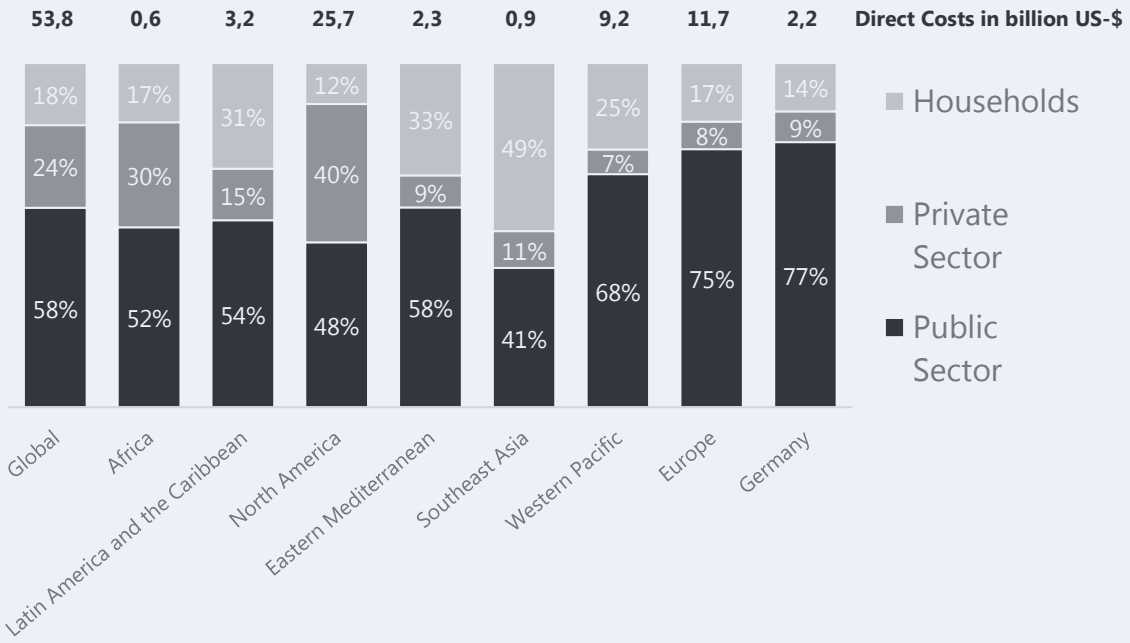
[6] Only in relation to the effects of physical inactivity on the four main non-communicable diseases (coronary heart disease, type II diabetes, colon and breast cancer).

Irrespective of the amount and method of calculating the monetary costs of physical inactivity, the predominantly positive influence of physical activity on individual health remains undisputed. However, this does not fully apply to sporting activity, which can also be associated with significant health-damaging aspects (Edwards & Rowe 2019). These range from short-term sports injuries to long-term physical and psychological overuse of competitive and competitive athletes and -athletes.

Excursus: Bearers of the direct costs of physical inactivity in international comparison

An international comparison shows that in Germany a relatively high proportion of (direct) costs (77%) is borne by the public sector (global: 58%). 9% of costs are borne by private institutions (globally 24%) and 14% by private households (globally 18%).

Fig. 2: Direct costs of physical inactivity and distribution to cost units according to Ding et al. 2016.



Source: Ding et al. 2016. Own illustration.

For Europe (non-EU countries are also taken into account) - although there are enormous differences within Europe (not tabulated) - the share of cost coverage is comparable to that in Germany: 75% is borne by public institutions, 8% by private institutions and 17% by private households. This distribution is mainly due to the solidarity-based health care systems prevailing in Europe. This means that direct health care costs as a whole and the direct health care costs caused by inactivity are mainly borne by the solidarity community via contribution financing.

WHO recommendations for physical activity

As a guideline for "sufficient" physical activity, the WHO published recommendations in 2010, which, although they do not exclude the above-mentioned risks, can significantly reduce the probability of occurrence and which are currently largely accepted.[7]

The WHO recommendations differentiate between age groups. For the adult population aged 18 years and over, the following recommendation is made:

- 150 minutes per week of moderate (aerobic)[8] physical activity or
- 75 minutes per week of high intensity (aerobic) physical activity or
- an equivalent combination of moderate and intensive activity.

The activity should be performed in units of at least 10 minutes each. In addition, muscle strengthening activities involving the large muscle groups should be carried out two or more days a week (WHO 2010). A distinction is, therefore, made between recommended "endurance activity" and "muscle strengthening activity".[9;10]

WHO recommendations for physical activity for adults (18 years and older):

Endurance activity

- 2.5 hours per week of moderate activity or
- 1.25 hours per week of intensive activity or
- an equivalent combination of moderate and intensive activity
- in units with a minimum duration of 10 minutes each

Muscle strengthening activity

- at least 2 days a week

Source: WHO 2010. Own illustration.

23% of the adult population is sufficiently physically active - 45% in terms of endurance activities

The benefits of physical activity and the costs of inactivity are - at the economic level and in recognition of the WHO recommendations - thus dependent on the level of activity, i.e. the proportion of the population that is sufficiently physically active in this sense. In Germany, the Robert Koch Institute (RKI) conducts regular health monitoring as part of the federal health reporting system.

[7] Guidelines or recommendations on physical activity or exercise have existed since before the WHO published them in 2010, such as the "EU Guidelines on Physical Activity" of 2008 (EU 2008). Since then, however, the criteria of the World Health Organization of 2010 have provided the frame of reference and point of orientation for many national and international recommendations and studies.

[8] "Aerobic" (aerobic = Greek for air) and, as a counterpart, "anaerobic" endurance activities differ in the type of energy production required for the exercise. With aerobic activity, energy is produced with the help of fats and oxygen, with (more intensive) anaerobic activity, the body uses carbohydrates in addition to oxygen to produce energy during metabolic processes (ISPO 2016).

[9] In some studies or contributions, no differentiation is made between the forms of activity or only the "endurance activity" is reported, which makes it difficult to compare the results of different studies or even country-specific comparisons.

[10] Further differentiations refer to recommendations for specific target groups: For example, national recommendations for Germany also exist for children up to 4 years of age, 5-17 years of age, frail or very old persons over 85 years of age, pregnant women, persons with disabilities and persons with chronic diseases (WHO 2018; Rütten & Pfeifer 2016).

Adult Population. Based on the study "Gesundheit in Deutschland aktuell" (GEDA)[11] from 2014-2015, it is shown, among other things, that 23% of the adult population (from 18 years of age) achieve the recommendations of the WHO regarding endurance and muscle strengthening activity (Finger et al. 2017a). Women with 21% and men with 25% differ "significantly" from each other (RKI 2015).

In terms of endurance activity ("at least 2.5 hours per week"), a total of 45% of those questioned achieve the activity criteria, and in terms of muscle strengthening 29% of the adult population. As a limitation, it should be mentioned that the reported values only refer to the leisure behavior of the respondents[12]. Physical activity at the workplace is therefore not taken into account.

Degree of fulfilment of the WHO recommendations for adults (from 18 years):

Endurance and muscle strengthening

- Total: 23%
- Women: 21%
- Men: 25%

Endurance activity

- Total: 45%
- Women: 43%
- Men: 48%

Muscle strengthening activity

- Total: 29%
- Women: 28%
- Men: 31%

Source RKI / Finger et al. 2017a. Own illustration.

Excursus: work-related physical activity. Indicators on work-related physical activity are also collected on the basis of the GEDA study by the RKI. According to these indicators, 47% of the adult population perform predominantly sedentary or standing jobs during work, 36% work predominantly while walking or doing moderately strenuous physical activities. 9% perform predominantly heavy physical work or physically demanding activities (Finger et al. 2017b). Differences in physical activity in the workplace are reported by gender (higher proportions of heavy physical work) and educational groups (more frequent sitting or standing at work at higher educational levels), among others. Overall, physical activity at the workplace is not per se health-promoting (but at least dependent on the severity of the work) and is generally not equivalent to sporting activity in leisure time (Finger et al. 2017b).

Children and young people. The Robert Koch Institute also provides data on the movement behavior of children and adolescents under 18 years of age. It should be noted that the WHO recommendations for children differ significantly from the recommendations for adults: According to them, children from 5 to 17 years should be physically active (moderate or intensive) for at least 60 minutes every day (WHO 2010). On the basis of the KiGGS study (Study on the Health of Children and Adolescents in Germany)[13], it is shown that 22% of girls and 29% of boys in Germany aged 3 to 17 years achieve these WHO recommendations (Finger et al. 2018). The proportion of children and adolescents who achieve the exercise recommendations is highest at the age of 3 to 6 years (43% for girls

Degree of fulfilment of the WHO recommendations with children and young people (3-17 years):

- Girls total: 22% | 3-6 y.: 43%; 14-17 y.: 8%
- Boys total: 29% | 3-6 y.: 49%; 14-17 y.: 16%

Source: RKI / Finger et al. 2018. Own illustration.

[11] A total of 24,016 persons aged 18 and over with permanent residence in Germany were interviewed by means of written or online questionnaires.

[12] Specifically, with regard to endurance activities, the study participants were asked about the length of time per week during which they engage in moderate strenuous aerobic physical activity in leisure time and cycling for locomotion. With regard to muscle strengthening activity, the number of days per week during which they engage in muscle strengthening activities was asked (Finger et al. 2017a).

[13] www.kiggs-studie.de.

and 49% for boys) and decreases continuously thereafter. In the age group from 14 to 17 years 8% of girls and 16% of boys are sufficiently physically active (Finger et al. 2018).

However, the prevalence measurement of attainment of the WHO criteria between children and adults are difficult to compare due to the differences in the recommendations.

In a European comparison, Germany is in the front midfield in terms of the proportion of physically active persons, behind the Netherlands, Denmark, Sweden and Latvia (Eurobaro-meter and European Commission 2018).

According to WHO criteria, the data on physical activity to date refer to all forms of exercise and activities in the context of "leisure". In the following, the main question is what contribution exclusively "sport" currently makes to the fulfilment of the WHO criteria. While the values and figures reported in the preceding sections are based on secondary literature, the following analyses are based on data from the Sports Satellite Account.

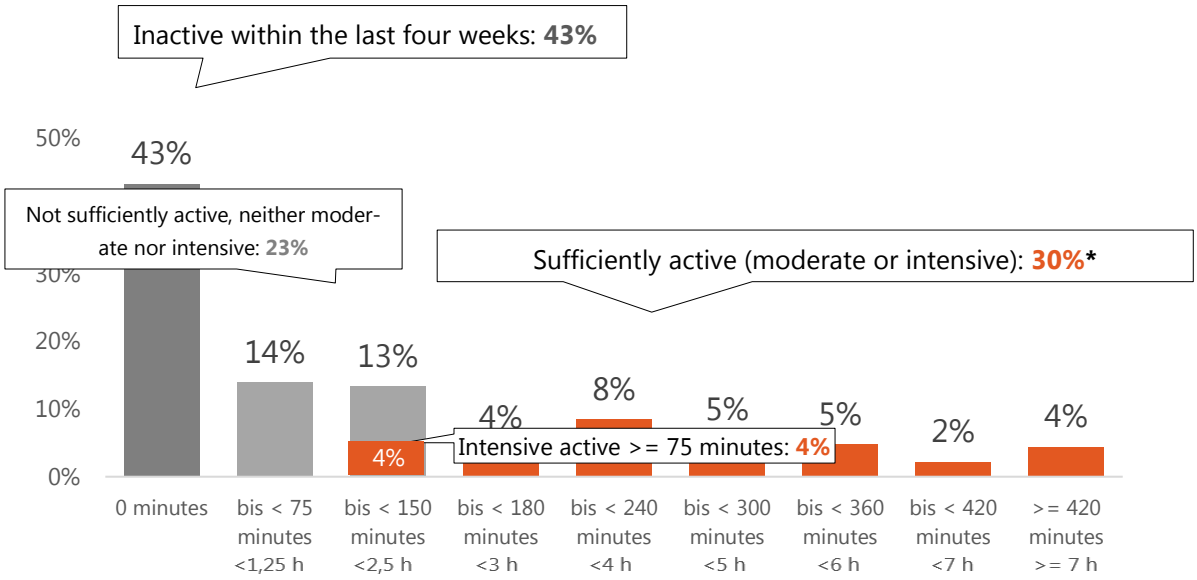
Contribution of sport to the fulfilment of WHO recommendations: 34% of the adult population meet the endurance recommendations based on physical activity alone

In the context of the population surveys for the sports satellite account Germany, most recently in spring 2018 (February to March), one aspect of the study was also the question of how many minutes per week are spent on the active practice of sports[14]. The survey was conducted per sport (more precisely: for 71 sport clusters of the sports satellite account, see Appendix). In addition, it was determined how many minutes were spent with what intensity: intensive, fashionable or without physical exertion.

Figure 3 first illustrates the distribution of respondents by minutes spent on sports per week. First of all, it is apparent that 43% of the population aged 16 and over are "inactive in terms of sport". 14% of the population are up to 75 minutes per week (1.25 hours) physically active, which is below the WHO minimum criteria. Between 75 and 150 minutes of physical activity are reported by 13% of the respondents. Of these 13%, just under a third are devoted to intensive sporting minutes. This corresponds to 4% of the population that engages in sufficiently intensive sports to meet the WHO criteria. Another 30% are either moderately or intensively active to a sufficient extent. 4% of the respondents even state that they do more than seven hours of sport per week.

[14] They were asked about their sports activity in the last four weeks and the results were converted to a weekly basis.

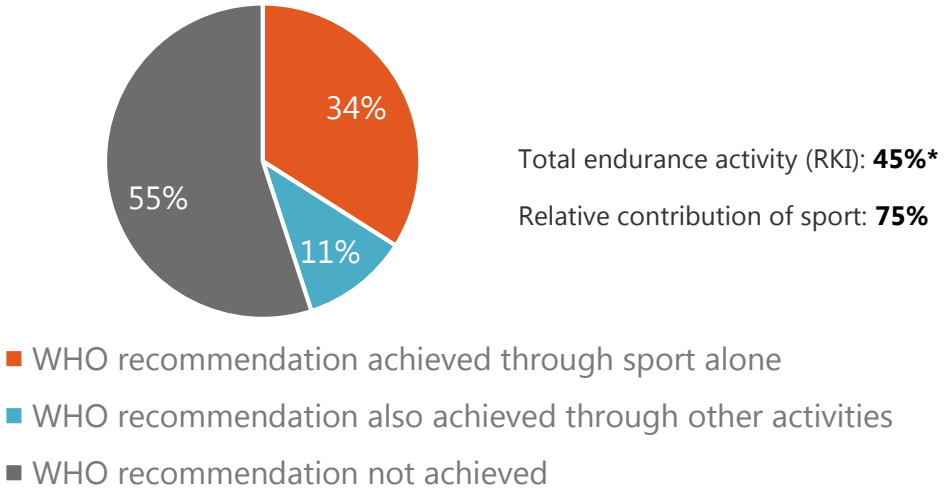
Fig. 3: Intensive or moderate sport per week, in minutes or hours (h).



Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).
**In the figure, the minutes from "up to 180 minutes" to ">= 420 minutes" add up to only 28% instead of 30% due to rounding.*

Overall, 34% of the population aged 16 years and older therefore engages in sufficient weekly sport to meet the WHO recommendations on "endurance activity" exclusively through physical activity. In relation to the 45% of the population who meet the WHO criteria in their leisure time, three quarters or 75% (34% of 45%) of endurance activities according to WHO criteria were achieved through sport alone in 2017 (Fig. 4).

Fig. 4: Fulfilment of the WHO recommendation on the endurance activity of the adult population (16 years and older).



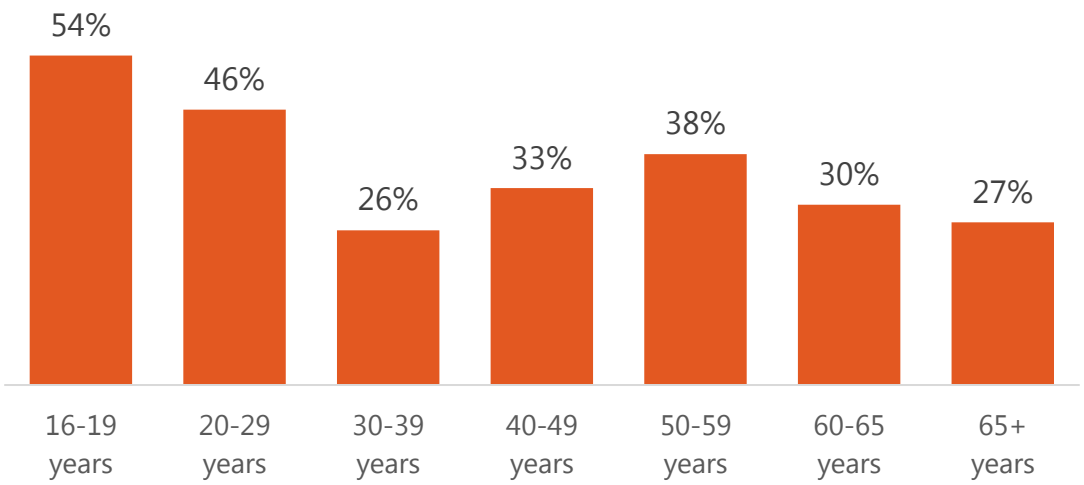
Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).
**Source: Finger et al. (2017a).*

The extent of sufficient physical activity varies according to age and social status

The following section describes whether and to what extent certain population groups differ in achieving the WHO criteria for physical activity due to sport.

Age. To begin, Figure 5 shows that the adherence to endurance activity recommendations through sport differs significantly between different age groups. The "compliance rate" is highest among persons aged 16 to 19 years, at over 54%, although according to the WHO definition, 16 and 17-year-olds should actually be assessed on the basis of the more demanding criteria for children and adolescents ("at least 60 minutes of physical activity per day", see above). That adolescents aged 16 to 19 represent the most active age group is plausible in view of compulsory school sports. Conversely, a rate of just over 50%, especially since the less demanding WHO recommendations for adults are included in the evaluation, can be considered relatively low.

Fig. 5: Proportion of the population that achieves the WHO recommendations through sport alone (endurance activity), by age groups.



Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).

Figure 5 also shows that compliance by no means decreases linearly from "young" to "old". On the contrary, the proportion of people in the 30-39 age group who are sufficiently active through sport falls to a low of 26%. Among other things, events that often fall into this phase of life and may constitute time restrictions for sporting activity, such as entry into working life or professional orientations and requirements for professional mobility or starting a family, could provide an explanation for the lower proportions.

In the middle age groups 40 to 49 years and 50 to 59 years, the proportion of people who are sufficiently active in sports initially rises again significantly to 38%. One explanation could be the increasing availability of leisure time in middle age (e.g. for adults with adult children) or higher occupational security. In the higher age groups, the proportion of people who are sufficiently active in sports decreases again. Here, sporting activities shift to other, health-oriented and

technically less demanding sports (an der Heiden et al. 2016). In general, however, no general withdrawal from physically active sporting activities can be observed even at an older age; in fact, a noticeable decline is only observed from around 70 years of age (an der Heiden et al. 2016).

Gender. No significant differences can be observed between women and men with regard to the criteria for endurance activity fulfilled by sport (Fig. 6).

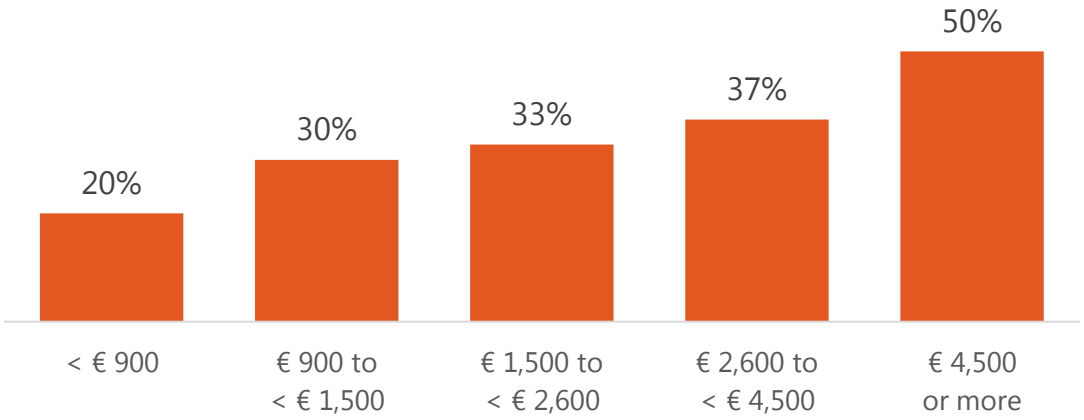
Fig. 6: Proportion of the population that achieves the WHO recommendations through sport alone (endurance activity), by gender.

Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).

Although men (35%) tend to achieve the WHO minimum criteria more often through sporting activity than women (33%), the difference is rather small. The Robert Koch Institute reports that women statistically significantly less often achieve the WHO recommendation on endurance activity overall (43% compared to 48% of men; Finger et al. 2017a).

Net household income. Considerable differences can be observed analogous to the general sports participation in Germany according to social status. The different proportions are particularly striking when broken down by net household income (Figure 7). People with low income reach the recommendations through sport much less often than people with high income: In the lowest income bracket up to 900 € 20% reach the minimum activity level, in the highest income bracket as much as 50% - which corresponds to 2.5 times the share of the lowest income bracket. Persons with a lower social status are on average more physically active at work (RKI 2015), although work-related physical activity does not bring the same health benefits as leisure-related physical activity (RKI 2015).

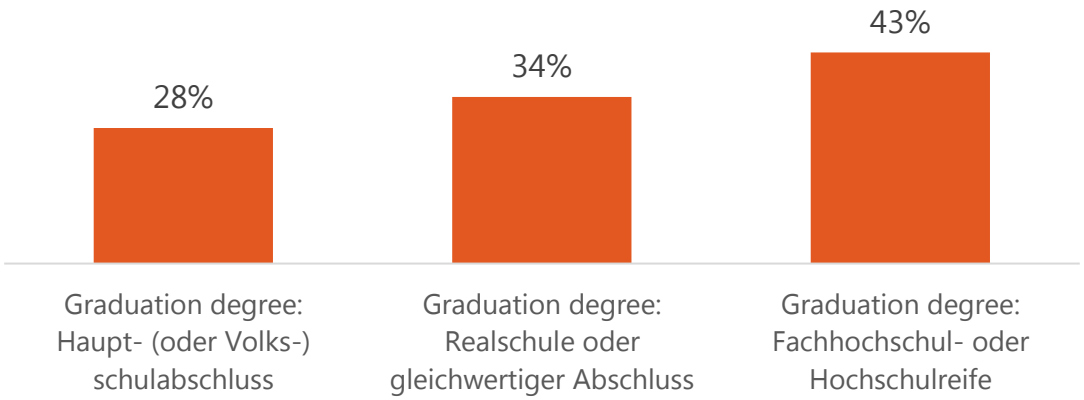
Fig. 7: Proportion of the population that achieves the WHO recommendations through sport alone (endurance activity), by monthly net household income.



Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).
Distribution of households in Germany on 1.1.2018 by net household income: <€ 900: 5%; € 900-€ 1,500: 12%; € 1,500-2.600: 27%; € 2,600-5,000: 40%; € 5,000-18,000: 14% (Destatis 2019).

Educational level. Different levels of goal attainment through sport are also apparent with regard to the level of education corresponding to income (Fig. 8): The higher the formal educational level, the more often the WHO recommendation is achieved through sport (see also Finger et al. (2017a) on physical activity in leisure time as a whole).

Fig. 7: Proportion of the population that achieves the WHO recommendations through sport alone (endurance activity), by educational level.



Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum. German population 2017 (representative sample N=1,222, aged 16 and over). Graduation degrees correspond to school types in Germany and do not have equivalents in English terms. Distribution of persons aged 15 and over in Germany by level of general education in 2017: Haupt- (oder Volks-) schulabschluss: 30%; Realschule oder gleichwertiger Abschluss: 30%; Fachhochschul- oder Hochschulreife: 32%; other or no qualification: 8% (Destatis 2020).

The differences between educational levels are somewhat less pronounced than the different patterns of activity by income class - at least between the extreme manifestations in income. It is also reasonable to assume that educational attainment and income, and thus also the different levels of attainment, are correlated.

In general, the results presented here should not be explicitly interpreted as causal causes of the practice of sport, but rather as a purely descriptive description of the sportsmen and women who practice sport. Causal analyses require the use of multivariate, inferential statistical methods (see Schüttoff & Pawlowski 2017)[15].

Excursus: Estimation of the (economic) health costs of sports injuries

As a counter result to the positive effects on health associated with regular exercise, sport is regularly associated with injuries and the resulting costs. First of all, it should be noted that there is no current study for Germany known to the authors which deals comprehensively with the costs associated with sport at the national economic level. The following explanations are therefore conceptual estimates based on existing data.

Sports injuries lead on the one hand to direct costs due to the use of medical services for inpatient or outpatient treatment, and on the other hand to indirect costs for the economy due to days of illness or absence.

Within the framework of the sports satellite account, a survey on the sports behavior of the German population aged 16 and over in 2015 revealed that just under 2% of athletes had to be treated as in-patients, i.e. in hospital, in order to practice sports. In 2015, this corresponded to a total number of approximately 1 million injured. A further 5% of the sportsmen and women (3.8 million persons) were treated on an outpatient basis. An older but much-cited study by Henke et al. (2000) also reports a sports-related injury rate of 5-6%.

According to the Federal Statistical Office, inpatient treatment in general, i.e. independent of sport, cost an average of €4,695 in 2017 (Destatis 2018). The costs for treatment of typical sports injuries are also roughly at this level: In 2016, for example, the treatment of a cruciate ligament rupture cost an average of about €3,200, that of a collarbone fracture €2,700 and that of a tibia or fibula fracture almost €5,000 (study by the University of Bochum and the Arag sports insurance company (RP Online 2017)).

According to the authors' estimates, the costs for sports-related inpatient treatment in 2015 amounted to approx. € 4.3 billion, while the costs for outpatient treatment are estimated at € 2.2 billion. In total, the treatment costs thus amount to € 6.5 billion.[16]

In addition to these direct health costs of sports practice, indirect costs also arise from the sickness or absence, disability and death associated with sports injuries. According to our own calculations based on a survey of the SSK in 2015, sports-induced absences amount to 3.4 days per

[15] Schüttoff & Pawlowski (2017) and Ainsworth et al. (2011) also present alternative approaches to calculating the contribution of sport to physical activity, using "metabolic equivalents" specific to the sport. Metabolic equivalents (MET) are used to compare the energy consumption of different activities.

[16] The total costs of inpatient hospital care amounted to €91.3 billion in 2017 (Destatis 2018).

person aged 16 years and older (mean value, in relation to the population aged 16 years and older); independently of sport, the respondents also reported an average of 13 days of absence or illness.[17] The share of sport in all days of absence is thus approx. 21% (3.4/16.4).

Employers' medical costs associated with absenteeism due to illness or injury (continued payment of wages in the event of illness) are estimated by the umbrella organization of company health insurance funds at a total of approx. 53 billion € (Institut der deutschen Wirtschaft 2019). Of this amount, about € 44.3 billion is accounted for by gross wages and € 8.8 billion by employers' social security contributions. In relation to the 21% of sick days caused by sports injuries, there are pro-rata sport-related indirect costs of approximately €11 billion due to occupational absences. (9.1 billion € for gross remuneration and 1.8 billion € for social security contributions).

The health costs caused by sport thus amount to about € 17.5 billion (the € 11 billion indirect costs and the € 6.5 billion direct costs together). Non-monetary costs are those due to disability or death caused by sport.

As mentioned above, these are conceptual estimates, which need to be further verified by studies[18].

Current studies on sports injuries, differentiated according to sport, are also scarce. According to Henke et al. (2000), football ranks first in the injury table in both organized, i.e. club-related, and non-organized sport - measured by the absolute number of sports injuries. In organized sport, handball and volleyball follow in 2nd and 3rd place, in non-organized sport alpine skiing and in-line skating. If the absolute number of sports injuries is compared to the number of sportsmen and women, a different ranking of sports according to the relative risk of injury is obtained. For example, the ball sports football, volleyball and handball have a similarly high relative risk of injury (Henke et al. 2000).

To date, negative psychological side-effects of playing sports have been largely unilluminated or quantified. E.g. Niedermeier et al. (2019) point out that excessive sports practice in particular can increase the risk of mental disorders such as eating disorders, substance abuse or sports addiction. Economic effects of this are either impossible or extremely difficult to assess.

Cycling, fitness and jogging contribute the most to physical activity

Activity and duration. Different sports contribute to different degrees to the fulfilment of WHO recommendations. Table 2 shows the most frequently practiced sports and the amount of weekly training in the last four weeks. The sports are sorted according to the proportion of the population over 16 years of age who exercise the sport at least once a year (cf. Repenning et al. 2019). According to this criterion, cycling and swimming are the most popular sports in the adult population. Other sports, such as many team sports, are practiced much less frequently by the

[17] For comparison: According to the umbrella organization of company health insurance funds, German employees were on sick leave for an average of 15.4 days in 2015 (Institut der deutschen Wirtschaft 2019).

[18] For comparison: For Austria, Alt et al. (2015) have calculated total costs resulting from movement injuries in the amount of approximately €0.4 billion on the basis of different calculation logics. Henke et al. (2000) put the economic costs due to sports injuries for Germany at about DM 8 billion (in 2000).

adult population and are not reported in the detailed analysis. However, they are included in the calculation of the fulfilment of endurance activity through sport.

Tab. 2: Detailed consideration of frequently practiced sports.

	Rank	Pop.-Share in total*	Of which percentage of people who have taken part in sport in the last four weeks	Number of sports units per week (without "0"), average values	Average duration per sports unit in minutes (without "0"), average values
Cycling	1	36%	56%	2,4	42
Swimming	2	36%	33%	0,8	56
Fitness	3	24%	67%	2,0	56
Running/Jogging	4	24%	60%	1,7	54
Hiking	5	24%	38%	1,4	75
Bowling	6	19%	23%	0,5	108
Gymnastics	7	15%	75%	1,6	33
Football	8	13%	38%	1,7	71
Health Sport	9	12%	67%	1,7	42
Dancing	11	10%	37%	1,1	82
Pilates, Yoga etc.	12	9%	64%	1,4	39
Nordic walking	14	8%	57%	1,8	47

Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).
The minimum number of cases for the detailed considerations is Nmin = 30, i.e. sports with a lower number of cases than Nmin = 30 in the sample in the relevant period "last four weeks" are not considered. The sports billiards and dancing (rank 10 and 13) were not practiced to a statistically sufficient extent during the survey period.
**At least once in 2017.*

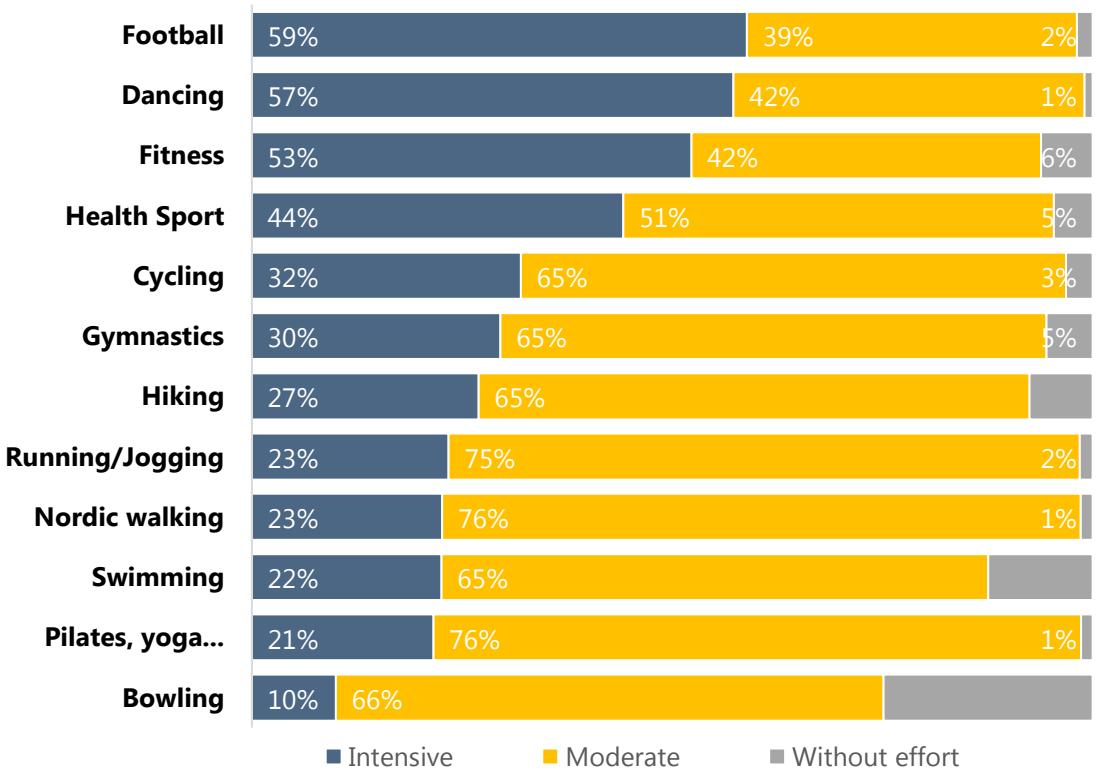
The proportion of the population that has taken part in the sport at least once a year does not correspond to the frequency of sports that have been practiced within the last four weeks. For example, only one third of the swimmers stated that they had also swum in the previous four weeks, while two thirds of the fitness enthusiasts practice this sport more regularly. In general, "fitness or health-related" sports such as Pilates, yoga, gymnastics or health sports are practiced on a regular basis.

The column "Number of sports units per week" gives further information about the regularity with which the sports are practiced. Cyclists cycle on average 2.4 times per week, while bowling is only done every two weeks on average (0.5 times per week). As a rule, the sports under consideration are practiced 1 to 2 times a week.

Relevant for the calculation of the critical endurance activity according to the WHO recommendations is also the number of minutes and the intensity spent per training or activity unit. As also shown in table 2, the average duration of a bowling unit is about 108 minutes and thus more than three times as much as an average gymnastics unit with 33 minutes. Yoga or Pilates and health sports as well as cycling are also at the lower end of the range of sports considered here, with about 40 minutes of activity per sports unit. For swimming, fitness and running an average of almost one hour is invested per sports unit.

Intensity. In addition to the results reported in Table 2, Figure 9 provides further necessary information regarding the contribution of the individual sports to the fulfilment of the WHO recommendations. It shows the proportion of intensive minutes, minutes with moderate physical exertion and minutes without physical exertion within a training unit.

Fig. 9: Distribution of intensities per sport.

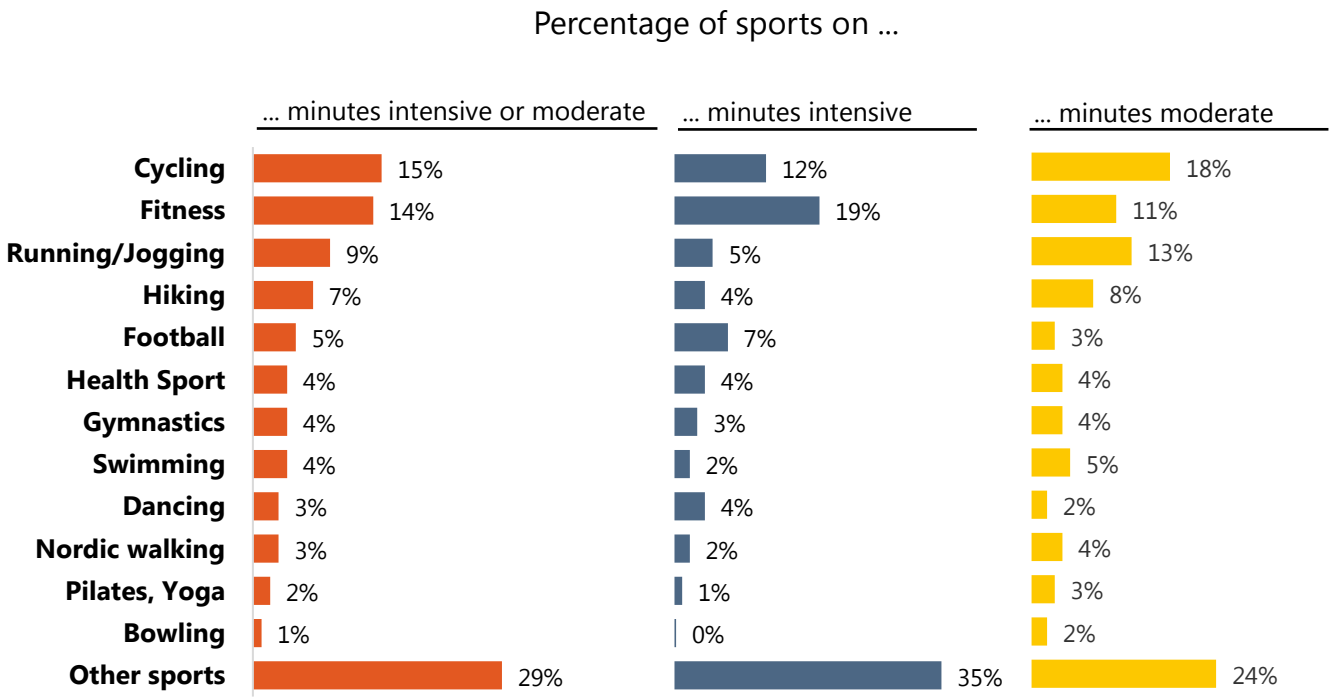


Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).).

In a comparison of the sports, football is the most intensive with 59% "intensive" minutes, followed by dancing (57%) and fitness (53%). Health sports (back training, fall prophylaxis, heart sports, lung sports) are also far ahead in this ranking. Bowling is the least intensive sport: 25% of training units are completed without effort, but 10% with intensive activity. Altogether, moderate minutes take up the largest share of the sport.

Contribution of sports to WHO recommendations. In the following, the contribution of the individual sports to the fulfilment of the WHO recommendations is finally determined by sport as a whole, i.e. what proportion of the sports currently contribute to the 34% of the population aged 16 and over who meet the WHO criteria through sport alone. The contribution of the individual types of sport to the fulfilment of the WHO criteria is also broken down into intensive and moderate physical activity. For each "column", the percentages indicated add up to 100%.

Fig. 10: Share of sports in all endurance-related minutes and separated according to intensive and moderate physical activity.



Source: Sports Satellite Account (SSA) of the Federal Ministry of Economics and Energy (BMWi) and the Federal Institute for Sports Science (BISp); calculations and presentation: 2HMforum.
German population 2017 (representative sample N=1,222, aged 16 and over).

Consequently, cycling and fitness currently make the greatest contribution to the endurance activity of the population. Cycling generates 15% of all moderate or intensive minutes, fitness 14%. The share of cycling can be traced back to the high basic share of athletes who practice the sport in general. Here, fitness benefits in particular from the regularity and intensity of the exercise. Remarkable: with running or jogging (9%) and hiking (7%) as well as cycling, three "outdoor sports"[19] are thus represented in the first four places. The sport of swimming is practiced by a large part of the population in principle, i.e. at least once a year, but too rarely to have a greater effect on endurance activity.

Overall, Figure 10 also illustrates the diverse character of the sports landscape in Germany: A total of 59 further sports are grouped together under "Other sports". These account for a total of 29% of the endurance-relevant activity minutes according to WHO recommendations.

The fulfilment of the WHO recommendations on the extent of muscular strength activities was not considered. The time spent on these activities as part of sports practice was not recorded for the sports satellite account. However, it can be assumed that certain sports are of particular importance for this and that everyday activities can only be used to a very limited extent to strengthen muscles. There is also a shift with regard to the types of sport: many of the sports frequently practiced are moderately practiced endurance sports which do not initially involve targeted muscle strengthening and therefore make only a small contribution. Thus, the list of

[19] On the importance of outdoor sports as an economic factor, see also Repenning et al. 2017.

top sports can provide an indication that the criteria for muscle strengthening through sport are fulfilled to a lesser extent than the criteria for endurance activity.

Positioning and discussion

The aim of this paper is to examine the role of sport in meeting WHO criteria for physical activity. It is shown that sport makes an important contribution to meeting the WHO criteria for physical activity. However, this finding is not new in itself, but is generally accepted as a consensus. Sport without physical activity is usually not possible either.

What is new, on the other hand, is the extent to which this has now been empirically proven: Sufficient weekly sport-related endurance activity is performed by 34% of the adult population. This means that a high proportion of the total number of hours spent on physical activity in leisure time is spent doing sports. Furthermore, it should be mentioned that these 34% already fulfils the WHO recommendations through sport alone. A further 11% achieves the WHO recommendations (also) through other endurance activities, although sport also makes a contribution (which cannot be quantified here). It can be assumed, however, that the 34% is rather the lower limit for the contribution of sport.

There are sometimes considerable differences between age groups and when socio-economic characteristics are considered. "Sport for all", also with regard to the health aspect of sport, remains an unfulfilled wish at present.

The current trend currently seems to be towards greater inactivity (European Commission 2018). With a view to the future and demographic change, the economic cost burden of physical inactivity could also rise, thus increasing the need for more exercise - the Centre for Economics and Business Research assumes that annual costs of over €125 billion[20] could be incurred across Europe in 2030 (Cebr 2015).

Measures that would bring only one fifth of currently inactive Europeans up to the recommended level of regular activity would already save up to €16 billion - and some 100,000 deaths associated with inactivity could be avoided across the EU. The savings potential for Germany is estimated at about € 2.9 billion (Cebr 2015).

The goal can, therefore, only be to remove barriers to access to sport and to encourage as high a proportion of the population as possible to engage in sufficient physical activity. Accordingly, the WHO, for example, has identified guiding principles and fields of action to fulfil the following mandate:

- promote physical activity and reduce sedentary work,
- create conditions conducive to physical activity, through an attractive and safe environment,
- areas accessible to the public and appropriate infrastructure,
- provide equal opportunities for physical activity regardless of gender, age, income, education, ethnicity or disability,
- facilitate movement and remove existing barriers (WHO 2015b).

[20] in prices of 2012

The German government is implementing this, for example, within the framework of the "National Action Plan" "IN FORM - Germany's Initiative for Healthy Food and More Physical Activity" in cooperation with the DOSB (www.in-form.de). In order to bring about a change in physical activity patterns in Germany, it could also make sense to further strengthen the preventive approach in the health care system and, for example, to make it more broadly based in the health objectives "sport and exercise".

It is interesting to note that recommendations and support programs predominantly include to increase physical activity in everyday life, but rarely the recommendation to engage in sport. This is probably due to the partly negative effects of sport on health. However, as the present report shows, the implementation of recommendations without sport is currently low and it is unlikely that it will make sense to forego the potential of sport for health maintenance in the future. Sport should therefore be given a much higher priority in promoting exercise and avoiding inactivity. To this end, research considers it necessary that sport also pursues health objectives more explicitly and specifically reduces harmful behavior (Edwards & Rowe 2019). In line with WHO recommendations, the greater integration of muscle strengthening activities in the context of endurance sports can contribute to this.

Organized, non-profit sports are also increasingly seeing themselves as providers of preventive and rehabilitation sports. Nationwide, there are about 15,000 prevention courses with the quality seal SPORT PRO GESUNDHEIT[21] and of currently about 115,000 rehabilitation sport groups, about 90,000 originate from non-profit sports. 34% of the approximately 90,000 sports clubs in Germany offer programs for health promotion, prevention and rehabilitation (Breuer 2015). The market share of sports clubs in the health sector (prevention and/or rehabilitation programs) is estimated at approx. 20% (Breuer 2013)[22].

The final answer to the economic question also depends on a stronger orientation of sport towards health objectives: What - purely from an economic perspective - weighs more heavily: the cost savings resulting from the positive effects of sport on well-being and health or the costs caused by sport (direct and indirect costs taken together)? Even if this question still requires in-depth investigation, existing studies report predominantly positive balances, e.g. Alt et al. (2015) for Austria. The Robert Koch Institute also comes to the conclusion that it is generally undisputed that "more physical activity results in less health expenditure" (RKI 2005).

[21] Courses deposited as eligible for subsidies by the health insurance funds via the Zentrale Prüfstelle Prävention.

[22] In addition, there are currently about 40,000 training licenses for Trainer B "Sport in Prevention" and about 41,000 licenses for Trainer B "Sport in Rehabilitation" (out of a current total of over 580,000 valid DOSB licenses). DOSB member organizations also offer numerous further training courses in areas such as fall prevention, exercise in old age, child and youth health, etc.

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List of the 71 sports of the Sports Satellite Account (SSA)

(according to the Institute of Sports Science at the University of Mainz; Preuß, Alfs & Ahlert 2012). Own illustration.

Sports (alphabetical)	
American football	Football
Archery	Gliding/ Motor flying (Aviation sports)
Athletics	Golf
Badminton	Gymnastics/Aerobic *(German: Gymnastik)*
Ballet	Gymnastics *(German: Turnen)*
Baseball/ Softball/Cricket	Handball
Basketball	Health sports (back training, fall prevention, heart sports, lung sports)
Beach Volleyball	Hiking
Biathlon	Hockey
Billiards	Ice Hockey
Bobsleighing/ Sledding (luge, skeleton)	Ice skating (figure skating, speed skating, ...)
Bodybuilding	Inline skating (speed skating)
Bowling/ Skittles	Lawn power sports
Boxing	Martial arts (Aikido, Karate, Judo, Ju Jutsu, Taekwondo, Kickboxing, ...)
Canoeing/ Kayaking	Minigolf
Chess	Modern pentathlon
Climbing/ Bouldering	Motor sports (automobile, motorcycle, kart, ...)
Curling	Mountaineering
Cycling (BMX, road bike, mountain bike, artistic cycling, bicycle ball, bicycle polo, unicycle hockey, ...)	Nordic walking
Dancing	Paragliding/ Hang gliding
Diving	Pilates/Qi Gong/Tai Chi/Yoga
Fencing	Riding (vaulting, dressage, military, show jumping, ...)
Fitness (gym - courses, equipment, ...)	Roller skating (roller hockey)

Rowing	Squash
Rugby	Windsurfing/ Surfing
Running (Jogging)	Swimming (including DLRG – German Lifeguard Association, synchronized swimming)
Sailing	Table tennis
Shooting	Tennis
Skateboarding	Triathlon
Skiing (Alpine, Nordic, Cross-country, ...)	Ultimate Frisbee
Skydiving	Volleyball/ Fistball
Snowboarding	Water jumping
Sport acrobatics	Water polo
Sport boating	Water ski/ Wakeboarding
Sport fishing	Weightlifting
Wrestling	

Published in the context of the sport satellite account to date:

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