

English version of "Körperliche Aktivität. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)" Bundesgesundheitsbl 2013 · 56:765–771 DOI 10.1007/s00103-012-1661-6 © Springer-Verlag Berlin Heidelberg 2013

S. Krug · S. Jordan · G.B.M. Mensink · S. Müters · J. Finger · T. Lampert

Department of Epidemiology and Health Monitoring, Robert Koch Institute, Berlin

Physical activity

Results of the German Health Interview and Examination Survey for Adults (DEGS1)

Background and purpose

Regular physical activity is important for physical and mental health [1, 2, 3, 4, 5, 6, 7, 8, 9]. A physically active lifestyle can, on the one hand, contribute to a reduction in the risk of cardiovascular diseases, overweight and musculoskeletal health problems and thereby reduce the probability of premature mortality [10]. On the other hand, regular physical activity enhances physical well-being and development of personal resources and social contacts, and it supports maintenance or improvement of one's physical fitness. A good fitness level enhances the quality of life at any age and is a basic requirement for the mobility and independence in everyday life of elderly persons.

The integration of physical activity in everyday life is opposed by an increasingly sedentary lifestyle both at work and during leisure time. Physical inactivity is recognised by the World Health Organisation (WHO) as the fourth most important mortality risk factor and is associated with the occurrence of non-communicable diseases [11, 12]. In order to avoid physical inactivity and the associated health risks, the limited opportunities for physical activity in everyday life have to be compensated by planned physical or sport activity. For these reasons, physical activity is acknowledged as a preventive measure and the promotion of physical activity as a central public health task [13]. The WHO recommends adults spend at least 2.5 h/week on moderate physical activity. In case of vigorous activity, the recommended time is 75 min

[11]. The time of activity should be sustained for at least 10 min without breaks.

With the first wave of the "German Health Interview and Examination Survey for Adults" (DEGS1) completed, results on self-reported physical activity are now available and can be compared with those of the "German National Health Interview and Examination Survey 1998 (GNHIES98)". This contribution presents the proportion of adults who pay considerable attention to adequate physical activity and those whose physical activity level meets the WHO recommendations. In addition, the proportion of persons engaged in sports is presented and compared with the results of GNHIES98. For all results, sex and age differences as well as differences in socioeconomic status are considered.

Methods

DEGS1 is part of the health monitoring system at the Robert Koch Institute (RKI). The concept and design of DEGS are described in detail elsewhere [14, 15, 16, 17, 18]. The first wave (DEGS1) of the survey was conducted from 2008 to 2011 and comprised interviews, examinations and tests [19, 20]. The target population comprises residents of Germany aged 18–79 years. DEGS1 has a mixed design that permits both cross-sectional and longitudinal analyses. For this purpose, a random sample from local population registries was drawn to complete the participants of GNHIES98 who re-participated. A total of 8,152 persons participated, including 4,193 first-time participants (response rate 42%) and 3,959 revisiting

participants of GNHIES98 (response rate 62%). In all, 7,238 persons attended one of the 180 examination centres, and 914 were interviewed only. The net sample (n=7,988, including 7,116 in study centres) facilitates representative cross-sectional and time trend analyses for the age range of 18–79 years in comparison with GNHIES98 [18]. The data of the revisiting participants are suitable for longitudinal analyses. Information on physical activity was collected with a self-administered questionnaire.

Definition of variables

Paying attention to adequate physical activity

The adult participants were asked: "Overall, to what extent do you pay attention to adequate physical activity?" For the analysis, the categories "very strong" and "strong" (in the following: "much") as well as "low" and "not at all" (in the following: "little") of the five-point scale were summarised and the category "partly" was retained.

Physical activity and sports

According to the definition of Caspersen et al. [21], the questions on activity behaviour differentiated between physical activity and sports, although the terms were not explicitly defined in the questionnaire: Whereas both physical and sports activities comprise movement caused by the musculoskeletal system, sports only includes physical activities that are planned, structured and repetitive and that aim to

Tab. 1 “Do you pay attention to adequate physical activity?”—Frequencies according to sex and age groups in percent (95% confidence interval)

Sex	Category	Age in years						Total
		18–29	30–39	40–49	50–59	60–69	70–79	
Women	Low (little/not at all)	29.7 (25.2–34.6)	32.5 (27.3–38.1)	24.7 (21.3–28.5)	25.8 (22.0–30.1)	14.3 (11.3–18.1)	17.0 (13.5–21.2)	24.5 (22.7–26.3)
	Partly	42.6 (38.1–47.2)	41.8 (36.8–46.9)	45.2 (40.8–49.7)	40.8 (37.1–44.7)	44.7 (40.5–49.1)	41.2 (36.8–45.7)	42.8 (40.9–44.8)
	Much (strong/very strong)	27.7 (23.9–32.0)	25.8 (21.4–30.6)	30.1 (26.5–33.9)	33.3 (29.4–37.5)	40.9 (36.7–45.3)	41.8 (36.8–47.0)	32.7 (30.9–34.6)
Men	Low (little/not at all)	20.1 (16.6–24.1)	31.0 (26.3–36.2)	31.3 (26.9–35.9)	22.3 (18.9–26.0)	17.5 (14.0–21.6)	11.7 (8.6–15.6)	23.3 (21.5–25.1)
	Partly	39.9 (34.7–45.2)	37.4 (32.2–42.9)	38.4 (34.3–42.7)	44.6 (40.5–48.7)	37.7 (32.7–43.1)	36.0 (30.9–41.5)	39.4 (37.2–41.5)
	Much (strong/very strong)	40.1 (34.8–45.6)	31.6 (26.6–37.0)	30.3 (26.4–34.5)	33.1 (29.1–37.3)	44.8 (39.7–50.1)	52.3 (46.6–57.9)	37.4 (35.4–39.4)
Total	Low (little/not at all)	24.8 (21.8–28.0)	31.7 (28.0–35.7)	28.0 (25.2–31.1)	24.1 (21.4–27.0)	15.9 (13.5–18.5)	14.6 (12.3–17.3)	23.9 (22.6–25.3)
	Partly	41.2 (37.7–44.8)	39.6 (35.9–43.4)	41.8 (38.7–44.9)	42.7 (39.9–45.6)	41.3 (37.8–44.9)	38.9 (35.4–42.5)	41.1 (39.6–42.6)
	Much (strong/very strong)	34.1 (30.5–37.8)	28.7 (25.2–32.4)	30.2 (27.4–33.1)	33.2 (30.4–36.2)	42.8 (39.3–46.4)	46.5 (42.5–50.6)	35.0 (33.7–36.4)

n_{unweighted}=7,758

increase physical performance. The questions on physical and sports activity referred to the last 3 months.

Considering physical activity, the participants were asked: “On how many days a week are you physically active in a way that you start to sweat or get out of breath? An average week is meant.” Active participants were further asked: “And how long are you physically active on average on the days when you start to sweat or get out of breath due to your physical activity?” The question could be answered with the options: “less than 10”, “10 to less than 30”, “30 to less than 60” or with “more than 60” min. The phrase “start to sweat or get out of breath” was added according to the recommendations of the US American Centers for Disease Control and Prevention (CDC) [22], to illustrate to the participants the recommended daily moderate intense activities that are associated with an increase in heart rate or breathing frequency. From the questions on frequency and duration, it is possible to approximately estimate the proportion of those who fulfil the WHO recommendation of 2.5 h/week. For this purpose, the average of the range in the answer categories was used for the duration, and the upper category was conservatively appointed to 60 min.

In addition, participants were asked: “How often do you participate in sports?” For the analyses, the categories of the five-point scale referring to 1 week “less than 1 h” and “regularly 1–2 h” (in the following: “up to 2 h”) as well as “regularly up to 4 h” and “regularly more than 4 h” (in the following: “regularly at least 2 h”) were summarised. The category “no sports activities” was retained. In the comparison of the DEGS1 results with those of GNHIES98, the change in age structure over the last 10 years was taken into account by also standardising the frequencies from GNHIES98 to the age structure of the population on 31 December 2012.

Statistical analysis

The analyses refer to the sample of 18–79-year-old adults (n=7,988) who completed the questionnaire [18]. The analyses were performed separately for sex, age and socioeconomic status groups. Six age groups were defined: 18–29, 30–39, 40–49, 50–59, 60–69 and 70–79 years. Socioeconomic status was determined using an index that includes information on school education and vocational training, professional status and net household income (weight-

ed by household needs) and that enables a classification into low-, middle- and high-status groups [23]. The cross-sectional and trend analyses were conducted with a weighting factor that corrects deviations in the sample from the population structure (of 31 December 2010) with regard to age, sex, region and nationality as well as community type and education [18]. For the examination part, a separate weighting factor was prepared. Calculation of the weighting factor also considered the re-participation probability of the GNHIES98 participants, based on a logistic regression model. For the purpose of conducting trend analyses, the data from GNHIES98 were age-adjusted to the population structure of 31 December 2010. A non-response analysis and a comparison of selected indicators with data from census statistics indicate a high level of representativity of the net sample for the residential population of Germany aged 18–79 years [18]

To take into account both the weighting and correlation of the participants within a community, the confidence intervals (CI) were determined with the SPSS-20 procedure for complex samples. Differences were regarded to be statistically significant if the respective 95% confidence intervals did not overlap.

Results

Paying attention to adequate physical activity

According to the information provided by the 18–79-year-old participants, 37.4% of men and 32.7% of women pay much attention to adequate physical activity, while 23.3% of men and 24.5% of women report paying little attention to adequate physical activity (see [Tab. 1](#)). Fewer men between 30 and 59 years of age pay attention to adequate physical activity than men between 18 and 29 years and men aged 60 years and older. A significantly larger proportion of women between 60 and 79 years report paying much attention to adequate physical activity compared to women between 18 and 40 years. In addition, a significantly higher proportion of men and women with a high socioeconomic status pay much attention to adequate physical activity than men and women with a low or middle socioeconomic status (see [Tab. 2](#)).

Physical activity

The results showed that 74.6% of men and 84.5% of women are physically active for less than 2.5 h/week. However, 25.4% of men and 15.5% of women are physically active for at least 2.5 h/week in a way that they start to sweat or get out of breath (see [Tab. 3](#)). This means that significantly more men than women meet the activity level recommended by the WHO. Whereas there are no significant age group differences among women, significantly more men aged 18–29 years (a proportion of 41.3%) meet the WHO recommendation compared to men in older age groups. The proportion of individuals meeting the WHO recommendations among older men tends to be lower than among younger men. There are no significant differences regarding socioeconomic status (see [Tab. 2](#)).

Sports activity

In all, 33.0% of men and 34.3% of women are not engaged in sports (see [Tab. 4](#)). The proportion of those who do not engage in sports tends to be higher among

Bundesgesundheitsbl 2013 · DOI 10.1007/s00103-012-1661-6
© Springer-Verlag Berlin Heidelberg 2013

S. Krug · S. Jordan · G.B.M. Mensink · S. Müters · J. Finger · T. Lampert

Physical activity. Results of the German Health Interview and Examination Survey for Adults (DEGS1)

Abstract

Regular physical activity can have a positive effect on health at any age. Today's lifestyles, however, can often be characterised as sedentary. Therefore, the promotion of physical activity and sports has become an integral part of public health measures. The representative data of adults aged 18 to 79 years in Germany obtained from the "German Health Interview and Examination Survey for Adults" (DEGS1) provide an overview of self-estimated current physical activity behaviour. The results show that one third of the adult population claims to pay close attention to reaching a sufficient level of physical activity and one fourth participates in sports for at least 2 h/week on a regular basis. Thus, the per-

centage of adults regularly engaged in sports has increased compared to the previous "German National Health Interview and Examination Survey 1998". Still, four out of five adults do not achieve at least 2.5 h/week of moderate-intensity physical activity as recommended by the World Health Organisation. Consequently, future individual-level and population-level interventions should focus on target group-specific measures while continuing to promote regular physical activity in all segments of the population.

Keywords

Health survey · Adults · Physical activity · Sports behaviour · Germany

Körperliche Aktivität. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1)

Zusammenfassung

Regelmäßige körperliche Aktivität kann in jedem Alter einen positiven Einfluss auf Gesundheit und Wohlbefinden haben. Allerdings ist das heutige Alltagsleben oft durch körperliche Inaktivität geprägt. Sport- und Bewegungsförderung sind daher fester Bestandteil von Public-Health-Maßnahmen. Die für die 18- bis 79-jährige Bevölkerung in Deutschland repräsentativen Daten der „Studie zur Gesundheit Erwachsener in Deutschland“ (DEGS1) ermöglichen einen Überblick des selbsteingeschätzten aktuellen körperlichen Aktivitätsverhaltens. Nach den Ergebnissen von DEGS1 achtet etwa ein Drittel der Erwachsenen auf ausreichende körperliche Aktivität, und etwa ein Viertel treibt regelmäßig mindestens 2 h pro Woche Sport. Damit hat die sportliche Aktivität im Vergleich zum diesbezüglichen Umfang, der

vor etwa 10 Jahren im Bundes-Gesundheits-survey 1998 (BGS98) ermittelt wurde, zugenommen. Die von der Weltgesundheitsorganisation (WHO) für einen gesundheitlichen Nutzen empfohlene Mindestaktivitätszeit von 2,5 h pro Woche in mäßig anstrengender Intensität ist allerdings bei etwa vier Fünfteln der Bevölkerung nicht gegeben. Das Ziel sollte daher weiterhin sein, zielgruppenspezifische verhaltens- und verhältnispräventive Maßnahmen anzubieten und die Bevölkerung bei der Einbindung regelmäßiger körperlicher Aktivität in ihren Alltag zu unterstützen.

Schlüsselwörter

Gesundheitssurvey · Erwachsene · Körperliche Aktivität · Sportliche Aktivität · Deutschland

older than younger persons. However, 29.3% of men and 21.6% of women engage in sports regularly for at least 2 h/week. Significantly more men aged 18–29 years engage in sports to this extent than older men, and women aged 18–29 years are significantly more active than women aged 30–39 years and 70–79 years. Women aged between 40 and 69 years tend to engage more often in sports regularly at least 2 h/week than women aged 30–39 years. Conversely, for men these pro-

portions tend to decrease further according to the age group, from 30–39 years up to the age group of 50–59 years. In addition, men and women with a high socioeconomic status are significantly more often active in sports to this extent than men and women with a middle or low socioeconomic status (see [Tab. 2](#)).

Whereas in GNHIES98, 22.6% of men and 15.1% of women reported to be engaged in sports regularly for at least 2 h/week, the figures for DEGS1 were 29.3%

Tab. 2 "Paying attention to adequate physical activity and physical and sports activity"—Frequencies according to socioeconomic status in percent (95% confidence interval)

Variable	Sex	Category	Socioeconomic status		
			Low	Middle	High
Paying attention to adequate physical activity <i>n</i> _{unweighted} =7,721	Women	Low (little/not at all)	30.9 (26.8–35.3)	24.5 (22.3–26.8)	16.9 (14.0–20.2)
		Partly	42.7 (38.7–46.8)	43.5 (41.2–46.0)	40.4 (36.3–44.5)
		Much (strong/very strong)	26.4 (23.0–30.1)	32.0 (29.8–34.2)	42.7 (38.6–47.0)
	Men	Low (little/not at all)	26.9 (22.4–31.9)	23.9 (21.6–26.5)	18.7 (16.1–21.7)
		Partly	39.0 (33.6–44.8)	40.9 (38.1–43.7)	35.7 (32.4–39.3)
		Much (strong/very strong)	34.1 (28.9–39.7)	35.2 (32.7–37.7)	45.5 (41.9–49.2)
Physical activity <i>n</i> _{unweighted} =7,638	Women	Less than 2.5 h/week	85.1 (81.1–88.4)	84.4 (82.6–86.1)	83.6 (80.2–86.4)
		At least 2.5 h/week	14.9 (11.6–18.9)	15.6 (13.9–17.4)	16.4 (13.6–19.8)
	Men	Less than 2.5 h/week	74.2 (69.4–78.5)	73.9 (71.1–76.4)	76.6 (72.7–80.0)
		At least 2.5 h/week	25.8 (21.5–30.6)	26.1 (23.6–28.9)	23.4 (20.0–27.3)
Sports activity <i>n</i> _{unweighted} =7,704	Women	No sports activity	48.9 (44.6–53.2)	34.0 (31.6–36.5)	18.9 (15.9–22.3)
		Up to 2 h/week	34.8 (31.1–38.6)	46.1 (43.7–48.5)	47.4 (43.2–51.6)
		regularly at least 2 h/week	16.3 (13.1–20.2)	19.9 (18.0–21.9)	33.7 (29.8–37.9)
	Men	No sports activity	51.3 (46.2–56.3)	32.8 (30.2–35.5)	19.0 (16.2–22.3)
		Up to 2 h/week	26.7 (22.5–31.4)	39.6 (36.9–42.4)	41.7 (37.8–45.8)
		Regularly at least 2 h/week	22.0 (18.1–26.4)	27.6 (25.2–30.2)	39.2 (35.5–43.1)

Tab. 3 "Physical activity"—Frequencies according to sex and age groups in percent (95% confidence interval)

Sex	Category	Age in years						Total
		18–29	30–39	40–49	50–59	60–69	70–79	
Women	Less than 2.5 h/week	81.6 (77.4–85.1)	87.7 (84.1–90.5)	83.0 (80.1–85.5)	84.5 (81.1–87.4)	83.2 (79.4–86.4)	89.0 (85.0–92.0)	84.5 (83.2–85.7)
	At least 2.5 h/week	18.4 (14.9–22.6)	12.3 (9.5–15.9)	17.0 (14.5–19.9)	15.5 (12.6–18.9)	16.8 (13.6–20.6)	11.0 (8.0–15.0)	15.5 (14.3–16.8)
Men	Less than 2.5 h/week	58.7 (53.5–63.7)	73.0 (67.4–77.9)	77.3 (73.2–81.0)	79.5 (75.9–82.7)	80.7 (76.3–84.4)	83.5 (79.4–87.0)	74.6 (72.5–76.6)
	At least 2.5 h/week	41.3 (36.3–46.5)	27.0 (22.1–32.6)	22.7 (19.0–26.8)	20.5 (17.3–24.1)	19.3 (15.6–23.7)	16.5 (13.0–20.6)	25.4 (23.4–27.5)
Total	Less than 2.5 h/week	69.8 (66.3–73.1)	80.4 (76.8–83.6)	80.1 (77.8–82.2)	82.0 (79.5–84.2)	82.0 (79.0–84.6)	86.4 (83.5–89.0)	79.6 (78.2–80.8)
	At least 2.5 h/week	30.2 (26.9–33.7)	19.6 (16.4–23.2)	19.9 (17.8–22.2)	18.0 (15.8–20.5)	18.0 (15.4–21.0)	13.6 (11.0–16.5)	20.4 (19.2–21.8)

*n*_{unweighted}=7,671

of men and 21.6% of women. This means that currently significantly more men (+6.7 percentage points) and women (+6.5 percentage points) regularly do sports activities for at least 2 h/week than about 10 years ago (see [Fig. 1](#)). These differences are particularly attributable to older age groups and especially to women. In the age group of 60–69 years, the proportion of persons who actively engage in sports increased for women (+12.6 percentage points) more clearly than for men (+7.7 percentage points) between GNHIES98 and DEGS1.

In GNHIES98, 46.9% (95% CI: 44.4–49.4) of men and 52.1% (95% CI: 49.5–54.7) of women reported to be inactive

in sports. In DEGS1, these figures were 33.0% of men and 34.3% of women (see [Tab. 4](#)). This means that the proportion of men (–13.9 percentage points) and women (–17.8 percentage points) who do not engage in sports has decreased significantly.

Discussion

An increase in personal physical activity is achieved, on the basis of the trans-theoretical model [24, 25], in a long-term multiple-stage process. According to this model, it is to be assumed that persons who report paying much attention to adequate physical activity are at least in

the phase of developing the intention to change their physical activity. The DEGS1 results show that slightly more than one third of men and women report paying much attention to adequate physical activity. The proportion is higher in the older than in the younger age groups. This may be attributable to a growing health awareness with advanced age, which is facilitated by the increased number of health-oriented sports and physical activity opportunities for the elderly [26]. A high socioeconomic status is also associated with paying more attention to adequate physical activity. This result may reflect a higher degree of awareness of a person's health behaviour or a high-

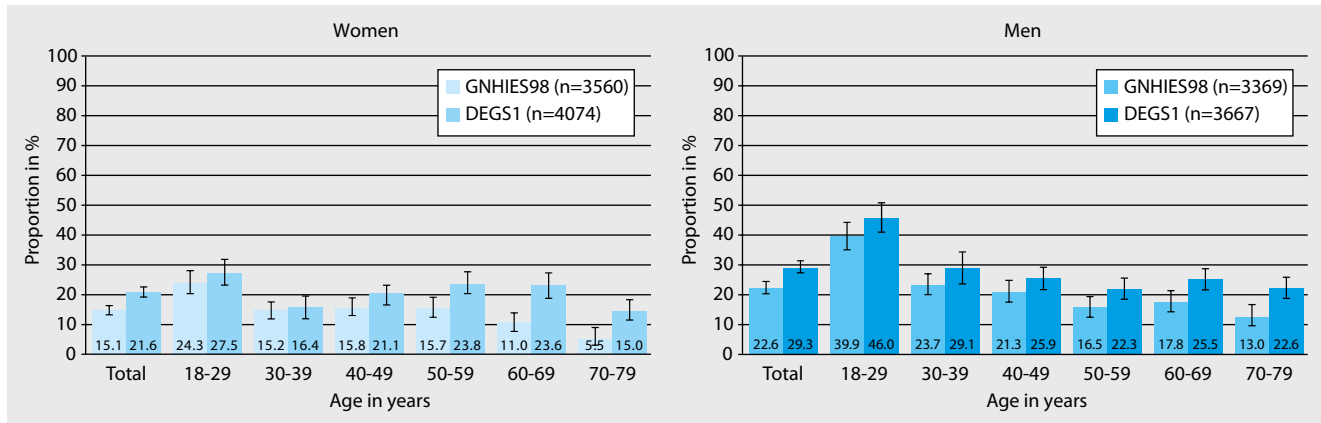


Fig. 1 ▲ Proportion of persons engaged in sports activities regularly for at least 2 h/week; comparison between GNHIES98 ($n_{\text{unweighted}}=6,929$) and DEGS1 ($n_{\text{unweighted}}=7,741$) in percent (95% confidence interval), differentiated by age groups for women and men

er socially desirable response behaviour among persons with a high socioeconomic status compared to those with middle or low socioeconomic status.

To meet the current WHO recommendation, physical activities must often be integrated into a person's leisure time. This requires, besides activity-stimulating environments and structures, a certain health awareness and willingness to change one's behaviour and hence a motivation for physical activity. A quarter of men and a fifth of women seem to succeed in meeting the WHO recommendations. Conversely, this means that about three quarters of men and fourth fifths of women are not adequately active in accordance with the WHO recommendation.

Although older people and persons with a high socioeconomic status report more often that they pay much attention to adequate physical activity, the proportion of those who meet the physical activity recommendation of the WHO is not higher than among younger individuals (aged 30 years or older) or persons with low or middle socioeconomic status. Persons with middle or low socioeconomic status less often pay much attention to adequate physical activity and are less often engaged in sports than persons with high socioeconomic status. However, they meet the WHO recommendation as often as those with a high socioeconomic status do. The results of recent studies [27, 28] indicate that persons with low socioeconomic status more often partake in strenuous physical activities, whereas persons

with middle or high socioeconomic status more often have sedentary jobs. During leisure time, this trend is inverted and individuals with middle or high socioeconomic status are physically more active than those of low socioeconomic status. Overall, physical activities at work and during leisure time seem to counterbalance each other.

When interpreting the results it should be considered that meeting the WHO recommendation can only be approximately estimated on the basis of the questions asked in DEGS1. On the one hand, for the construction of variables, average values or conservative estimates of the ranges of answer categories had to be used. On the other hand, with the available data, persons who engage in vigorous activities for 75 min/week—thereby also meeting the WHO recommendation—cannot be taken into account, nor can the requirement that activities must be sustained for at least 10 min. These aspects could not be accounted for during the development of the DEGS1 questionnaire, since the WHO recommendation was updated and published in 2010, after the start of the data collection period.

About a quarter of men and women in Germany engage in sports regularly for at least 2 h/week. There is a positive association between young age and high sports activity. Compared to about 10 years ago, there has been a significant increase in sports activities, especially in the age groups above 60 years. On the one hand, this positive trend suggests increased

health awareness in this age group. On the other hand, it shows that the expansion of sports opportunities (such as cardiovascular, rehabilitation sport, walking groups), launched especially for the elderly in the context of demographic changes in recent years, finds approval. The clearly increased proportion of elderly women in comparison to elderly men suggests that the health-promoting sports programmes are more appealing to women than to men [29, 30]. However, besides the demographic change and the increased awareness of the importance of sport activities for health, especially among older persons [31], the observed trend can also be attributed to the comparison of generations with differing sports socialisation [32].

By definition, sports activities constitute a special aspect of physical activity [21]. In the presented results, the proportion of those who are actively involved in sports (regularly for at least 2 h/week) could nevertheless be higher than the proportion of those who engage in general physical activities (at least 2.5 h/week), because the question on physical activity included the required intensity by the addition of "start to sweat or get out of breath". By contrast, sports activities do not necessarily have to cause sweating or shortness of breath according to the questions asked in DEGS1 (for instance, older persons at rehabilitation sports). Moreover, when interpreting the results, it must be taken into account that the increase in sports activity shown over the

Tab. 4 "Sports activity"—Frequencies categorised by sex and age groups in percent (95% confidence interval)

Sex	Category	Age in years						Total
		18–29	30–39	40–49	50–59	60–69	70–79	
Women	No sports activity	25.7 (21.7–30.0)	39.7 (34.3–45.4)	33.3 (29.0–37.8)	32.7 (28.6–37.1)	34.0 (29.6–38.6)	44.9 (40.0–49.8)	34.3 (32.4–36.4)
	Up to 2 h/week	46.9 (42.1–51.7)	43.8 (38.5–49.4)	45.6 (41.3–50.0)	43.5 (39.6–47.6)	42.4 (38.0–46.9)	40.1 (35.8–44.6)	44.0 (42.1–46.0)
	Regularly at least 2 h/week	27.5 (23.4–32.0)	16.4 (13.0–20.6)	21.1 (18.0–24.6)	23.8 (20.3–27.6)	23.6 (19.6–28.1)	15.0 (11.9–18.7)	21.6 (20.0–23.4)
Men	No sports activity	17.6 (14.1–21.8)	28.0 (23.5–32.9)	36.6 (32.1–41.2)	38.6 (34.6–42.8)	38.5 (33.7–43.4)	44.4 (38.9–50.0)	33.0 (30.9–35.2)
	Up to 2 h/week	36.4 (31.9–41.2)	43.0 (37.1–49.1)	37.6 (33.3–42.0)	39.1 (35.1–43.2)	36.0 (32.1–40.1)	33.0 (28.2–38.3)	37.7 (35.6–39.9)
	Regularly at least 2 h/week	46.0 (41.1–50.9)	29.1 (24.0–34.7)	25.9 (22.3–29.8)	22.3 (18.9–26.0)	25.5 (21.2–30.4)	22.6 (18.2–27.6)	29.3 (27.3–31.3)
Total	No sports activity	21.5 (18.8–24.6)	33.9 (30.1–37.8)	34.9 (31.8–38.2)	35.7 (32.9–38.6)	36.2 (32.9–39.6)	44.7 (41.1–48.3)	33.7 (32.2–35.2)
	Up to 2 h/week	41.4 (38.6–44.5)	43.4 (39.3–47.6)	41.5 (38.5–44.6)	41.3 (38.5–44.2)	39.3 (36.2–42.5)	37.0 (33.8–40.2)	40.9 (39.5–42.3)
	Regularly at least 2 h/week	36.9 (33.6–40.5)	22.7 (19.4–26.4)	23.5 (21.1–26.1)	23.0 (20.4–25.8)	24.5 (21.5–27.9)	18.4 (15.6–21.5)	25.4 (24.0–26.9)

n_{unweighted}=7,741

last few years may not necessarily compensate the further decrease in everyday activities.

Since no comparable representative examination surveys on physical activity are available for the adult German population, the DEGS1 results were compared with the "German Health Update" surveys of 2009 and 2010 (GEDA09, GEDA10).

Although both the DEGS1 results as well as the GEDA09 and GEDA10 studies show an increase in the proportion of sports activity [27, 33, 34] compared to earlier assessments, the results differ in the proportions of men and women actively engaged in sports. Whereas about two fifths of men and women in GEDA09 and GEDA10 report taking part in at least 2 h of sports per week, only one fourth of men and women report this in DEGS1. This direct comparison of the results from GEDA and DEGS is complicated, however, owing to methodical differences. Whereas DEGS is designed as a follow-up study of GNHIES98 in which self-administered questionnaires are combined with examination parameters, GEDA was conducted as a telephone interview. Besides different sample drawing and sample sizes, methodological differences in the question and answer categories result from the concept of the different studies to preserve comparability over

time. The visibility and ascending order of the answer categories as well as the limitation to a 3-month period in DEGS1 questions on physical activity and sports, as with the exclusive consideration of regular sports activities, are possible reasons for the lower proportions seen in DEGS1 compared to GEDA09 and GEDA10. In addition, by engaging interviewers in the GEDA studies, higher proportions of social desirable answers may be expected. Moreover, it may be that there are differences in the willingness to participate in the time-consuming examination surveys and telephone interviews between those who are active and inactive in sports.

Overall, when interpreting the results it must be considered that self-reports on activity behaviour are generally subject to a certain degree of imprecision as a result of recall difficulties. Moreover, because of social desirability bias, such assessments tend to overestimate the activity behaviour in the population [35, 36]. Since physical activity and fitness have become increasingly important in recent years, the social desirability of responses must be considered even more seriously than in the past. A particular difficulty is the clear assignment of physical and sports activity. Since these terms cannot be explained comprehensively in the questionnaire owing to time

and space limits, their interpretation, as well as the estimation of the intensity of physical activity, remains a subjective judgement.

Outlook

In addition to subjective information on physical activity and sports behaviour, DEGS1 also provides objective measurements of the physical fitness level of a representative sample of adults in Germany [37, 38]. This means that further analyses can compare subjective and objective parameters. Moreover, DEGS1 includes a broad spectrum of physical and mental health parameters that can be analysed in the context of physical activity behaviour.

Corresponding address

S. Krug
Department of Epidemiology and Health Monitoring, Robert Koch Institute
General-Pape-Str. 62–66, 12101 Berlin
Germany
KrugS@rki.de

Acknowledgements. The study was financed by the Robert Koch Institute and the Federal Ministry of Health.

Conflict of interest. On behalf of all authors, the corresponding author states that there are no conflicts of interest.

References

1. US Department of Health and Human Services (1996) Physical activity and health: a report of the Surgeon General. Centers of Disease Control and Prevention. CDC, Atlanta
2. Sallis J, Owen N (1998) Physical activity and behavioural medicine. Sage, Thousands Oaks CA
3. Robert Koch-Institut (RKI) (Hrsg) (2005) Körperliche Aktivität. Gesundheitsberichterstattung des Bundes. Heft 26. RKI, Berlin
4. Rejeski WJ, Mihalko SL (2001) Physical activity and quality of life in older adults. *J Gerontol A Biol Sci Med Sci* 56:23–35
5. Department of Health (2004) Physical activity—health improvement and prevention: at least five a week. Department of Health, London
6. US Department of Health and Human Services (USDHHS) (2008) Physical activity guidelines for americans. USDHHS, Washington DC
7. Warburton DER, Charlesworth S, Ivey A et al (2010) A systematic review of the evidence for Canada's physical activity guidelines for Adults. *Int J Behav Nutr Phys Act* 7:39
8. Samitz G, Egger M, Zwahlen M (2011) Domains of physical activity and all-cause mortality: systematic review and dose-response meta-analysis of cohort studies. *Int J Epidemiol* 1–19 (advanced access)
9. Teychenne M, Ball K, Salmon J (2008) Physical activity and likelihood of depression in adults: a review. *Prev Med* 46:397–411
10. Blair S, Kohl H, Paffenbarger R et al (1989) Physical fitness and all-cause mortality. A prospective study of healthy men and women. *JAMA* 262:2395–2401
11. World Health Organization (WHO) (2010) Global recommendations on physical activity for health. WHO, Geneva
12. Lee IM, Shiroma EJ, Lobelo F et al (2012) Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 380:219–229
13. World Health Organization (WHO) (2004) Global strategy on diet, physical activity and health. WHO, Geneva
14. Kurth BM, Lange C, Kamtsiuris P, Hölling H (2009) Health monitoring at the Robert Koch-Institute. Status and perspectives (in German). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 52:557–570
15. Kurth BM (2012) Das RKI-Gesundheitsmonitoring – was es enthält und wie es genutzt werden kann. *Public Health Forum* 20(76):4.e1–4.e3
16. Gößwald A, Lange M, Kamtsiuris P, Kurth BM (2012) DEGS: German Health Interview and Examination Survey for Adults. A nationwide cross-sectional and longitudinal study within the framework of health monitoring conducted by the Robert Koch-Institute (in German). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 55:775–780
17. Scheidt-Nave C, Kamtsiuris P, Gößwald A et al (2012) German Health Interview and Examination Survey for Adults (DEGS)—design, objectives and implementation of the first data collection wave. *BMC Public Health* 12:730
18. Kamtsiuris P, Lange M, Hoffmann R et al (2013) The first wave of the German Health Interview and Examination Survey for Adults (DEGS1). Sampling design, response, sample weights, and representativeness. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:620–630
19. Robert Koch-Institut (Hrsg) (2009) DEGS: Studie zur Gesundheit Erwachsener in Deutschland – Projektbeschreibung. Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin
20. Gößwald A, Lange M, Döller R, Hölling H (2013) The first wave of the German Health Interview and Examination Survey for Adults (DEGS1). Participant recruitment, fieldwork, and quality management. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:611–619
21. Caspersen CJ, Powell KE, Christenson GM (1985) Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports* 100:126–131 (Washington, DC: 1974)
22. Pate RR, Pratt M, Blair SN et al (1995) Physical activity and public health. *JAMA* 273:402–407
23. Lampert T, Kroll L, Müters S, Stolzenberg H (2013) Measurement of Socioeconomic Status in the German Health Interview and Examination Survey for Adults (DEGS1). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:631–636
24. Prochaska JO, DiClemente CC (1992) Stages of change in the modification of problem behaviors. *Prog Behav Modif* 28:183–218
25. Spencer L, Adams TB, Malone S et al (2006) Applying the transtheoretical model to exercise: a systematic and comprehensive review of the literature. *Health Promot Pract* 7:428–443
26. Jordan S, Weiß M, Krug S, Mensink GBM (2012) Overview of primary prevention measures to promote physical activity in Germany (in German). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 55:73–81
27. Lampert T, Mensink GBM, Müters S (2012) Physical and sporting activity among adults in Germany. Results from the “German Health Update 2009” survey (in German). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 55:102–110
28. Finger J, Tyllskär T, Lampert T, Mensink GBM (2012) Physical activity patterns and socioeconomic position: the German National Health Interview and Examination Survey (GNHIES) 1998. *BMC Public Health* 12:1079
29. Klein M (2006) Geschlechtsbezogene Vermarktungsstrategien kommerzieller Sportanbieter. In: Hartmann-Tews J, Rulofs B (Hrsg) *Handbuch Sport und Geschlecht. Beiträge zur Lehre und Forschung im Sport*. Hofmann, Schorndorf, S 211–218
30. Jordan S, Lippe E von der, Hagen C (2011) Verhaltenspräventive Maßnahmen zur Ernährung, Bewegung und Entspannung. In: Robert Koch-Institut (RKI) (Hrsg) *Beiträge zur Gesundheitsberichterstattung des Bundes. Daten und Fakten: Ergebnisse der Studie “Gesundheit in Deutschland aktuell 2009”*. RKI, Berlin, S 23–33
31. Pahmeier I (2008) Sportliche Aktivität aus der Lebenslaufperspektive. *Z Gerontol Geriat* 41:168–176
32. Klein T, Becker S (2008) Gibt es wirklich eine Reduzierung sportlicher Aktivität im Lebenslauf? Eine Analyse alters- und kohortenbezogener Unterschiede der Sportaktivität. *Z Soziol* 37:226–245
33. Robert Koch-Institut (RKI) (2012) Beiträge zur Gesundheitsberichterstattung des Bundes. Daten und Fakten: Ergebnisse der Studie “Gesundheit in Deutschland aktuell 2010”. RKI, Berlin
34. Robert Koch-Institut (RKI) (2011) Beiträge zur Gesundheitsberichterstattung des Bundes. Daten und Fakten: Ergebnisse der Studie “Gesundheit in Deutschland aktuell 2009”. RKI, Berlin
35. Adams SA, Matthews CE, Ebbling CB et al (2005) The Effect of Social Desirability and Social Approval on Self-Reports of Physical Activity. *Am J Epidemiol* 161:389–398
36. Hagströmer M, Oja P, Sjöstöm M (2006) The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutrition* 9:755–762
37. Finger J, Krug S, Gößwald A et al (2013) Cardiorespiratory fitness among adults in Germany. Results of the German Health Interview and Examination Survey for Adults (DEGS1). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:772–778
38. Finger J, Gößwald A, Härtel S et al (2013) Measurement of Cardiorespiratory Fitness in the German Health Interview and Examination Survey for Adults (DEGS1). *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 56:885–893