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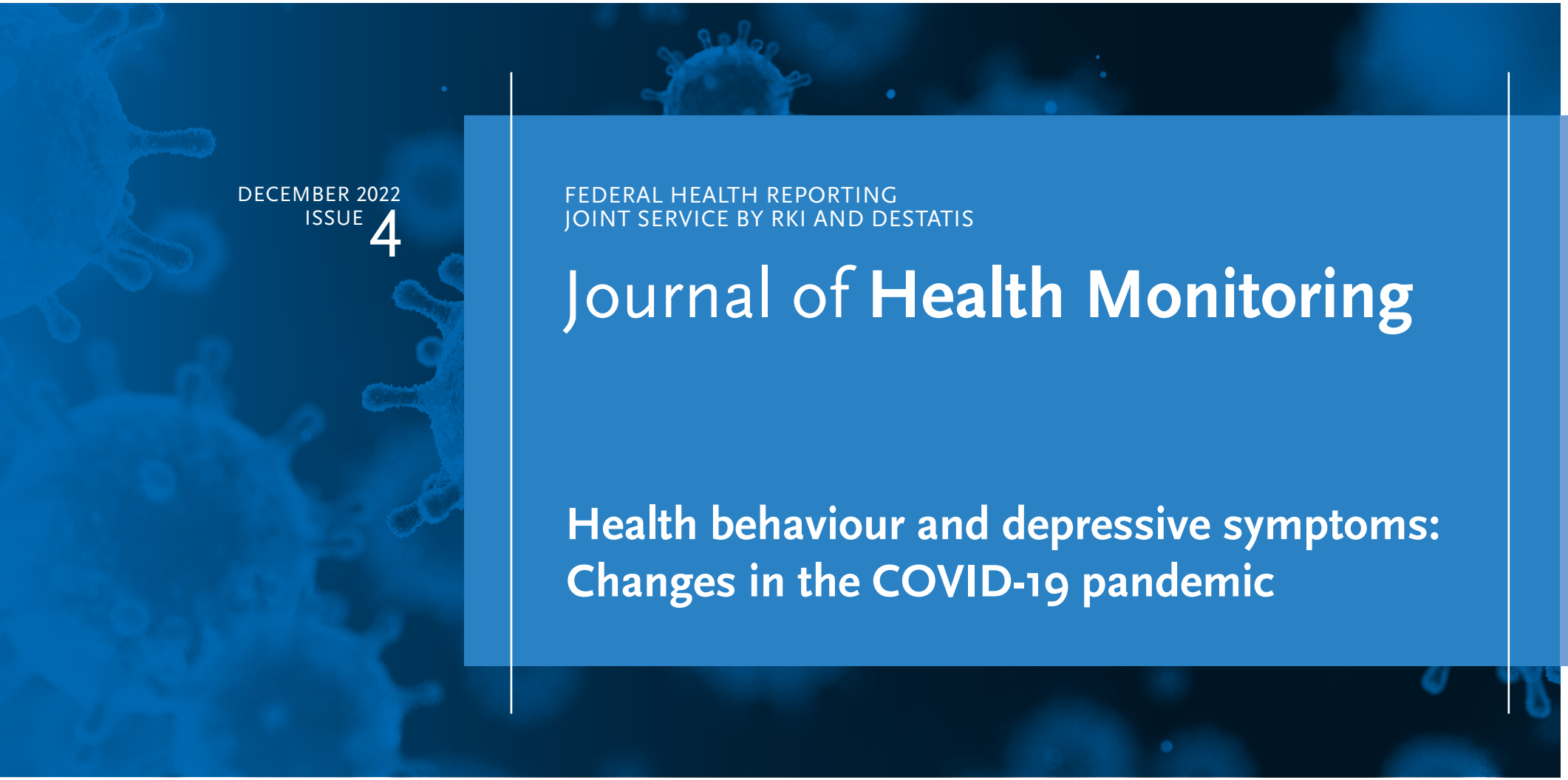

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Health behaviour and depressive symptoms: Changes in the COVID-19 pandemic

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Depressive symptoms in the general population before and in the first year of the COVID-19 pandemic: Results of the GEDA 2019/2020 study

Abstract

Background: Study results on the impact of the COVID-19 pandemic on mental health in the first year of the pandemic are contradictory. The GEDA 2019/2020 study makes it possible to examine changes in depressive symptoms in the population.

Methods: A standardised telephone interview was used to survey a random sample of the population in Germany aged 15 and older. To exclude seasonal effects, 10,220 interviewees from the period April 2019 to January 2020 were compared with 11,900 from the period April 2020 to January 2021. Depressive symptoms were assessed with the internationally established 8-item Patient Health Questionnaire (PHQ-8).

Results: The prevalence of depressive symptoms decreased from 9.2% to 7.6% in the first year of the pandemic. Changes differ between women and men as well as between age and education groups. The analysis of individual symptoms suggests that it is not about a reduction of mental disorders of the depressive type in the narrower sense, but rather a decrease in stress-associated individual symptoms.

Conclusions: The decrease in stress-associated depressive symptoms in parts of the population can be interpreted as an indication that pandemic-related changes in everyday life and the working environment may have had a positive effect on individual areas of mental health in certain groups, at least temporarily in the first year of the pandemic. The continuing strong social inequality in depressive symptoms to the disadvantage of low education groups confirms that the need for social situation-related health promotion and prevention with regard to the living and working conditions of socially disadvantaged people must not be lost sight of in times of pandemic. For groups in the population that partly showed a worsening of symptoms in this phase of the pandemic, e.g. the diminished ability to concentrate of very old men, targeted support options should be created in the future.

COVID-19 PANDEMIC · DEPRESSION · MENTAL HEALTH · RESILIENCE · AGE · PHQ-8

GEDA 2019/2020

Fifth follow-up survey of the German Health Update

Data holder: Robert Koch Institute

Objectives: Provision of reliable information on the health status, health behaviour and health care of the population living in Germany, with the possibility of European comparisons

Study design: Cross-sectional telephone survey

Population: German-speaking population aged 15 and older living in private households that can be reached via landline or mobile phone

Sampling: Random sample of landline and mobile telephone numbers (dual-frame method) from the ADM sampling system (Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.)

Sample size: 26,507 respondents

Study period: April 2019 to January 2021 (GEDA-EHIS to September 2020)

GEDA survey waves:
- GEDA 2009
- GEDA 2010
- GEDA 2012
- GEDA 2014/2015-EHIS
- GEDA 2019/2020

Further information in German is available at www.geda-studie.de

1. Introduction

As a population-representative health survey among adults in Germany, the study German Health Update (GEDA) forms an essential pillar of the continuous health monitoring at the Robert Koch Institute (RKI) [1]. Since GEDA 2014/2015-EHIS, the questionnaire of the European Health Interview Survey (EHIS), which is conducted every five years to take stock of the health situation in the population aged 15 and older, has been integrated into GEDA [2]. The current work complements previous work on depressive symptoms, which was based on GEDA-EHIS. Among other things, depressive symptoms were described together with other selected indicators of the health situation in Germany [3], results for Germany were compared with other European countries [4] and first observations since the beginning of the COVID-19 pandemic were published [5–7].

Depressive symptoms do not only occur in the case of manifest depression in the sense of a mental disorder. It can also occur as an accompanying secondary symptom of other mental disorders, trauma, chronic stress and other psychological distress. The consequences of depression for the individual, society and the health system are serious [8]. For this reason, it is of particular importance to identify any changes in the population triggered by crises. The questionnaire used in GEDA 2019/2020-EHIS, the Patient Health Questionnaire (PHQ-8), is correlated with almost all areas of mental health and covers a total of eight symptom areas. This instrument makes it possible to analyse specific symptom areas and to attribute any changes in depressive symptoms to individual symptom areas. Basic results on depressive symptoms in connection with other aspects of health, methodological features of the PHQ and its significance in comparison to other population-related indicators of mental health in general as well as depression in particular, have been published in a current focus report on mental health in Germany [8]. The current GEDA survey allows an analysis of depressive symptoms during, as well as a comparison with times before the pandemic.

Prior to the present analyses, the RKI prepared a rapid review (as of July 30, 2021) on the mental health of adults in Germany during the COVID-19 pandemic [9]. At that time, the majority of the studies referred to the first phase of the pandemic, which was mainly characterised by containment measures and the associated changes in care. For the most part, the studies showed both an overall resilient population and largely adaptive care [10]. However, there were indications of vulnerable subgroups. It is important to note that the review and subsequent published works also examined studies of other indicators of mental health, such as subjectively experienced stress, loneliness, quality of life and anxiety symptoms. Although these findings are not readily transferable to depressive symptoms, due to overlaps and additions, they are very helpful in analysing depressive symptoms in the context of the pandemic.

In summary, the following observations were made: Women tended to show abnormalities in loneliness [11–13], anxiety [14, 15], depressive symptoms [13], depressive and anxiety symptoms [11], and lower affective well-being [11, 13] and life satisfaction [11]. Women rate their resilience as lower [16]. Professional absenteeism due to mental disorders also increased in 2020, especially among women, but this is embedded in a general trend of the years before [17]. People under the age of 30 appear to be affected more often

or more severely by the effects of the pandemic, according to previous publications. They are more affected by loneliness [11, 12, 18], depressive symptoms [19] and depressive and anxiety symptoms [11]. They also rate themselves as less resilient compared to the norm values available for Germany [20, 21]. With regard to anxiety symptoms, age differences seem to be less pronounced at the beginning of the pandemic [15], while younger people are more affected in later phases [19, 22]. These short-term consequences have been interpreted in younger people more as reactions to stress and less as mental disorders in the narrower sense [16]. A scoping review on the situation of older people in the initial phase of the COVID-19 pandemic gives indications that elderly were particularly affected by the contact restrictions associated with the pandemic [23]. For Germany, however, there is hardly any reliable data, especially for people living in private households.

The findings on mental health over the course of the pandemic are consistent in many respects for both sex and age. However, there is still a lack of methodologically high-quality data from representative samples for later pandemic phases as well as meaningful longitudinal and trend studies that map a course and include the time before the pandemic as a comparison.

Against the background of the studies and data available so far, there is little information on whether and how the frequency of depressive symptoms in women and men and in different age groups has changed. Also, little is known about whether education proves to be a resource of resilience in the pandemic.

The results so far mainly refer to the first phase of the pandemic. However, a further analysis beyond the period of the beginning of the pandemic seems advisable against the background of a dynamic change of the pandemic situation and the possible consequences. Since initial analyses of the prevalences of depressive symptoms show fluctuations in the course of the year [6, 7], the present analysis is intended to compare two calendar periods of time before and during the pandemic that are largely identical.

In previous studies in which the PHQ-8 or PHQ-9 was used, the overall test result on depressive symptoms was reported. In this study, however, the individual symptom areas are examined. This is intended to determine whether any effects on depressive symptoms can be attributed to individual symptom areas. The analyses are stratified by gender and different age and education groups in order to find out whether differences between parts of the population can be identified.

2. Methods

2.1 Study design and sampling

The GEDA study is a cross-sectional survey based on a nationwide random sample of the adult resident population living in Germany. Commissioned by the Federal Ministry of Health, the GEDA study has been conducted by the RKI at multi-year intervals since 2008 and is part of the health monitoring system [24, 25]. The current GEDA survey is a telephone survey of the German-speaking population aged 15 years and older using a programmed, fully structured questionnaire (Computer Assisted Telephone Interview) (Info box). Details on the range of topics, questionnaire and sample design, sampling and data weighting

of the GEDA 2019/2020-EHIS study are described in detail elsewhere [26, 27].

After the originally planned survey was completed in September 2020, it was possible to continue the data collection from October 2020 until January 2021 in order to observe the effects of the pandemic as it progressed. The study design was maintained with a slightly shortened questionnaire. The survey period from April 2019 to January 2021 is referred to as GEDA 2019/2020, whereas GEDA 2019/2020-EHIS refers to the detailed questionnaire up to the study date of September 2020.

A total of 23,001 people participated in the GEDA 2019/2020-EHIS study with complete interviews. The continuation of interviews between October 2020 and January 2021 includes 3,506 participants. A total of 26,507 people (13,955 female, 12,552 male) participated in GEDA 2019/2020 between April 2019 and January 2021.

2.2 Indicator and analysis groups

Depressive symptoms

The presence of depressive symptoms in the last two weeks was assessed by self-reporting by the participants using the internationally established 8-item Patient Health Questionnaire (PHQ-8) [28].

This instrument assesses eight symptom areas of major depression in line with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 4. Edition) [29]. The initial question is: 'Over the last 2 weeks, how often have you been bothered by any of the following problems?' The eight symptom areas are as follows: 1. Little interest or pleasure in doing things; 2. Feeling down, depressed, or hopeless; 3. Trouble falling or staying asleep, or sleeping too much; 4. Feeling tired or having little energy; 5. Poor appetite or overeating; 6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down; 7. Trouble concentrating on things, such as reading the newspaper or watching television; 8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual. For each item, the frequency is asked with the categories 'not at all', 'several days', 'on more than half the days', or 'nearly every day'. The frequencies are given the value 0 to 3 and the presence of depressive symptomatology is assumed from a scale total value of at least 10 of the maximum 24 points. When evaluating the individual questions, dichotomisation was used: 'not at all' or 'several days' was analysed as inconspicuous and 'on more than half the days' or 'nearly every day' was analysed as impaired.

Education

Education status was determined by highest school-leaving qualification and highest professional qualification of respondents. The CASMIN classification (Comparative Analysis of Social Mobility in Industrial Nations) was used to distinguish between a low (CASMIN 1: primary or low secondary education), medium (CASMIN 2: medium or high secondary education) and high (CASMIN 3: tertiary education) education group [30].

Gender

The analyses for women and men were based on the information provided by the respondents and not on biological sex [31].

Age groups

When forming the age groups, a rough subdivision was chosen in favour of statistical significance.

2.3 Statistical analysis

In a first step, the sample was divided into two comparison periods, the period before (April 2019 to January 2020) and from the beginning of the pandemic (April 2020 to January 2021). Only identical interview weeks were used, which are available at both periods, in order to exclude any seasonal effects on the indicators. Since data were only collected in the first few days of January in both 2020 and 2021, the year jump in the designation of the periods is omitted in the text for better readability. These were participants who were interviewed in the first week of January due to the December holidays. In addition, all equivalent interview weeks in September and October 2019 are excluded, as data collection in 2020 was interrupted for six weeks in these months.

The analyses are thus based on data from 22,120 participants aged 15 to 101 years. Among the respondents were 11,670 women, 10,386 men and 64 respondents who indicated a different or no gender. In the analyses by gender, the latter are not shown separately because the case numbers are too small. However, they are included in the overall category [31].

To correct for deviations of the sample from the population structure, the analyses were performed applying a weighting factor. As part of the data weighting, a design weighting was first performed for the different selection probabilities (mobile and landline network). This was followed by an adjustment to the official population figures based on age, sex, federal state, and district type (as of: 31/12/2019). In addition, the sample was adjusted to the education distribution in the 2017 Microcensus according to the ISCED classification [32]. The weighting procedure is described in detail elsewhere [26].

In addition, the probability of participation of certain population groups could be influenced due to the COVID-19 pandemic and the associated containment measures (e.g. home office, contact restrictions) [7, 33]. For this reason, as described in [7] an additional adjustment weighting was performed separately for the sample periods before and after the cut-off date of 16.03.2020 (adoption of the federal states agreement on guidelines against the spread of the corona virus [34]). For the analyses stratified according to education groups, age standardisation to the European Standard Population 2013 was performed, in order to compensate for cohort effects with regard to educational qualifications and corresponding age differences between the education groups.

The analyses were performed with SAS 9.4. All analyses were calculated using the SAS survey procedures of in order to take the appropriate weighting into account when calculating confidence intervals and p-values. A statistically significant difference between groups/time periods is assumed if the corresponding p-value in the Rao-Scott-Chi-Square test is smaller than 0.05.

3. Results

3.1 Depressive symptoms

Depressive symptoms according to PHQ-8 were present in 9.2% of the respondents before the pandemic (Table 1).

The prevalence of depressive symptoms decreased from 9.2% to 7.6% in the first period of the pandemic.

Table 1
Proportion of people with depressive symptoms according to PHQ-8 in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523)*
Source: GEDA 2019/2020

	April 2019 to January 2020			April 2020 to January 2021		
	n**	%	(95% CI)	n**	%	(95% CI)
Total	658	**9.2**	**(8.3–10.3)**	628	**7.6**	**(6.8–8.6)**
Women (total)	397	**9.8**	**(8.5–11.2)**	378	**7.6**	**(6.6–8.8)**
15–29 years	39	12.2	(8.5–17.2)	42	10.5	(7.3–14.8)
30–44 years	58	**10.4**	**(7.5–14.2)**	62	**6.6**	**(4.7–9.3)**
45–64 years	194	**11.3**	**(9.3–13.7)**	166	**8.2**	**(6.5–10.2)**
65–79 years	72	5.2	(3.8–7.0)	75	6.1	(4.3–8.4)
≥80 years	34	7.2	(4.1–12.3)	33	6.3	(3.8–10.1)
Men (total)	256	8.5	(7.2–10.0)	241	7.4	(6.1–8.8)
15–29 years	38	7.9	(5.3–11.8)	31	7.6	(4.9–11.5)
30–44 years	45	8.2	(5.8–11.4)	34	6.5	(4.1–10.1)
45–64 years	113	11.0	(8.5–14.0)	108	8.2	(6.3–10.7)
65–79 years	41	5.3	(3.4–8.4)	42	6.1	(3.6–10.2)
≥80 years	19	5.8	(3.3–10.0)	26	7.8	(4.4–13.6)

* Due to missing values in the PHQ-8, 182 cases in 2019 and 268 in 2020 were not included in the analysis.
** Number of persons with a positive PHQ-8 from the value range 10 and above
CI = confidence interval
Values in bold: p-value in t-test smaller than 0.05

The decrease in the prevalence of depressive symptoms can be attributed to individual symptom areas.

During the pandemic, the prevalence in the total sample was lower at 7.6%. However, the prevalence decreased statistically significantly only among women from 9.8% to 7.6%. In men, the prevalence before the pandemic was 8.5% and was comparable to that in women at 7.4% during the pandemic. The strongest declines occurred among women in the age groups 30 to 44 and 45 to 64 years. Overall, there is a parallel trend in the age groups up to 64 years of age. This trend is not confirmed in the age groups from age 65 and older.

The analysis differentiated by education shows considerable education differences in depressive symptoms in both periods, with the highest prevalences in the low education groups (Table 2). Overall, these strongly pronounced differences to the disadvantage of low education groups persist over the observation period from before to during the pandemic. In the low and medium education groups, there is a declining trend in depressive symptoms, however this is only significant in the largest group with medium education status when women and men are analysed together. The group with high education has a consistently low prevalence of depressive symptoms both before and during the pandemic compared to the medium and low education groups.

Table 2
Age-standardised prevalence of depressive symptoms according to PHQ-8 in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523), by education*
Source: GEDA 2019/2020

	April 2019 to January 2020			April 2020 to January 2021		
	n**	%	(95% CI)	n**	%	(95% CI)
Total						
Low education group	178	13.4	(10.8–16.5)	152	10.2	(8.0–12.8)
Medium education group	337	**9.6**	**(8.3–11.0)**	318	**7.6**	**(6.5–8.8)**
High education group	141	3.9	(3.1–4.7)	158	3.8	(3.2–4.7)
Women						
Low education group	101	14.1	(10.3–19.2)	87	10.8	(7.8–14.9)
Medium education group	206	10.2	(8.4–12.2)	198	8.2	(6.8–9.9)
High education group	89	5.0	(3.8–6.5)	93	4.2	(3.3–5.4)
Men						
Low education group	75	11.6	(8.6–15.5)	63	9.0	(6.3–12.5)
Medium education group	129	8.9	(7.1–11.1)	113	6.7	(5.2–8.6)
High education group	51	2.7	(2.0–3.7)	65	3.5	(2.6–4.8)

* Education group according to CASMIN classification
** Number of persons with a positive PHQ-8 from the value range 10 and above
CI = confidence interval
Values in bold: p-value in t-test smaller than 0.05

3.2 Individual symptom areas of depressive symptoms

The analyses of the individual symptoms of the PHQ-8 are contained in Table 3. With regard to the two core characteristics of depressive symptoms 1. 'Little interest or pleasure in doing things' and 2. 'Feeling down, depressed, or hopeless', the analyses do not reveal a clear trend in the overall sample when comparing the two time periods. However, when subdivided by sex and age groups, a partially opposing development is shown. The increase in the frequency of question 1 among respondents aged 80 and older is striking. Among women, the percentage increases from 8.8% to 12.4% and among men from 9.1% to 16.0%. Due to the small number of cases of people aged 80 and older, an additional test was performed here to see to what extent an age effect could be observed without differentiating between women and men. This resulted in an increase from 8.9% to 13.9% (p=0.029), which deviates from the results in younger age groups, with the exception of women aged 15 to 29 years.

The changes in the prevalence of individual symptoms differ between women and men as well as between age and education groups.

During the pandemic, compared to the year before the pandemic, there is a significant decrease in frequency for symptoms 4. 'Feeling tired or having little energy energy', 5. 'Poor appetite or overeating' and 6. 'Feeling bad about yourself – or that you are a failure or have let yourself or your family down'.

For women, the figure was at least on half of the days for 4. Suffering from 'Feeling tired or having little energy' decreased from 20.3% to 15.2%. The greatest decrease from 26.2% before the pandemic to 17.0% during the pandemic was among women aged 15–29. Only for women aged 80 years and older was no decline reported. There were no significant changes among men, but the prevalences among 15 to 29 year olds, 65 year olds and older with an increase in symptoms trended in the opposite direction to the middle age groups of 30 to 64 years.

The frequency of 5. 'Poor appetite or overeating' showed a decrease from 13.3% to 7.4% among women in the age group of 15 to 29 years. Due to the opposite trend among women in the age groups 65 and older compared to the younger age groups, a supplementary analysis was performed summarising these age groups. This showed an increase in the time of the pandemic from 3.8% to 6.1% (p=0.035). Men showed a decrease from 6.8% to 5.2%, which, unlike for women, was similar in all age groups. 'Feeling bad about yourself – or that you are a failure or have let yourself or your family down' (question 6) was significantly less frequent in the gender-specific analysis only among women during the pandemic than before the pandemic (3.0% vs. 46%). A similar development was observed among men, but to a lesser extent (3.7% vs. 4.2%). It is noticeable that among women and men, the question 6. 'Feeling bad about yourself – or that you are a failure or have let yourself or your family down' was stated much more frequently among younger people than among older people. In addition, an increase in frequency of 7. 'Trouble concentrating on things' among men aged 80 years and older from 3% before the pandemic to 9.8% during the pandemic (p=0.018) can be observed.

The analysis results documented in Table 4 on the individual symptoms surveyed with the PHQ-8 show consistent and time-persistent differences between the three education groups. All individual symptoms are reported most frequently in the low education group and least frequently

Table 3
Proportion of people who were affected by the above symptoms (PHQ 1 to 4)* 'on more than half the days' or 'nearly every day' in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523)
Source: GEDA 2019/2020

	1. Little interest/lack of pleasure				2. Down/depressed/hopeless			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	9.7	(8.8–10.7)	9.8	(8.9–10.8)	7.3	(6.5–8.2)	6.6	(5.8–7.4)
Women (total)	9.0	(7.8–10.3)	10.0	(8.7–11.3)	7.3	(6.2–8.6)	6.6	(5.7–7.8)
15–29 years	8.2	(5.4–12.3)	11.5	(8.3–15.7)	8.8	(5.8–13.3)	9.2	(6.2–13.3)
30–44 years	8.9	(6.4–12.3)	8.7	(6.2–12.0)	**7.3**	**(5.0–10.5)**	**3.9**	**(2.5–6.1)**
45–64 years	9.9	(8.0–12.1)	10.4	(8.5–12.8)	7.7	(6.0–9.8)	7.2	(5.6–9.2)
65–79 years	8.2	(6.1–10.9)	8.0	(6.1–10.5)	5.1	(3.5–7.3)	6.5	(4.7–9.0)
≥80 years	8.8	(5.9–12.8)	12.4	(8.4–18.1)	7.9	(4.6–13.2)	6.9	(4.1–11.5)
Men (total)	10.5	(9.2–12.0)	9.3	(8.0–10.8)	7.2	(6.1–8.6)	6.3	(5.2–7.6)
15–29 years	9.0	(6.4–12.5)	9.2	(6.4–13.0)	5.1	(3.1–8.3)	7.0	(4.5–10.6)
30–44 years	11.6	(8.8–15.3)	7.4	(5.0–10.9)	7.8	(5.5–11.0)	5.1	(3.2–8.2)
45–64 years	12.6	(10.1–15.6)	10.3	(8.3–12.8)	8.9	(6.8–11.6)	7.6	(5.7–10.0)
65–79 years	6.6	(4.6–9.2)	6.9	(4.6–10.4)	5.1	(3.2–8.3)	4.1	(2.4–7.1)
≥80 years	9.1	(5.7–14.3)	16.0	(10.8–23.1)	7.4	(3.8–14.0)	6.6	(3.7–11.6)

	3. Sleep disorders				4. Tired/loss of energy			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	21.2	(20.0–22.5)	20.0	(18.9–21.3)	**17.0**	**(15.9–18.2)**	**13.8**	**(12.7–14.8)**
Women (total)	23.4	(21.7–25.2)	23.4	(21.7–25.1)	**20.3**	**(18.6–22.1)**	**15.2**	**(13.8–16.7)**
15–29 years	21.0	(16.5–26.3)	18.4	(14.4–23.3)	**26.2**	**(21.2–31.9)**	**17.0**	**(13.2–21.7)**
30–44 years	18.7	(15.4–22.7)	18.3	(14.9–22.2)	**21.9**	**(18.1–26.1)**	**15.9**	**(12.8–19.6)**
45–64 years	25.7	(23.0–28.6)	24.4	(21.7–27.2)	**20.0**	**(17.5–22.8)**	**15.6**	**(13.4–18.1)**
65–79 years	24.6	(21.2–28.2)	24.6	(21.4–28.1)	**14.3**	**(11.6–17.5)**	**10.4**	**(8.4–12.8)**
≥80 years	28.8	(22.7–35.8)	37.4	(31.1–44.2)	18.5	(13.2–25.2)	18.3	(13.5–24.3)
Men (total)	19.0	(17.3–20.8)	16.6	(15.0–18.3)	13.6	(12.1–15.2)	12.0	(10.5–13.6)
15–29 years	**18.4**	**(14.5–23.1)**	**11.2**	**(8.3–14.9)**	10.9	(8.1–14.5)	12.0	(8.9–16.1)
30–44 years	14.9	(11.8–18.5)	11.4	(8.3–15.5)	14.6	(11.6–18.3)	11.5	(8.0–16.1)
45–64 years	21.3	(18.4–24.5)	20.2	(17.5–23.2)	16.0	(13.4–19.1)	11.4	(9.3–14.0)
65–79 years	18.6	(15.0–22.8)	20.5	(16.9–24.6)	10.9	(8.1–14.5)	11.6	(8.6–15.6)
≥80 years	24.3	(18.0–31.8)	22.3	(16.4–29.5)	11.3	(7.6–16.3)	16.9	(11.8–23.5)

* The full wording of the questioned symptoms can be found in section 2.2 depressive symptoms
CI = confidence interval
Values in bold: p-value in t-test smaller than 0.05

The prevalence of individual symptoms is possibly influenced by changes in the living environment in times of the pandemic.

Continued on next page

Table 3 *Continued*
Proportion of people who were affected by the above symptoms (PHQ 5 to 8)* 'on more than half the days' or 'nearly every day' in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523)
Source: GEDA 2019/2020

	5. Loss of appetite/overeating				6. Bad opinion, failure/disappointing family			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	**7.2**	**(6.4–8.1)**	**5.8**	**(5.1–6.6)**	**4.4**	**(3.8–5.2)**	**3.4**	**(2.8–4.1)**
Women (total)	7.3	(6.3–8.6)	6.2	(5.3–7.3)	**4.6**	**(3.6–5.7)**	**3.0**	**(2.4–3.8)**
15–29 years	**13.3**	**(9.8–17.9)**	**7.4**	**(5.0–10.8)**	9.2	(6.2–13.4)	6.3	(3.9–9.8)
30–44 years	7.5	(5.2–10.9)	5.0	(3.5–7.1)	7.0	(4.5–10.7)	4.2	(2.7–6.5)
45–64 years	6.9	(5.5–8.7)	6.6	(5.1–8.6)	3.4	(2.3–4.9)	2.2	(1.5–3.2)
65–79 years	3.6	(2.5–5.2)	5.3	(3.6–7.9)	1.3	(0.6–2.6)	1.4	(0.7–2.7)
≥80 years	4.2	(2.5–7.0)	7.6	(4.4–12.9)	0.6	(0.1–2.4)[1]	0.7	(0.3–1.9)[1]
Men (total)	**6.8**	**(5.7–8.2)**	**5.2**	**(4.2–6.4)**	4.2	(3.3–5.2)	3.7	(2.8–4.8)
15–29 years	9.3	(6.4–13.4)	7.3	(4.9–10.8)	7.5	(5.1–10.9)	6.6	(4.2–10.2)
30–44 years	7.3	(5.0–10.6)	5.9	(3.6–9.7)	5.5	(3.6–8.2)	4.3	(2.3–7.6)
45–64 years	6.9	(5.1–9.4)	4.8	(3.5–6.6)	2.8	(1.8–4.1)	3.2	(2.1–4.8)
65–79 years	4.1	(2.4–6.8)	3.1	(1.6–5.8)	1.5	(0.7–3.4)	1.2	(0.3–5.0)
≥80 years	4.1	(2.2–7.5)	2.9	(1.5–5.3)	3.6	(1.5–8.4)[1]	0.8	(0.2–2.9[1])

	7. Diminished ability to concentrate				8. Changes in movement or speech			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	5.1	(4.4–5.9)	4.9	(4.2–5.7)	3.7	(3.1–4.4)	3.4	(2.8–4.0)
Women (total)	5.2	(4.2–6.3)	4.0	(3.3–4.9)	3.3	(2.6–4.1)	2.9	(2.3–3.7)
15–29 years	7.8	(5.0–12.0)	5.4	(3.2–9.1)	3.4	(1.7–6.4)	2.1	(1.1–4.0)
30–44 years	4.7	(3.0–7.5)	3.1	(1.9–4.9)	3.6	(2.1–6.2)	3.5	(2.2–5.5)
45–64 years	5.8	(4.4–7.7)	4.9	(3.6–6.7)	3.8	(2.8–5.1)	4.2	(2.9–6.1)
65–79 years	1.8	(1.1–3.2)	1.9	(1.2–3.0)	2.7	(1.6–4.6)	1.7	(1.1–2.8)
≥80 years	5.7	(2.8–11.4)	4.7	(2.7–8.3)	1.4	(0.7–3.0)	1.0	(0.5–2.3)
Men (total)	4.9	(3.9–6.1)	5.7	(4.6–7.1)	4.1	(3.3–5.2)	3.7	(2.8–4.7)
15–29 years	6.1	(3.7–9.7)	6.8	(4.3–10.7)	4.9	(2.9–8.2)	3.7	(2.0–6.8)
30–44 years	4.4	(2.7–7.1)	5.8	(3.5–9.4)	3.2	(1.9–5.3)	3.1	(1.6–5.7)
45–64 years	5.7	(4.0–8.0)	5.2	(3.6–7.3)	5.1	(3.5–7.3)	4.1	(2.9–5.9)
65–79 years	3.1	(1.9–5.2)	3.6	(1.9–6.7)	2.8	(1.5–5.0)	3.8	(2.0–6.8)
≥80 years	**3.0**	**(1.3–6.6)**	**9.8**	**(5.5–17.0)**	3.3	(1.4–8.0[1])	2.9	(1.2–6.9)

** The full wording of the questioned symptoms can be found in section 2.2 depressive symptoms
[1] Number of cases n<10
CI=confidence interval
Values in bold: p-value in t-test smaller than 0.05

The serious differences between education groups show the need, especially for women with low or medium education, to pay more attention in prevention to how they can be specifically supported and relieved.

Table 4
Age-standardised proportion of people who were affected 'on more than half the days' or 'almost every day' by the symptoms mentioned (PHQ 1 to 4)* in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523), by education**
Source: GEDA 2019/2020

	1. Little interest/lack of pleasure				2. Down/depressed/hopeless			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total								
Low education group	13.8	(11.3–16.7)	13.6	(11.2–16.4)	10.2	(7.9–13.2)	8.9	(7.0–11.2)
Medium education group	9.7	(8.4–11.1)	9.0	(7.9–10.3)	7.8	(6.6–9.1)	6.3	(5.3–7.4)
High education group	5.1	(4.2–6.2)	5.4	(4.5–6.4)	3.5	(2.7–4.5)	3.5	(2.9–4.3)
Women								
Low education group	13.4	(9.9–18.0)	15.2	(11.6–19.7)	11.1	(7.5–16.2)	9.5	(6.9–13.1)
Medium education group	8.8	(7.2–10.7)	9.0	(7.6–10.8)	7.5	(6.0–9.4)	6.3	(5.1–7.7)
High education group	5.1	(3.9–6.5)	5.5	(4.3–6.9)	4.1	(3.1–5.6)	3.9	(3.0–5.1)
Men								
Low education group	13.8	(10.6–17.6)	10.9	(8.1–14.5)	8.8	(6.3–12.2)	7.7	(5.4–11.0)
Medium education group	10.6	(8.7–12.8)	8.8	(7.2–10.9)	8.0	(6.3–10.2)	6.2	(4.7–8.1)
High education group	5.2	(3.9–6.8)	5.3	(4.1–6.9)	2.8	(1.8–4.2)	3.1	(2.3–4.3)

	3. Sleep disorders				4. Tired/loss of energy			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total								
Low education group	25.1	(22.1–28.5)	23.4	(20.4–26.6)	**21.3**	**(18.3–24.6)**	**16.6**	**(13.9–19.7)**
Medium education group	21.0	(19.3–22.7)	19.1	(17.6–20.8)	**17.0**	**(15.5–18.7)**	**13.8**	**(12.4–15.3)**
High education group	14.2	(12.7–15.7)	13.8	(12.5–15.2)	10.5	(9.2–11.9)	9.2	(8.0–10.5)
Women								
Low education group	26.5	(21.9–31.7)	27.0	(22.8–31.7)	**25.5**	**(20.7–31.0)**	**18.3**	**(14.4–23.0)**
Medium education group	23.3	(21.0–25.8)	22.1	(20.0–24.4)	**20.4**	**(18.1–22.9)**	**15.9**	**(14.1–18.0)**
High education group	17.2	(15.0–19.6)	16.0	(14.1–18.2)	13.3	(11.2–15.6)	11.5	(9.6–13.7)
Men								
Low education group	23.4	(19.6–27.7)	19.7	(15.8–24.3)	16.6	(13.4–20.4)	14.1	(10.8–18.4)
Medium education group	18.7	(16.4–21.3)	16.0	(13.9–18.5)	13.7	(11.7–16.0)	11.6	(9.6–13.9)
High education group	11.1	(9.3–13.3)	11.5	(9.9–13.3)	7.6	(6.1–9.5)	6.7	(5.5–8.2)

* The full text of the symptoms questioned in the PHQ-8 can be found in section 2.2 depressive symptoms
** Education groups according to CASMIN classification
CI = confidence interval
Values in bold: p-value in t-test smaller than 0.05

Continued on next page

Table 4 *Continued*
Age-standardised proportion of people who were affected 'on more than half of the days' or 'nearly every day' by the symptoms mentioned (PHQ 5 to 8)* in the period before the COVID-19 pandemic, April 2019 to January 2020 (total N=10,220, women n=5,332, men n=4,863) compared to the period during the COVID-19 pandemic, April 2020 to January 2021 (total N=11,900, women n=6,338, men n=5,523), by education**
Source: GEDA 2019/2020

	5. Loss of appetite/overeating				6. Bad opinion, failure/disappointing family			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total								
Low education group	10.3	(8.0–13.2)	7.5	(5.7–9.8)	7.5	(5.4–10.5)	4.6	(3.2–6.7)
Medium education group	7.6	(6.5–8.9)	6.1	(5.2–7.2)	4.9	(4.0–6.0)	3.7	(2.9–4.7)
High education group	3.9	(3.0–5.0)	2.6	(2.1–3.2)	2.1	(1.5–3.1)	2.0	(1.4–2.9)
Women								
Low education group	10.5	(7.2–15.0)	9.5	(6.7–13.4)	9.7	(6.0–15.2)	4.9	(2.9–8.3)
Medium education group	7.5	(6.0–9.2)	6.4	(5.2–7.8)	4.7	(3.5–6.2)	3.6	(2.6–4.9)
High education group	5.5	(4.0–7.6)	3.2	(2.4–4.1)	2.1	(1.3–3.6)	2.5	(1.5–4.1)
Men								
Low education group	9.1	(6.4–12.8)	5.6	(3.6–8.6)	4.9	(3.1–7.7)	4.3	(2.5–7.2)
Medium education group	7.7	(6.1–9.7)	5.8	(4.4–7.6)	5.0	(3.8–6.6)	3.7	(2.5–5.3)
High education group	2.2	(1.5–3.2)	2.0	(1.4–2.9)	2.1	(1.2–3.5)	1.6	(1.0–2.6)

	7. Diminished ability to concentrate				8. Changes in movement or speech			
	April 2019 to January 2020		April 2020 to January 2021		April 2019 to January 2020		April 2020 to January 2021	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total								
Low education group	7.2	(5.3–9.5)	6.2	(4.6–8.5)	5.1	(3.6–7.1)	5.2	(3.6–7.3)
Medium education group	5.1	(4.2–6.2)	4.9	(4.0–6.0)	3.7	(2.9–4.6)	3.3	(2.6–4.1)
High education group	2.0	(1.5–2.7)	2.5	(2.0–3.2)	1.6	(1.2–2.3)	1.8	(1.3–2.3)
Women								
Low education group	7.4	(4.9–11.2)	4.5	(2.7–7.4)	3.7	(2.0–6.8)	5.0	(2.9–8.4)
Medium education group	5.2	(4.0–6.9)	4.6	(3.5–6.0)	3.5	(2.6–4.8)	2.9	(2.1–4.1)
High education group	2.6	(1.7–4.0)	2.3	(1.6–3.2)	2.1	(1.4–3.3)	2.1	(1.5–3.1)
Men								
Low education group	6.5	(4.3–9.6)	7.5	(5.1–11.0)	6.0	(4.0–8.9)	5.0	(3.1–7.9)
Medium education group	4.9	(3.7–6.5)	5.1	(3.7–7.0)	3.9	(2.8–5.4)	3.5	(2.5–4.8)
High education group	1.4	(0.9–2.1)	2.7	(1.9–3.9)	1.1	(0.7–1.9)	1.3	(0.9–2.0)

* The full text of the symptoms questioned in the PHQ-8 can be found in section 2.2 depressive symptoms
** Education group according to CASMIN classification
CI = confidence interval
Values in bold: p-value in t-test smaller than 0.05

in the high education group. The decrease in the frequency of 4. 'Feeling tired or having little energy' in the low and medium education groups in the first pandemic year compared to the previous year is striking. The separate analysis by gender shows that this decrease is primarily observed in women. Another change during the pandemic period is the near doubling of 7. 'Trouble concentrating on things, such as reading the newspaper or watching television' among men in the high education group from 1.4% before the pandemic to 2.7% during the pandemic. However, despite doubling in this education group, the frequency of this symptom area still remains significantly below the frequency in the other education groups.

4. Discussion

4.1 Depressive symptoms

With the data from the GEDA 2019/2020 study, a lower prevalence of depressive symptoms according to PHQ-8 is observed in the first year of the pandemic (2020) than in the comparison period one year earlier. The sharpest decrease was seen in women in the age groups 30 to 64 years. It is remarkable that the sex difference in depressive symptoms [8, 35] found in earlier studies does not persist under the conditions of the pandemic. Whereas the latter already existed before the beginning of the pandemic only in the age groups from 15 to 44 years. It is worth mentioning in this context that in the age group of 45 to 64 year-olds, women with 11.3% and men with 11.0% showed almost no differences even before the pandemic, and a uniform decline was observed after the start of the pandemic. A prevalence of 8.2% was found in both men and women. This decline in the 30 to 64 age groups can possibly be explained by the fact that the measures taken during the pandemic, such as home office and short-time work, not only promoted protection against infection, but also brought about a stress-reducing deceleration in the working and living environment [9], which could have had a positive effect, at least temporarily, on individual areas of the mental health of certain population groups during the first year of the pandemic. However, further research is needed to explain this finding. In principle, it is also conceivable that measures accompanying the pandemic, which were intended to counteract psychological distress, have promoted a reduction in depressive symptoms [36].

The considerable social differences in the prevalence of depressive symptoms to the disadvantage of low educated groups remain under pandemic conditions. Contrary to assumptions sometimes made and justified in references [9], population groups with low education apparently had no additional increased risk of developing depressive symptoms under conditions of the pandemic, at least in the first year of the pandemic considered here. However, the socioepidemiological pattern of a higher prevalence of depressive symptoms in low education groups has persisted both before and during the pandemic and corresponds to the pattern already found in previous GEDA waves [35].

4.2 Individual symptom areas of depressive symptoms

The analysis of individual symptom areas shows that there are partly contrary developments that are not visible in the overall result for the PHQ-8. For example, among those

aged 80 and older, there is an increase in the symptom area 'little interest or pleasure in in doing things', in women from 8.8% to 12.4% and in men from 9.1% to 16.0%. Furthermore, 9.8% of men of this age reported diminished ability to concentrate in the first year of the pandemic, compared to 3.0% in the pre-pandemic period, which was significantly lower. Although these results are subject to a relatively large statistical uncertainty and must therefore be interpreted with caution, there seems to be evidence that individuals in this age group living in private households were not only particularly affected by isolation during the pandemic, but in the case of men, may have experienced effects on cognitive performance. It is known from a larger population study on cognitive performance that social support, in the sense of a supportive density of contact, is beneficial to maintaining cognitive performance in old age [8]. In the future, special attention should be paid to ensuring supportive contact services for people who become highly isolated in a pandemic situation.

The decrease in frequency of 'Feeling tired or having little energy', 'Poor appetite or overeating' and 'Feeling bad about yourself – or that you are a failure or have let yourself or your family down' are symptom areas associated with chronic stress [37, 38]. The results support the interpretation that the decline in the frequency of depressive symptoms in the early period of the pandemic is explained by a decline in specific everyday stresses rather than by a decline in individuals with a depressive disorder in the narrow sense. In this context, the OECD has introduced the term 'Mental Ill-Health', which is to be understood more as impaired mental health and less as a chronic mental illness [39]. It is also consistent that in the first two symptoms queried in the PHQ-8, 1. 'Little interest or pleasure in doing things' and 2. 'Feeling down, depressed, or hopeless', no very large changes were found. These two core features need to be present in a severely impairing way in order to diagnose major depression, along with other accompanying symptoms [40]. Fullana et al. assume that the elimination of work-related duties during the pandemic provided a chance for temporary recovery in part of the population [36]. A study with a non-probabilistic sample was able to show that people who worked from home during the pandemic experienced less stress, reported more positive and less negative affect, and more life satisfaction than those who did not work from home [41]. The authors of this study, following the theory of resource maintenance, interpret that home office can be seen as a resource gain and, according to self-regulation theory, a way to cope with the pandemic challenges. A rapid review on this topic emphasises that the potential resource gain from home office during the pandemic and the positive effects on mental health that could be achieved with it depended on how good the organisational support was for people who worked from home during the pandemic [42].

Another indication of the potentially positive effects of changes in working conditions are the results on tiredness and the loss of energy. In 2019, in the age groups up to 64 years, between 20.3% and 26.2% of women reported that they were affected 'on more than half the days' or 'nearly every day'. During the pandemic period, the percentage decreased to between 15.2% to 17.0%. For men, the proportions were significantly lower in 2019 and only among the age groups from 30 to 64 years, although not significant, the trend was downward. This is the phase of life characterised by working life.

These observations are consistent with other study results at the beginning of the pandemic, which also reported a decrease in individual symptoms of depressive symptoms. As in the present study, there was a decrease in symptoms of tiredness and loss of energy [5, 6] as well as diminished ability to concentrate [7].

As part of the National Cohort (NAKO Health Study) [43, 44], a special survey was conducted at the beginning of the COVID-19 pandemic between 30 April 2020 and 15 May 2020, in writing and online, using the PHQ-9 as a survey instrument [43]. The prevalence of depressive symptoms was 9.5% during the survey period, 2.4% higher than the average prevalence of 7.1% in 2014–2019. However, an increase can only be seen in the age groups below 60 years, especially among younger women [44]. On the other hand, 32% of the respondents also reported an improved self-assessed health status at the beginning of the pandemic [44]. It was not possible to conclusively assess whether these changes were also partly due to systematic deviations in the sociodemographic composition of the sample at the time of the survey [43]. It is also not possible to determine whether any seasonal fluctuations in depressive symptoms had an influence on the results because the survey periods were not identical to those of the comparison years. Nevertheless, the NAKO study provides particularly valuable evidence that an increase in depressive symptoms at the beginning of the pandemic was associated with social consequences of the pandemic, such as job loss, reduction of working hours without short-time allowance, but also overtime, as well as an increase in job insecurity and a worsening of the financial situation [43].

Our analyses, which differentiated by education (Table 4), indicate that in the first year of the pandemic, people in the low or medium education group in particular may have benefited at least temporarily, from pandemic-induced changes with regard to certain depression symptoms, as indicated by the reduction found in a stress-associated depression symptom in these groups. Nevertheless, both women and men in the low education group continued to be by far the most affected by this depression symptom during the pandemic. The education-specific decrease found in the frequency of the symptoms during the pandemic requires further research and explanation.

Other population-based studies of the pandemic have found a reduction in education-related differences in loneliness and life satisfaction [11, 12]. People with high education reported increased stress during the pandemic, so that existing educational differences in loneliness experiences and life satisfaction were reduced compared to the pre-pandemic period. Since the calculations of the cited studies apparently did not use age standardisation, the results must be interpreted with reservations in view of age-group-specific changes during the pandemic and different age structures of the education groups. Liu et al. [45] found, on the other hand, that people with few years of education had higher psychological stress at the beginning of the pandemic. However, it must be taken into account that no baseline level was determined in the study and that the data were not based on a random sample from the population, but on an online survey in which three times as many women as men participated, as well as a disproportionately high number of younger respondents. Nevertheless, the partly inconsistent findings confirm that there is a need for

further research regarding this question of social inequalities in the consequences of the pandemic for mental health.

4.3 Strengths and limitations

The number of cases in GEDA 2019/2020 makes it possible to analyse the data on depressive symptoms and the associated individual symptoms by sex, age groups and education groups. In a departure from previous studies, any seasonal variations to be levelled out the two comparable time periods in 2019 and 2020. GEDA 2019/2020 is a survey with telephone interviews based on a random sample of landline and mobile phone numbers. Despite the weighting of the respective study population according to age, gender, region and education group according to the population composition at the corresponding time of the survey, deviations of the study population with regard to other characteristics cannot be ruled out [26].

The intended analysis by gender, age and education groups did not allow for a closer look at different phases during the pandemic.

Any fluctuations in the course of the pandemic with regard to depressive symptoms were highlighted in another publication [6].

The summary of the age group 15 to 29 years remains unsatisfactory in view of the considerable dynamics of life changes in this stage of life. Much higher case numbers would have been necessary for this. The same applies to certain life situations possibly negatively influenced by the COVID-19 pandemic, which could be associated with a higher risk of depressive symptoms, as could be shown, for example, in the special analysis of the NAKO health study [43].

How the discontinuation of support services (such as self-help groups) or, on the other hand, the creation of alternative support services (such as online formats for counselling and therapy), have affected mental health cannot be assessed on the basis of the GEDA data [10].

4.4 Conclusion

The adult population has proven to be predominantly resilient in terms of depressive symptoms during the period studied at the beginning of the pandemic. However, the results also indicate that there are large groups in the population that have to bear a higher symptom burden than others. This affects women to a greater extent than men and especially people with low and medium education. These results on the first year of the pandemic have shown that the frequency of depressive symptoms can be influenced by changes in the living environment and that high prevalences should not be accepted as circumstances that can be influenced little. It seems urgent to continue the data collection in order to further observe developments in the population and to determine whether and how the now cumulative crises, such as the pandemic, inflation and the consequences of the war in Europe since February 2022, affect mental health. Against the background of the current results, it is important to continue to observe how opportunities and risks develop for different age and education groups, women and men. Further analyses of the course in 2021 and 2022, which are already planned, will show whether the previous resilience has held up in the further course of the pandemic and the added crises, and whether the situation of the people aged 80 years and older has

improved again. Supplementary surveys and analyses that also include children have been started, but will not be completed until mid-2023.

From 2022 onwards, any changes will no longer be interpreted in relation to the pandemic alone, because economic pandemic consequences and challenges, such as the war in Eastern Europe, could also have an impact on mental health.

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Data protection and ethics

GEDA 2019/2020 is subject to strict compliance with the data protection provisions set out in the EU General Data Protection Regulation (GDPR) and the Federal Data Protection Act (BDSG). The Ethics Committee of the Charité – Universitätsmedizin Berlin assessed the ethics of the study and approved the implementation of the study (application number EA2/070/19). Participation in the study was voluntary. The participants were informed about the aims and contents of the study and about data protection. Informed consent was obtained verbally.

Availability of data

The authors confirm that some access restrictions apply to the data underlying the findings. The data set cannot be made publicly available because informed consent from study participants did not cover public deposition of data. However, the minimal data set underlying the findings is archived in the Research Data Centre at the Robert Koch Institute and can be accessed by researchers on reasonable request. On-site access to the data set is possible at the Secure Data Center of the Robert Koch Institute's Research Data Centre. Requests should be submitted by e-mail to fdz@rki.de.

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Conflicts of interest

The authors declared no conflicts of interest.

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References

1. Lange C, Jentsch F, Allen J et al. (2015) Data Resource Profile: German Health Update (GEDA) – the health interview survey for adults in Germany. International Journal of Epidemiology 44(2):442–450
2. Lange C, Finger JD, Allen J et al. (2017) Implementation of the European health interview survey (EHIS) into the German health update (GEDA). Archives of Public Health 75(1):1–14
3. Heidemann C, Scheidt-Nave C, Beyer AK et al. (2021) Health situation of adults in Germany – Results for selected indicators from GEDA 2019/2020-EHIS. J Health Monit 6(3):3–25. https://edoc.rki.de/handle/176904/8754 (As at 02.12.2022)
4. Hapke U, Cohrdes C, Nübel J (2019) Depressive symptoms in a European comparison – Results from the European Health Interview Survey (EHIS) 2. J Health Monit 4(4):57–65. https://edoc.rki.de/handle/176904/6248 (As at 02.12.2022)
5. Cohrdes C, Yenikent S, Wu J et al. (2021) Indications of Depressive Symptoms During the COVID-19 Pandemic in Germany: Comparison of National Survey and Twitter Data. JMIR mental health 8(6):e27140
6. Damerow S, Rommel A, Beyer AK et al. (2022) Health situation in Germany during the COVID-19 pandemic. Developments over time for selected indicators of GEDA 2019/2020 – An update. J Health Monit 7(S3):1–19. https://edoc.rki.de/handle/176904/9908 (As at 02.12.2022)
7. Damerow S, Rommel A, Prütz F et al. (2020) Developments in the health situation in Germany during the initial stage of the COVID-19 pandemic for selected indicators of GEDA 2019/2020-EHIS. J Health Monit 5(4):3–22. https://edoc.rki.de/handle/176904/7550.2 (As at 02.12.2022)
8. Cohrdes C, Hapke U, Nübel J et al. (2022) Erkennen – Bewerten – Handeln. Schwerpunktbericht zur psychischen Gesundheit der Bevölkerung in Deutschland. Teil 1 – Erwachsenenalter. Robert Koch-Institut. https://edoc.rki.de/handle/176904/9259 (As at 02.12.2022)
9. Mauz E, Eicher S, Peitz D et al. (2021) Mental health of the adult population in Germany during the COVID-19 pandemic. Rapid Review. J Health Monit 6(S7):1–65. https://edoc.rki.de/handle/176904/9362 (As at 02.12.2022)
10. Scheidt-Nave C, Barnes B, Beyer AK et al. (2020) Care for the chronically ill in Germany – The challenges during the COVID-19 pandemic. J Health Monit 5(S10):1–28. https://edoc.rki.de/handle/176904/7801 (As at 02.12.2022)
11. Entringer T, Kröger H (2021) Psychische Gesundheit im zweiten Covid-19 Lockdown in Deutschland. SOEP papers on Multidisciplinary Panel Data Research 1136. DIW, Berlin
12. Entringer T, Kröger H, Schupp J et al. (2020) Psychische Krise durch Covid-19? Sorgen sinken, Einsamkeit steigt, Lebenszufriedenheit bleibt stabil. SOEP papers on Multidisciplinary Panel Data Research 1087. DIW, Berlin
13. Liebig S, Buchinger L, Entringer T et al. (2020) Ost- und Westdeutschland in der Corona-Krise: Nachwendegeneration im Osten erweist sich als resilient. DIW Wochenbericht. DIW, Berlin
14. Mata J, Wenz A, Rettig T et al. (2020) Health behaviors and mental health before and during the COVID-19 pandemic: A longitudinal population-based survey. PsyArXiv
15. Naumann E, Mata J, Reifenscheid M et al. (2020) Die Mannheimer Corona-Studie: Schwerpunktbericht zum Angstempfinden in der Bevölkerung. Untersuchungszeitraum 20. März bis 16. April 2020. https://madoc.bib.uni-mannheim.de/55136/1/Schwerpunktbericht_Angstempfinden_Mannheimer_Corona_Studie.pdf (As at 02.12.2022)
16. Gilan D, Röthke N, Blessin M et al. (2020) Psychomorbidity, Resilience, and Exacerbating and Protective Factors During the SARS-CoV-2 Pandemic: A systematic literature review and results from the German COSMO-PANEL. Dtsch Arztebl Int 117(38):625–630
17. Techniker Krankenkasse (2021) Gesundheitsreport. Arbeitsunfähigkeiten. 2021. Techniker Krankenkasse, Hamburg
18. COSMO – COVID-19 Snapshot Monitoring (2021) Ressourcen und Belastungen. https://projekte.uni-erfurt.de/cosmo2020/web/topic/vertrauen-zufriedenheit-ressourcen/20-belastungen/ (As at 02.12.2022)
19. Hajek A, König HH (2021) The Prevalence and Correlates of Probable Major Depressive Disorder and Probable Generalized Anxiety Disorder during the COVID-19 Pandemic. Results of a Nationally Representative Survey in Germany. Int J Environ Res Public Health 18(23)
20. COSMO – COVID-19 Snapshot Monitoring (2021) Resilienz. https://projekte.uni-erfurt.de/cosmo2020/web/topic/vertrauen-zufriedenheit-ressourcen/10-resilienz/ (As at 02.12.2022)
21. Kunzler AM, Chmitorz A, Bagusat C et al. (2018) Construct validity and population-based norms of the German brief resilience scale (BRS). Eur J Health Psychol 25(3):107

22. Bohlken J, Kostev K, Riedel-Heller S et al. (2021) Effect of the COVID-19 pandemic on stress, anxiety, and depressive disorders in German primary care: A cross-sectional study. J Psychiatr Res 143:43–49

23. Gaertner B, Fuchs J, Möhler R et al. (2021) Older people at the beginning of the COVID-19 pandemic: A scoping review. J Health Monit 6(S4):1–37. https://edoc.rki.de/handle/176904/8169 (As at 02.12.2022)

24. Kurth BM, Lange C, Kamtsiuris P et al. (2009) Gesundheits-monitoring am Robert Koch-Institut. Sachstand und Perspektiven. Bundesgesundheitsbl 52:557–570

25. Lange C, Jentsch F, Allen J et al. (2015) Data Resource Profile: German Health Update (GEDA) – the health interview survey for adults in Germany. Int J Epidemiol 44(2):442–450

26. Allen J, Born S, Damerow S et al. (2021) German Health Update (GEDA 2019/2020-EHIS) – Background and methodology. J Health Monit 6(3):66–79. https://edoc.rki.de/handle/176904/8757 (As at 02.12.2022)

27. Robert Koch-Institut (Hrsg) (2021) Fragebogen zur Studie Gesundheit in Deutschland aktuell: GEDA 2019/2020-EHIS. J Health Monit 6(3):88–106. https://edoc.rki.de/handle/176904/8752 (As at 02.12.2022)

28. Kroenke K, Strine TW, Spitzer RL et al. (2009) The PHQ-8 as a measure of current depression in the general population. J Affect Disord 114(1/3):163–173

29. American Psychiatric Association (1994) Diagnostic and Statistical Manual of Mental Disorders, Forth edition (DSM-IV). American Psychiatric Association, Washington, DC

30. Brauns H, Scherer S, Steinmann S (2003) The CASMIN educational classification in international comparative research Advances in cross-national comparison. Springer, 221–244

31. Pöge K, Rommel A, Starker A et al. (2022) Survey of sex/gender diversity in the GEDA 2019/2020-EHIS study – objectives, procedure and experiences. J Health Monit 7(2):48–65. https://edoc.rki.de/handle/176904/9890 (As at 02.12.2022)

32. Forschungsdatenzentren der Statistischen Ämter des Bundes und der Länder (2017) Mikrozensus 2017. DOI: 10.21242/12211.2017.00.00.1.1.1, own calculations

33. Damerow S, Rommel A, Prütz F et al. (2020) Developments in the health situation in Germany during the initial stage of the COVID-19 pandemic for selected indicators of GEDA 2019/2020-EHIS. J Health Monit 5(4):3–22. https://edoc.rki.de/handle/176904/7550.2 (As at 02.12.2022)

34. Bundesregierung (2020) Leitlinien gegen Ausbreitung des Coronavirus (16.03.2020). https://www.bundesregierung.de/breg-de/themen/coronavirus/leitlinien-bund-laender-1731000 (As at 02.12.2022)

35. Bretschneider J, Kuhnert R, Hapke U (2017) Depressive symptoms among adults in Germany. J Health Monit 2(3)77–83. https://edoc.rki.de/handle/176904/2826 (As at 02.12.2022)

36. Fullana MA, Hidalgo-Mazzei D, Vieta E et al. (2020) Coping behaviors associated with decreased anxiety and depressive symptoms during the COVID-19 pandemic and lockdown. J Affect Disord 275:80–81

37. Hapke U, Maske U, Scheidt-Nave C et al. (2013) Chronischer Stress bei Erwachsenen in Deutschland. Bundesgesundheitsbl 56(5):749–754

38. Monroe SM, Slavich GM, Georgiades K (2014) The social environment and depression: The roles of life stress. In: Gotlib IH, Hammen CL (Hrsg), Handbook of depression (S. 296–314). The Guilford Press.

39. OECD (2021) A New Benchmark for Mental Health Systems: Tackling the Social and Economic Costs of Mental Ill-Health, OECD Health Policy Studies. OECD Publishing Paris, France

40. American Psychiatric Association (2014) Diagnostisches und statistisches Manual psychischer Störungen – DSM-5®. German Version oft the Diagnostic and Statistical Manual of Mental Disorders – DSM-5®. Hogrefe Verlag.

41. Rieth M, Hagemann V (2021) The impact of telework and closure of educational and childcare facilities on working people during COVID-19. Zeitschrift für Arbeits- und Organisationspsychologie A&O, 9 (16). https://doi.org/10.1026/0932-4089/a000370 (As at 02.12.2022)

42. Oakman J, Kinsman N, Stuckey R et al. (2020) A rapid review of mental and physical health effects of working at home: how do we optimise health? BMC Public Health 20(1):1–13

43. Dragano N RM, Peters A, Engels M et al. (2022) Increase in Mental Disorders During the COVID-19 Pandemic – The Role of Occupational and Financial Strains. An analysis of the German National Cohort (NAKO) Study. Dtsch Arztebl Int 119:179–187

44. Peters A, Rospleszcz S, Greiser KH et al. (2020) The impact of the COVID-19 Pandemic on self-reported health: Early evidence From the German National Cohort. Dtsch Arztebl Int 117(50):861

45. Liu S, Haucke MN, Heinzel S et al. (2021) Long-Term Impact of Economic Downturn and Loneliness on Psychological Distress: Triple Crises of COVID-19 Pandemic. J Clin Med 10(19):4596

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Change in sports activity and walking and cycling for transport since the COVID-19 pandemic – Results of the GEDA 2021 study

Abstract

Background: Physical activity is a significant health promotion behaviour. COVID-19 pandemic mitigation measures, such as reducing social contact, closing sports facilities and working from home offices, may make it more difficult to engage in regular physical activity.

Methods: The data collected between July and October 2021 from the nationally representative study German Health Update (GEDA 2021) were used. The activity behaviour is described by the change in the amount of sports activity as well as the amount of physical active transport (walking/cycling) since the beginning of the COVID-19 pandemic. The sample comprises 2,985 participants aged 18 and older.

Results: A quarter of the population reduced their sports activity compared to before the COVID-19 pandemic, while 12% increased their sports activity and 38% reported no change. In terms of physical active transport, it shows that 15% reduced the amount, 17% increased it and 55% maintained it. Compared to younger adults, older adults were more likely to maintain their activity behaviour rather than reduce or increase it.

Conclusion: Even before the pandemic, physical inactivity was common among the population. The high proportion of adults who reduced their sports activity during the pandemic underlines the need for effective measures to promote physical activity.

SPORTS ACTIVITY · PHYSICAL ACTIVITY · CYCLING · WALKING · ADULTS · HEALTH MONITORING

1. Introduction

Physical activity and sports play an important role in the prevention and treatment of a variety of non-communicable diseases [1, 2]. For example, regular physical activity reduces the risk of developing cardiovascular disease, type 2 diabetes mellitus, obesity, breast and colon cancer and depression [3, 4]. Furthermore, it is known that regular physical activity and sports activity and the associated physical fitness have a positive effect on the function of the immune system [5]. Over the course of the COVID-19 pandemic, studies have shown that physically active individuals had a lower risk of severe COVID-19 infections than less active individuals [6, 7].

The occurrence of SARS-CoV-2 infections in 2020 and 2021 had different effects on activity behaviour and can be divided into 6 phases: Phase 1 with the first COVID-19 wave and the entry into force of comprehensive containment

GEDA 2021

Sixth follow-up survey of the German Health Update

Data holder: Robert Koch Institute

Objectives: Provision of reliable information on the health status, health behaviour and health care of the population living in Germany and their changes in the course of the SARS-CoV-2 pandemic.

Study design: Cross-sectional telephone survey

Population: German-speaking population aged 16 years and older living in private households that can be reached via landline or mobile phone

Sampling: Random sample of landline and mobile telephone numbers (dual-frame method) from the ADM sampling system (Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.)

Sample size: 5,030 respondents

Study period: July 2021 to December 2021

GEDA survey waves:
- GEDA 2009
- GEDA 2010
- GEDA 2012
- GEDA 2014/2015-EHIS
- GEDA 2019/2020-EHIS
- GEDA 2021

Further information in German is available at www.geda-studie.de

measures (March to May 2020). This was followed by phase 2 (summer plateau – May to September 2020) with comparatively low infection levels and relaxed measures. Phase 3 and Phase 4 (October 2020 to June 2021) included the second and third COVID-19 wave and the reintroduction of containment measures, such as the obligation for employers to offer home office to employees at the end of January 2021 unless there are operational reasons not to do so ('home office obligation'). In phase 5 (summer plateau – June to August 2021), the infection prevalence was again low, the measures were relaxed and there was a comprehensive vaccination offer. The following phase 6 was characterised by the fourth wave, which increased significantly in October 2021, and the introduction of containment measures, such as access restrictions depending on vaccination and convalescence status (the so-called 3G and 2G rules; from the end of August 2021) [8–10].

Many of the COVID-19 pandemic containment measures, especially in phases 1, 3 and 4, had the potential to reduce physical activity among the population. For example, sports facilities were closed and group sports were prohibited [11]. In addition, due to the increased work in the home office and the general request to stay at home, commutes and other distances that can be covered in a physically active way were eliminated. The obligation to be in domestic isolation due to infection or close contact with an infected person may also have had a negative impact on physical activity [12]. Day care centre and school closures challenged families and often significantly reduced the possibility for many mothers and fathers to be physically active in their free time [13, 14].

While part of the population had to give up leisure activities due to the containment measures, other parts of the population, such as men and women in short-time work, gained time that could be spent doing sports. At the same time, during the COVID-19 pandemic, new opportunities to be physically active have become established: For example, the proportion of the population in Germany using digital media for exercise (e.g. online fitness classes) was higher in autumn 2020 than before the COVID-19 pandemic [15]. Likewise, there was an increase in outdoor physical activities, such as cycling on urban green spaces [16]. However, results from the Germany-wide study 'Examining Physical Activity and Sports Behaviour in the Face of COVID-19 Pandemic' (SPOVID study) show that the overall proportion of adolescents and adults who reduced their sports activity during the first phase of the pandemic was significantly higher than the proportion of those who increased their sports activity (31% vs. 6%) [17]. A predominant decrease in sports activity is confirmed by the data of the German Ageing Survey (DEAS) for individuals over 45 years of age, which was collected in the summer of 2020 [18]. Reviews of international studies also conclude that physical activity decreased during the COVID-19 pandemic [19–22].

In conclusion, data on changes in physical activity in the adult population in Germany during the COVID-19 pandemic are insufficient. Especially if other areas of activity, such as physical active transport, are considered in addition to sports activity and the time period is extend beyond the first year of the pandemic.

The aim of this article is to describe the change in physical activity in terms of the amount of sports activity and active transport (walking or cycling) since the beginning of the COVID-19 pandemic, based on the nationwide study

German Health Update (GEDA 2021). The temporal focus here is on the summer and autumn months of 2021.

2. Methods

2.1 Study design

The GEDA study is a cross-sectional survey of the German-speaking resident population aged 16 and older, which is conducted regularly as part of the nationwide health monitoring of the Robert Koch Institute (RKI). The aim of the study is to describe the health situation, health behaviour and its influencing factors, the use of prevention and care.

GEDA 2021 was conducted as the sixth follow-up survey from July to December 2021 as a telephone interview using a programmed, structured questionnaire (Computer Assisted Telephone Interview, CATI). The sampling is based on a mobile and fixed network sample (dual frame method), which allows for an almost complete coverage of the population [23, 24]. The population comprised the population aged 16 and older living in private households whose usual place of residence at the time of data collection was in Germany. The present analysis is limited to persons aged 18 and older and the survey period from mid-July to the end of October 2021 (n=2,985).

The participants were asked the following question (a) to survey the change in the amount of sport: 'Have you changed the amount of sport you do since the start of the Corona pandemic, i.e. since March 2020?'. The four answer options were: 'No, I do no sport' (a1), 'No, I do the same amount of sport overall' (a2 'unchanged'), 'Yes, I do less sport overall' (a3 'reduced'), 'Yes, I do more sport overall' (a4 'increased').

The following question (b) was asked to survey the change in physical active transport (hereafter referred to as 'active transport'): 'Since the start of the Corona pandemic, i.e. March 2020, have you changed the amount of walking or cycling you do for work, shopping or leisure?'. The four response categories were: 'No, I do not walk or cycle these distances' (b1), 'No, I walk as much overall or cycle as much overall' (b2 'unchanged'), 'Yes, I walk less overall or cycle less overall' (b3 'reduced'), 'Yes, I walk more overall or cycle more overall' (b4 'increased').

2.2 Statistical methods

Gender identity was used in GEDA 2019/2020-EHIS to describe gender differences [25]. Participants were able to indicate which sex they felt they belonged to. Among participants 18 years and older, 11,959 indicated a female identity and 10,687 indicated a male identity. 62 participants indicated a different sex identity or did not provide any information. In the analyses by gender, individuals with a different gender identity or no indication are not shown. The analyses on sports activity and active transport are based on 2,985 participants aged 18 and older (1,549 women, 1,428 men and 8 individuals with a different gender identity or no information; Table 1). Of these, 2,978 participants (99.8%) have valid data on sports activities and 2,963 participants (99.3%) have valid data on active transport.

The indicators of change in physical activity, defined here as the amount of sport or active transport since the start of the COVID-19 pandemic, are presented both for the entire adult population and in relation to the active part of the population (exclusion of participants who indicated

response category a1 'No sport' or b1 'No active transport'). The number of cases for the indicator on the change in sports activity is 2,978 (response categories a1–4) and 2,337 participants (a2–4) respectively, and for the change in active transport 2,963 (b1–4) and 2,632 participants (b2–4) respectively.

Results are reported as prevalence in percent with 95% confidence interval (95% CI) separately by gender (women, men), age group in years (18–29, 30–44, 45–64, ≥65) and education status (International Standard Classification of Education, ISCED: low, medium, high education group [26]).

Multinomial logistic regression models were used to analyse the independent influence of gender, age and education on the reduction or increase of the amount of sport (a) or active transport (b) compared to unchanged activity behaviour. The dependent variables are presented in the following categories: 'Unchanged' (reference group), 'Reduction' and 'Increase' of the respective activity behaviour. Relative risks (RR) were calculated, which represent the ratio of two absolute risks and thus enable comparison between groups. For example, the risk for women to reduce their activity is put in relation to the risk for men to reduce their activity. An RR of 1 means that there is no difference between the groups, while a value <1 reduces the risk and a value >1 increases the risk. For the regression models, only those participants were considered who took part in sport or actively covered distances and had valid values in the variables gender, age and education. The sample size of the regression model for change in sports activity thus includes data from 2,323 participants and that of the model for change in active transport includes data from 2,616 participants.

All analyses were performed using a weighting factor that corrects for deviations of the sample from the population structure. First, a design weighting was carried out for the different selection probability (mobile and fixed network) and then an adjustment was made to official population figures with regard to age, sex, federal state and district type (as of: 31.12.2020) and in relation to education (Microcensus 2018). The analyses were carried out with Stata 17.0 using the survey procedures. A statistically significant difference between groups is assumed if the corresponding p-value is less than 0.05.

	Numbers of cases	Proportion (unweighted)	Proportion (weighted)	Missing values
	n	%	%	n
Total	**2,985**	**100**	**100**	
Gender				8
Women	1,549	52.0	50.8	
Men	1,428	48.0	49.2	
Age group				0
18–29 years	261	8.7	16.2	
30–44 years	513	17.2	23.4	
45–64 years	1,145	38.4	33.7	
≥65 years	1,066	35.7	26.8	
Education status				12
Low education group	136	4.6	17.2	
Medium education group	1,259	42.3	57.0	
High education group	1,578	53.1	25.8	

Table 1
Description of the sample by gender, age and education
Source: GEDA 2021

Figure 1
Change in sports activity since the beginning of the COVID-19 pandemic by gender (total N=2,978, women n=1,547, men n=1,423), proportion in percent with 95% confidence intervals
Source: GEDA 2021

38% of the population did the same amount of sports in summer/fall 2021 as before the COVID-19 pandemic.

24% reduced their sports activity since the COVID-19 pandemic, while only 12% increased it.

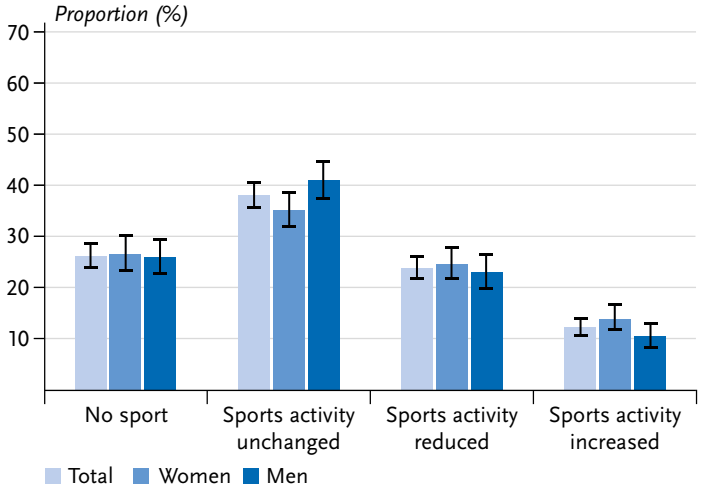
3. Results

Change in sports activity since the beginning of the COVID-19 pandemic

23.7% of adults reported that they had reduced their amount of sport compared to before the pandemic, while 12.1% reported that they had increased their amount of sport (Figure 1). 38.1% reported that they had not changed their amount of sport since the start of the COVID-19 pandemic. Slightly more than a quarter reported not doing any sport both before and since the start of the COVID-19 pandemic. There are no statistically significant differences between women and men with regard to the above categories of sports activity since the beginning of the COVID-19 pandemic.

If only participants who participate in sport are considered (73.9% of the adult population), the proportion of those who maintained their amount of sport since the start of the COVID-19 pandemic is 51.6% (Table 2). 32.1% of the participants who do sport reduced and 16.3% increased their amount of sport compared to the time before the pandemic. The results of the bivariate analysis show that women increased their amount of sport more often than men. The age distribution shows that adults aged 45- to 64-years and older maintained their sports activity more often than younger adults, with those under 45 years increasing their sports activity more often than older adults (Table 2). There are no significant differences between the education groups in any of the above categories (Table 2).

Regardless of gender and education, the multivariate analysis confirms that adults aged 45- to 64-years and older were more likely to maintain their sports activity compared



to 18 to 29-year olds and were less likely to report a reduction or increase of their sports activity (Table 4). With regard to the increase in sports activity, the multivariate analysis also shows that women increased their sports activity more often than men, instead of maintaining it (Table 4).

Change in active transport since the beginning of the COVID-19 pandemic

In terms of the total adult population, 15.4% reported a reduction in active transport compared to the pre-pandemic period, while 16.8% reported an increase (Figure 2). The majority of all adults (54.7%) reported that they actively travel as much as they did before the pandemic. The proportion of adults who reported no active transport both before and since the beginning of the COVID-19 pandemic was 13.1%. There are no significant differences between women and men.

If only those who actively travel (86.9% of the adult population) are considered, 62.9% maintained the amount of

Table 2
Change in sports activity since the beginning of the COVID-19 pandemic, by gender, age and education
(total N=2,337, women n=1,214, men n=1,115)
Source: GEDA 2021

	Amount of sports activity						
	Unchanged		Reduced		Increased		
	%	(95% CI)	%	(95% CI)	%	(95% CI)	p-value*
Total	**51.6**	**(48.4–54.7)**	**32.1**	**(29.2–35.1)**	**16.3**	**(14.1–18.9)**	
Gender							
Women	47.8	(43.5–52.1)	33.4	(29.4–37.6)	18.8	(15.5–22.6)	0.042
Men	55.3	(50.6–59.9)	30.9	(26.6–35.5)	13.8	(10.8–17.5)	
Age group							
18–29 years	39.8	(31.7–48.6)	33.3	(25.5–42.1)	26.9	(19.8–35.4)	<0.001
30–44 years	40.6	(34.1–47.5)	38.3	(31.9–45.2)	21.1	(16.1–27.1)	
45–64 years	59.9	(55.0–64.5)	28.1	(23.8–32.7)	12.1	(9.3–15.5)	
≥65 years	62.1	(56.8–67.2)	29.9	(25.2–35.0)	8.0	(5.7–11.1)	
Education status							
Low education group	53.0	(41.2–64.5)	26.2	(17.0–38.0)	20.8	(12.6–32.4)	0.513
Medium education group	51.3	(46.9–55.6)	33.6	(29.6–37.9)	15.1	(12.3–18.5)	
High education group	51.2	(47.2–55.1)	32.0	(28.3–35.9)	16.9	(13.8–20.5)	

CI = confidence interval, *Pearson's chi-squared test Pearson

Older adults were more likely to maintain their sports activity compared to younger adults than to reduce or increase it.

these trips since the beginning of the COVID-19 pandemic, 17.8% reduced and 19.3% increased the amount (Table 3). The results of the bivariate analysis show that the proportion of those who reduced the volume is higher among 18- to 29-year olds than among older persons. In addition, more people in the medium compared to the low education group tended to report that they had maintained the amount of active transport. There are no statistically significant differences between women and men (Table 3).

The multivariate analysis confirms that adults aged 30 to 44 years and older were less likely than 18- to 29-year olds to reduce the active transport and more likely to maintain their pre-pandemic levels (Table 4). In addition, adults aged 65 and older were less likely to increase the amount of active transport compared to 18- to 29-year olds (Table 4). There are no statistically significant differences between women and men and between the education groups.

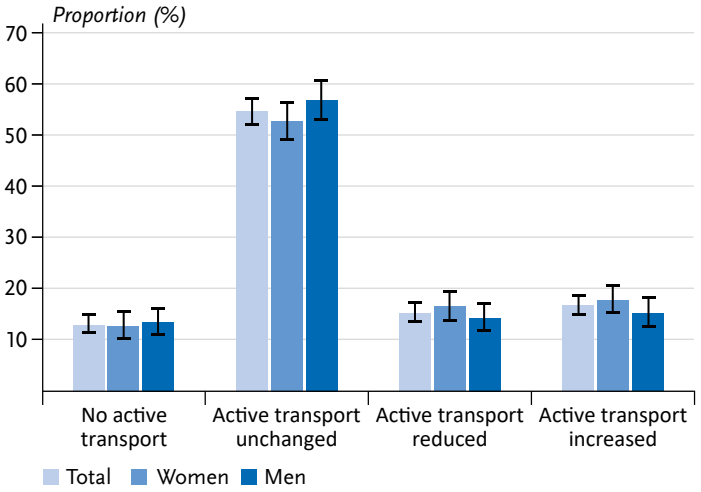


Figure 2
Change in active transport since the beginning of the COVID-19 pandemic by gender
(total N=2,963, women n=1,536, men n=1,419), proportion in percent with 95% confidence intervals
Source: GEDA 2021

Table 3
Change in active transport since the beginning of the COVID-19 pandemic, by gender, age and education (total N=2,632, women n=1,374, men n=1,251)
Source: GEDA 2021

	Amount of active transport						
	Unchanged		Reduced		Increased		
	%	(95% CI)	%	(95% CI)	%	(95% CI)	p-value*
Total	**62.9**	**(60.0–65.8)**	**17.8**	**(15.5–20.2)**	**19.3**	**(17.1–21.7)**	
Gender							
Women	60.5	(56.4–64.4)	19.0	(15.8–22.6)	20.5	(17.5–23.9)	0.205
Men	65.7	(61.5–69.7)	16.6	(13.6–20.1)	17.7	(14.6–21.3)	
Age group							
18–29 years	48.1	(39.4–57.0)	29.9	(22.2–38.9)	22.0	(15.6–29.9)	<0.001
30–44 years	62.5	(56.3–68.4)	16.0	(12.0–20.9)	21.5	(16.7–27.3)	
45–64 years	67.9	(63.4–72.1)	12.9	(10.1–16.3)	19.2	(15.8–23.1)	
≥65 years	66.7	(61.9–71.2)	17.7	(14.1–22.0)	15.6	(12.3–19.5)	
Education status							
Low education group	53.5	(43.1–63.5)	23.4	(15.7–33.5)	23.1	(15.3–33.2)	0.055
Medium education group	66.6	(62.8–70.2)	16.2	(13.5–19.4)	17.2	(14.5–20.2)	
High education group	60.7	(56.8–64.4)	17.2	(14.4–20.4)	22.1	(19.0–25.6)	

CI = confidence interval, *Pearson's chi-squared test

15% of the population reduced walking and cycling for transport since the COVID-19 pandemic, 17% increased it, and 55% did not change it.

Adults aged 18- to 29-years were more likely than older adults to report having reduced active transport.

Table 4
Change in sports activity and active transport, using multinomial logistic regression, by gender, age and education
Source: GEDA 2021

	Amount of sports activity (Reference group: unchanged)						Amount of active transport (Reference group: unchanged)					
	Reduced			Increased			Reduced			Increased		
Variable	RR	(95% CI)	p-value	RR	(95% CI)	p-value	RR	(95% CI)	p-value	RR	(95% CI)	p-value
Gender												
Women	1.29	(0.97–1.72)	0.084	1.78	(1.21–2.63)	0.004	1.31	(0.94–1.82)	0.114	1.31	(0.96–1.79)	0.088
Men	1.0			1.0			1.0			1.0		
Age group												
18–29 years	1.0			1.0			1.0			1.0		
30–44 years	1.08	(0.64–1.84)	0.764	0.76	(0.42–1.38)	0.370	0.4	(0.23–0.69)	0.001	0.71	(0.41–1.25)	0.240
45–64 years	0.52	(0.32–0.84)	0.008	0.28	(0.16–0.49)	<0.001	0.31	(0.19–0.52)	<0.001	0.63	(0.38–1.06)	0.081
≥65 years	0.53	(0.33–0.87)	0.011	0.18	(0.10–0.32)	<0.001	0.41	(0.24–0.68)	0.001	0.5	(0.30–0.85)	0.011
Education status												
Low education group	1.0			1.0			1.0			1.0		
Medium education group	1.36	(0.72–2.56)	0.343	0.78	(0.39–1.56)	0.48	0.66	(0.38–1.16)	0.153	0.61	(0.34–1.08)	0.092
High education group	1.29	(0.68–2.43)	0.435	0.88	(0.44–1.79)	0.732	0.83	(0.47–1.45)	0.51	0.91	(0.50–1.62)	0.739
	n=2,323 (women n=1,210, men n=1,113)						n=2,616 (women n=1,369, men n=1,247)					

RR = Relative risk, CI = confidence interval

4. Discussion

The measures taken to contain the COVID-19 pandemic, such as reducing social contact, closing facilities and increasing home office working, were important steps in protecting the population from SARS-CoV-2 infection [27]. Early on in the pandemic, it was discussed that there would be profound changes in lifestyle as a result of the containment measures, which could have a negative impact on health behaviours such as physical activity [28]. However, the dynamics of the infection event and the corresponding regulations make it difficult to reach general conclusions about changes in activity behaviour in the pandemic. It is also unclear whether adults of different gender, age and education groups responded equally to containment measures in terms of their physical activity behaviour.

The present results of the GEDA 2021 study show that at the time of data collection between summer and autumn 2021, it was possible for 38% of the adult population to maintain their amount of sports activity. 12% of the population were even able to increase their sports activity. However, the proportion of people who reduced their sports activity was 24% and thus about twice as high as the proportion of those who increased their sports activity. This is particularly worrying given that a quarter of the population did not participate in sport at all and that even before the pandemic, the majority of the adult population's physical activity level was below the recommended level [29]. More than half (55%) of the population were able to maintain the amount of active transport, 17% were able to increase it and 15% reduced it.

The results also show that adults of different ages changed the amount of sport they did differently during the pandemic. In part, there were also differences between women and men. However, there were no differences with regard to education status. With regard to the change in distances actively travelled since the beginning of the pandemic, there were also differences between adults of different ages. There were no differences between women and men or between the education groups.

A comparison of the present study results with existing literature on changes in physical activity during the COVID-19 pandemic is only possible to a limited extent, as both the survey methods (such as the questions on activity behaviour) and the times at which the studies were conducted differ. It could be shown that the physical activity of the population changed during the pandemic depending on the infection numbers and containment measures [30, 31].

In the for Germany representative SPOVID study, data on changes in physical activity behaviour of individuals aged 14 years and older were collected at the beginning of the pandemic in March and April 2020 using web-based questionnaires. The proportion of individuals who reduced their sports activity was 31% in the SPOVID study, higher than in GEDA 2021 (24%), while the proportion who increased their sports activity was lower (6% vs. 12%) [17]. One possible explanation for these deviations are the different survey times: The data collection of the SPOVID study took place in a period with comparatively strict containment measures, while at the time of the implementation of the GEDA 2021 study (summer/autumn 2021), the sports infrastructure was largely open, in compliance with

infection control and hygiene measures. In addition, the proportion of vaccinated population was 63% [32] at the time of the GEDA 2021 survey, which may have encouraged parts of the population to resume previous sports habits during this phase of the pandemic.

Data on self-reported changes in sports activity during the pandemic, with a focus on the population over 45 years of age, is provided by the German Ageing Survey (DEAS), a representative survey conducted by the German Centre for Gerontology during the summer plateau 2020 [18]. According to the DEAS, more adults aged 45 and older reduced their sports activity (28%) than adults of the same age in GEDA 2021 (19%; data not shown), while the proportion of adults who did more sports activity was almost the same in both studies (8% vs. 7%; data not shown).

A higher proportion of women than men increasing their sports activity is initially surprising against the background of the existing references. A study conducted in Germany between October and November 2020 with women and men working full-time showed that women reduced their sports activity more often than men [14]. This was especially true for mothers of minor children. At the time of the present GEDA study, day care centres, schools and recreational facilities for children were widely open, which may have eased the daily burden on mothers and fathers. Mothers may have used this situation to compensate for any sport deficits from previous phases of the pandemic. This could explain the higher proportion of women with an increased amount of sport compared to before the pandemic. In addition, women and younger adults in particular used digital sports services during the pandemic, e.g. online fitness courses [15]. It is also possible that women continued the digital offers they used in the early course of the pandemic due to the higher temporal flexibility in the later course of the pandemic, when they were able to (partially) resume their original sports activities.

With regard to age differences, the results from GEDA 2021 show that adults aged 45 and older more often maintained the amount of sport than those under 45 years. On the one hand, this is positive, as older adults thus reduced their amount of sport less often, but on the other hand they also increased it significantly less often than younger adults. The SPOVID study mentioned above comes to opposite results: In March and April 2020, adults aged 30 and older were more likely to reduce their sports activity than 14- to 29-year olds [17]. It appears that older adults have found ways to return to their pre-pandemic activity levels over the course of the pandemic, possibly aided by the reopening of sports infrastructure with infection control measures in place.

Nevertheless, between summer and autumn 2021, a quarter of the adult population reported having done less sport than before the pandemic. Thus, the pandemic containment measures in place at that time may have made it difficult for at least some of the population to return to their previous levels of sports activity. Sports facilities were open to the greatest extent possible, but under so-called infection control and hygiene conditions, which included the 3G rules for indoor sports from the end of August 2021. In addition, the number of cases of individuals infected with SARS-CoV-2 increased significantly in autumn 2021, which may have led to an avoidance of contact and thus also to an avoidance of sports facilities.

According to the current state of research, there are hardly any studies so far that describe the change in active

transport in Germany since the beginning of the pandemic. In a Forsa study in February 2021, the health insurance company DAK-Gesundheit asked employees who worked in a home office several times a week about a change in active transport since working predominantly in a home office [33]. The results show that more than half (54%) of the participants actively travelled less frequently. The proportion of participants who reduced active transport was significantly lower in GEDA 2021 (16%) than in the DAK study, which is presumably mainly due to the different target groups (entire adult population vs. employees in the home office) as well as the different survey times and thus different phases of the pandemic. Due to the official end of the 'home office obligation' in June 2021, there are fewer employees who work in a home office and can therefore actively travel to work more frequently again. This could be an explanation for the relatively low proportion of the population who reduced active transport in GEDA 2021 [9, 34]. In addition, day care centres and schools were largely open at this time and, compared to phases with more extensive restrictions, there were again more opportunities for leisure activities, which may also have led to increased active transport.

4.1 Strengths and limitations

Based on a nationally representative sample, this study provides results on the self-assessed change in physical activity in adulthood at the beginning of the fourth COVID-19 wave in 2021 and thus provides data for this phase of the pandemic for the first time. In addition to the change in the amount of sports activity, the change in the amount of active transport is also described. When interpreting the results, it should be noted that a bias of the results cannot be ruled out due to the reference period being relatively far in the past (time before the outbreak of the pandemic) and the associated difficulty in remembering correctly (recall bias). Furthermore, the results represent a snapshot of the time of the survey and do not include information on physical activity behaviour in earlier phases of the pandemic. Moreover, no statements can be made about the exact reasons for the change in physical activity. Besides the change in lifestyle, due to the non-pharmaceutical measures to contain the pandemic, long-term health consequences of SARS-CoV-2 infection (for example, due to Long COVID or Post COVID Syndrome) could have been another reason for the reduction in physical activity [35].

18- to 29-year olds and adults in the low education group are under-represented in the present sample, which is compensated for by conducting the analysis with a weighting factor. However, it cannot be ruled out that especially the 18- to 29-year olds or those in the low education group who participated in GEDA 2021 differed in their activity behaviour during the pandemic from those who refused to participate.

4.2 Conclusion

The first two years of the COVID-19 pandemic were characterised by high dynamics, both in terms of the number of infected persons and the extent of containment measures. Between July and October 2021, i.e. about one and a half years after the beginning of the pandemic, a significant proportion of the population has not returned to the amount of sports activity to which they were accustomed before the pandemic. The fact that during this period measures were relaxed to take account of 3G or 2G rules and

sports facilities were open could be an indication that it is not enough to withdraw measures to contain the pandemic (for example, reopening sports infrastructure). Rather, parts of the population seem to need more support to take up sports activities again. Against the background of the generally high level of physical inactivity in the population, these results underline the need for effective measures to promote physical activity. To promote physical activity, it is recommended that so-called multi-component approaches be pursued, combining, for example, information campaigns and the design of the environment to promote physical activity [36]. In addition, cross-sectoral cooperation (for example, between the health and urban planning sectors) is required for the implementation of a large number of measures to promote physical activity.

The COVID-19 pandemic also illustrates the importance of regular and flexible monitoring of physical activity at the population level in order to detect and quantify changes in activity behaviour in a timely manner.

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Data protection and ethics

GEDA 2021 is subject to strict compliance with the data protection provisions set out in the EU General Data Protection Regulation (GDPR) and the Federal Data Protection Act (BDSG). The Ethics Committee of the Charité – Universitätsmedizin Berlin assessed the ethics of the study and approved the implementation of the study (application number EA2/201/21). Participation in the study was voluntary. The participants were informed about the aims and contents of the study and about data protection. Informed consent was obtained verbally.

Availability of data

The authors confirm that some access restrictions apply to the data underlying the findings. The data set cannot be made publicly available because informed consent from study participants did not cover public deposition of data. However, the minimal data set underlying the findings is archived in the Research Data Centre at the Robert Koch Institute and can be accessed by researchers on reasonable request. On-site access to the data set is possible at the Secure Data Center of the Robert Koch Institute's Research Data Centre. Requests should be submitted by e-mail to fdz@rki.de.

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Conflicts of interest

The authors declared no conflicts of interest.

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References

1. Wold Health Organization (2020) WHO guidelines on physical activity and sedentary behaviour. Geneva
2. Posadzki P, Pieper D, Bajpai R et al. (2020) Exercise/physical activity and health outcomes: an overview of Cochrane systematic reviews. BMC public health 20(1):1724
3. 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(9838):219–229
4. Schuch FB, Vancampfort D, Richards J et al. (2016) Exercise as a treatment for depression: A meta-analysis adjusting for publication bias. JPsychiatrRes 77:42–51
5. Burtscher J, Burtscher M, Millet GP (2021) The central role of mitochondrial fitness on antiviral defenses: An advocacy for physical activity during the COVID-19 pandemic. Redox Biol 43:101976
6. Sallis R, Young DR, Tartof SY et al. (2021) Physical inactivity is associated with a higher risk for severe COVID-19 outcomes: a study in 48 440 adult patients. Br J Sports Med 55(19):1099–1105
7. Malisoux L, Backes A, Fischer A et al. (2022) Associations between physical activity prior to infection and COVID-19 disease severity and symptoms: results from the prospective Predi-COVID cohort study. BMJ open 12(4):e057863
8. Tolksdorf K, Buda S, Schilling J (2021) Aktualisierung zur „Retrospektiven Phaseneinteilung der COVID-19-Pandemie in Deutschland". Epid Bull (37):13–14
9. Corona Datenplattform (2021) Themenreport 02, Homeoffice im Verlauf der Corona-Pandemie, Ausgabe Juli 2021. Bonn. https://www.corona-datenplattform.de/pages/themenreports (As at 02.11.2022)
10. Die Bundesregierung (2021). https://www.bundesregierung.de/breg-de/aktuelles/bund-laender-beratung-corona-1949606 (As at 02.11.2022)
11. Kehl M, Strobl H, Tittlbach S et al. (2021) „Der Mensch, der Handball spielt, braucht den Ball, den Kontakt und die Gemeinschaft" – Veränderungen im Sportangebot durch die COVID-19 Pandemie und deren Bedeutung für Sportvereine. Gesundheitswesen 83(3):159–165
12. Gehlhar A, Schmidt N, Eisenburger N et al. (2022) Impact of physical activity on COVID-19-related symptoms and perception of physical performance, fatigue and exhaustion during stay-at-home orders. BMJ Open Sport Exerc Med 8(2):e001319
13. Bujard M, von den Driesch E, Ruckdeschel K et al. (2021) Belastungen von Kindern, Jugendlichen und Eltern in der Corona-Pandemie. Bundesinstitut für Bevölkerungsforschung (BiB)
14. Mutz M, Reimers AK (2021) Leisure time sports and exercise activities during the COVID-19 pandemic: a survey of working parents. Ger J Exerc Sport Res 51(3):384–389
15. Mutz M, Müller J, Reimers AK (2021) Use of Digital Media for Home-Based Sports Activities during the COVID-19 Pandemic: Results from the German SPOVID Survey. Int J Environ Res Public Health 18(9):4409
16. Schweizer AM, Leiderer A, Mitterwallner V et al. (2021) Outdoor cycling activity affected by COVID-19 related epidemic-control-decisions. PLoS One 16(5):e0249268
17. Mutz M, Gerke M (2020) Sport and exercise in times of self-quarantine: How Germans changed their behaviour at the beginning of the Covid-19 pandemic. Int Rev Sociol Sport 56(3):305–316
18. Nowossadeck S, Wettstein M, Cengia A (2021) Körperliche Aktivität in der Corona-Pandemie: Veränderung der Häufigkeit von Sport und Spazierengehen bei Menschen in der zweiten Lebenshälfte. dza aktuell – Deutscher Alterssurvey, Deutsches Zentrum für Altersfragen (Ed). https://www.dza.de/fileadmin/dza/Dokumente/DZA_Aktuell/DZA_Aktuell_03_2021_Koerperliche_Aktivitaet_in_der_Corona-Pandemie.pdf (As at 02.11.2022)
19. Ng TK, Kwok CK, Ngan GY et al. (2022) Differential impacts of COVID-19 pandemic on physical activity involvements and exercise habits in people with and without chronic diseases: A systematic review and meta-analysis. Arch Phys Med Rehabil:103(7):1448–1465.e6

20. Stockwell S, Trott M, Tully M et al. (2021) Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. BMJ Open Sport Exerc Med 7(1):e000960

21. Christensen A, Bond S, McKenna J (2022) The COVID-19 Conundrum: Keeping safe while becoming inactive. A rapid review of physical activity, sedentary behaviour, and exercise in adults by sex and age. PLoS One 17(1):e0263053

22. Oliveira MR, Sudati IP, Konzen VDM et al. (2022) Covid-19 and the impact on the physical activity level of elderly people: A systematic review. Exp Gerontol 159:111675

23. von der Heiden C (2013) Das ADM-Stichprobensystem für Telefonbefragungen. https://www.gessgroup.de/wp-content/uploads/2016/09/Beschreibung-ADM-Telefonstichproben_DE-2013.pdf (As at 02.11.2022)

24. Gabler S, Sand M (2019) Gewichtung von (Dual-Frame-) Telefonstichproben. In: Häder S, Häder M, Schmich P (Ed) Telefonumfragen in Deutschland. Springer VS, Wiesbaden

25. Pöge K, Rommel A, Starker A et al. (2022) Survey of sex/gender diversity in the GEDA 2019/2020-EHIS study – objectives, procedure and experiences. J Health Monit 7(2):48–65. https://edoc.rki.de/handle/176904/9890 (As at 28.09.2022)

26. UNESCO Institute for Statistics (2012) International Standard Classification of Education: ISCED 2011. UNESCO Institute for Statistics, Montreal

27. Talic S, Shah S, Wild H et al. (2021) Effectiveness of public health measures in reducing the incidence of covid-19, SARS-CoV-2 transmission, and covid-19 mortality: systematic review and meta-analysis. BMJ 375:e068302

28. Jordan S, Starker A, Krug S et al. (2020) Health behaviour and COVID-19: Initial findings on the pandemic. J Health Monit 5(S8):2–14. https://edoc.rki.de/handle/176904/7491 (As at 28.09.2022)

29. Finger JD, Mensink G, Lange C et al. (2017) Health-enhancing physical activity during leisure time among adults in Germany. J Health Monit 2(2):35–42. https://edoc.rki.de/handle/176904/2660 (As at 28.09.2022)

30. Beck F, Mutz M, Engels ES et al. (2021) Changes in Physical Activity during the COVID-19 Pandemic-An Analysis of Differences Based on Mitigation Policies and Incidence Values in the Federal States of Germany. Sports (Basel) 9(7)

31. Ding K, Yang J, Chin MK et al. (2021) Physical Activity among Adults Residing in 11 Countries during the COVID-19 Pandemic Lockdown. Int J Environ Res Public Health 18(13)

32. Robert Koch-Institut (2021) Wöchentlicher Lagebericht des RKI zur Coronavirus-Krankheit-2019 (COVID-19) – 07.10.2021 – AKTUALISIERTER STAND FÜR DEUTSCHLAND. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Situationsberichte/Wochenbericht/Wochenbericht_2021-10-07.pdf (As at 02.11.2022)

33. DAK-Gesundheit (2021) Ist der Trend zum Homeoffice gesundheitsförderlich? Ergebnisse einer Forsa-Studie der DAK. https://www.dak.de/dak/download/studie-2452404.pdf (As at 28.09.2022)

34. ifo Institut (2021) Pressemitteilung „Homeoffice weniger stark genutzt". https://www.ifo.de/node/64836 (As at 02.11.2022)

35. Wright J, Astill SL, Sivan M (2022) The Relationship between Physical Activity and Long COVID: A Cross-Sectional Study. Int J Environ Res Public Health 19(9):5093

36. Rütten A, Pfeiffer K (2017) Nationale Empfehlungen für Bewegung und Bewegungsförderung. In: Bundeszentrale für gesundheitliche Aufklärung (Ed) Forschung und Praxis der Gesundheitsförderung, Sonderheft 03. https://shop.bzga.de/pdf/60640103.pdf (As at 28.09.2022)

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Participation of the adult population in preventive measures for non-communicable diseases during the COVID-19 pandemic in 2020/2021

Abstract

Background: In 2020/2021, the COVID-19 pandemic and the protective measures associated therewith severely limited the opportunity to participate in prevention and health promotion measures. The article examines the utilisation of the measures and possible factors that are associated with a lower participation during these pandemic years.

Methods: It is based on data acquired between March and August 2021 from the study 'COVID-19 vaccination rate monitoring in Germany' (COVIMO), a cross-sectional telephone survey. The data was used to examine the participation in preventive measures in the last 12 months in terms of sociodemographic factors and to analyse a decreased participation with regard to pandemic-related factors. The analysis sample includes individuals aged 18 years and over (n=3,998).

Results: 63% of participants generally did not use these programmes, 7% indicated an unchanged participation, 28% reported having participated in fewer measures, and 2% in more measures. Men reported significantly more often than women that they generally do not participate in prevention and health promotion measures. A relevant pandemic-related factor for decreased participation of men was the less clearly perceived comprehensibility of the regulations against the spread of SARS-CoV-2.

Conclusions: Prevention and health promotion should be part of the contingency planning in epidemically significant situations to prevent a decreased participation and to promote health and gender-related equal opportunities even in a crisis.

PREVENTIVE MEASURES · COVID-19 PANDEMIC · CROSS-SECTIONAL STUDY · POPULATION SURVEY

1. Introduction

The prevention and avoidance of non-communicable diseases using structural and individual prevention and health promotion measures is a central task of public health because these diseases represent a high disease burden for the population [1]. The German Prevention Act of 2015 also focuses predominantly on health objectives for the prevention of non-communicable diseases, such as diabetes mellitus type 2 or cancer [2]. The COVID-19 pandemic and the protective measures associated therewith changed the framework conditions for prevention and health promotion of non-communicable diseases. There are still hardly any studies available that use data to show the changes and impacts of the COVID-19 pandemic on prevention and health promotion during the pandemic.

COVIMO – COVID-19 vaccination rate monitoring in Germany

Data owner: Robert Koch Institute

Objectives: Monitoring the willingness and acceptance of different population groups in Germany to get vaccinated against COVID-19.

Survey methodology: Interview by telephone at different survey periods (waves), each time with a new sampling (repetitive cross-sectional study)

Population: German-speaking population aged 18 and over (exception wave 9, in which 6 languages are recognised)

Sampling: Random sample from the sampling system of the ADM (Registered Association of German Market and Social Research Institutes). The sample includes randomly generated mobile and landline numbers (dual frame approach).

Participants: Mostly approximately 1,000 individuals for each survey point (wave)

Response rate: Depending on the collection period, the response rate is between 24.0% and 27.3%

Examination period: January 2021 – December 2022

Further information at www.rki.de/covimo

In 2020 and 2021, Germany had partly wide-scale public restrictions during the COVID-19 pandemic with restrictions on movement and contact (so-called lockdown) [3, 4]. This also limited the opportunities for offering or for participating in prevention and health promotion measures for prevention of non-communicable diseases. Group programmes for promoting physical activity, nutritional counselling, or classes for managing stress, did not take place at all at times because institutions, such as adult education centres, fitness studios, sports fields, or gyms were closed. As a result, sports clubs, for example, lost 792,119 members in 2020, a reduction of almost 3% compared to 2019 [5]. Due to enclosed spaces and the temporary obligation to work from home, companies had to limit their health promotion programmes or switch to digital programmes, respectively. Various other providers, such as the statutory health insurance funds, also offered some prevention measures digitally during the COVID-19 pandemic [6]. Nevertheless, the statutory health insurance funds, as most important provider of prevention and health promotion measures, were nonetheless not able to offer approximately one third of their prevention and health promotion measures in 2020 [6]. Compared to the previous year, course participation declined by 36%, and 31% of the health promotion measures could not be carried out in day-care centres, schools, and local communities; in companies it was 36% [6, p. 15, 98]. Due to the reduced number of programmes, an overall decline of the utilisation of (primary) prevention and health promotion measures can be assumed. A pandemic-related decreased utilisation of secondary preventive measures, such as early detection examinations [7] or medical care services has already been shown [8, 9].

Health promotion measures and measures for the prevention of non-communicable diseases are important in times of social crisis, such as the COVID-19 pandemic. Studies were able to show, for example, that for many people, the containment measures for the spread of the pathogen SARS-CoV-2 had a negative impact on the health behaviour, such as physical activity and, associated therewith, also on body weight [10–12]. Negative effects on mental health are meanwhile likewise known in individual population groups [13]. During the pandemic, the health-related and psychosocial effects could be observed more frequently in socially disadvantaged population groups [14], have intensified existing socially-induced health inequality, and suggest pandemic-specific need for support [15, 16].

Information at population level on how widespread the participation in health promotion and prevention measures of non-communicable diseases was in Germany during the pandemic years 2020 and 2021, was not available yet. This article is to close this research gap, and, when answering this first research questions, also takes into consideration whether there were differences within the population with regard to sex, age, and education because these factors were significant for the utilisation of preventive measures even before the pandemic [17, 18]. This refers to programmes directed towards primary prevention, such as courses, exercises, counselling on the topics of diet, physical activity, relaxation, and sport or fitness, which were partly financed by health insurance funds, and which could be hosted by various providers. Secondary preventive measures, such as early detection examinations, are not included.

The article examines a second research question, whether, in addition to the above-described restrictions, there were

pandemic-related factors, which led to a decreased participation in certain population groups. In 2020 and 2021, communication about the pandemic was shaped by a variety of sources of information and contents of different quality. In part, contradictory information existed about infection and its containment measures [19]. The resulting uncertainty and difficulties in comprehending information within the population has already been reported in other studies [19, 20] and will be examined here as possible factors on utilisation. This includes (1) the participants' assessment with regard to uncertainty due to the large amount of information about the COVID-19 pandemic, and (2) the comprehensibility of the rules for the containment of SARS-CoV-2. Additional pandemic-related factors that could be relevant to the decision to participate in a prevention and health promotion measure, are the vaccination status and belonging to a risk group for a SARS-CoV-2 infection or a severe course of COVID-19.

2. Methods

2.1 Sample design and study conduct

The data from the study COVID-19 vaccination rate monitoring in Germany (COVIMO) by the Robert Koch Institute was used for the analyses. The primary objective of the COVIMO study is to collect and to analyse the willingness and acceptance of different population groups in Germany to get vaccinated against COVID-19. COVIMO is a repeated cross-sectional study, for which a new random sample is drawn approximately every four weeks from the sampling system of the ADM (Registered Association of German Market and Social Research Institutes) since January 2021 [21]. The sample includes randomly generated mobile and landline numbers (dual frame approach). The data collection takes place using a standardised telephone interview of mostly approximately n=1,000 people of the German-speaking population aged 18 and over. Depending on different survey periods (waves), the response rate for the COVIMO survey is between 24.0% and 27.3% [21]. Additional information about how the study is conducted can be found in the detailed methodology report relating to the study [21].

At four periods during the COVIMO survey (waves), the participation in health promotion measures during the COVID-19 pandemic was additionally collected in the interview. These four COVIMO waves used for the analysis are wave 3 (17.03.2021–10.04.2021), wave 4 (21.04.2021–07.05.2021), wave 6 (28.06.2021–13.07.2021), and wave 7 (26.07.2021–18.08.2021), whereby the total data collection period for the data available here extends from 17.3.2021 to 18.8.2021.

2.2 Indicators

Participation in preventive measures during the pandemic 2020/2021

The participation in preventive measures during the pandemic was captured using the question: 'There are a number of health promotion measures that are offered by various providers and which focus, for example, on diet, physical activity, relaxation, and sport or fitness. Such measures are partly financed by health insurance funds. Did you change your participation in such measures (courses, exercises, counselling) in the last 12 months due to the

limitations caused by CORONA? Available response options were: (1) 'No, I do not use such programmes.', (2) 'No, I used the same amount of programmes overall.', (3) 'Yes, I used fewer programmes overall.' and (4) 'Yes, I used more programmes overall '. Below, (1) will be referred to as 'generally no participation' (or 'those who generally did not use the measures'), (2) as 'unchanged participation', (3) as 'lower participation', and (4) as 'higher participation'.

Sociodemographic factors

The evaluations considered the impact of gender. To describe gender differences, the information about gender identity was used in COVIMO: Participants were able to specify, to which gender they felt they belonged ('male', 'female', 'diverse').

Participants' responses about their age were included in the analyses with four age groups. The four age categories included the following age ranges: 18 to 29 years, 30 to 49 years, 50 to 64 years, and 65 years and over.

The education status was surveyed using the highest level of education and was classified in three education groups: 'Low education group': No school-leaving qualification, left school without qualifications, still in school, lower secondary/elementary school graduate, year 9/10 of polytechnic secondary school, school-leaving qualification after attending maximally seven years of school; 'medium education group': secondary school level I certificate, general certificate of secondary education, 10th grade of polytechnic secondary school or equal school-leaving qualification; and 'high education group': A levels, subject-specific higher education entrance qualification or subject-specific advanced technical college qualification.

Pandemic-related factors

To collect the self-assessed uncertainty caused by the large amount and variety of information about the COVID-19 pandemic, the following question was asked: 'Some people feel uncertain because of the large amount of information about the coronavirus and no longer have any idea what information they can trust. How do you feel: Do you feel uncertain because of the large amount of information?' This wording, minimally abbreviated, originates from a study by Okan et al. from 2020 und 2021 [19] relating to the health literacy and to the information behaviour during the COVID-19 pandemic. The following response options were available on a four-point Likert scale: 'No, not uncertain at all', 'No, hardly uncertain', 'Yes, somewhat uncertain', and 'Yes, very uncertain'. For the statistical analyses, they were combined in the following two categories 'not at all/hardly uncertain' and 'somewhat/very uncertain'.

The perceived comprehensibility of the rules against the spread of SARS-CoV-2 was captured by means of a question from the COVID-19 snapshot monitoring (COSMO) [22], a periodically online study relating to the risk perception and communication in Germany relating to the COVID-19 pandemic. The question, which was adapted for the telephone interview, was: 'On a scale of 1 to 7, 1 means contradictory, and 7 means clear. With the values in-between, you can grade your response. For me, the current rules for the containment of the coronavirus are ...' [23]. For the calculation, three categories were created from the information on the seven-point Likert scale: Data with the values 1 and 2 formed the category 'contradictory', the values 3 to 5 formed the category 'less clear', and the values 6 and 7 form the category 'clear'.

Determining whether the participants belonged to a risk group for a SARS-CoV-2 infection or for a severe course of the disease, respectively, was accomplished by querying disease-related risk factors known at the time of the survey in the following manner: 'Next, we would like to know, to what extent you are part of a risk group for some infectious diseases. For this, I will read out several underlying diseases to you and when I am done, please tell me if you have one or several of the underlying diseases I mentioned. If you have none of the mentioned underlying diseases, please respond with 'no': Cardiovascular diseases, for example heart disease and high blood pressure; Chronic lung diseases, for example COPD; Chronic kidney and liver diseases; Diabetes mellitus, diabetes; Cancer; Severe mental disease, for example schizophrenia or severe depression; Weakened immune system, congenital or acquired; Obesity, severe overweight'. There were two response options: 'Yes, I have one or several of the mentioned diseases.' Or 'No, I do not have any of the mentioned diseases.'.

The vaccination status was collected with the question 'Did you get vaccinated against the coronavirus, also referred to as COVID-19?'. Those who specified either 'yes, once' or 'yes, twice', were considered to be vaccinated; The classification as 'unvaccinated' was made accordingly with the answer 'no'.

2.3 Study population

The survey data originated from four waves (wave 3, 4, 6, and 7) of the COVIMO study, and was pooled for the analyses. The analyses were based on data of N=3,998 participants with valid information relating to the participation in preventive measures during the pandemic (women: n=2,149, men: n=1,828). 21 participants provided no information about the gender identity and were disregarded in the gender-based evaluations. The eight individuals who assigned themselves to the category 'diverse', could also not be included in gender-based evaluations due to the small number of cases. The analyses relating to the decreased participation in preventive measures for non-communicable diseases during the COVID-19 pandemic were based on data from a total of 1,632 participating individuals (women: n=1,038, men: n=586).

The calculations were made using a weighting factor, which was calculated for the analyses and which corrects deviations of the sample from the population structure (as of: 31.12.2020) with regard to sex, age, and education. The COVIMO sample was thereby divided into partial populations (strata), which do not overlap and for which the population figures were known. In the sample, the weights were changed in each stratum in such a way that the estimated number corresponds to the external information. The weighting was made iteratively according to the so-called 'raking' method [24]. To make the information from the participants relating to education comparable, the International Standard Classification of Education (ISCED) was used for the weighting, which is based on information about school-leaving and vocational qualifications [25]. A detailed description of the methodology of COVIMO can be found in the methodology report relating to the COVIMO study [21].

28% of participants used fewer prevention and health promotion measures in 2020/2021, 7% used them just as often, and 2% used more. Almost two thirds generally did not use these measures in general.

2.4 Statistical methods

To answer the questions about the participation or the decreased participation, respectively, in prevention and health promotion measures, the information from participants of the COVIMO study was considered descriptively and was examined for group differences using the Chi-square test. Relative frequencies were reported with 95% confidence intervals (95% CI). These are estimated values, the accuracy of which can be rated with the help of confidence intervals – broad confidence intervals suggest a larger statistical uncertainty of the results. The confidence intervals (CI) were determined on the Logit scale. A significant difference was assumed when the p-value calculated considering the weighting and the survey design was less than 0.05.

The connection between pandemic-related factors and a lower participation in prevention and health promotion measures was also estimated by means of logistic regression using odds ratios (OR). The odds ratio indicates the factor by which the statistical odds of a lower participation in one group is increased compared to a reference group. Pandemic-related variables were included in Model 1, and an adjustment by sociodemographic variables was additionally made in Model 2. The following categories were in each case used as reference group (Ref.) in the regression models: Uncertainty because of a large amount of information: Ref.: Not at all/hardly; Comprehensibility of rules: Ref.: Clear; Risk group for SARS-CoV-2 infection: Ref.: No; Vaccination status: Ref.: Vaccinated; Age group: Ref.: Aged 18–29, and education group: Ref.: High education group.

The analyses were made using SAS 9.4. To appropriately consider the weighting in the calculation of confidence intervals and p-values, all analyses were calculated using the survey procedures of SAS.

3. Results

3.1 Participation in prevention and health promotion measures

Almost two thirds of participants indicated that they generally do not use prevention and health promotion programmes in the form of, for example, courses, exercises, or counselling (63.1%). Just over one quarter (28.3%) reported a lower participation in the last 12 months. 6.5% of participants indicated an unchanged participation, and 2.1% utilised more programmes (Table 1). Therefore, a total of 36.9% used the measures in general.

There was a significant difference between the genders ($p<0.001$). The proportion of those who generally did not use these measures was significantly higher in men with 70.0% than in women with 56.6%, while 33.6% of women indicated a lower participation, but only 22.7% of men.

With regard to the sociodemographic characteristics age ($p=0.005$) and education ($p=0.007$), there were significant differences only within the group of women (Table 1): It was noticeable that only approximately half of the women aged between 45 and 64 generally did not participate in the programmes, while in the other age groups this was partially almost two thirds. At the same time, the 45- to 64-year-olds were the age group with the highest proportion for a lower participation in the last 12 months (41.5%). The low education group had the highest proportion of women who generally did not participate: 66.0% versus 53.8% (medium education group) and 52.8% (high education

Table 1
Participation in preventive measures during the COVID-19 pandemic 2020/2021 by women and men by age and education, relative frequency in percent (total N=3,998, women n=2,149, men n=1,828)
Source: COVIMO 2021
(pooled data of waves 3, 4, 6, 7)

	Generally no participation (n=2,366)		Unchanged participation (n=313)		Lower participation (n=1,234)		Higher participation (n=85)	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total (women and men)*	63.1	(60.7–65.5)	6.5	(5.4–7.8)	28.3	(26.1–30.6)	2.1	(1.5–2.9)
Women (total)	**56.6**	**(53.2–60.0)**	**7.3**	**(5.7–9.3)**	**33.6**	**(30.6–36.8)**	**2.4**	**(1.5–3.8)**
Age group*								
18–29 years	60.5	(49.4–70.6)	7.1	(3.4–14.3)	27.0	(18.2–38.1)	5.3	(1.9–14.3)
30–44 years	62.6	(54.4–70.2)	9.3	(5.5–15.3)	27.1	(20.7–34.7)	1.0	(0.2–3.7)
45–64 years	47.8	(42.7–53.0)	7.4	(4.9–11.1)	41.5	(36.4–46.7)	3.3	(1.8–6.0)
≥65 years	60.0	(55.0–64.8)	5.9	(4.1–8.3)	33.1	(28.6–37.9)	1.0	(0.5–2.0)
Education status (schooling)*								
Low education group	66.0	(58.9–72.4)	5.8	(2.9–11.2)	27.8	(22.0–34.4)	0.5	(0.1–1.9)
Medium education group	53.8	(48.2–59.3)	6.3	(4.2–9.4)	37.3	(32.1–42.8)	2.5	(1.2–5.1)
High education group	52.8	(48.0–57.5)	10.2	(7.4–13.8)	33.1	(28.9–37.6)	3.9	(2.0–7.5)
Men (total)	**70.0**	**(66.5–73.2)**	**5.6**	**(4.2–7.3)**	**22.7**	**(19.7–26.0)**	**1.8**	**(1.1–2.7)**
Age group								
18–29 years	67.8	(56.9–77.0)	5.4	(2.4–11.6)	24.5	(15.9–35.8)	2.4	(0.9–6.1)
30–44 years	73.2	(65.2–79.9)	3.1	(1.4–6.8)	22.7	(16.4–30.6)	1.1	(0.3–3.6)
45–64 years	68.5	(62.9–73.6)	7.2	(4.7–11.1)	22.4	(18.1–27.5)	1.9	(0.9–3.7)
≥65 years	70.7	(64.9–75.8)	5.6	(3.8–8.1)	21.9	(17.2–27.4)	1.9	(0.8–4.4)
Education status (schooling)								
Low education group	70.4	(62.4–77.3)	5.8	(3.0–11.2)	21.7	(15.5–29.4)	2.1	(0.8–5.1)
Medium education group	70.0	(63.7–75.6)	5.5	(3.6–8.4)	22.3	(17.1–28.5)	2.2	(1.2–4.2)
High education group	69.1	(64.7–73.2)	5.4	(3.7–7.9)	24.3	(20.6–28.5)	1.1	(0.6–2.1)

CI = confidence interval, * = significant with p<0.05

Men reported significantly more frequently than women that they generally do not participate in prevention and health promotion measures.

group), respectively. It was also noticeable that in the group with a higher participation, the proportion of young women aged between 18 and 29 and of women with a high education was above average.

3.2 Factors for a lower participation in prevention and health promotion measures

Those participants who indicated that they generally do not use such programmes at all were initially excluded for the analysis of the factors that might impact a lower participation in the preventive measures. Of those who indicated that they used such programmes, the group with a lower participation in the last 12 months was by far the largest. In the pandemic years 2020 and 2021, more than three quarters of women and men reported a lower utilisation compared to approximately one sixth with an unchanged participation, and approximately 6% with a higher participation (Figure 1).

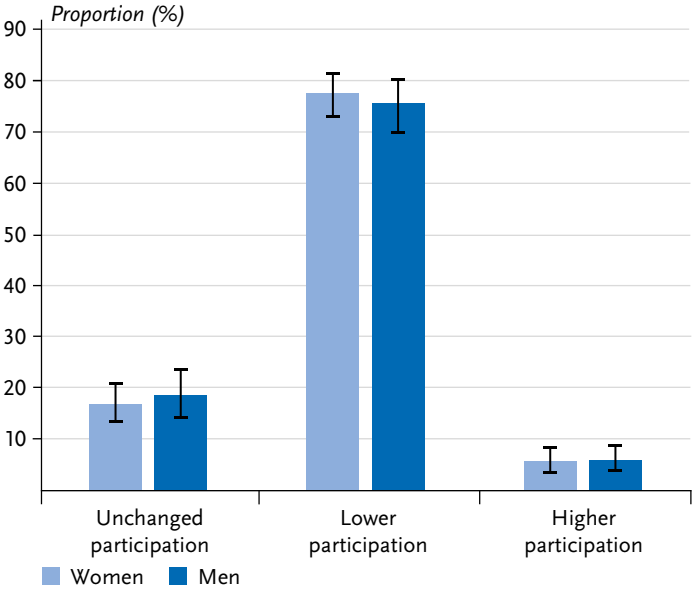


Figure 1
Participation in preventive measures during the COVID-19 pandemic 2020/2021 by women and men in the three population groups, which generally participate in such measures, relative frequency in percent (n=1,632, n=1,038 women, n=586 men)
Source: COVIMO 2021 (pooled data of waves 3, 4, 6, 7)

Women in the middle age group or with medium or high education used prevention and health promotion measures more frequently than the respective comparison groups.

Different, pandemic-related factors were used to examine, which factors could be related with a lower participation in prevention and health promotion measures in the last 12 months (Table 2). Within the group of participants who used fewer programmes, the number of people who felt 'not at all/hardly uncertain' and the ones who felt 'somewhat/very uncertain' was approximately the same, that is, there were no significant differences with regard to the level of uncertainty on the basis of a large amount of information about the pandemic. The situation is different with the perceived comprehensibility of the rules relating to the pandemic. Men who perceived the existing rules for the containment of SARS-CoV-2 to be contradictory (74.1%) or to be less clear (82.8%) at the time of the survey, are more frequent in the group with a lower participation than those who classified the rules to rather be clear (62.1%). This significant difference could not be observed in women. Even though individuals who were, based on their information about various diseases, assigned to a risk group for an infection with SARS-CoV-2 or a severe course of the disease in the event of contracting COVID-19, more likely to report a lower participation than those without risk, but the difference was not significant. The same was the case with the vaccination status. Even though in the group with a lower participation, the group of unvaccinated individuals was larger than the group of vaccinated individuals, the difference was not significant, neither in women nor in men.

When examining the association between pandemic-related factors and a lower participation in prevention and health promotion measures in the last 12 months, sociodemographic factors were also considered. It was noticeable thereby that proportionately more women of the two higher age groups (aged 45–64 and aged 65 and over) indicated that they use the measures less than the younger group. The same could be observed for the low and medium education group, compared to the high education group. However, the differences are not significant. The distribution of the frequencies of the sociodemographic factors was exactly the opposite in men. The proportions of the two younger age groups (aged 18–29 and 30–44) among those who participate less were higher than the proportions of the older age group, and the high education group had the highest proportion compared to the two other education groups. These differences are also not significant (Table 2).

The regression analyses largely confirmed the bivariant results for a lower participation in prevention and health promotion measures in the last 12 months during the pandemic years 2020 and 2021. As can be seen in Figure 2a,

Table 2
Pandemic-related and sociodemographic factors in individuals with lower participation in preventive measures during the COVID-19 pandemic 2020/2021 by gender, relative frequency in percent* (n=1,632)
Source: COVIMO 2021
(pooled data of waves 3, 4, 6, 7)

	Women (n=1,038)			Men (n=586)		
	%	(95% CI)	p-value	%	(95% CI)	p-value
Total	77.6	(72.9–81.6)		75.5	(69.8–80.5)	
Pandemic-related factors						
Uncertainty due to large amount of information			0.373			0.962
Not at all/hardly uncertain	75.6	(69.6–80.7)		75.6	(68.1–81.7)	
Somewhat/very uncertain	79.6	(72.0–85.6)		75.3	(65.6–83.0)	
Comprehensibility of the rules			0.313			**0.009**
Contradictory	83.8	(74.2–90.3)		74.1	(61.8–83.5)	
Less clear	75.8	(69.1–81.5)		82.8	(76.1–87.8)	
Clear	76.3	(66.8–83.7)		62.1	(48.1–74.4)	
Risk group for SARS-CoV-2 infection			0.102			0.405
Yes	81.8	(75.1–87.0)		78.0	(71.0–83.7)	
No	74.6	(68.0–80.1)		73.6	(64.6–81.0)	
Vaccination status			0.617			0.059
Vaccinated	76.7	(70.6–81.8)		70.0	(62.1–76.8)	
Unvaccinated	79.0	(71.4–85.0)		80.4	(71.9–86.8)	
Sociodemographic factors						
Age group			0.191			0.339
18–29 years	68.4	(50.2–82.3)		76.0	(58.6–87.6)	
30–44 years	72.6	(59.7–82.6)		84.7	(71.8–92.3)	
45–64 years	79.5	(72.3–85.1)		71.1	(61.0–79.5)	
≥65 years	82.8	(77.1–87.3)		74.6	(65.3–82.0)	
Education status (schooling)			0.086			0.665
Low education group	81.6	(68.7–89.9)		73.3	(58.3–84.3)	
Medium education group	80.9	(73.9–86.3)		74.1	(64.4–82.0)	
High education group	70.2	(62.5–76.8)		78.8	(71.6–84.5)	

*Based on the population groups that generally participate in such measures; Comparison group: combined proportions of unchanged and higher participation
Bold: Significant with p<0,05, CI = confidence interval

A lower participation was only associated with the pandemic-related factor 'perceived comprehensibility of the rules against the spread of SARS-CoV-2' among men.

the results for women suggest an impact of the four examined pandemic-related factors. In the regression model, which is adjusted by sociodemographic factors (Figure 2b), the calculated OR for the pandemic-related factors also consistently reach positive values (OR from 1.1 to 1.8), but the OR are not significant compared to the respective reference group.

For men, a similar picture emerges with regard to the connection between pandemic-related factors and a lower participation in the prevention and health promotion measures. As can be seen in Figure 3a and 3b, the results for men also point towards a possible association in three of the examined pandemic-related factors (uncertainty due to a large amount of information, risk group for SARS-CoV-2

Figure 2a
Associations between a lower participation in preventive measures during the Corona pandemic 2020/2021 and pandemic-related factors, women, odds ratios (n=1,038)
Source: COVIMO 2021 (waves 3, 4, 6, 7)

Figure 2b
Associations between a lower participation in preventive measures during the Corona pandemic 2020/2021 and pandemic-related factors, women, odds ratios, adjusted by sociodemographic factors (n=1,038)
Source: COVIMO 2021 (waves 3, 4, 6, 7)

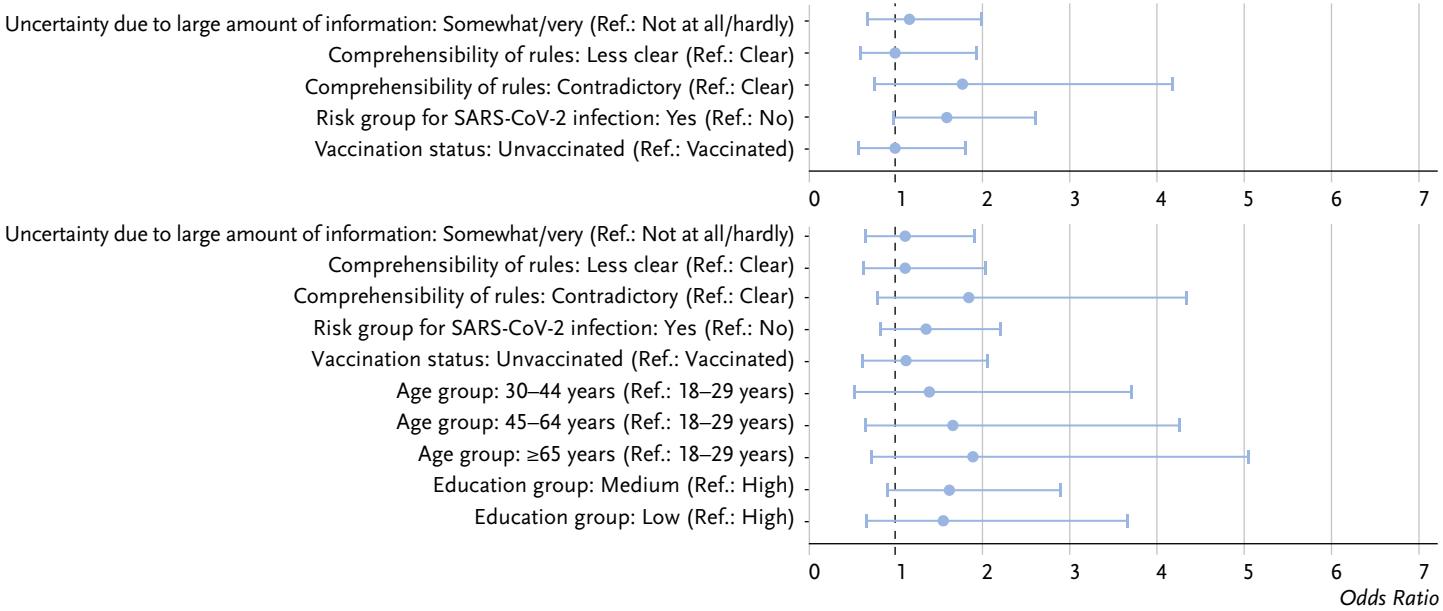
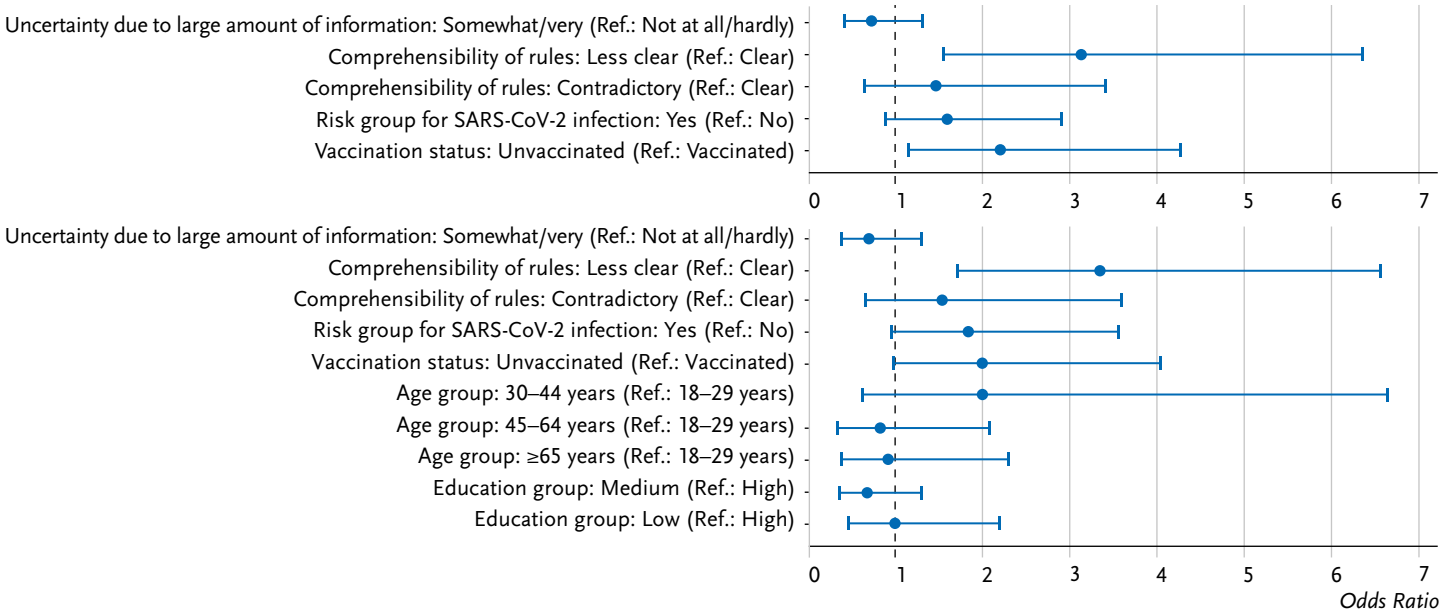


Figure 3a
Associations between a lower participation in preventive measures during the Corona pandemic 2020/2021 and pandemic-related factors, men, odds ratios (n=586)
Source: COVIMO 2021 (waves 3, 4, 6, 7)

Figure 3b
Associations between a lower participation in preventive measures during the Corona pandemic 2020/2021 and pandemic-related factors, men, odds ratios, adjusted by sociodemographic factors (n=586)
Source: COVIMO 2021 (waves 3, 4, 6, 7)



infection, vaccination status). In the regression model, which is adjusted by sociodemographic factors (Figure 3b), almost all of the respective OR reached positive values between 1.5 and 2.0 (with the exception of the OR of 0.7 of the value of 'uncertainty due to large amount of information about the pandemic'), but the OR are not significant compared to the respective reference group. In men, however, the regression calculations confirmed a pandemic-related factor, which is already significant in the bivariate analyses (Figure 3b): Men who perceived the rules relating to the pandemic to be less clear had 'odds' that were increased 3.3-times of participating less in the measures (compared to the group that rated the rules to be clear).

Health promotion and prevention of non-communicable diseases should be part of contingency planning in epidemically significant situations.

4. Discussion

In 2020 and 2021, the COVID-19 pandemic resulted in wide-scale restrictions in everyday life in Germany, which also hampered and temporarily hindered the implementation and utilisation of prevention and health promotion measures. Our analyses show, how this impacted the utilisation of prevention and health promotion for the prevention of non-communicable diseases.

Almost two thirds of the participants generally did not use the measures in the form of, for example, courses, exercises, or counselling in the last 12 months, 7% used the programmes to the same extent, and 2% even to an increased extent. Just over one quarter decreased the participation during that time. Gender, age, and education were associated with differences in participation. When only looking at the group, which generally uses these measures in the form of, for example, courses, exercises, or counselling, then it is even three quarters that participated more rarely in measures during the pandemic years 2020/2021.

In the population group with a decreased participation, various pandemic-related factors were examined with regard to an association. Even though differences could be observed, significant differences could be found within the group of men only for the perceived comprehensibility of the rules against the spread of SARS-CoV-2.

4.1 Classification of the results

The relatively high proportion of 36.9% that generally used the programmes is noticeable in the analyses in 2020/2021. This is more than double compared to the determined frequency for the period between 2008 and 2011 (16.6% in the German Health Interview and Examination Survey for Adults (DEGS, [17]) or 16.0% in the study German Health Update (GEDA) 2009 [26]), respectively, and approximately four times compared to 1997 to 1999, in which this question was raised with the German Health Interview and Examination Survey (BGS98) (9.1%, [17]). The results from these studies, however, only allow an approximate comparison because even though the population itself was surveyed there as well, slightly different formulations of questions and partly different survey modes were used, and the data analyses in these studies partly focused on individuals insured by statutory health insurance. However, current data from the prevention report of the statutory health insurance also point towards an increased utilisation until the start of the pandemic. The services of the statutory health insurance and the groups of people that are reached

by primary prevention and health promotion in different settings and at the workplace are reported. Until the pre-pandemic year 2019, the proportion of companies/sites that have been reached by workplace health promotion (BGF) increased approximately 3.5-times since 2010 and the number of the other settings that were reached with health promotion measures increased about 1.5-times [6, p. 51, 71]. A significant proportion of behaviour-related measures especially on the topics of physical activity and diet were implemented thereby [6]. The expansion of the mere individual behaviour-based prevention remained approximately at a similarly high level [6, p. 98]. Overall, the conclusion based on the presented results that there was a further increase in the utilisation of prevention and health promotion measures in the form of courses, exercises, or counselling in the last ten years, seems plausible.

The differences relating to the participation frequency in 2020/2021, which were observed with the data from the COVIMO study, with regard to different sociodemographic groups, large coincide with the current state of research relating to the utilisation before the pandemic. The differences between women and men correspond to the insights from earlier research [6, 27–30], for example analyses with data from the studies DEGS [17] and GEDA [26], which found a participation in the prevention and health promotion measures significantly more frequently for women than for men [17, 26]. The generally observable higher health consciousness of women, and the measures that are generally not designed to be gender-specific, are considered to be cause and explanation for this difference [31]. The higher participation in the middle and higher age groups that can be observed within the group of women, also became apparent in studies, which examined the utilisation of prevention and health promotion at earlier points in time [17, 26]. Earlier studies for Germany likewise found these age differences in the group of men [26, 29, 31]. The health consciousness, which increases with increasing age, is also considered to be an explanation here for the utilisation, which rises with age [32]. The education differences, which were only observed for women, also became apparent in other studies, which found no significant or only slight differences between the education groups or social status groups, respectively, for men [17, 31]. These are indications of an interaction between the factors of gender and social status with regard to preventive or health-promoting behaviour, respectively [31, 33].

Three quarters of those who generally used these prevention and health promotion measures, decreased their participation during the pandemic in 2020/2021. The assumption that the pandemic-related factors examined here – uncertainty due to a large amount of corona-related information, comprehensibility of the rules for the containment of the pandemic, belonging to a risk group for a SARS-CoV-2 infection, vaccination status – are associated with a lower participation in the measures, was largely not confirmed in our data analysis. This allows drawing the conclusion that there are other factors, such as, for example, the containment measures, in particular the lockdown, but also closure of enclosed spaces that were in place in phases, and contact limitations, which led to a smaller offered range of such measures. This hindered women and men who generally participate in the measures, from actually using them during the pandemic. Thus, it failed to reach at least vulnerable groups, such as individuals

with a social disadvantage who have a higher risk for non-communicable diseases, but also for an infection with SARS-CoV-2 or a severe course of COVID-19, with these health promotion measures.

In our reported results about possible factors, which could be associated with a lower participation in health promotion measures in the pandemic years 2020/2021, a significant association became apparent for the group of the men only for the perceived comprehensibility of the rules against the spread of SARS-CoV-2. If men perceived the rules to be less clear, they used fewer measures. The COSMO study was able to show that individuals who are more familiar with the current rules, perceive them to be less contradictory than individuals who are less familiar with them [20]. This could mean that men who were less familiar with the rules were more uncertain or had less information about how they could have participated in the programmes that still existed or in alternatives, for example digital programmes, or programmes outdoors. Gender-specific differences in the search for health information were already known before the pandemic. Men look for health information less frequently than women [34, 35]. It was shown during the COVID-19 pandemic, for example, that men used online media less frequently to look for information than women during the lockdown [36]. Gender-specific differences should be taken into consideration for the communication in crisis situations, e.g. for the communication of pandemic-related information, such as the currently applicable rules.

The gender-related and social differences confirmed with the COVIMO data for the general participation in prevention and health promotion measures have already been known for approximately two decades. In spite of the utilisation, which increased overall during this period, it is still more difficult to reach men and people from the low education group with prevention and health promotion measures for the prevention of non-communicable diseases. This problem, which is referred to as prevention dilemma, represents one of the biggest challenges for public health in Germany and became even more relevant during the COVID-19 pandemic. Socially disadvantaged population groups generally have a higher health burden caused by non-communicable diseases [37] and were more severely affected by SARS-CoV-2 infections [38] and psychosocial effects [14] over the course of the pandemic. Accordingly, existing socially-induced health inequalities increased during the pandemic, which was not only observed in Germany, but also in other countries [39]. For prevention and health promotion in Germany, this means offering pandemic-specific support on the one hand [15, 16]. The switch to or enhancement by digital programmes, respectively, can only be one measure thereby [6] because even though socially disadvantaged population groups use digital media just as frequently as other groups, they benefit less therefrom (third-level digital divide) [40]. In a survey of 98 health insurance funds and associations of health insurance funds conducted in 2021, they indicated that vulnerable groups are difficult to reach and decreasing equal health opportunities due to the pandemic [41]. On the other hand, structures and conditions should be created, which make it possible even in times of crisis, such as the pandemic, to maintain prevention and health promotion measures. These necessary 'resilient structures for health promotion' need to be organised and equipped so that they provide

for creativity and flexibility in order to cope with unforeseeable conditions [6, p. 14, 41] and simultaneously promote the equal health opportunities [42]. For future protective measures in the COVID-19 pandemic, other epidemics, or social crises, this means planning health promotion and prevention for non-communicable diseases alongside the development of the containment measures, and taking social determinants in terms of the health-in-all-policies approach into consideration [43].

4.2 Strengths and weaknesses

The presented results are not only the first set of data concerning the utilisation of prevention and health promotion measures during the pandemic in 2020/2021, but generally the first set of data in a long time concerning the participation of adults in these programmes from the population's perspective. The analyses provide important information about the extent of the measures in the pandemic years 2020/2021 and take the significance of sociodemographic, but also of pandemic-related factors, into consideration.

When interpreting these results, it is important to take into consideration that the survey period was from 17.3.2021 until 18.8.2021 and thus covered a relatively large time period. Due to the fact that the participants were to base their response relating to the participation in prevention and health promotion measures on the last 12 months, it becomes clear that the participants based their responses on different periods. With regard to the course of the pandemic, these were periods with varying degrees of restrictions. It is also important to keep in mind that the vaccination status used in the analyses does take into consideration, how long ago the interviewed individual got vaccinated. This limits the interpretation of the factor of vaccination status to a lower participation in the measures because the participation was based on the last 12 months.

Last but not least, it is important to point out that, when assessing the results, this is a cross-sectional study, and that the results represent associations, but cannot reveal any causations. In addition, it is important to consider the structure of the sample. Only German-speaking individuals who could be reached by telephone either on their mobile phone or via a landline, were interviewed for the COVIMO waves used here. It is thus possible that small subgroups, which may be particularly vulnerable, were not reached.

The results of the study suggest additional need for research. With regard to a lower participation in the measures, the pandemic-related factors examined in this study, which did not reveal any significant differences with very large confidence intervals, should be examined once again in larger samples. Additional pandemic-related factors could be used thereby. These include structural determinants, for example the availability of programmes, but also individual factors, such as the risk perception and the attitude towards and the handling of SARS-CoV-2 protective measures. They were used, for example, in the COSMO study [23], but could not be examined here. For the future communication under pandemic conditions, it would also be important to know, how these determinants need to be worded in a target group-specific manner, in order to motivate especially population groups with a higher risk for non-communicable diseases to utilise prevention and health promotion measures even during a crisis situation.

4.3 Conclusion

Fortunately, the use of prevention and health promotion measures to prevent non-communicable diseases seems to have increased over the last ten years. The pandemic stopped this development. Hopefully, this development was only interrupted and will reach a pre-pandemic level in the next few years again. It was also more difficult to reach socially disadvantaged individuals during the pandemic years 2020/2021. Resilient structures, which provide measures for reaching disadvantaged groups and which counteract the social health inequalities, even in times of crisis, are thus required. Due to the fact that prevention and health promotion measures for non-communicable diseases have the potential to at least partly counteract the psychosocial and health consequences of the crisis during a pandemic situation, they should be part of the crisis planning in epidemically significant situations in the future.

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Data protection and ethics

COVIMO is in strict compliance with the General Data Protection Regulation (DSGVO) and the Federal Data Protection Act (BDSG). RKI's data protection officer verified the COVIMO study in advance on the basis of the current General Data Protection Regulation (DSGVO) and the Federal Data Protection Act (BDSG). All respondents were informed at the beginning of the telephone interview about the voluntary nature of participation, the objectives of the survey, and data protection, and are asked for their verbal consent to participate.

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Conflicts of interest

The authors declared no conflicts of interest.

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References

1. World Health Organization (2013) Global action plan for the prevention and control of noncommunicable diseases (2013–2020). www.who.int/nmh/events/ncd_action_plan/en/ (As at 01.01.2019)
2. Präventionsgesetz (2015) Gesetz zur Stärkung der Gesundheitsförderung und der Prävention (Präventionsgesetz – PrävG). Bundesgesetzblatt Teil I Nr 31 vom 24.07.2015:1368–1379

3. Schilling J, Buda S, Fischer M et al. (2021) Retrospektive Phaseneinteilung der COVID-19-Pandemie in Deutschland bis Februar 2021. Epid Bull (15):8–17

4. Tolksdorf K, Buda S, Schilling J (2021) Aktualisierung zur „Retrospektiven Phaseneinteilung der COVID-19-Pandemie in Deutschland". Epid Bull (37):13 –14

5. Deutscher Olymischer Sportbund (DOSB) (2022) Comeback nach Mitgliederverlust. https://www.dosb.de/sonderseiten/news/news-detail/news/comeback-nach-pandemiebedingtem-mitgliederverlust (As at 24.11.2022)

6. Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen (MDS), GKV-Spitzenverband (2021) Präventionsbericht 2021. Leistungen der gesetzlichen Krankenversicherung: Primärprävention und Gesundheitsförderung. Leistungen der sozialen Pflegeversicherung: Prävention in stationären Einrichtungen. Berichtsjahr 2020. MDS, GKV-Spitzenverband, Essen, Berlin

7. Hajek A, De Bock F, Huebl L et al. (2021) Determinants of postponed cancer screening during the COVID-19 pandemic: Evidence from the nationally representative COVID-19 Snapshot Monitoring in Germany (COSMO). Risk Manag Healthc Policy 14:3003–3011

8. Heidemann C, Reitzle L, Schmidt C et al. (2022) Non-utilisation of health care services during the COVID-19 pandemic: Results of the CoMoLo study. J Health Monit 7(S1):2–17. https://edoc.rki.de/handle/176904/9509 (As at 24.11.2022)

9. Mangiapane S, Kretschmann J, Czihal T et al. (2022) Veränderung der vertragsärztlichen Leistungsinanspruchnahme während der COVID-Krise. Tabellarischer Trendreport bis zum Ende des Jahres 2021. Zentralinstitut für die kassenärztliche Versorgung in der Bundesrepublik Deutschland (Zi), Berlin

10. Jordan S, Starker A, Krug S et al. (2020) Health behaviour and COVID-19: Initial findings on the pandemic. J Health Monit 5(S8):2–14. https://edoc.rki.de/handle/176904/7491 (As at 24.11.2022)

11. Damerow S, Rommel A, Prütz F et al. (2020) Developments in the health situation in Germany during the initial stage of the COVID-19 pandemic for selected indicators of GEDA 2019/2020-EHIS. J Health Monit 5(5):3–20. https://edoc.rki.de/handle/176904/7550.2 (As at 24.11.2022)

12. Füzéki E, Schröder J, Reer R et al. (2021) Physical activity and well-being during the second covid19-related lockdown in Germany in 2021. Sustainability (Switzerland) 13(21)

13. Dragano N, Reuter M, Berger K (2022) Increase in Mental Disorders During the COVID-19 Pandemic – The Role of Occupational and Financial Strains. Dtsch Arztebl Int 119(11):179–187

14. Hoebel J, Grabka MM, Schröder C et al. (2022) Socioeconomic position and SARS-CoV-2 infections: seroepidemiological findings from a German nationwide dynamic cohort. J Epidemiol Community Health 76(4):350–353

15. Fiske A, Galasso I, Eichinger J et al. (2022) The second pandemic: Examining structural inequality through reverberations of COVID-19 in Europe. Soc Sci Med 292:114634

16. Strauß B, Berger U, Rosendahl J (2021) Folgen der COVID-19-Pandemie für die psychische Gesundheit und Konsequenzen für die Psychotherapie – Teil 1 einer (vorläufigen) Übersicht. Psychotherapeut 66(3):175–185

17. Jordan S, von der Lippe E (2013) Teilnahme an verhaltenspräventiven Maßnahmen. Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1). Bundesgesundheitsbl 56(5/6):878–884

18. Ladebeck N, March S, Swart E (2015) Inanspruchnahme von Leistungen zur individuellen Gesundheitsförderung bei Erwerbstätigen: Ergebnisse der lidA-Studie. Präv Gesundheitsf 10(1):22–27

19. Okan O, Bollweg T, Bauer U et al. (2021) Trendstudie zur coronaspezifischen Gesundheitskompetenz: Ergebnisse der zweiten Erhebung der HLS-COVID-19 Studie. Bielefeld. https://doi.org/10.4119/unibi/2950307 (As at 24.11.2022)

20. COVID-19 Snapshot Monitoring (COSMO) (2020) Ergebnisse aus dem wiederholten querschnittlichen Monitoring von Wissen, Risikowahrnehmung, Schutzverhalten und Vertrauen während des aktuellen COVID-19 Ausbruchsgeschehens. Stand: 12.06.2020 (Version 14-01). 16. Wahrgenommene Konsistenz der Regelungen. https://projekte.uni-erfurt.de/cosmo2020/archiv/14-01/cosmo-analysis.html (As at 24.11.2022)

21. USUMA (2022) Methodenbericht. COVIMO – COVID-19 Impfquoten-Monitoring in Deutschland – Bundesweite Bevölkerungsbefragung im Rahmen der Durchführung von telefonischen Ad-hoc-Befragungen für das Robert Koch-Institut. USUMA, Berlin. www.rki.de/covimo (As at 01.08.2022)

22. Betsch C, Wieler L, Bosnjak M et al. (2020) Germany COVID-19 Snapshot Monitoring (COSMO Germany): Monitoring knowledge, risk perceptions, preventive behaviours, and public trust in the current coronavirus outbreak in Germany. PsychArchives

23. COSMO – COVID-19 Snapshot Monitoring (2020) Methode. https://projekte.uni-erfurt.de/cosmo2020/web/method/ (As at 24.11.2022)

24. Lumley T (2011) Complex Surveys: A Guide to Analysis Using R. Wiley, Hoboken, New Jersey

25. Schroedter J, Lechert Y, Lüttinger P (2006) Die Umsetzung der Bildungsskala ISCED-1997 für die Volkszählung 1970, die Mikrozensus-Zusatzerehebung 1971 und die Mikrozensen 1976–2004 (Version). ZUMA-Methodenbericht 2006/08. http://www.gesis.org/fileadmin/upload/forschung/publikationen/gesis_reihen/gesis_methodenberichte/2006/06_08_Schroedter.pdf (As at 24.11.2022)

26. Jordan S, von der Lippe E, Hagen C (2011) Verhaltenspräventive Maßnahmen zur Ernährung, Bewegung und Entspannung. In: Robert Koch-Institut (RKI) (Ed) Daten und Fakten: Ergebnisse der Studie „Gesundheit in Deutschland aktuell 2009" Beiträge zur Gesundheitsberichterstattung des Bundes. RKI, Berlin, P. 23–33

27. Robert Koch-Institut (RKI) (2020) 2.3.2 Verhaltensprävention. Gesundheitliche Lage der Frauen in Deutschland. RKI, Berlin, P. 133–138

28. Robert Koch-Institut (RKI) (2020) 2.3.3 Betriebliche Gesundheitsförderung. Gesundheitliche Lage der Frauen in Deutschland. RKI, Berlin, P. 138–143

29. Keil J, Brendler V, Sachse C et al. (2020) Geschlechterspezifische Inanspruchnahme von Gesundheitsleistungen in einer urbanen Erwachsenenpopulation. Gesundheitswesen 82(3):e17–e23

30. Hiller J, Schatz K, Drexler H (2017) Gender influence on health and risk behavior in primary prevention: a systematic review. Z Gesundh Wiss 25(4):339–349

31. Jordan S (2020) Inanspruchnahme präventiver Maßnahmen. Eine Analyse von Einflussfaktoren auf die Nutzung von Verhaltensprävention bei Erwachsenen. Universität Bielefeld, Bielefeld

32. Jordan S, Domanska O, Firnges C (2017) Gesundheitskompetenz und Gesundheitsbewusstsein: Überlegungen zur Konzeption von Gesundheitskompetenz unter Einbezug empirischer Daten aus der GEDA-Studie. In: Schaeffer D, Pelikan J (Eds) Health Literacy – Die zunehmende Bedeutung von Wissen und Kompetenzen für die Gesundheit. Hogrefe, Bern, P. 225–237

33. Abel T, Bucher S, Duetz M et al. (2002) Gesundheitsrelevante Lebensstile und soziale Differenzierung: Zur Weiterentwicklung eines empirischen Konzepts in der Public Health Forschung. In: Flick U (Ed) Innovation durch New Public Health. Hogrefe, Göttingen, P. 113–136

34. Baumann E, Czerwinski F, Rosset M et al. (2020) Wie informieren sich die Menschen in Deutschland zum Thema Gesundheit? Erkenntnisse aus der ersten Welle von HINTS Germany. Bundesgesundheitsbl 63(9):1151–1160

35. Horch K (2021) Searching for health information on the Internet – Results from the KomPaS study. J Health Monit 6(2):67–73. https://edoc.rki.de/handle/176904/8406 (As at 24.11.2022)

36. Lemenager T, Neissner M, Koopmann A et al. (2021) Covid-19 lockdown restrictions and online media consumption in Germany. Int J Environ Res Public Health 18(1):1–13

37. Robert Koch-Institut (RKI) (Ed) (2015) Gesundheit in Deutschland. Gesundheitsberichterstattung des Bundes. Gemeinsam getragen von RKI und Destatis. RKI, Berlin

38. Beese F, Waldhauer J, Wollgast L et al. (2022) Temporal Dynamics of Socioeconomic Inequalities in COVID-19 Outcomes Over the Course of the Pandemic – A Scoping Review. Int J Public Health 67:1605128

39. Jensen N, Kelly AH, Avendano M (2021) The COVID-19 pandemic underscores the need for an equity-focused global health agenda. Humanities and Social Sciences Communications 8(1):15

40. van Deursen AJAM, Helsper EJ (2015) The Third-Level Digital Divide: Who Benefits Most from Being Online? Communication and Information Technologies Annual. Emerald Group Publishing Limited, P. 29–52

41. Nguyen TH, Marschall J (2021) Auswirkungen der Corona-Pandemie auf die Gesundheitsförderung und Prävention – eine Erhebung. In: Medizinischer Dienst des Spitzenverbandes Bund der Krankenkassen (MDS), GKV-Spitzenverband (Eds) Präventionsbericht 2021 Leistungen der gesetzlichen Krankenversicherung: Primärprävention und Gesundheitsförderung Leistungen der sozialen Pflegeversicherung: Prävention in stationären Einrichtungen Berichtsjahr 2020. MDS, GKV-Spitzenverband, Essen, Berlin, P. 15–19

42. Voss M, Hartl J (2022) Aus der Krise lernen. Auf dem Weg zu einer resilienten Gesundheitsförderung. https://www.gesundheitliche-chancengleichheit.de/service/meldungen/aus-der-krise-lernen/ (As at 24.11.2022)

43. Buse K, Nilo A, Kim J et al. (2020) COVID-19 combination prevention requires attention to structural drivers. Lancet 396(10249):466

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How has body weight changed since the beginning of the COVID-19 pandemic?

Abstract

Background: Measures for containing the COVID-19 pandemic in 2020 and 2021 resulted in drastic changes in physical activity and dietary habits that also impacted body weight.

Methods: The representative study German Health Update (GEDA 2021) includes self-reported information about body weight and body height for adults aged 18 years and older (n=2,985) from July to October 2021. In addition, the study asked about changes in body weight since the beginning of the COVID-19 pandemic.

Results: For 59% of participants, body weight has not changed since the beginning of the COVID-19 pandemic, 26% report weight gain, and 15% report weight loss. Younger people indicate weight gain more often than older people, and individuals with obesity report weight gain more often than individuals without obesity. 1.5 years after the beginning of the COVID-19 pandemic, the average weight change within the population is approximately +0.34kg.

Conclusions: The effects of restrictions in everyday life with regard to the possible negative impacts on body weight should be given greater consideration and should be monitored in the future.

WEIGHT CHANGE · WEIGHT GAIN · COVID-19 PANDEMIC · ADULTS · GEDA 2021

Introduction

The measures for containing the COVID-19 pandemic in 2020 and 2021 resulted in drastic changes in the lifestyle and wellbeing of many people. There are indications that changes in physical activity and dietary habits manifest in the course of the COVID-19 pandemic and lead to weight changes [1–3]. Initial results from Germany from survey data for adults were available in September 2020. At that time, approximately 1,000 parents between the ages of 20 and 65 with children up to the age of 14 were asked about weight changes since the beginning of the COVID-19 pandemic. 27% indicated having gained weight since the beginning of the COVID-19 pandemic [4]. An evaluation of the study German Health Update (GEDA 2019/2020-EHIS) showed an increase of the average body weight by 1.1kg and an increase of the average BMI by 0.5kg/m² [5] in a comparison between the pre-pandemic period April to August 2019 and April to August 2020. A more recent evaluation suggests that this increase did not continue after October 2020 [6]. In such a population-wide observation, individual changes of weight gain and of weight loss balance each other out to some extent. Therefore, an analysis will be made here, based on survey data across Germany, to find out which groups of people have been affected by

GEDA 2021

Sixth follow-up survey of the German Health Update

Data holder: Robert Koch Institute

Objectives: Provision of reliable information on the health status, health behaviour and health care of the population living in Germany and their changes in the course of the SARS-CoV-2 pandemic.

Study design: Cross-sectional telephone survey

Population: German-speaking population aged 16 years and older living in private households that can be reached via landline or mobile phone

Sampling: Random sample of landline and mobile telephone numbers (dual-frame method) from the ADM sampling system (Arbeitskreis Deutscher Markt- und Sozialforschungsinstitute e.V.)

Sample size: 5,030 respondents

Study period: July 2021 to December 2021

GEDA survey waves:
- GEDA 2009
- GEDA 2010
- GEDA 2012
- GEDA 2014/2015-EHIS
- GEDA 2019/2020-EHIS
- GEDA 2021

Further information in German is available at www.geda-studie.de

weight changes since the beginning of the COVID-19 pandemic, and how many kilograms they have gained or lost. The data for this was acquired between July and October 2021, and thus approximately 1.5 years after the beginning of the COVID-19 pandemic.

Indicator

The German Health Update (GEDA) is a cross-sectional survey of the residential population living in Germany, which has the objective of describing the state of health, the health care, and the health behaviour, and of capturing demographic and socioeconomic determinants. GEDA 2021 is a telephone survey of people aged 16 years and older.

From July to October, participants were asked about body height and weight, and the body mass index (BMI, kg/m²) was calculated from this information. In addition, the question 'Has your body weight changed since the beginning of the Corona pandemic, thus since March 2020?' was asked. The response options were: 'Yes, I gained weight", 'yes, I lost weight', and 'no, remained the same'. Participants who reported weight gain or loss were then asked for an estimate in kg (question: 'Approximately how many kilograms?').

The analyses are based on information from 2,985 participants aged 18 years and older. Valid information relating to weight changes during the pandemic is available for 2,965 individuals. Evaluations relating to the average weight change in kilograms are based on valid information from 2,944 individuals who report a weight gain or loss (n=1,114). Individuals whose body weight remained the same (n=1,830) are assigned the value 0kg for the weight change.

Prevalence was reported with 95% confidence intervals (95% CI) by gender (women, men) [7], age group (aged 18–29, aged 30–44, aged 45–64, ≥65 years of age) and education group (International Standard Classification of Education, ISCED: Low, medium, high education group) [8], and mean values (M) were identified with 95% CI. In a multinominal logistic regression (outcome: gain/loss, reference: same/stable weight), gender, age, education, and obesity (BMI≥30kg/m²) were included, and odds ratios (OR) were calculated as effect estimates with 95% confidence intervals (95% CI). An OR can be interpreted as the factor, by which the odds of an event increases (here, e.g., weight gain), when being exposed to the risk factor. Only participants with valid values in all variables (n=2,909) are taken into consideration for the regression analysis.

To correct deviations of the sample from the population structure, the analyses were performed using a weighting factor. First of all, a design weighting was performed for the various selection probabilities (mobile service and landline) as part of the data weighting. Then, an adaptation to the official population numbers was made based on age, sex, federal state, district type (as of: 31.12.2020), and education (microcensus 2018). All analyses were performed using SAS 9.4. A significant difference between the groups is assumed when the p-value, which is calculated in consideration of the weighting and of the survey design, is less than 0.05.

Results and discussion

Almost 60% of the participants indicate that their body weight remained the same since the beginning of the COVID-19 pandemic, 26.2% report weight gain, and 14.5%

report weight loss. There were no statistically significant differences between men and women or between education groups. Significant differences can be observed with age and the BMI. Older people report unchanged body weight more often than younger people. In contrast, younger people indicate weight gain more often than older people. This is also observed among middle-aged groups. On average, those with unchanged weight are eight years older than those with weight gain. With 27.3kg/m² among participants who indicate weight gain, the average BMI is significantly higher compared to those who report weight loss (25.5kg/m²) or stable weight (25.3kg/m²). Obesity is present among 47.8% of those whose body weight remained the same, among 39.1% of those who indicate weight gain, and among 13.1% of those who indicate weight loss (Table 1).

The multinominal regression analysis shows a higher odds ratio for women to have gained body weight since the beginning of the COVID-19 pandemic. In addition, age is a further determinant for a weight change: The younger the individuals, the higher the odds ratio of weight gain. It also is observed that people in the youngest age group compared to those aged 65 years and older indicate weight loss more frequently. Obesity is associated with a higher odds ratio for weight gain (Table 2).

59% of participants indicate that their body weight remained the same since the beginning of the COVID-19 pandemic, 26% report weight gain, and 15% report weight loss.

	%	Stable weight n=1,830 (95% CI)	%	Weight gain n=747 (95% CI)	%	Weight loss n=388 (95% CI)	p-value*
Total	**59.3**	**(56.5–62.0)**	**26.2**	**(23.8–28.7)**	**14.5**	**(12.6–16.7)**	**<0.0001**
Gender							0.0724
Women	56.2	(52.4–59.9)	27.5	(24.2–31.1)	16.3	(13.5–19.5)	
Men	62.3	(58.3–66.2)	24.9	(21.6–28.6)	12.8	(10.3–15.8)	
Age (years, M)	54.4	(52.9–55.9)	46.3	(44.4–48.3)	49.4	(46.2–52.7)	<0.0001
Age group							<0.0001
18–29 years	46.5	(38.2–55.0)	35.1	(27.6–43.5)	18.4	(12.4–26.5)	
30–44 years	53.3	(47.2–59.4)	30.7	(25.4–36.7)	15.9	(11.9–21.1)	
45–64 years	61.5	(57.2–65.6)	27.4	(23.7–31.3)	11.2	(8.7–14.2)	
≥65 years	69.4	(65.1–73.5)	15.5	(12.5–18.9)	15.1	(12.1–18.7)	
Education status							0.3023
Low education group	66.2	(57.1–74.2)	20.3	(13.8–28.8)	13.5	(8.4–20.8)	
Medium education group	57.6	(53.9–61.2)	27.3	(24.1–30.7)	15.2	(12.6–18.1)	
High education group	59.0	(55.3–62.6)	27.1	(24.0–30.5)	13.8	(11.1–17.1)	
BMI (kg/m², M)	25.3	(25.0–25.6)	27.3	(26.7–27.8)	25.5	(24.8–26.2)	<0.0001
Obesity (BMI≥30kg/m²)	47.8	(41.2–54.5)	39.1	(32.7–45.9)	13.1	(9.3–18.1)	<0.0001

* p-value: group differences
CI = confidence interval, M = mean, BMI = body mass index

Table 1
Subjective change of body weight since the beginning of the COVID-19 pandemic (N=2,965, n=1,421 women, n=1,544 men) by gender, age, education, and body mass index
Source: GEDA 2021

Table 2
Multinominal logistic regression for weight change◇. Odds ratios by gender, age, education, and body mass index (n=1,510 women, n=1,399 men)
Source: GEDA 2021

	Weight gain OR (95% CI)		Weight loss OR (95% CI)	
Gender				
Women	1.33	(1.02–1.75)*	1.38	(0.98–1.96)
Men		1.0		1.0
Age group				
18–29 years	4.16	(2.61–6.63)**	1.88	(1.05–3.37)*
30–44 years	2.74	(1.86–4.03)**	1.47	(0.94–2.29)
45–64 years	1.95	(1.40–2.71)**	0.86	(0.58–1.26)
≥65 years		1.0		1.0
Education status				
Low education group		1.0		1.0
Medium education group	1.61	(0.95–2.71)	1.38	(0.77–2.47)
High education group	1.64	(0.96–2.78)	1.30	(0.71–2.38)
Obesity (BMI≥30kg/m²)◇◇	2.52	(1.79–3.55)**	1.25	(0.80–1.96)

* p<0.05, ** p<0.001
◇ reference=category 'stable weight'
◇◇ reference=no obesity
OR = odds ratio, CI = confidence interval, BMI = body mass index

Younger people report weight gain more often than older people.

The average weight change within the population since the beginning of the COVID-19 pandemic is +0.34kg (95% CI: 0.07–0.61). Among those who have indicated weight gain since the beginning of the COVID-19 pandemic, the average weight gain is 5.3kg (95% CI: 4.8–5.8). Those who report weight loss, have lost 7.0kg (95% CI: 6.3–7.7) on average.

The GEDA 2021 study provides population-based survey data from July to October 2021 on the subjective weight change, which, in retrospect, includes a period of approximately 1.5 years since the beginning of the COVID-19 pandemic. During that time, temporary containment measures led to long-lasting restrictions in everyday life, such as increased sedentary activities and less physical activity [9]. With regard to the development of the body weight, the odds ratio for weight gain was increased especially for younger people and individuals with obesity.

A placement of the available results of the study in the existing national and international literature on weight change since the beginning of the COVID-19 pandemic is only possible to a very limited extent because not only the times of the survey and thus also associated different infection dynamics and restrictions in everyday life vary greatly across individual countries, but also because survey methods and the wording of questions differ as well. In addition, the methodological quality of the studies is very heterogeneous and the validity may be limited due to lack of representativeness (e.g. selected samples in social media). Moreover, many studies – such as this GEDA 2021 study – are cross-sectional studies, which ask retrospectively about weight changes in the beginning of the COVID-19 pandemic, and this information can be biased by personal recollection.

A rapid review analysed the impact of the containment and quarantine measures on modifiable cardiovascular risk factors within populations and draws the conclusion that at least one fourth of adults reports weight gain [1]. In an online survey conducted in April 2020 in the USA, 27.5% of participants also indicated weight gain, even 33.4% among individuals with obesity [10], a magnitude, which was also found in this GEDA 2021 study. In a representative online survey in April 2021 among adults between the ages of 18 and 70 years in Germany, 48% of participants indicated no weight change, 39% indicated weight gain, and 11% indicated weight loss since the beginning of the COVID-19 pan-

People with obesity report weight gain more often than people without obesity.

The average weight change within the population around 1.5 years after the beginning of the COVID-19 pandemic is +0.34kg.

demic [11]. A repeated survey in May/June 2022 showed that 49% of participants had no change in weight, 35% reported weight gain, and 15% reported weight loss since the beginning of the COVID-19 pandemic [12]. With 15%, the proportion of those who reported in GEDA 2021 after 1.5 years having lost weight is identical, and the proportion without weight changes is significantly greater with 59%. The nu3 Corona study, which was conducted in April 2020 [13], already showed that younger people indicate weight gain more frequently than older people. Individuals between the ages of 35 and 44 years reported weight gain most frequently (29%), in the online survey from April 2021 it was individuals between the ages of 30 and 44 years [11]. The fact that individuals with obesity report weight gain significantly more frequently was also the result of an online survey in the USA [10]. In GEDA 2021, the average weight gain since the beginning of the COVID-19 pandemic was 340g. This is thus slightly higher than the average weight gain per year, observed in a longitudinal evaluation of cohort studies in Germany between 1994 and 2007. At that time, the average weight gain within the general population between the ages of 45 and 64 was 250g in men, and 240g in women [14]. The change is similar to the one already described earlier for Western countries in the period between mid-November and mid-January [15]. A weight gain of 340g in just under 1.5 years is probably clinically insignificant, but there are substantial deviations from this average value. Among those who indicate weight gain or loss, respectively, the average change of +5kg or -7kg, respectively, lies within the range of the online survey from April 2021 and May/June 2022 [11, 12]. If these weight changes observed since the beginning of the COVID-19 pandemic continue, impacts on the health of the population cannot be ruled out. For example, weight gain in women between the ages of 40 and 55 is associated with significantly higher odds of multimorbidity [16].

Even though only subjective estimates considering changes in body weight are available in the GEDA 2021 study, and comparatively acquired data from the pre-pandemic period is missing, the results represented here show that restrictions in everyday life caused by the COVID-19 pandemic have possibly influenced the body weight in the last 1.5 years. Certain population groups, such as younger people and individuals with obesity, were affected more frequently by weight changes. In the long run, (persistent) weight gain can go hand in hand with health risks and other non-communicable diseases, which are associated with overweight and obesity. This is why the effects of restrictions in everyday life should be given greater consideration with regard to the possible negative impacts on body weight and should be monitored in the future.

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Data protection and ethics

GEDA 2021 is subject to strict compliance with the data protection provisions set out in the EU General Data Protection Regulation (GDPR) and the Federal Data Protection Act (BDSG). The Ethics Committee of the Charité – Universitätsmedizin Berlin assessed the ethics of the study and approved the implementation of the study (application number EA2/201/21). Participation in the study was voluntary. The participants were informed about the aims and contents of the study and about data protection. Informed consent was obtained verbally.

Availability of data

The authors confirm that some access restrictions apply to the data underlying the findings. The data set cannot be made publicly available because informed consent from study participants did not cover public deposition of data. However, the minimal data set underlying the findings is archived in the Research Data Centre at the Robert Koch Institute and can be accessed by researchers on reasonable request. On-site access to the data set is possible at the Secure Data Center of the Robert Koch Institute's Research Data Centre. Requests should be submitted by e-mail to fdz@rki.de.

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Conflicts of interest

The authors declared no conflicts of interest.

References

1. Freiberg A, Schubert M, Romero Starke K et al. (2021) A Rapid Review on the Influence of COVID-19 Lockdown and Quarantine Measures on Modifiable Cardiovascular Risk Factors in the General Population. Int J Environ Res Public Health 18(16)
2. Zeigler Z (2021) COVID-19 Self-quarantine and Weight Gain Risk Factors in Adults. Curr Obes Rep 10(3):423–433
3. Bakaloudi DR, Barazzoni R, Bischoff SC et al. (2021) Impact of the first COVID-19 lockdown on body weight: A combined systematic review and a meta-analysis. Clin Nutr 20: S0261-5614(21)00207-7
4. Koletzko B, Holzapfel C, Schneider U et al. (2021) Lifestyle and Body Weight Consequences of the COVID-19 Pandemic in Children: Increasing Disparity. Ann Nutr Metab 77(1):1–3
5. Damerow S, Rommel A, Prütz F et al. (2020) Developments in the health situation in Germany during the initial stage of the COVID-19 pandemic for selected indicators of GEDA 2019/2020-EHIS J Health Monit 5(4):3–20. https://edoc.rki.de/handle/176904/7550.2 (As at 16.11.2022)
6. Damerow S, Rommel A, Beyer AK et al. (2022) Health situation in Germany during the COVID-19 pandemic. Developments over time for selected indicators of GEDA 2019/2020 – An update. J Health Monit 7(S3):2–19. https://edoc.rki.de/handle/176904/9908 (As at 16.11.2022)
7. Pöge K, Saß AC, Starker A et al. (2022) Survey of sex/gender diversity in the GEDA 2019/2020-EHIS study – objectives, procedure and experiences. J Health Monit 7(2):48–65. https://edoc.rki.de/handle/176904/9890 (As at 16.11.2022)
8. UNESCO Institute for Statistics (2012) International Standard Classification of Education: ISCED 2011. UNESCO Institute for Statistics, Montreal
9. Hall G, Laddu DR, Phillips SA et al. (2021) A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? Prog Cardiovasc Dis 64:108–110
10. Flanagan EW, Beyl RA, Fearnbach SN et al. (2021) The Impact of COVID-19 Stay-At-Home Orders on Health Behaviors in Adults. Obesity (Silver Spring) 29(2):438–445

11. EKFZ/TUM (2021) Lebensstil und Ernährung von Erwachsenen in Corona-Zeiten. Pressekonferenz/Expertengespräch zur Forsa-Studie. München, 2. Juni 2021. https://www.ekfz.tum.de/fileadmin/PDF/PPT__EKFZ_und_Forsa_2_Final.pdf (As at 16.11.2022)

12. EKFZ/TUM (2022) Lebensstil / Ernährung / psychisches Befinden von Erwachsenen in Corona-Zeiten. Pressekonferenz/ EKFZ Expertengespräch. München, 28. Juli 2022. https://www.wzw.tum.de/fileadmin/download/events/EKFZ-Expertengespraech-Prof-Hauner.pdf (As at 16.11.2022)

13. nu3 ((2020) nu3 Corona-Studie. Wie wir uns in Zeiten von Social Distancing und Home-Office ernähren und bewegen. https://www.nu3.de/pages/corona-studie#gref (As at 16.11.2022)

14. Haftenberger M, Mensink GBM, Herzog B et al. (2016) Changes in body weight and obesity status in German adults: results of seven population-based prospective studies. Eur J Clin Nutr 70(3):300–305

15. Schoeller DA (2014) The effect of holiday weight gain on body weight. Physiol Behav 134:66–69

16. Xu X, Mishra GD, Dobson AJ et al. (2019) Short-term weight gain is associated with accumulation of multimorbidity in mid-aged women: a 20-year cohort study. Int J Obes (Lond) 43(9):1811–1821

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