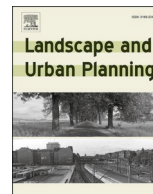




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Self-reported well-being and the importance of green spaces – A comparison of garden owners and non-garden owners in times of COVID-19

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HIGHLIGHTS

- Garden owners had greater self-reported well-being than non-garden owners.
- Garden and non-garden owners differed in many socio-economics variables.
- They also differed in time spent outside as well as personality traits.
- Detected differences explained much of the differences in self-reported well-being.
- Public and private greens spaces were highly appreciated during COVID-19.

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ABSTRACT

This study focuses on the effects of the use of green spaces on the self-reported well-being measures of life satisfaction and mental well-being during the COVID-19 pandemic. We compare two distinct groups of people: garden owners and non-garden owners. We collected quantitative data and data from an open-ended question online from 495 people living in all regions of Germany in May 2020. To analyze our quantitative data, we used a combination of descriptive statistics and hierarchical regressions. Here, results indicated that garden owners had substantially greater life satisfaction and mental well-being than non-garden owners. Additionally, the two groups differed statistically significant in many socioeconomic factors (e.g., income, age, fear of job loss), in the context of time spent outside, as well as personality traits. Our analyses suggest that these differences are valuable for understanding differences between the two groups' self-reported well-being. To analyze the open-ended question, we followed the main steps of a qualitative content analysis. Here, we found that the vast majority of participants associated positive meanings (e.g., freedom and joy) with private gardens and public green spaces during the pandemic. Our findings have implications for policies to promote and support the design and use of public green spaces. Overall, our findings support governmental decisions in Germany (as elsewhere) to keep public green spaces open during the first wave of the outbreak of COVID-19, suggesting that green spaces provide valuable support for self-reported well-being in these difficult times of COVID-19 contagion.

1. Introduction

On March 11, 2020, the [World Health Organization \(2020\)](https://www.who.int) declared the COVID-19 outbreak to be a pandemic. At the outset of the pandemic, governments responded with different speed and intensity to implement social measures and legal restrictions to fight the spread of the virus. Some European cities and regions—e.g., in Spain—imposed heavy restrictions, requiring people to stay indoors, with only limited exceptions ([Barton et al., 2020](#)). To fight the first wave of the pandemic, several cities in Europe also closed city parks to the public ([Kleinschroth and](#)

[Kowarik, 2020](#)). In Germany, although some contact restrictions for outdoors were set in place, public green spaces principally remained open. While the main intention of social measures to decrease the spread of the virus may have been temporarily effective, negative side-effects on well-being have already been detected (e.g., [Zacher and Rudolph, 2020](#)). Whereas many potential factors may positively and negatively affect well-being in the time of COVID-19, this study focuses on the effects of using green spaces on self-reported well-being measures. We do this by focusing on and comparing two distinct groups of people: garden owners and non-garden owners in Germany.

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1.1. Self-reported well-being in COVID-19 pandemic

There are many different measures of well-being, ranging from more “objective”, i.e. objectively observable, measures such as, income or physical health to self-reported, subjective measures (Hirschauer et al., 2015). At least three dimensions of subjective wellbeing may be distinguished—evaluative wellbeing (also known as cognitive well-being, e.g., life satisfaction), hedonic wellbeing (also known as affective well-being, i.e., feelings of happiness, sadness, anger, stress, and pain), and eudemonic wellbeing, which is the sense of purpose and meaning in life (Kahneman et al., 2003; Steptoe, et al., 2015). While self-reported measures of well-being may differ in the aspect they want to capture, and consequently may differ in their correlates, COVID-19 seems to affect a wide range of them. Zhang et al. (2020a,b) found that one month into the outbreak of COVID-19 in China, adults who did not work experienced worse mental health, greater distress, and less life satisfaction than those who worked. Focusing on Chinese students, Cao et al. (2020) found that living in urban areas, family income stability, and living with their parents helped protect students from anxiety. Qiu et al. (2020) saw that psychological distress in China significantly and substantially varied by gender, age group, education, occupation, and region. Women, people between 18 and 30 years of age or over 60, people with higher education, migrant workers, and people living in the middle region of China tended to have higher levels of psychological distress. Focusing on evidence from Europe, the results of a survey by Carson et al. (2020) suggest that younger English participants (18–25) had significantly lower life-satisfaction scores than older people. Blasco-Belled et al. (2020) studied the effects of COVID-19 on life satisfaction in Spain and found that hope positively and social phobia negatively affected life satisfaction. Focusing on the effect of physical activity in Italy, Maugeri et al. (2020) discovered that the reduction of total physical activity severely and negatively impacted psychological well-being. For Germany, Zacher and Rudolph (2020) collected data at four dates between December 2019 and May 2020, and saw that, on average, life satisfaction did not change substantially between December and March but decreased between March and May. Having surveyed Germans and focusing on the question of who is at risk during COVID-19 and why, Kroencke et al. (2020) argue that global pandemics threaten individuals’ psychological well-being, particularly those who are highly neurotic, one of the so-called “big five” personality traits. This argumentation is in line with a substantial body of literature suggesting a link between personality traits and well-being, where neuroticism is found to have, for instance, a strong negative relation to measures of subjective well-being (e.g., Anglim et al., 2020; Steel et al., 2008).

In summary, some evidence suggests that measures of self-reported well-being are lower during the pandemic than before, and it affects different groups of people differently.

1.2. Green spaces: effects on self-reported well-being

There is ample scientific evidence on the relationship between green spaces, their use, and self-reported well-being. However, studies focusing on private gardens are relatively sparse (de Bell et al., 2020; Wendelboe-Nelson et al., 2019). In contrast to public gardens such as community gardens, the private (domestic) garden is the private outdoor extension of the dwelling (Coolen and Meesters, 2012). There is some evidence regarding a positive relationship between private gardens and health, which, in turn, correlates to subjective well-being measures (Okun et al, 1984; Steptoe et al., 2015). Dennis and James (2017) aim to quantify the mitigation of local health deprivation (measured by e.g., years of potential life lost, comparative illness and disability ratio) by private gardens. They found associations between private garden coverage in an area and a reduction of health deprivation. Similarly, Brindley et al. (2018) used a geographical approach and connect general health data with average garden size in the area and measures of deprivation. Their results suggest that residents of areas

with small domestic gardens had the highest levels of poor health, as well as health inequality related to income deprivation. De Bell et al. (2020) investigated the relationships between private garden access and well-being and found that having access is positively associated with evaluative and eudemonic well-being in England.

In contrast to the rather sparse evidence on private gardens, evidence is more pronounced regarding the effects of public green spaces on measures of well-being. However, the definitions of what constitutes a public green space and how to measure it varies between studies (Houlden et al., 2018). Twohig-Bennett and Jones (2018) review and analyze the health benefits (a correlate of subjective well-being) of public green spaces, defined as open, undeveloped land with natural vegetation as well as urban greenspaces, which included urban parks and street greenery. They found that public green space exposure is associated with a wide range of health measures, such as a decrease in diabetes or the reduction in diastolic blood pressure, salivary cortisol and heart rate. Focusing specifically on the relationship between public green space and the well-being of adults, Houlden et al. (2018) find in their systematic review that public green spaces have positive associations with mental well-being and hedonic well-being, but conclude that evidence is currently neither sufficient nor specific enough to guide planning decisions. Zhang et al. (2020b) synthesize findings on the effect of green spaces (defined as urban areas of vegetation) on adolescents and conclude that there are beneficial associations between green space exposure and reduced stress, positive mood, less depressive symptoms, better emotional well-being, improved mental health and behavior, and decreased psychological distress.

Overall, the positive link between self-reported well-being and the use of different types of green spaces is well established (Zhang, Wang et al., 2020; Zhang, Mavoa et al., 2020). A review by Wendelboe-Nelson et al. (2019) indicated that a central shortcoming of studies in the field is that a very common approach to measuring mental health and well-being is by means of developing original questionnaires, despite the range of existing and validated instruments.

1.3. Research questions and hypotheses

Scholars have pointed out the lack of knowledge and studies on garden owners (e.g., de Bell et al., 2020; Brindley et al., 2018). To tackle part of this research gap, we collected and analyzed quantitative data and data from an open-ended question from 495 people living in Germany in May 2020, to focus on two central research questions:

1) Did garden owners and non-garden owners differ in their self-reported well-being during the first wave of the COVID-19 pandemic, and if so, why?

Following previous results (e.g., de Bell et al., 2020), our main hypothesis (H1) is that garden owners had greater self-reported well-being during the period than non-garden owners. In terms of reasons, we investigated three potential sources. First, there is substantial evidence of the influence of economic factors (e.g. income, employment status) and personal characteristics (e.g. age, family status) on self-reported well-being (for a review on subjective well-being, see, e.g., Dolan et al., 2008). Additionally, there is evidence that geographical factors can have an impact on subjective well-being (Gilbert et al., 2016). Thus, we hypothesize that a potential reason for differences in self-reported well-being may be differences in socioeconomic factors between these two groups (H2). A further potential source of differences in self-reported well-being may be differences in the time spent outside during COVID-19. A priori, it appears likely that garden owners spend more time outside than non-garden owners, and previous evidence suggests (White et al., 2019), that time spent outside affects self-reported well-being. Thus, we hypothesize that garden owners and non-garden owners differ in their self-reported well-being, because they spent more time in the respective green spaces (H3). Finally, there is a well-established link between personality traits and self-reported well-being (e.g., Anglim et al., 2020; Steel et al., 2008). Thus, a potential source of differences in

self-reported well-being may be differences in personality traits between garden owners and non-garden owners (H4).

2) What did private gardens and public green spaces signify to participants during the first wave of the COVID-19 pandemic?

In this exploratory phase of the research, we want to find out what participants associate with private gardens and public green spaces during the first wave of the COVID-19 pandemic.

2. Material and methods

2.1. Data collection and questionnaire

We collected data online during the first wave of COVID-19 from 495 people living in Germany, in the age range from 18 to 65, between May 14 and 24, 2020. An external commercial panel provider invited for a voluntary and anonymous participation. Participants received points (mingle points) for their participation and above a payout threshold (currently 5, 15 or 20 euros), the amount can be transferred as cash, converted into a shopping voucher or donated to a selected organization. We set quotas for age, gender, region, and household income, to obtain results similar to the German population in the age range of 18–65 years, still the resulting sample must be judged as a non-probability sample. After screenings due to the quotas, 561 individuals started to fill out the further questionnaire. 66 participants stopped the questionnaire during the process (64 before the here relevant questions, 2 within these). These incomplete datasets were eliminated and a total of 495 completely filled out surveys remained for the analyses.

The measurements described below were part of a larger questionnaire concerning well-being and consumer behavior during the pandemic. The questionnaire was set up to tackle different research goals in the realm of horticultural research and consisted of four essential parts. A first part covered participants' sociodemographic characteristics. The second part was composed of questions regarding horticultural consumer behavior. In a third part, we captured participants' personalities. Lastly, we elicited participants' behaviors and well-being during the COVID-19 crisis. We carried out a pre-test with three participants to ensure the quality of the online questionnaire. This led to some adaptations and improvements.

2.2. Measurements

Self-reported well-being: We used two different measures of self-reported well-being: mental well-being and life satisfaction. To capture *mental well-being*, we applied the Warwick-Edinburgh Mental Well-being Scale (WEMWBS). On the one hand, this scale covers elements of the subjective experience of happiness and life satisfaction and, on the other hand, positive psychological functioning, good relationships with others, and self-realization, reflected in 14 items (Stewart-Brown and Janmohamed, 2008; Annex 1). All items are worded positively. The scale was scored by summing the responses to each item, answered on a 1-to-5 Likert scale. Using the scale, this led to a possible range of scores for the 14 items from 14 to 70. Then, participants were asked to describe their experiences during the two weeks prior to the questioning, the first half of May, around the time that lock-down regulations in reaction to the first wave of COVID-19 started to become looser in Germany. To capture *life satisfaction* individually (as indicated, WEMWBS includes life satisfaction but also covers psychological well-being), participants were asked to answer, on a scale ranging from 0 (=completely dissatisfied) to 10 (=completely satisfied), the question, "How satisfied are you at present, all in all, with your life?" This scale is used frequently in scientific research (e.g., Blasco-Belled et al., 2020), as well as in the German Socio-Economic Panel (DIW, 2020). We decided in favor of this type of measurement mainly because it allowed us to directly compare our results with previous scale scores from Germany.

Time spent in the garden and public greens: To capture the time that people spent in their garden and in public green spaces, respectively, we

asked participants to indicate how many hours on average per week they spent outside in the spring of 2020, i.e., in March, April, and May, indicating hours spent (i) doing gardening (only those with gardens), (ii) on recreational time (without sports activities) and (iii) doing sports activities. We asked garden owners only about their time spent in the garden and non-garden owners only about their time spent in the public green spaces. We calculated the sum of average hours spent in the garden and in the public greens, eliminating five obviously incorrect answers from our regression analyses (i.e., answers with more than 168 h outside per week were recoded as missing). In addition to the hours spent outside, we asked participants to compare the extent to which they spent more or less time in the garden and in public green spaces, respectively, this year than in previous years. For these items, participants were to indicate their answers on a scale ranging from "far less" = 1 to "far more" = 7.

Personality traits: To measure a participant's personality, we applied the Midlife Development Inventory (MIDI) scale (Lachman and Weaver, 1997), which covers six personality traits: the "big five" personality traits (i.e., extraversion, agreeableness, conscientiousness, openness, and neuroticism), as well as agency. Extraversion refers to people's tendency to be friendly, lively, and talkative. Agreeableness captures people's interpersonal behavior and their tendency to be helpful, caring, and warm. Conscientiousness differentiates those who are organized, systematic in planning, and hard-working, from those who are not. Openness captures individuals' interest in being creative, imaginative, and curious. Neuroticism describes individuals' emotional stability in terms of being moody, nervous, or worrying. Finally, agency refers to being assertive, dominant, self-confident, and outspoken. The MIDI has been successfully applied in many different situations ranging from food-choice behavior (e.g., Peschel et al., 2019) to health research (e.g., Lee et al., 2019). Personality traits were captured via a list of 30 adjectives, and participants were to indicate how well each describes them using a scale from 1 ("a lot") to 4 ("not at all"). In accordance with the analytical advice that Lachman and Weaver (1997) provide, we recoded the answers so that higher scale values indicated greater endorsement of the construct. Reliability testing (McDonald's omega) led to dropping one item (calm) from the neuroticism scale and one item (careless) from the conscientiousness scale.

Socioeconomic variables: We used a number of standard socioeconomic variables, such as age, gender, income, living alone and employment status. Due to the ongoing pandemic and its effects on the economy, we also included participants' fear of job loss, on a scale ranging from no fear at all (=1) to a lot of fear (=7). Regarding the impact of geography, quotas were set for the seven Nielsen regions in Germany. However, results of an ANOVA suggest that neither life satisfaction nor mental well-being differed statistically significant between regions and thus we did not include them into the final analyses.

Meaning of green spaces in times of COVID-19: To capture participants' own assessment of what their garden or public green spaces, currently mean to them, we used an open-ended question for each group: "Please describe in your own words what the public green/the private garden currently means to you." We asked garden owners about their garden and non-garden owners about the public green. Open-ended questions require participants to give answers in their own words without being directed in a particular direction by predefined response options. It is helpful in identifying new or unknown aspects.

2.3. Data analysis

Quantitative data: To investigate whether garden owners and non-garden owners differ in their self-reported well-being during the pandemic—and, if so, the reasons—we conducted hierarchical linear regressions on mental well-being and life satisfaction. This analytical process is similar to other studies on the effect of garden use on self-reported well-being, which enter variables in theoretically based blocks (e.g., de Bell et al., 2020; Cervinka et al., 2016). We added three

blocks of variables stepwise into the model to evaluate their impact on the model fit:

- Block I: Control variables, including owning a garden;
- Block II: Time spent in the garden and on public greens;
- Block III: Personality traits.

We used SPSS version 25. We assume, alongside many scholars (Blasco-Belled et al., 2020; Zhang, Wang et al., 2020; Zhang, Mavoa et al., 2020), that OLS regression is an adequate approach to analyze Likert data. However, others argue that Likert data is ordinal, indicating that parametric analyses are not appropriate (for a discussion see e.g., Norman, 2010). To interpret the results with regard to our H2 to H4, we combined the findings from the hierarchical linear regressions with the descriptive evidence regarding group differences related to socioeconomic variables (Table 1), as well as differences in personality and being outdoors (Table 2). For instance, if we found evidence that income-levels in our sample were significant and substantial for understanding levels of life satisfaction, and garden owners had higher average income, we concluded that differences in levels of life satisfaction between garden and non-garden owners were partly due to differences in income. We set the alpha value at $p < 0.05$.

One key benefit of using the hierarchical linear regression approach is that it allowed us to determine how much of the variance in the dependent variables was attributable to the inclusion of variables

Table 1
Socio-demographic statistics of the total sample (n = 495) and comparison between the sub-samples of garden owners and non-garden owners.

Characteristic	Total sample (%)	Garden owners (%)	Non-garden owners (%)	Comparison p-value	Germans (18–65 years) in 2019
Age				0.000 [#]	
18–29	22.2	17.9	27.0		21.6 ¹
30–39	19.8	17.6	22.3		20.6 ¹
40–49	20.8	19.8	21.9		19.4 ¹
50–59	24.8	31.3	17.6		25.7 ¹
60–65	12.3	13.4	11.2		12.7 ¹
Gender				0.002 ^{##}	
female	49.1	55.7	41.6		49.0 ²
male	50.9	44.3	58.4		51.0 ²
Region				0.000 ^{##}	
rural (<20,000 inhabitants)	45.1	58.4	30.0		
urban (>20,000 inhabitants)	54.9	41.6	70.0		
Net household income				0.000 [#]	
€0–€1,500	15.8	8.4	24.0		16.3 ²
€1,501–€2499	22.4	15.3	30.5		18.6 ²
€2,500–€4,000	34.1	37.4	30.5		32.7 ²
>€4,000	27.7	38.9	15.0		32.5 ²
Living alone				0.000 ^{##}	
yes	20.0	11.5	29.6		21.2 ³
no	80.0	88.5	70.4		78.8 ³
Full-time employed				0.497 ^{##}	
yes	60.8	62.2	59.2		
no	39.2	37.8	40.8		

¹ Statistisches Bundesamt, 2019a.

² GESIS-Leibniz-Institut für Sozialwissenschaften, 2019.

³ Compared to all Germans in 2019, Statistisches Bundesamt, 2020.

[#] Two-Tailed Mann-Whitney U test, H0: both are identical.

^{##} Chi-squared test, (H0): there is no relationship.

covering time spent outside and personality traits. The variance inflation factors were all <3.2 in the regression models, i.e., well below the commonly recommended threshold of 10 for multiple regression analysis (e.g., Chatterjee and Hadi, 2012). Thus, multicollinearity should not be an issue. The Breusch-Pagan Test indicated that heteroscedasticity may be assumed in the hierarchical regression with the dependent variable “life satisfaction” (i.e., the null hypothesis of homoscedasticity is rejected); thus, here we used robust standard errors (Hayes and Cai, 2007).

A clear linear trend in the increase of mental well-being and life satisfaction, due to an increase in each hour spent outside, was not visible in the partial regression diagrams. Consequently, we built four categories, based on the quartiles: the 1st quartile resulted in ≤4 h spent outside; 2nd quartile = > 4 to ≤10 h spent outside; 3rd quartile = > 11 to ≤18 h spent outside, 4th quartile >18 h spent outside.

Data from open-ended question: To analyze answers to the open-ended question, we followed the main steps of a qualitative content analysis (Mayring, 2015). Specifically, we applied an inductive approach to building categories. To do so, we paraphrased answers, when needed, and compared the paraphrases, summarizing, generalizing, and sorting them into categories.

3. Results and discussion

3.1. Sample

The quotas were well met (Table 1), with n = 266 garden owners (private garden and/or allotment garden) and n = 233 non-garden owners in the sample. Group comparison indicates that participants from both groups differed significantly regarding many socioeconomic variables. For example, garden owners were more likely to have a higher household income and to live with other people.

3.2. Quantitative results: Did garden owners and non-garden owners differ in their life satisfaction and their mental well-being during the first wave of the COVID-19 pandemic, and if so, why?

3.2.1. Descriptive results

The means, standard deviations, and medians of all the non-sociodemographic variables included in the regressions are depicted in Table 2.

On average, participants did not have a high degree of fear of job loss at the time of the survey (i.e., the average is well below the neutral option of the scale, i.e., “4”). However, non-garden owners had a significantly higher degree of fear.

Regarding personality traits, in both groups, participants scored highest on conscientiousness and agreeableness, followed by being extraverted and open. The sample scored lowest on agency and neuroticism. This is rather similar to other studies using the MIDI scale, where agreeableness and conscientiousness are the highest-scored personality traits and neuroticism the lowest (e.g., Peschel et al., 2019). In our sample, garden owners and non-garden owners differed statistically significant in all six captured personality traits. Garden owners had higher scores for all captured personality traits than non-garden owners, except for neuroticism.

Garden owners spent substantially more time outside in their garden than non-garden owners spent in public green spaces. Drawing from results by de Bell et al. (2020) and Lin et al. (2014), it may also have been possible that garden owners visited public green space more often than non-garden owners. Due to the operationalization process, this is, however, not definitive to say. Concerning the relative time spent outside, on average, participants indicate having spent the same time as usual on leisure time in their garden or in public green spaces (i.e., average values around 4). Compared to non-garden owners, garden owners spent more time on average at sports than in previous springs.

With regard to our main hypothesis, i.e. that garden owners had

Table 2

Descriptive statistics for independent variables exploring the relationship between garden ownership and life satisfaction and mental well-being for 495 German residents during the COVID-19 pandemic.

Variable (Mc Donald's Omega, when scale)	Garden owners				Non-garden owners				Comparison [#]
	n	Mean	SD	Median	n	Mean	SD	Median	p-value
Fear of job loss	262	2.39	1.64	2.00	233	2.84	1.91	2.00	0.014
Personality traits									
Extraversion (0.817)	262	3.01	0.58	3.00	233	2.82	0.63	3.00	0.002
Agreeableness (0.843)	262	3.22	0.53	3.20	233	3.04	0.63	3.00	0.003
Agency (0.814)	262	2.76	0.63	2.80	233	2.55	0.69	2.40	0.000
Openness (0.792)	262	2.94	0.53	2.93	233	2.75	0.59	2.71	0.001
Conscientiousness (0.714)	262	3.34	0.55	3.33	233	3.13	0.61	3.00	0.000
Neuroticism (0.623)	262	2.26	0.66	2.33	233	2.42	0.69	2.33	0.014
Hours spent per week in private gardens, respectively public green spaces	261	18.24	17.27	15.00	229	9.91	16.69	6.00	0.000
Change in time spend outside									
Leisure time	262	3.97	1.14	4	233	4.10	1.28	4	0.075
Sports	262	4.74	1.16	4	233	3.73	1.40	4	0.000
Life satisfaction	262	7.40	1.80	8	233	6.31	2.26	7	0.000
Mental well-being (0.913)	262	50.71	8.69	52.0	233	46.55	9.01	46.0	0.000

[#] Two-Tailed Mann-Whitney U test, H0: both are identical.

greater self-reported well-being during the first wave of COVID-19 than non-garden owners, our data supports this hypothesis. Both, the measure of life-satisfaction and the measure for mental well-being is statistically significant greater for garden owners. This is similar to results by de Bell et al. (2020) indicating that people with access to private gardens have significantly better scores for self-reported well-being, depending on the measure in focus. Mean scores for garden owners' life satisfaction

of 7.40 (SD = 1.80) were similar to values from Germany (Entringer et al., 2020), where life satisfaction was, on average, 7.41 (SD = 1.61) in April 2020 and 7.43 (SD = 1.69) in 2019. The mean of life-satisfaction score of the overall sample (garden and non-garden owners) is much lower than the cited scores from Germany in April 2020 and in 2019.

Table 3

Hierarchical regression exploring the relationship between garden ownership and mental well-being for 490 German residents during the COVID-19 pandemic (unstandardized beta weights).

	Model 1				Model 2				Model 3			
	Beta	p-value	95% CI		Beta	p-value	95% CI		Beta	p-value	95% CI	
Constant	42.963	0.000	37.612	48.314	35.558	0.000	29.661	41.454	29.088	0.000	21.824	36.351
<i>Block I: Socio-demographics</i>												
Gender	-0.668	0.439	-2.364	1.027	-0.258	0.761	-1.923	1.406	0.032	0.968	-1.560	1.625
<i>Age (reference = 18–29 years)</i>												
30–39	0.531	0.660	-1.839	2.900	0.402	0.733	-1.916	2.720	0.592	0.598	-1.612	2.795
40–49	-1.185	0.315	-3.500	1.129	-0.730	0.523	-2.976	1.515	-1.227	0.262	-3.376	0.921
50–59	-0.556	0.629	-2.820	1.708	-0.117	0.917	-2.317	2.083	-0.314	0.769	-2.413	1.785
60–65	2.551	0.067	-0.179	5.281	3.126	0.021	0.464	5.787	2.121	0.108	-0.465	4.707
<i>Household income (reference = ≤€1,500)</i>												
€1,501 - €2,499	0.907	0.505	-1.762	3.576	1.242	0.344	-1.336	3.819	0.602	0.630	-1.854	3.058
€2,500 - €4,000	2.470	0.067	-0.172	5.112	2.428	0.062	-0.126	4.983	1.903	0.126	-0.538	4.343
>€4,000	2.653	0.074	-0.262	5.568	2.681	0.063	-0.147	5.509	2.413	0.080	-0.290	5.116
Fully employed (1 = yes)	2.124	0.020	0.340	3.909	1.870	0.034	0.143	3.596	0.777	0.367	-0.916	2.470
Region (1 = urban)	0.609	0.452	-0.981	2.199	0.534	0.494	-0.999	2.068	0.147	0.845	-1.328	1.621
Living alone (1 = yes)	-1.154	0.293	-3.309	1.001	-1.266	0.234	-3.355	0.823	-0.887	0.380	-2.870	1.097
Fear of job loss	-1.265	0.000	-1.699	-0.831	-1.336	0.000	-1.758	-0.913	-1.219	0.000	-1.623	-0.815
Garden owners (1 = yes)	2.704	0.002	1.000	4.407	1.229	0.193	-0.625	3.084	0.261	0.773	-1.512	2.033
<i>Block II: Being outside (reference = ≤4 h)</i>												
>4 to ≤ 10 h (2nd quartile)					3.007	0.005	0.922	5.093	2.483	0.014	0.503	4.463
>11 to ≤ 18 h (3rd quartile)					3.733	0.001	1.483	5.983	2.731	0.013	0.579	4.884
>18 h (4th quartile)					3.427	0.003	1.137	5.716	2.324	0.038	0.129	4.519
Change in time spend outside for sport					0.514	0.098	-0.096	1.123	0.533	0.071	-0.046	1.111
Change in time spend outside for leisure					1.182	0.000	0.538	1.827	1.039	0.001	0.427	1.650
<i>Block III: Personality traits</i>												
Extraversion									1.493	0.115	-0.364	3.350
Agreeableness									1.025	0.236	-0.674	2.724
Agency									1.335	0.074	-0.129	2.799
Openness									0.152	0.873	-1.711	2.015
Conscientiousness									1.487	0.054	-0.024	2.997
Neuroticism									-2.191	0.000	-3.299	-1.083
F-statistics	F(13,476) = 7024				F(18,471) = 7785				F(24, 465) = 9168			
Prob>F	0.000				0.000				0.000			
Adjusted R ²	0.138				0.220				0.286			
R ²	0.161				0.200				0.321			
Delta R ²					0.068				0.092			
F for Delta R ²					8353 (p = 0.000)				10,492 (p = 0.000)			

3.2.2. Regression results

To identify why garden owners and non-garden owners differed in their self-reported well-being, Tables 3 and 4 display the results of the hierarchical regressions (Annex 2 displays correlations between dependent and independent variables.)

Garden ownership, time spent outside, and personality: Model 1 indicates that on average, garden owners had significantly better mental well-being and higher levels of life satisfaction, even when controlling for standard socioeconomic variables. This suggests that the differences in these variables alone (Table 1) cannot explain all of the differences in self-reported well-being.

By including variables regarding the average weekly time spent outside during the spring of 2020 (Model 2), the R² increased around 7% for mental well-being and around 4% for life satisfaction, indicating that these variables are valuable for further explaining levels of self-reported well-being. Focusing first on the size of the effect (i.e., the beta value) of the “garden ownership” variable, we see that the values substantially decreased from both Model 1 to both Model 2 regressions and were no longer significant. Regarding mental well-being, participants who reported being outside over 4 h per week had a significantly higher level of mental well-being. The size effect was similar for all three groups >4 h, but the highest beta value is the one for the group that spent 11 to ≤18 h outside. In addition, an increase in the time spent outside for leisure in spring 2020 (as compared to previous years) was beneficial for mental well-being. For life satisfaction, merely a positive change in time spent outside for leisure in the spring of 2020 had a significant effect on life-satisfaction scores. Overall, the described findings are comparable to results suggesting that the amount of time spent in nature is important

for understanding well-being (e.g., White et al., 2019). To summarize Model 2, measures of time spent outside appeared to be more meaningful for understanding self-reported well-being than garden ownership alone. However, we know from Table 2 that garden owners spent far more time outside; thus, a garden seemed to facilitate going outside, which, in turn, increased self-reported well-being.

Including personality traits in the regressions (Model 3) led to an increase in the R² of around 9% for mental well-being and around 7% for life satisfaction. Neuroticism had a significantly negative effect on both measures of self-reported well-being. This supports the conclusion by Kroencke et al. (2020) that people measuring high in neuroticism are especially at risk during the COVID-19 pandemic. Combined with findings from Table 2, the results suggest that in our sample, garden owners had a higher level of self-reported well-being because they had lower scores in neuroticism. Additionally, the beta-value of the variable “garden ownership” substantially decreased from Model 2, indicating again that in our sample, owning a garden does not directly explain differences in self-reported well-being between the two groups, when controlling for more than socioeconomic variables. In Model 3, all variables related to time spent outside, which were significant in Model 2, were still significant, indicating that these were robust direct effects.

Sociodemographic variables: A specific look at robust findings regarding the sociodemographic variables (i.e., those significant in all three models) for mental well-being indicates that only fear of job loss had a robust negative effect. However, results depicted in Table 1 indicate that non-garden owners had a substantially higher fear of job loss. Thus, another reason for garden owners’ higher scores in mental well-being appears to be that they had less fear of job loss. For life

Table 4

Hierarchical regression exploring the relationship between garden ownership and life satisfaction for 490 German residents during the COVID-19 pandemic (unstandardized beta weights).

	Model 1				Model 2				Model 3			
	Beta	p-value	95% CI		Beta	p-value	95% CI		Beta	p-value	95% CI	
Constant	7.023	0.000	5.763	8.284	5.620	0.000	4.157	7.083	4.360	0.000	2.396	6.324
<i>Block I: Socio-demographics</i>												
Gender	0.051	0.790	-0.326	0.428	0.097	0.620	-0.288	0.483	0.152	0.413	-0.213	0.517
<i>Age (reference = 18–29 years)</i>												
30–39	-0.100	0.674	-0.568	0.367	-0.080	0.738	-0.553	0.392	-0.004	0.986	-0.471	0.462
40–49	-0.751	0.004	-1.262	-0.239	-0.666	0.009	-1.168	-0.164	-0.763	0.002	-1.251	-0.275
50–59	-0.795	0.001	-1.251	-0.338	-0.705	0.003	-1.167	-0.244	-0.745	0.001	-1.201	-0.288
60–65	-0.627	0.081	-1.333	0.079	-0.518	0.138	-1.204	0.167	-0.677	0.047	-1.346	-0.008
<i>Household income (reference = €0 - €1,500)</i>												
€1,501–€2,499	0.498	0.187	-0.243	1.240	0.573	0.118	-0.146	1.293	0.493	0.186	-0.239	1.225
€2,500–€4,000	1.206	0.001	0.487	1.925	1.246	0.001	0.545	1.947	1.187	0.001	0.471	1.904
>€4,000	1.563	0.000	0.784	2.342	1.623	0.000	0.862	2.384	1.659	0.000	0.884	2.435
Fully employed (1 = yes)	0.253	0.214	-0.147	0.654	0.199	0.337	-0.208	0.607	-0.023	0.914	-0.435	0.389
Region (1 = urban)	-0.106	0.563	-0.466	0.254	-0.113	0.533	-0.470	0.243	-0.195	0.276	-0.546	0.156
Living alone (1 = yes)	-0.249	0.333	-0.754	0.256	-0.259	0.302	-0.750	0.233	-0.169	0.501	-0.661	0.324
Fear of job loss	-0.314	0.000	-0.435	-0.194	-0.315	0.000	-0.436	-0.195	-0.298	0.000	-0.421	-0.174
Garden owners (1 = yes)	0.590	0.004	0.184	0.996	0.398	0.065	-0.024	0.820	0.195	0.351	-0.216	0.605
<i>Block II: Being outside (reference = ≤4 h)</i>												
> 4 to ≤10 h (2nd quartile)					0.317	0.212	-0.182	0.816	0.218	0.370	-0.260	0.696
>11 to ≤18 h (3rd quartile)					0.363	0.179	-0.167	0.894	0.169	0.514	-0.340	0.678
>18 h (4th quartile)					0.375	0.169	-0.160	0.910	0.175	0.508	-0.345	0.696
Change in time spend outside for sport					0.078	0.290	-0.067	0.223	0.073	0.312	-0.069	0.215
Change in time spend outside for leisure					0.258	0.002	0.097	0.420	0.230	0.004	0.072	0.388
<i>Block III: Personality traits</i>												
Extroversion									0.314	0.168	-0.132	0.759
Agreeableness									0.257	0.287	-0.216	0.729
Agency									0.042	0.848	-0.392	0.477
Openness									0.322	0.183	-0.153	0.798
Conscientiousness									0.161	0.429	-0.239	0.561
Neuroticism									-0.448	0.001	-0.707	-0.189
F-statistics	F(13,481) = 10835				F (18,471) = 8626				F(24, 465) = 8774			
Prob > F	0.000				0.000				0.000			
Adjusted R ²	0.217				0.246				0.309			
R ²	0.238				0.274				0.343			
Delta R ²					0.036				0.069			

satisfaction, we found that being over 39 years of age had a robust significantly negative effect, different from previous findings from England (Carson et al., 2020), which indicated that especially young people’s self-reported well-being is at risk during the pandemic. Moreover, household income above €2499 had a robust positive effect, and the fear of job loss had a robust negative effect. This is similar to such findings by Heidl et al. (2012), who used SOEP data from West Germany and found that younger people and people with higher incomes tended to have higher levels of life satisfaction. Thus these effects appear to be somewhat unrelated to the specific situation of the pandemic. In combination with findings from Table 1, our results suggest that differences in life satisfaction between garden owners and non-garden owners were partly due to differences in these three socioeconomic variables.

Contrasting results from mental-well-being and life-satisfaction regressions: Life satisfaction is an aspect included in the Warwick-Edinburgh Mental Well-being Scale. Thus, it is not surprising that similarities, as well as differences, are in the findings. Regarding similarities, we found that three variables were significant in both Model 3 estimations: fear of job loss, change in time spent outside for leisure, and neuroticism. As for the differences, we only found robust evidence that the number of hours spent outside was significant for mental well-being during the first wave of COVID-19. Additionally, we found only robust evidence that out of the sociodemographic variables, age and income played an important role in understanding the levels of life satisfaction. Comparing Model 3 for life satisfaction and mental well-being, the (adjusted) R² are very similar, suggesting that the independent variables used explain roughly the same amount of variance in the two dependent variables.

3.2.3. Summary of findings regarding research question 1 and the hypotheses

In our sample, garden owners had a significantly higher level of mental well-being and life satisfaction during the first wave of COVID-19 than non-garden owners, supporting our main hypotheses (H1). To

determine the reason, we combined our findings from descriptive results (Tables 1 and 2) with the regression results (Tables 3 and 4). Overall, we found evidence that not the ownership of the garden itself, but rather variables related to garden ownership were the key to understanding the differences in self-reported well-being. Specifically, our results suggest that garden owners had better mental well-being because, on average, they (i) had less fear of job loss, (ii) spent more time in their garden than non-garden owners in public green spaces, (iii) had lower scores for neuroticism. Regarding life satisfaction, we find evidence that garden owners had higher satisfaction scores because, on average, they (i) had a higher income, (ii) had less fear of job loss, (iii) were less neurotic. Thus, our data support H2, stating that differences in self-reported well-being may be due to differences in socioeconomic factors between the two groups in focus. It partly supports H3, where we find that mental well-being differs due to the time spent in the garden and in public green spaces during COVID-19. Our results support H4, as we find evidence that differences in self-reported well-being are partly due to differences in the personality trait of neuroticism between garden owners and non-garden owners.

However, we keep in mind that the researchers assume the causal direction running from independent variables to the dependent variable in a regression using cross-sectional data. However, our econometric analysis cannot determine the direction of causality. Nonetheless, our assumptions are in line with many prior studies in this area (e.g., de Bell et al., 2020, Gilbert et al., 2016).

3.3. Results from open-ended question: what did private gardens and public green spaces signify to participants during the first wave of the COVID-19 pandemic?

Table 5 displays the top ten stated meanings of garden owners regarding private gardens and non-garden owners regarding public green spaces during the pandemic. By comparing the results from both groups, we see that recreation, freedom, and nature were the three most

Table 5
Meaning of private gardens and public green spaces to 495 German residents during the COVID-19 pandemic.

Garden (n ¹ = 307)					Public green space (n ¹ = 240)			
Category	Explanation	Examples	Fr.	Category	Explanation	Examples	Fr.	
1	Recreation	Expressing the notion that gardens are used as a recreational place	“recreation and relaxation”, “a possibility to enjoy the free time”	120	Recreation	Expressing the notion that gardens are used as a recreational place	“more recreation and leisure”, “to get the head free, to recover”	68
2	Freedom	Place of freedom	“freedom”, “a piece of freedom”	45	Nature	As a place of (getting in touch with) nature	“it means having a piece of nature and fresh air right outside my front door”, “park”, “forest”	59
3	Nature	Place of (getting in touch with) nature	“nature”, “sun”, “fresh air”	26	Freedom	A place of freedom	“freedom”, “without mask, freedom”	38
4	Work	Gardens as a place for work	“a lot of work”, “to build it”, “work”	18	Nothing	Expressing that public green spaces mean nothing to oneself	“nothing special”, “nothing at all”, “nothing”	18
5	Retreat	Place, where one can be alone and retract from others	“distance to neighbors”, “my island, my paradise”	13	Variety	Public green spaces as a place to experience some variety in the daily routine	“a change from everyday life”, “see something else”	11
6	Family	Place, where children and the family can spend time (together)	“a possibility to spend time outside with my little child”, “family-happiness”	9	Negative aspects	Expressing negative association with being outside in green spaces	“stress”, “too many people”, “dirty”	9
7	Joy	Expressing that gardens give some kind of joy	“pleasure”, “beautiful sight”, “happiness”	10	Exercise	Using public green spaces for some form of exercise	“for me, running in the woods”	8
8	A lot	A lot	“a lot”, “everything”	9	Family	Place, where children and the family can spend time (together)	“Possibility to get out in nice weather and do something with the family”	4
9	Hobby	Opportunity to pursue a hobby and unfold creativity	“hobby”, “creativity”, “creative venue”	9	Normality	The notion that being outside provides some feeling of normativity	“a piece of normality”	3
10	Subsistence farming	Opportunity grow own fruits and vegetables	“reasonably healthy vegetables”, “to have vegetables and fruit that taste better and are mostly organic”	6	Health	health	“health”	3

¹ Multiple answers possible.

frequently stated meanings for both the private garden and the public green. Another similarity was that descriptions of both private gardens and public green spaces as a place where a family can spend time together, and children can play. However, mentions of family were rather low. This is somewhat surprising as previous findings suggest that children were one of the main reasons for the frequency of visits to urban green spaces (Garrido-Cumbrera et al., 2020) and that private gardens provided opportunities for intergenerational linkages, at least for immigrant families (Mazumdar and Mazumdar, 2012). One may speculate that the lack of mentions of children and family may be because our sample was biased against households with children. However, in our sample 31% of participants indicated to have children under 18 years living in their household, which is similar to official statistics indicating that 28% of household do so (Statistisches Bundesamt, 2019b).

Besides the similarity between the associations with private gardens and public green spaces, several differences are apparent between the categories of answers of the two groups. Most strikingly for gardens (and not the public greens) was the fact that the productive aspects of working in the garden, subsistence farming, and pursuing a hobby were frequently mentioned. The most noticeable difference in the description of public green spaces (and not the private gardens) was that negative aspects sometimes appeared, such as being dirty, or constituting a potential risk source for infections. Still, participants largely appeared to be very aware of the positive aspects of green public spaces, which is in line with findings that a majority of people are even willing to pay to conserve green spaces (e.g., Xu et al., 2020). They also support Kleinschroth and Kowarik (2020), who stipulate that the COVID-19 pandemic demonstrates a crucial need for urban greenspaces.

Overall, the vast majority of expressed meanings of private gardens and public greens had a very positive connotation, supporting our quantitative result that green spaces are important and necessary for participants during the COVID-19 pandemic.

3.4. Strength, limitations, and implications

The strength of this study is that we used a sample similar to the German population. Additionally, the roughly equal size of the two groups of garden owners and non-garden owners is a very good basis for comparison. To the best of our knowledge, a systematic comparison of these two groups, in terms of self-reported well-being, socioeconomic factors, time spent outside, and personality traits, has not occurred in general and, specifically, not in times like the COVID-19 pandemic. Moreover, information on garden owners is relatively sparse, and this study sheds some light on this specific group. Another strength is that we use quantitative data and data from an open-ended question to study the importance of green spaces during the pandemic and capture self-reported well-being through two different measures.

Besides these strengths, our study also has some key limitations. First, by focusing on garden owners and non-garden owners, we refrained from differentiating between the effects of private gardens and allotment gardens. However, only around 1%–2% of Germans rent an allotment garden (Bundesinstitut für Bau-, Stadt-, und Raumforschung, 2019). Thus, a meaningful investigation of particular potential effects on self-reported well-being during the COVID-19 pandemic would require a larger sample than ours. A second key limitation of the survey is that garden owners were not asked about their time spent in public green spaces, nor were non-garden owners asked about their time spent in others' gardens. However, the significant effect of time spent outside on mental well-being indicates that our data regarding time spent outside is meaningful in the analysis. Further, we did not provide a definition to the term "public green" to our participants. This may have resulted in some confusion. However, neither the pre-test nor the answer to research question 2 indicate that a substantial part of the sample was unaware of the meaning. Another limitation is that while our open-ended questions enabled us to investigate participants own meaning

regarding private gardens and public green spaces, the quality of such responses is not comparable to data from qualitative interviews. Respondents gave mainly short answers, in form of half sentences or words, ranging from one to 34 words. The average length of answers was 2.8 words (SD = 3.63). Moreover, answers were mandatory, which can lead to a number of nonsensical answers. However, around 95% of respondents gave meaningful answers. Also, while we did control in our quantitative analyses for a number of standard socioeconomic factors, controlling for all potentially relevant variables is hardly possible (e.g., education level, marriage status, further geographical factors). Thus, we cannot fully mitigate concerns regarding omitted variable bias.

In terms of practical implications, our study indicates that future debates around social measures and legal restrictions to fight the spread of COVID-19 should consider effects on self-reported well-being and the inequitable impact such restrictions would have on different population segments. Our quantitative results suggest that non-garden owners already have a significantly lower level of self-reported well-being, and restrictions on going outside are likely to further decrease their well-being. Owning a private garden is associated with higher incomes, which means that those of lower incomes are at a higher risk of having their well-being negatively impacted. This effect may be intensified during times of crisis like the COVID-19 pandemic. Thus, overall, our findings support governmental decisions in Germany to keep public green spaces open during the first wave of the COVID-19 pandemic. Also, results from our open-ended question suggest that the vast majority of current associations with public green spaces are very positive. The identified positive associations, such as "freedom", "family time" or "health" can be utilized for promoting public green spaces in general, and specifically in districts where residents do not have access to private gardens. Our findings implicate that policies or programs to enhance well-being would benefit from considering the effects of using public green spaces or private gardens. More generally, our findings support the conclusion by de Bell et al. (2020) that planning and developing urban areas may call for private green and outdoor spaces alongside publically accessible green spaces.

Important questions about the self-reported well-being of garden owners and non-garden owners remain open, and we hope that our research stimulates future work on comparing these two groups. We find that garden owners and non-garden owners substantially differ, not only in their socioeconomic statistics but also in their personality traits and time spent outside. Additionally, our results suggest that neuroticism and time spent outside were important factors for understanding self-reported well-being. This brings forth questions concerning the direction of causality. For example, it may be the case that people who score higher in neuroticism are less likely to obtain a garden or, alternatively, having and using a garden makes one less neurotic. The same holds true for time spent outside. To answer these types of questions, experiments and/or long-term studies with panel data may be insightful. Once the pandemic is over, future research may also focus on which of our results are pandemic specific and which hold true even after the pandemic has vanished. For instance, the few negative connotations and meanings of public green spaces may be pandemic specific. Additionally, many of the variables we identified to be valuable in explaining the differences between self-reported well-being between garden owners and non-garden owners appear to be unrelated to the pandemic (e.g., income, neuroticism). Thus, future research could adopt a time comparative perspective.

4. Conclusion

In line with an increasing body of evidence, our results indicated that mean measures of life satisfaction are lower during the pandemic than before it began, and it affects different groups of people differently. In our study, we compared garden owners and non-garden owners, and we found that garden owners had a substantially higher level of self-reported well-being. Our results suggest that socioeconomic factors,

spending time outside, and neuroticism were valuable in explaining differences in self-reported well-being between the two groups.

Going beyond the differences in self-reported well-being between the two groups, our study demonstrates the importance of green spaces for self-reported well-being in times like the COVID-19 pandemic. In our sample, the time spent outside is more important for self-reported well-being than the place (own garden vs. public green). However, garden owners spent much more time in their garden than non-garden owners in public green spaces; thus, access to the garden appeared to facilitate time spent outside.

Ethical statement

The authors declare that the online study received ethical approval from German Association for Experimental Economic Research e.V. (Certificate No. ckVDWfPA).

CRedit authorship contribution statement

Mira Lehberger: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Anne-Katrin Kleih:** Conceptualization, Writing - review & editing. **Kai Sparke:** Conceptualization, Writing - review & editing, Funding acquisition.

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Annex 1. Mental well-being items of Warwick-Edinburgh mental well-being scale.

	Garden owners (n = 262)		Non-garden owners (n = 233)		Comparison [#] p-value
	Mean	SD	Mean	SD	
I've been feeling optimistic about the future	3.32	0.88	3.09	0.91	0.005
I've been feeling useful	3.53	0.96	3.18	1.01	0.000
I've been feeling relaxed	3.49	0.91	3.27	0.98	0.011
I've been feeling interested in other people	3.74	0.85	3.38	0.99	0.000
I've had energy to spare	3.35	0.91	3.07	0.96	0.001
I've been dealing with problems well	3.79	0.81	3.53	0.92	0.001
I've been thinking clearly	4.02	0.81	3.75	0.91	0.001
I've been feeling good about myself	3.58	0.91	3.29	0.93	0.002
I've been feeling close to other people	3.36	0.92	3.03	1.01	0.000
I've been feeling confident	3.53	0.91	3.21	0.99	0.000
I've been able to make up my own mind about things	4.16	0.85	3.91	0.99	0.005
I've been feeling loved	3.87	0.94	3.47	1.12	0.000
I've been interested in new things	3.60	0.94	3.27	1.01	0.000
I've been feeling cheerful	3.36	0.97	3.10	0.98	0.005

[#]Two-Tailed Mann-Whitney U test, H0: both are identical.

Annex 2. Correlations between dependent and independent variables.

	Mental well-being		Life satisfaction	
	Pearson's r	p-value	Pearson's r	p-value
Gender	-0.055	0.224	-0.012	0.798
18-29 years	-0.051	0.261	0.060	0.186
30 - 39 years	0.010	0.828	0.066	0.143
40 - 49 years	-0.081	0.073	-0.076	0.090
50 - 59 years	0.026	0.561	-0.026	0.558
60-65 years	0.117	0.009	-0.026	0.559
€0 - €1500	-0.143	0.001	-0.249	0.000
€1501 - €2499	-0.121	0.007	-0.153	0.001
€2500- €4000	0.065	0.149	0.094	0.036
>€4000	0.161	0.000	0.245	0.000
Fully employed (1 = yes)	-0.112	0.012	-0.136	0.003
Region (1 = urban)	-0.015	0.744	-0.081	0.073
Living alone (1 = yes)	-0.118	0.008	-0.182	0.000
Fear of job loss	-0.269	0.000	-0.276	0.000
Garden owners (1 = yes)	0.237	0.000	0.262	0.000
Being outside (1st quantile)	-0.231	0.000	-0.169	0.000
Being outside (2nd quantile)	0.020	0.655	0.012	0.788
Being outside (3rd quantile)	0.087	0.054	0.062	0.170
Being outside (4th quantile)	0.129	0.004	0.099	0.029
Change in time spend outside for sport	0.197	0.000	0.188	0.000
Change in time spend outside for leisure	0.199	0.000	0.179	0.000
Extroversion	0.307	0.000	0.269	0.000
Agreeableness	0.172	0.000	0.147	0.001
Agency	0.308	0.000	0.243	0.000
Openness	0.264	0.000	0.259	0.000
Conscientiousness	0.281	0.000	0.223	0.000
Neuroticism	-0.226	0.000	-0.189	0.000
Mental well-being			0.531	0.000

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