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A Snapshot of Health-Related Behaviours in Adults Living with Disabilities One Year Into the COVID-19 Pandemic

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Abstract:

Objectives: This survey aimed to assess the status of a range of health-related behaviours one year after the coronavirus outbreak was declared a pandemic in adults living with disabilities comparative to those with no disabilities.

Design: This cross-sectional study reports findings from an online survey conducted in March 2021. Mann Whitney U and chi-square tests were used to compare a range of health behaviours including time spent self-isolating, smoking, alcohol consumption, exercise frequency and diet in adults with and without disabilities.

Setting: A convenience sample of UK adults was recruited through the researchers' personal and professional networks including UK-based sight loss sector charities, social media platforms and professional forums.

Participants: A total of 123 UK participants completed the survey.

Outcome measures: COVID-19 diagnosis, time spent self-isolating, alcohol consumption frequency, exercise frequency, change in smoking habit, eating habits.

Results: No significant differences were found in alcohol consumption, smoking, water intake, breakfast or fruit and vegetable intake. There were statistically significant differences in the time spent self-isolating (U = 2061, p = .001), exercise frequency (U = 1171.5, p = .005), and the amount of food eaten ($\chi 2$ (2) = 9.60, p = 0.008, Cramer's V = .281). Although the majority in both groups reported exercising 3-4 times per week and eating what they should, those with disabilities were more likely to eat less than they should, not exercise at all and to have been self-isolating for over 6 months than participants with no disabilities.

Conclusions: The data in this study presents some key differences between the two groups, with those living with disabilities more likely to report not exercising, not eating as much as they should and having been self-isolating for prolonged periods of time. This raises concerns for the health and well-being of individuals with disabilities.

Keywords: COVID-19, Coronavirus, Disability, Smoking, Alcohol, Exercise, Diet

Article Summary

Strengths and limitations of this study:

- The survey was conducted one year into the pandemic, after the third UK lockdown, allowing for a snapshot assessment of the effects of living through a year under pandemic circumstances.
- This study contributes to a limited pool of research focusing on the experiences of adults with disabilities, a group expected to be disproportionately affected during this time.
- This study assesses outcomes which tend to be overlooked in research involving adults with disabilities.
- Recruitment via convenience sampling and small sample size mean that findings cannot be extrapolated to the general population.
- This study would have benefited from observing the same outcome measures at another timepoint earlier in the pandemic or prior to the pandemic to assess how attitudes and behaviours may have changed.

Introduction

In March 2020 the World Health Organisation declared the coronavirus outbreak a pandemic. In the same month, COVID-19 cases began to surge, and the death toll started to rise in the United Kingdom (UK). In response, the UK government put a range of measures in place to mitigate the spread of coronavirus including a push to work from home where possible; social distancing (keeping at least 2m distance from others) and mask-wearing indoors. People at high-risk of contracting coronavirus due to underlying health conditions were advised to shield, while people with COVID-19 symptoms (a new continuous cough, a high temperature and/or a loss of smell or taste) were required to self-isolate and travellers coming from abroad were required to quarantine. All three measures required people to stay indoors and restrict contact with others. In addition, the UK government has implemented three national lockdowns to date, in March 2020, November 2020 and January 2021. These required all but essential shops to shut, and people to stay at home and restrict their social contact except for essential purposes including food shopping, medical appointments and work where working from home was not possible.

These measures have resulted in disruption to daily activities, such as going to work, socialising, and exercise routines, with many being left without adequate exercise equipment or space to exercise, and no longer commuting by foot or bike. While people in the UK were allowed to exercise outdoors during all three lockdowns, this was restricted to once per day, with those advised to shield unable to exercise outside at all. Regular physical activity has been linked with reduced levels of stress, depression, anxiety and inflammation, ultimately contributing to better physiological and psychological health outcomes.[1] Research found that exercise frequency decreased between the first and second UK lockdowns while sedentary activities, e.g. working, watching TV and gaming, increased.[2] Levels of stress, anxiety or depression have all increased during the pandemic due to financial-, employment-, social-, and health-related concerns, and caring responsibilities.[3-6] There is a risk that people may have used maladaptive coping mechanisms such as comfort-eating, smoking, alcohol or drugs during this period,[7 8] although the evidence is mixed. Some research has identified increased smoking,[9] overeating and subsequent weight gain[10] to cope with greater levels of stress and anxiety at this time. An English study[11] found an increase in the prevalence of high-risk drinking, but no change in smoking prevalence, and increased rates of smoking cessation and attempts to quit during the first UK lockdown. In contrast, another UK study[2] found that smoking, alcohol consumption and eating habits remained largely the same between the first and third UK lockdowns. However, sustained changes in drinking alcohol and eating behaviours were found in a small proportion of participants.[2] A healthy, balanced diet may play a role in protecting against noncommunicable diseases[12] and poor mental health.[13] An unhealthier diet adopted during lockdown, and reduced physical activity, were both independently linked to a greater negative mood score.[14] The negative effects of smoking and alcohol on health are well known, with smoking increasing the risk of health conditions such as certain cancers, coronary heart disease, and stroke,[15 16] and heavy drinking being associated with obesity[17] among other consequences.

Vulnerable populations such as those with disabilities may be at increased risk of the negative impacts of the pandemic.[18] People with disabilities made up 60% of those who died from COVID-19 between January and November 2020, and they have been found to experience worse mental health outcomes than those without disabilities.[19] Maintaining a healthy lifestyle and avoiding harmful health behaviours may, therefore,

be particularly important in this group. However, existing evidence suggests that even before the pandemic, people living with disabilities were twice as likely to be physically inactive as people without disability.[20] In addition, disruption to shopping, food preparation and cooking already presented obstacles to a healthy diet for people living with visual impairment,[21] resulting in fewer nutrients being consumed in this group compared to age-matched controls,[22] and a high incidence of malnourishment and obesity. During the pandemic, shielding and reliance on local services or volunteers, long queue times at shops, difficulty securing food delivery slots,[23] and negative impacts on job retention and finances,[24] may have further impacted access to food and exercise. Indeed, people with disabilities were found to be more likely to report a negative impact of the pandemic on their ability to exercise due to health concerns and lack of exercise space.[20] One Norwegian study reported that 66% of their participants with physical disabilities reported a decrease in exercise during the pandemic compared to pre-pandemic times.[25] Difficulties accessing groceries, medication, and healthcare for non-coronavirus-related issues, as well as negative impacts on health, have been more prevalent among people with disabilities than those without disabilities.[26] Food insecurity at this time rose, especially in already vulnerable groups in the UK.[27] Existing COVID-19 research involving people with disabilities has mainly focused on impacts on access to medical care and exercise. To our knowledge there are no studies assessing alcohol consumption, dietary changes and smoking during the pandemic in this population. Those with chronic health conditions often meet the definition of disability as set out by The Equality Act 2010.[28] There is evidence of a greater impact on harmful health behaviours in those with chronic health conditions during the pandemic. Increases in alcohol consumption and smoking in light smokers were more prevalent in those with chronic health conditions,[29] whilst decreases in alcohol consumption were more prevalent in heavy drinkers with no health conditions.[29]

Existing research highlights that those living with disability may be at greater risk of negative impacts of COVID-19 on health and health-related behaviours than individuals with no disabilities.[18] Considering the long-term negative physical and mental health outcomes associated with harmful health behaviours, it is important to determine the extent to which people living with disabilities have engaged in health-promoting and harmful health behaviours. This article provides a snapshot of a range of health behaviours including alcohol consumption, smoking, exercise and diet in a sample of UK adults living with disabilities compared to adults with no disabilities, approximately one year into the COVID-19 pandemic.

Materials and Methods

This article draws on survey data collected as part of a longitudinal assessment of health and well-being in individuals with and without disabilities conducted between 1st April 2020 and 28th March 2021. The current article presents findings from the final survey conducted between 8th and 28th March 2021, approximately one year after the implementation of the first UK lockdown. The results were reported according to the STROBE cross-sectional reporting guidelines.[30] Findings relating to loneliness[31] and sleep[32] in the same sample population are reported elsewhere.

2.1. Materials

An online survey was developed by the Research and Innovation Team at Blind Veterans UK (a UK-based charity providing support to veterans with sight loss), in collaboration with the University of Oxford, to collect information on current life circumstances, health and health-related behaviours, sleep and social well-being across several timepoints. The same questionnaire had been administered in previous rounds, however, changes to the layout and wording of questions had been made between each round to improve data quality and a number of demographics and health questions had been removed to decrease participant burden. Due to these changes a longitudinal comparison of health behaviours was not possible.

To make the survey accessible to participants with visual impairment, Microsoft Forms (Microsoft Corporation, Redmond, WA) was used to develop the survey. The platform has a range of accessibility features including colour contrast; high contrast settings; and compatibility with screen readers to facilitate participation for those with vision-related disabilities. Reading of grid questions was made easier by splitting questions across individual pages so that participants were seeing only one question per page.

2.2. Measures

To assess for disability, participants were first asked if they considered themselves to have a disability, followed by a question listing 16 conditions, including visual impairment or blindness, acquired brain injury, diabetes, epilepsy, disability affecting mobility, mental health issues, and learning difficulties, which required a "*Yes*", "*No*" or "*Prefer not to say*" response for each condition.

Single questions assessed COVID-19 diagnosis, current COVID-19 symptoms, self-isolation status, exercise frequency, alcohol consumption, and change in smoking habits. Diet over the last 3 weeks was assessed with a set of questions asking participants to indicate if their diet had improved, worsened or stayed the same; if they had been eating what they should, more or less than they should; if they had been drinking enough water, more or less water than they should; if they had been eating fruit and vegetables at least 2 or more times a week; and if they had been eating breakfast daily or most days.

2.3. Sample

This article presents findings for a subsample of UK based participants who completed the final survey in this survey series. The full sample consists of a convenience sample of adults aged 18 and over and was recruited through the researchers' personal and professional networks, social media platforms and professional forums. Participants who had consented to be being recontacted for follow-up research and provided a valid email address were invited via email to take part in subsequent rounds of the survey. Responses to the first survey in this series were received from 22 different countries predominantly the UK (61.9%) and participants from nine different countries took part in the final survey, the majority based in the UK (76.9%). Frequencies for other countries were too small to enable cross-country comparisons. The timings and nature of containment measures varied substantially between countries and so the current article focuses on the UK subsample.

2.4. Procedure

The Medical Sciences Interdivisional Research Ethics Committee (University of Oxford) advised that ethical approval was not required for this research. Participants were able to access the survey by clicking a link embedded in the invitation. Participants were first provided with information about the study and their rights, before

being asked to consent to taking part in the research. At the start of each section, participants were able to choose if they wanted to answer or skip the section. For most questions, participants also had the option to select 'Prefer not to say'. While the preferred mode was online self-completion to reduce social desirability bias and the potentially sensitive nature of some questions, participants who contacted the research team with difficulties accessing the survey were offered the option of completing the survey with a researcher over the telephone. Only one participant selected this option.

2.5. Statistical Analysis

Duplicates and non-responses were removed from the dataset before analysis. Responses were treated as missing if participants had missed relevant response options, selected "Prefer not to say", or had skipped the section.

Subgroup analysis was carried out to compare participants who reported having one or more types of disability ('1+ disabilities') to participants who reported that they did not have a disability ('no disabilities').

Proportions and frequencies for all variables measured are presented in the respective tables to show spread of responses by subgroup. Proportions are presented for the total number of valid responses achieved for each question. The total number of valid responses (*n*) are reported in the tables. Differences between the groups were analysed using Mann-Whitney U and chi-square tests. The test statistics and *p*-values are reported in the tables. Fisher's Exact tests were conducted if chi-square test assumptions were violated, and respective *p*-values are reported in tables instead.

2.5. Patient and Public Participation

Patients and the public were not involved in the design of this study

3. Results

3.1. Participant characteristics

Table 1 provides a summary of participant characteristics. After removing one duplicate, two cases who did not consent to participating in this follow-up survey, and 37 surveys received from outside the UK, a total of 123 UK residents completed the survey. Participants were mostly white, female, aged 46-55, in paid employment, and living with others. Approximately two thirds of participants reported having no disabilities. A third reported having one or more disabilities, with a mean of 2.95 (*SD* = 1.82) different types of disability and a maximum of eight types of disability being reported by one participant. The most commonly reported types of disability in this sample were visual impairment or blindness, disability affecting mobility, and mental health difficulties.

Table 1. Sample characteristics of total survey sample. [1]Participants were able to report multiple disabilities. Proportions are calculated for the number of participants who reported each condition out of the entire sample (*n* = 123).

		% (*n*)
Gender	Female	55.7 (68)
	Male	44.3 (54)
Ethnicity	Asian	1.6 (2)
	Black/African/Caribbean	0.8 (1)
	Hispanic/Latino/Spanish origin	1.6 (2)
	Mixed/multiple ethnic groups	-
	White/Other White	95.9 (117)
Age	18-25	0.8 (1)
	26-35	9.8 (12)
	36-45	14.8 (18)
	46-55	36.1 (44)
	56-65	24.6 (30)
	66-75	11.5 (14)
	76-85	2.5 (3)
	86+	-
Employment status	In paid employment	73.6 (89)
	I am employed but furloughed	1.7 (2)
	Retired	14.9 (18)
	Unemployed and not looking for work	7.4 (9)
	Unemployed but looking for work	2.5 (3)
Living status	I live on my own	23.8 (29)
	I live with others	76.2 (93)
Disability	No disability	68.0 (83)
	One or more disabilities	32.0 (39)
Type of disability[1]	Visual impairment or blindness	21.1 (26)
	Disability affecting mobility	16.3 (20)
	Mental health issues	13.8 (17)
	Medical condition (e.g. asthma, diabetes, or epilepsy)	12.2 (15)
	Hearing impairment or deafness	11.4 (14)
	Emotional/behavioural difficulties	5.7 (7)
	Being immunocompromised	4.1 (5)
	Learning difficulties	2.4 (3)
	Acquired brain injury	1.6 (2)
	Multiple sclerosis	1.6 (2)
	Profound complex disabilities	1.6 (2)
	Limb loss	0.8 (1)
	Dyslexia	0.8 (1)

3.2. COVID-19 and self-isolating

Table 2 shows that 5 people had been diagnosed with COVID-19, and 3 people reported having COVID-19 symptoms at the time of completing the survey.

There was a statistically significant difference in the time spent self-isolating between the '1+ disabilities' group and the 'no disability' group, with not isolating being more

likely amongst participants in the 'no disability' group. Just over 80% of participants with no disability reported that they were not self-isolating in March 2021 compared to around half of participants with 1+ disabilities. In contrast, participants with 1+ disabilities were more than three times more likely to report that they had been self-isolating for over 6 months at the time of the survey than those with no disabilities (46.2% and 14.6% respectively).

Table 2. COVID-19 diagnosis, symptoms and time spent self-isolating by subgroup. Significant group differences are marked by an asterisk (*). [1]Between group analysis not conducted due to low prevalence. [2]Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses.

		No disability % (*n*)	**1+ disabilities % (*n*)**
Since the last COVID-19 Pandemic Survey, have you been diagnosed with COVID-19?[1]	*n*	83	39
	Yes	4.8 (4)	2.6 (1)
Do you currently have any of the following COVID-19 symptoms: a new, continuous cough, a high temperature, or a loss or change to your sense of smell and taste?[2]	*n*	83	39
	Yes	1.2 (1)	5.1 (2)
Please indicate for how long you have been self-isolating: By self-isolating we mean staying at home, except for urgent medical assistance, and not having any visitors.[2]	*n*	82	39
	Not self-isolating	80.5 (66)	53.8 (21)
	≤ 2 wk.	1.2 (1)	-
	2-4 wk.	-	-
	6-8 wk.	1.2 (1)	-
	8-12 wk.	1.2 (1)	-
	3-4 mo.	-	-
	4-5 mo.	1.2 (1)	-
	≥ 6 mo.	14.6 (12)	46.2 (18)
		U = 2061, *p* = .001*	

3.3. Health behaviours

Prevalence of self-reported smoking was low in this sample (Table 3). Over 90% of respondents in both groups were non-smokers, and there was no significant difference in smoking habits between the two groups.

There were also no statistically significant differences between the two groups in terms of alcohol consumption. Almost half of the respondents with '1+ disabilities' reported that they did not drink alcohol at all (46.2%) compared to just a third of those with no disabilities (32.5%). The prevalence of more frequent alcohol consumption was relatively similar in the two groups, with 23.1% of participants with 1+ disabilities

drinking alcohol at least 3-5 times a week compared to 26.5% of participants with no disabilities, including three who reported drinking alcohol every day.

In contrast, there was a statistically significant difference in exercise frequency between the two groups. Around a quarter (25.6%) reporting that they had not exercised at all over the last 3 weeks compared to 7.2% of participants with no disabilities. This means that around three quarters of participants with disabilities and over 90% of participants with no disabilities managed to do exercise at least once per week in the three weeks leading up to the survey. Encouragingly, a majority in both groups reported exercising 3-4 times a week but this was more common in participants with no disabilities (67.5% compared to 46.2% in participants with 1+ disabilities). Only exercising once a week was selected by a greater proportion of those with disabilities (15.4%) compared to those without disabilities.

Table 3. Smoking habit, alcohol and exercise frequencies by subgroup. Significant group differences are marked by an asterisk (*). Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses.

		No disability % (*n*)	**1+ disabilities % (*n*)**
Thinking about the time since you completed the last COVID-19 Pandemic Survey, which of the following statements best describes your smoking habits?	*n*	81	39
	I don't smoke	93.8 (76)	92.3 (36)
	Smoked less than usual	1.2 (1)	-
	Smoked the same	4.9 (4)	5.1 (2)
	Smoked more than usual	-	2.6 (1)
		U = 1607, *p* = .721	
Over the last 3 weeks, how often have you been drinking alcohol?	*n*	83	39
	I don't drink alcohol	32.5 (27)	46.2 (18)
	Once a week	18.1 (15)	12.8 (5)
	Only on weekends	22.9 (19)	17.9 (7)
	3-5 times a week	22.9 (19)	23.1 (9)
	Every day	3.6 (3)	-
		U = 1410.5, *p* = .235	
In the last 3 weeks how often have you participated in some kind of exercise?	*n*	83	39
	3-4 times per week	67.5 (56)	46.2 (18)
	1-2 times per week	18.1 (15)	12.8 (5)
	Once per week	7.2 (6)	15.4 (6)
	Not at all	7.2 (6)	25.6 (10)
		U = 1171.5, *p* = .005*	

Overall, the majority of participants reported a healthy diet which included eating fruit and vegetables at least twice a week and eating breakfast daily or on most days (Table 4). Although not statistically significant, the proportions reporting this were slightly higher among participants with no disabilities. There were also no statistically significant differences between the two groups in relation to changes in their diet and water intake. When asked about changes in their diets, a majority in both groups stated that their diet had remained the same. Participants with disabilities were slightly more likely to report that their diet had stayed the same or worsened than participants with

no disabilities, while the latter group was slightly more likely to report improvements in their diet. Around half of the participants in each group reported drinking enough water and just under half reported not drinking enough. One person in each group reported drinking more water than they should. There was, however, a statistically significant difference between the two groups in the amount of food eaten over the 3 weeks leading up to the survey. While a majority in both groups reported eating what they should (56.6% of participants with no disabilities and 41.0% of those with disabilities), participants with disabilities were almost 5 times more likely to report that they were eating less than they should (23.1% vs 4.8% for those with no disability) and almost 40% in both groups reported eating more than they should.

Table 4. Dietary, eating and drinking habits by subgroup. Participants were asked to select all the statement/s which best describe them over the last 3 weeks. Significant group differences are marked by an asterisk (*). Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses. [3]Result of Fisher's exact test

		No disability % (*n*)	**1+ disabilities % (*n*)**
I eat fruit and veg 2+ times a week	*n*	83	38
	Yes	95.2 (79)	86.8 (33)
	No	4.8 (4)	13.2 (5)
		p = .137[3]	
I eat breakfast daily or most days	*n*	83	38
	Yes	79.5 (66)	71.1 (27)
	No	20.5 (17)	28.9 (11)
		$\chi2$ *(2, 121)* = 1.05, p = .305, φ = -.093	
Diet	*n*	83	39
	My diet has improved	27.7 (23)	15.4 (6)
	My diet has stayed the same	56.4 (47)	64.1 (25)
	My diet worsened	15.7 (13)	20.5 (8)
		$\chi2$ *(2, 122)* = 2.31, p = .315, *Cramer's V* = .138	
Diet habits	*n*	83	39
	I eat what I should	56.6 (47)	41.0 (16)
	I eat less than I should	4.8 (4)	23.1 (9)
	More than I should	38.6 (32)	35.9 (14)
		$\chi2$ *(2, 122)* = 9.60, p = *.008*, Cramer's V* = .281	
Water intake	*n*	83	39
	Drinking enough	51.8 (43)	51.3 (20)
	Drinking less than I should	47.0 (39)	46.2 (18)
	Drinking more than I should	1.2 (1)	2.6 (1)
		p = .860[3]	

4. Discussion

Existing evidence suggests that prior to the pandemic, unhealthy behaviours were more prevalent in people with disabilities[20-22 33 34], and as a result there was concern that this group would be disproportionately affected by the pandemic.[35] This study provides a snapshot of a range of health-related behaviours in people with disabilities compared to people with no disabilities approximately one year into the COVID-19 pandemic. Notable group differences were found for exercise frequency, time spent self-isolating and the amount of food eaten.

Reflecting existing evidence of a negative impact on physical activity during the pandemic in this group,[36 37] participants with disabilities were around 3.5 times more likely to not exercise at all than participants with no disabilities. This may reflect challenges imposed by lockdown restrictions including disruption to public transport and reduced access to professional and social support for attending gyms,[38] and existing barriers to physical activity.[20 39] The most common types of disability in this sample were visual impairment/blindness, disability affecting mobility and mental health conditions. Severe visual impairment, fear of falling, inaccessible facilities and lack of inclusive environments are just a few factors known to minimise time spent exercising in those with visual impairment.[40-42] Participants with mobility-related disabilities may be less likely to participate in frequent regular exercise compared to other impairments, such as hearing impairment.[43] Encouragingly, at least three quarters in both groups reported getting some form of exercise and a majority of participants in each group reported exercising 3-4 times a week. One year into the pandemic, this may suggest an adaptation to the restrictions on exercise imposed by the pandemic. It may also reflect the presence of participants recruited through contacts in the sight loss and military sectors. Members of the charity Blind Veterans UK, for example, were actively supported to participate in sports and recreational activities during the pandemic through remotely delivered exercise sessions.

Statistically significant group differences were also observed in the length of time participants had spent self-isolating. Participants with disabilities were around three times more likely to have been self-isolating for more than 6 months than those without disabilities. This is perhaps unsurprising given the increased risk of COVID-19-related complications for those living with a disability,[18] and advice for vulnerable adults to shield during the pandemic. This is of concern due to the impact of self-isolating on mental health and experiences of loneliness.[44 45] White and Van Der Boor[46] reported higher levels of anxiety and depression and lower well-being in UK adults who had been self-isolating before a lockdown; these adults reported feeling more isolated than usual during lockdown. However, findings reported in our previous article[31] indicated that isolation did not contribute to feelings of loneliness in this sample population. Over three quarters of participants without disabilities indicated that they were not self-isolating, compared to around half of participants with disabilities. This is despite stay-at-home orders having been implemented across the UK during December 2020/January 2021. There is evidence of differing attitudes towards dealing with the pandemic, with those with disabilities more likely to report having concerns about leaving home compared to those without disabilities.[47]

There was a statistically significant group difference in the amount of food eaten but not any of the other dietary indicators. Eating habits in this sample indicate that undereating was almost five times more likely in those with disabilities. Prior to the pandemic, associations had been drawn between disability and undernutrition.[48]

Existing barriers to food preparation[49 50] and additional challenges accessing food shopping during the pandemic[51], may have contributed to the undereating within this group. However, in general, participants in both groups were adhering to healthy dietary habits with most eating breakfast and fruit and vegetables regularly and drinking enough water. Whilst there was no statistically significant group difference in relation to changes in diet, those with disabilities were slightly more likely to state that their diet had worsened.

There were no statistically significant differences in alcohol consumption and changes in smoking between participants with and without disabilities. Over 90% of participants in both groups were non-smokers. This is higher than the prevalence of non-smokers reported by Fancourt, et al.[52] The prevalence of smokers in both groups is also around half of that reported for the general population (13.8%) in Great Britain in the first quarter of 2020.[53] It is unclear if this reflects a mode effect, social desirability bias or a lower prevalence in this sample. To our knowledge, there is limited research exploring alcohol consumption and smoking among people with disabilities. Smoking was found to be more prevalent in UK adults with disabilities than those without disabilities prior to the pandemic[34] and research from the UK found that people without chronic physical conditions were less likely have increased from light to moderate smoking and more likely to have stopped smoking than those with chronic physical conditions during the pandemic.[52] Due to the small number of smokers in the current sample, comparisons cannot be drawn.

While the prevalence of more frequent drinking was similar in both groups, participants with disabilities were around 1.4 times more likely to be non-drinkers than participants with no disabilities. This reflects existing evidence from the US which found a lower prevalence of alcohol abuse among people with disabilities prior to the pandemic.[54] But it contradicts evidence from another US study conducted in February/March 2021 which found higher levels of alcohol consumption before and during the pandemic in people with disabilities.[55] Results from a UK panel study carried out during the pandemic showed that 30% of participants reported not drinking alcohol.[2] This compares to the proportion of non-drinkers among participants with no disabilities in this study but is lower than the proportion observed for participants with disabilities. The same panel also found that alcohol consumption remained stable during the pandemic, but an increase was found to be more likely for people with chronic health conditions than those without.[29] Changes in alcohol consumption were not explored in the current article. Considering early evidence of an increase in alcohol consumption in people with disabilities during the pandemic, future research may be required to monitor drinking behaviours amongst these individuals as the pandemic continues.

This study addresses the lack of data surrounding alcohol consumption, smoking and diet in UK adults with disabilities during the pandemic. There are some limitations of this study. Firstly, participants were a convenience sample meaning that findings cannot be extrapolated to the general population. Similarly, the use of a web-based survey could exclude members of certain subgroups. Additionally, findings may be more representative of our specific sample of participants who had been receiving support throughout the pandemic and not of people with disabilities in general. Secondly, the sample consisted of considerably smaller numbers of respondents reporting disabilities than those without disabilities. While it is encouraging that there were few differences between our groups in terms of health behaviours, it must be noted that pre-pandemic results are not available. For example, participants who said that their diet had stayed the same may have been referring to the maintenance of an

unhealthy diet. Existing studies have provided some longitudinal analysis, by either comparing responses at two timepoints during the pandemic,[2 29] or making comparisons to pre-pandemic times. Whilst data was collected at an earlier point in the pandemic, longitudinal analysis could not be carried out due to changes made to survey questions between surveys. Current results, therefore, cannot confirm whether the findings reflect the impact of the pandemic or not. This study instead attempts to quantify the behaviours being exhibited by those with and without disabilities following a full year of living with pandemic restrictions. Existing literature has so far only explored the impact on exercise and access to care. This report provides novel data on behaviours such as smoking, alcohol consumption and eating habits in people with disabilities.

Future studies should attempt to determine effects on health habits during the pandemic, and any long-term impacts, of having different types and numbers of disabilities. Research may also seek to identify if barriers to participation in physical activity for people with disabilities were pre-existing or if lockdown posed additional challenges. Further exploration of the level and cause of undereating in those with disabilities may also be valuable.

5. Conclusions

Despite concerns about the disproportionate impact of the COVID-19 pandemic on people with disabilities, this study offers a mixed picture. While those with disabilities fared significantly worse in terms of exercise frequency, time spent in self-isolation and food consumption, this study found no statistically significant differences in relation to smoking, changes in diet, water intake, fruit and vegetable and breakfast consumption, and alcohol consumption. Furthermore, participants with disabilities were more likely to be non-drinkers. Implications for clinical practice are that people living with a disability may benefit from additional support and guidance relating to diet and exercise as we transition through different phases of the ongoing pandemic.

Author Contributions

Conceptualization, R.G., S.H. and N.H.; methodology, R.G., T.K., C.C., N.H., S.H.; formal analysis, N.H. and L.G.; investigation, R.G. and N.H.; resources, R.G., T.K., C.C., N.H., S.H. and L.G.; data curation, N.H.; writing—original draft preparation, S.H. and N.H.; writing—review and editing, S.H., N.H., C.C. and L.G.; visualization, S.H. and N.H.; project administration, R.G.; funding acquisition, R.G. All authors have read and agreed to the published version of the manuscript

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Data availability statement

Data are available upon reasonable request by contacting the corresponding author. The data are not publicly available because participants were not asked if they

consented for their data to be shared outside of the research teams involved in this study.

Ethics statements

Ethics approval

In accordance with the local legislation and institutional requirements (The Medical Sciences Interdivisional Research Ethics Committee at the University of Oxford), ethical review and approval was not required for the study on human participants. Written and informed consent was provided by members of the public that agreed to participate in this study.

Competing Interests

All authors declare: no support from any organisation for the submitted work, no commercial or financial relationships with any organisations that might have an interest in the submitted work in the previous 36 months; no other relationships or activities that could be construed as having influences the submitted work.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	2
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2

Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	#3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	#4	Present key elements of study design early in the paper	5,6
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	6
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	5,6

Bias	#9	Describe any efforts to address potential sources of bias	5,6
Study size	#10	Explain how the study size was arrived at	6,7
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	6
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	6
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	6
Statistical methods	#12c	Explain how missing data were addressed	6
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	6
Statistical methods	#12e	Describe any sensitivity analyses	n/a
Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	5,6

		separately for for exposed and unexposed groups if applicable.	
Participants	#13b	Give reasons for non-participation at each stage	n/a due to online nature of study
Participants	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	7,8
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	8, can be calculated using the n for each variable
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	9,10,12
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a not relevant

Main results	#16b	Report category boundaries when continuous variables were categorized	n/a not relevant
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a not relevant
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	8-12
Discussion			
Key results	#18	Summarise key results with reference to study objectives	12-14
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14,15
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
Other Information			
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

BMJ Open

A Snapshot of Health-Related Behaviours in Adults Living with Disabilities One Year Into the COVID-19 Pandemic: a Cross-Sectional Survey Study

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A Snapshot of Health-Related Behaviours in Adults Living with Disabilities One Year Into the COVID-19 Pandemic: a Cross-Sectional Survey Study

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Word Count: 4,487

Abstract:

Objectives: This survey aimed to assess the status of a range of health-related behaviours one year after the coronavirus outbreak was declared a pandemic in adults living with disabilities comparative to those with no disabilities.

Design: This cross-sectional study reports findings from an online survey conducted in March 2021. Mann Whitney U and chi-square tests were used to compare a range of health behaviours including time spent self-isolating, smoking, alcohol consumption, exercise frequency and diet in adults with and without disabilities.

Setting: A convenience sample of UK adults was recruited through the researchers' personal and professional networks including UK-based sight loss sector charities, social media platforms and professional forums.

Participants: A total of 123 UK participants completed the survey.

Outcome measures: COVID-19 diagnosis, time spent self-isolating, alcohol consumption frequency, exercise frequency, change in smoking habit, eating habits.

Results: No significant differences were found in alcohol consumption, smoking, water intake, breakfast or fruit and vegetable intake. There were statistically significant differences in the time spent self-isolating (U = 2061, p = .001), exercise frequency (U = 1171.5, p = .005), and the amount of food eaten ($\chi 2$ (2) = 9.60, p = 0.008, Cramer's V = .281). Although the majority in both groups reported exercising 3-4 times per week and eating what they should, those with disabilities were more likely to eat less than they should, not exercise at all and to have been self-isolating for over 6 months than participants with no disabilities.

Conclusions: The data in this study presents some key differences between the two groups, with those living with disabilities more likely to report not exercising, not eating as much as they should and having been self-isolating for prolonged periods of time. This raises concerns for the health and well-being of individuals with disabilities.

Keywords: COVID-19, Coronavirus, Disability, Smoking, Alcohol, Exercise, Diet

Article Summary

Strengths and limitations of this study:

- The survey was conducted one year into the pandemic, after the third UK lockdown, allowing for a snapshot assessment of the effects of living through a year under pandemic circumstances.
- This study contributes to a limited pool of research focusing on the experiences of adults with disabilities, a group expected to be disproportionately affected during this time.
- This study assesses outcomes which tend to be overlooked in research involving adults with disabilities.
- Recruitment via convenience sampling and small sample size mean that findings cannot be extrapolated to the general population.
- This study would have benefited from observing the same outcome measures at another timepoint earlier in the pandemic or prior to the pandemic to assess how attitudes and behaviours may have changed.

Introduction

In March 2020 the World Health Organisation declared the coronavirus outbreak a pandemic. In the same month, COVID-19 cases began to surge, and the death toll started to rise in the United Kingdom (UK). In response, the UK government put a range of measures in place to mitigate the spread of coronavirus including a push to work from home where possible; social distancing (keeping at least 2m distance from others) and mask-wearing indoors. People at high-risk of contracting coronavirus due to underlying health conditions were advised to shield, while people with COVID-19 symptoms (a new continuous cough, a high temperature and/or a loss of smell or taste) were required to self-isolate and travellers coming from abroad were required to quarantine. All three measures required people to stay indoors and restrict contact with others. In addition, the UK government has implemented three national lockdowns to date, in March 2020, November 2020 and January 2021. These required all but essential shops to shut, and people to stay at home and restrict their social contact except for essential purposes including food shopping, medical appointments and work where working from home was not possible.

These measures have resulted in disruption to daily activities, such as going to work, socialising, and exercise routines, with many being left without adequate exercise equipment or space to exercise, and no longer commuting by foot or bike. While people in the UK were allowed to exercise outdoors during all three lockdowns, this was restricted to once per day, with those advised to shield unable to exercise outside at all. Regular physical activity has been linked with reduced levels of stress, depression, anxiety and inflammation, ultimately contributing to better physiological and psychological health outcomes.[1] Research found that exercise frequency decreased between the first and second UK lockdowns while sedentary activities, e.g. working, watching TV and gaming, increased.[2] Levels of stress, anxiety or depression have all increased during the pandemic due to financial-, employment-, social-, and health-related concerns, and caring responsibilities.[3-6] There is a risk that people may have used maladaptive coping mechanisms such as comfort-eating, smoking, alcohol or drugs during this period,[7 8] although the evidence is mixed. Some research has identified increased smoking,[9] overeating and subsequent weight gain to cope with greater levels of stress and anxiety at this time. An English study[10] found an increase in the prevalence of high-risk drinking, but no change in smoking prevalence, and increased rates of smoking cessation and attempts to quit during the first UK lockdown. In contrast, another UK study[2] found that smoking, alcohol consumption and eating habits remained largely the same between the first and third UK lockdowns. However, sustained changes in drinking alcohol and eating behaviours were found in a small proportion of participants.[2] A healthy, balanced diet may play a role in protecting against noncommunicable diseases[11] and poor mental health.[12] An unhealthier diet adopted during lockdown, and reduced physical activity, were both independently linked to a greater negative mood score.[13] The negative effects of smoking and alcohol on health are well known, with smoking increasing the risk of health conditions such as certain cancers, coronary heart disease, and stroke,[14 15] and heavy drinking being associated with obesity[16] among other consequences.

Vulnerable populations such as those with disabilities may be at increased risk of the negative impacts of the pandemic.[17] People with disabilities made up 60% of those who died from COVID-19 between January and November 2020, and they have been found to experience worse mental health outcomes than those without disabilities.[18] Maintaining a healthy lifestyle and avoiding harmful health behaviours may, therefore,

be particularly important in this group. However, existing evidence suggests that even before the pandemic, people living with disabilities were twice as likely to be physically inactive as people without disability.[19] In addition, disruption to shopping, food preparation and cooking already presented obstacles to a healthy diet for people living with visual impairment,[20] resulting in fewer nutrients being consumed in this group compared to age-matched controls,[21] and a high incidence of malnourishment and obesity. During the pandemic, shielding and reliance on local services or volunteers, long queue times at shops, difficulty securing food delivery slots,[22] and negative impacts on job retention and finances,[23] may have further impacted access to food and exercise. Difficulties accessing groceries, medication, and healthcare for non-coronavirus-related issues, as well as negative impacts on health, have been more prevalent among people with disabilities than those without disabilities.[24] Food insecurity at this time rose, especially in already vulnerable groups in the UK.[25] Existing COVID-19 research involving people with disabilities has mainly focused on impacts on access to medical care and exercise. To our knowledge there are no studies assessing alcohol consumption, dietary changes and smoking during the pandemic in this population. Those with chronic health conditions often meet the definition of disability as set out by The Equality Act 2010.[26] There is evidence of a greater impact on harmful health behaviours in those with chronic health conditions during the pandemic. Increases in alcohol consumption and smoking in light smokers were more prevalent in those with chronic health conditions,[27] whilst decreases in alcohol consumption were more prevalent in heavy drinkers with no health conditions.[27]

Existing research highlights that those living with disability may be at greater risk of negative impacts of COVID-19 on health and health-related behaviours than individuals with no disabilities.[17] Considering the long-term negative physical and mental health outcomes associated with harmful health behaviours, it is important to determine the extent to which people living with disabilities have engaged in health-promoting and harmful health behaviours. This article provides a snapshot of a range of health behaviours including alcohol consumption, smoking, exercise and diet in a sample of UK adults living with disabilities compared to adults with no disabilities, approximately one year into the COVID-19 pandemic.

Materials and Methods

This article draws on survey data collected as part of a longitudinal assessment of health and well-being in individuals with and without disabilities conducted between 1st April 2020 and 28th March 2021. The current article presents findings from the final survey conducted between 8th and 28th March 2021, approximately one year after the implementation of the first UK lockdown. The results were reported according to the STROBE cross-sectional reporting guidelines.[28] Findings relating to loneliness,[29] sleep[30] and anxiety[31] in the same sample population are reported elsewhere.

2.1. Materials

An online survey was developed by the Research and Innovation Team at Blind Veterans UK (a UK-based charity providing support to veterans with sight loss), in collaboration with the University of Oxford, to collect information on current life circumstances, health and health-related behaviours, sleep and social well-being

across several timepoints. The same questionnaire had been administered in previous rounds, however, changes to the layout and wording of questions had been made between each round to improve data quality, and a number of demographics and health questions had been removed to decrease participant burden. Due to these changes a longitudinal comparison of health behaviours was not possible.

To make the survey accessible to participants with visual impairment, Microsoft Forms (Microsoft Corporation, Redmond, WA) was used to develop the survey. The platform has a range of accessibility features including colour contrast, high contrast settings, and compatibility with screen readers to facilitate participation for those with vision-related disabilities. Reading of grid questions was made easier by splitting questions across individual pages so that participants were seeing only one question per page.

2.2. Measures

To assess for disability, participants were first asked if they considered themselves to have a disability, followed by a question listing 16 conditions, including visual impairment or blindness, acquired brain injury, diabetes, epilepsy, disability affecting mobility, mental health issues, and learning difficulties, which required a "*Yes*", "*No*" or "*Prefer not to say*" response for each condition.

Single questions assessed COVID-19 diagnosis, current COVID-19 symptoms, self-isolation status, exercise frequency, alcohol consumption, and change in smoking habits. Diet over the last 3 weeks was assessed with a set of questions asking participants to indicate if their diet had improved, worsened or stayed the same; if they had been eating what they should, more or less than they should; if they had been drinking enough water, more or less water than they should; if they had been eating fruit and vegetables at least 2 or more times a week; and if they had been eating breakfast daily or most days.

2.3. Sample

This article presents findings for a subsample of UK based participants who completed the final survey in this survey series. The full sample consists of a convenience sample of adults aged 18 and over and was recruited through the researchers' personal and professional networks, social media platforms and professional forums. Participants who had consented to be being recontacted for follow-up research and provided a valid email address were invited via email to take part in subsequent rounds of the survey. Responses to the first survey in this series were received from 22 different countries predominantly the UK (61.9%) and participants from nine different countries took part in the final survey, the majority based in the UK (76.9%). Frequencies for other countries were too small to enable cross-country comparisons. The timings and nature of containment measures varied substantially between countries and so the current article focuses on the UK subsample.

2.4. Procedure

The Medical Sciences Interdivisional Research Ethics Committee (University of Oxford) advised that ethical approval was not required for this research. Participants were able to access the survey by clicking a link embedded in the invitation. Participants were first provided with information about the study and their rights, before being asked to consent to taking part in the research. At the start of each section, participants were able to choose if they wanted to answer or skip the section. For most questions, participants also had the option to select 'Prefer not to say'. While the preferred mode was online self-completion to reduce social desirability bias and the

potentially sensitive nature of some questions, participants who contacted the research team with difficulties accessing the survey were offered the option of completing the survey with a researcher over the telephone. Only one participant selected this option.

2.5. Statistical Analysis

Duplicates and non-responses were removed from the dataset before analysis. Responses were treated as missing if participants had missed relevant response options, selected "Prefer not to say", or had skipped the section.

Subgroup analysis was carried out to compare participants who reported having one or more types of disability ('≥1 disabilities') to participants who reported that they did not have a disability ('no disabilities').

Proportions and frequencies for all variables measured are presented in the respective tables to show spread of responses by subgroup. Proportions are presented for the total number of valid responses achieved for each question. The total number of valid responses (*n*) are reported in the tables. Differences between the groups were analysed using Mann-Whitney U and chi-square tests. The test statistics and *p*-values are reported in the tables. Fisher's Exact tests were conducted if chi-square test assumptions were violated, and respective *p*-values are reported in tables instead.

2.5. Patient and Public Participation

Patients and the public were not involved in the design of this study

3. Results

3.1. Participant characteristics

Table 1 provides a summary of participant characteristics. After removing one duplicate, two cases who did not consent to participating in this follow-up survey, and 37 surveys received from outside the UK, a total of 123 UK residents completed the survey. Participants were mostly white, female, aged 46-55, in paid employment, and living with others. Approximately two thirds of participants reported having no disabilities. A third reported having one or more disabilities, with a mean of 2.95 (*SD* = 1.82) different types of disability and a maximum of eight types of disability being reported by one participant. The most commonly reported types of disability in this sample were visual impairment or blindness, disability affecting mobility, and mental health difficulties.

Table 1. Sample characteristics of total survey sample. [1]Participants were able to report multiple disabilities. Proportions are calculated for the number of participants who reported each condition out of the entire sample (*n* = 123).

		% (*n*)
Gender	Female	55.7 (68)
	Male	44.3 (54)
Ethnicity	Asian	1.6 (2)
	Black/African/Caribbean	0.8 (1)
	Hispanic/Latino/Spanish origin	1.6 (2)
	Mixed/multiple ethnic groups	-
	White/Other White	95.9 (117)
Age	18-25	0.8 (1)
	26-35	9.8 (12)
	36-45	14.8 (18)
	46-55	36.1 (44)
	56-65	24.6 (30)
	66-75	11.5 (14)
	76-85	2.5 (3)
	86+	-
Employment status	In paid employment	73.6 (89)
	I am employed but furloughed	1.7 (2)
	Retired	14.9 (18)
	Unemployed and not looking for work	7.4 (9)
	Unemployed but looking for work	2.5 (3)
Living status	I live on my own	23.8 (29)
	I live with others	76.2 (93)
Disability	No disability	68.0 (83)
	One or more disabilities	32.0 (39)
Type of disability[1]	Visual impairment or blindness	21.1 (26)
	Disability affecting mobility	16.3 (20)
	Mental health issues	13.8 (17)
	Medical condition (e.g. asthma, diabetes, or epilepsy)	12.2 (15)
	Hearing impairment or deafness	11.4 (14)
	Emotional/behavioural difficulties	5.7 (7)
	Being immunocompromised	4.1 (5)
	Learning difficulties	2.4 (3)
	Acquired brain injury	1.6 (2)
	Multiple sclerosis	1.6 (2)
	Profound complex disabilities	1.6 (2)
	Limb loss	0.8 (1)
	Dyslexia	0.8 (1)

3.2. COVID-19 and self-isolating

Table 2 shows that 5 people had been diagnosed with COVID-19, and 3 people reported having COVID-19 symptoms at the time of completing the survey.

There was a statistically significant difference in the time spent self-isolating between the '≥1 disabilities' group and the 'no disability' group, with not isolating being more likely amongst participants in the 'no disability' group. Just over 80% of participants with no disability reported that they were not self-isolating in March 2021 compared to around half of participants with ≥1 disabilities. In contrast, participants with ≥1 disabilities were more than three times more likely to report that they had been self-isolating for over 6 months at the time of the survey than those with no disabilities (46.2% and 14.6% respectively).

Table 2. COVID-19 diagnosis, symptoms and time spent self-isolating by subgroup. Significant group differences are marked by an asterisk (*). [1]Between group analysis not conducted due to low prevalence. [2]Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses.

		No disability % (*n*)	**≥1 disabilities % (*n*)**
Since the last COVID-19 Pandemic Survey, have you been diagnosed with COVID-19?[1]	*n*	83	39
	Yes	4.8 (4)	2.6 (1)
Do you currently have any of the following COVID-19 symptoms: a new, continuous cough, a high temperature, or a loss or change to your sense of smell and taste?[2]	*n*	83	39
	Yes	1.2 (1)	5.1 (2)
Please indicate for how long you have been self-isolating: By self-isolating we mean staying at home, except for urgent medical assistance, and not having any visitors.[2]	*n*	82	39
	Not self-isolating	80.5 (66)	53.8 (21)
	≤ 2 wk.	1.2 (1)	-
	2-4 wk.	-	-
	6-8 wk.	1.2 (1)	-
	8-12 wk.	1.2 (1)	-
	3-4 mo.	-	-
	4-5 mo.	1.2 (1)	-
	≥ 6 mo.	14.6 (12)	46.2 (18)
		$U = 2061$, $p = .001$*	

3.3. Health behaviours

Prevalence of self-reported smoking was low in this sample (Table 3). Over 90% of respondents in both groups were non-smokers, and there was no significant difference in smoking habits between the two groups.

There were also no statistically significant differences between the two groups in terms of alcohol consumption. Almost half of the respondents with '≥1 disabilities' reported that they did not drink alcohol at all (46.2%) compared to just a third of those with no disabilities (32.5%). The prevalence of more frequent alcohol consumption was relatively similar in the two groups, with 23.1% of participants with ≥1 disabilities

drinking alcohol at least 3-5 times a week compared to 26.5% of participants with no disabilities, including three who reported drinking alcohol every day.

In contrast, there was a statistically significant difference in exercise frequency between the two groups. Around a quarter (25.6%) of participants with disabilities reported that they had not exercised at all over the last 3 weeks compared to 7.2% of participants with no disabilities. This means that around three quarters of participants with disabilities and over 90% of participants with no disabilities managed to do exercise at least once per week in the three weeks leading up to the survey. Encouragingly, a majority in both groups reported exercising 3-4 times a week but this was more common in participants with no disabilities (67.5% compared to 46.2% in participants with ≥1 disabilities). Only exercising once a week was selected by a greater proportion of those with disabilities (15.4%) compared to those without disabilities (7.2%).

Table 3. Smoking habit, alcohol and exercise frequencies by subgroup. Significant group differences are marked by an asterisk (*). Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses.

		No disability % (*n*)	**≥1 disabilities % (*n*)**
Thinking about the time since you completed the last COVID-19 Pandemic Survey, which of the following statements best describes your smoking habits?	*n*	81	39
	I don't smoke	93.8 (76)	92.3 (36)
	Smoked less than usual	1.2 (1)	-
	Smoked the same	4.9 (4)	5.1 (2)
	Smoked more than usual	-	2.6 (1)
		U = 1607, *p* = .721	
Over the last 3 weeks, how often have you been drinking alcohol?	*n*	83	39
	I don't drink alcohol	32.5 (27)	46.2 (18)
	Once a week	18.1 (15)	12.8 (5)
	Only on weekends	22.9 (19)	17.9 (7)
	3-5 times a week	22.9 (19)	23.1 (9)
	Every day	3.6 (3)	-
		U = 1410.5, *p* = .235	
In the last 3 weeks how often have you participated in some kind of exercise?	*n*	83	39
	3-4 times per week	67.5 (56)	46.2 (18)
	1-2 times per week	18.1 (15)	12.8 (5)
	Once per week	7.2 (6)	15.4 (6)
	Not at all	7.2 (6)	25.6 (10)
		U = 1171.5, *p* = .005*	

Overall, the majority of participants reported a healthy diet which included eating fruit and vegetables at least twice a week and eating breakfast daily or on most days (Table 4). Although not statistically significant, the proportions reporting this were slightly higher among participants with no disabilities. There were also no statistically significant differences between the two groups in relation to changes in their diet and water intake. When asked about changes in their diets, a majority in both groups stated that their diet had remained the same. Participants with disabilities were slightly more

likely to report that their diet had stayed the same or worsened than participants with no disabilities, while the latter group was slightly more likely to report improvements in their diet. Around half of the participants in each group reported drinking enough water and just under half reported not drinking enough. One person in each group reported drinking more water than they should. There was, however, a statistically significant difference between the two groups in the amount of food eaten over the 3 weeks leading up to the survey. While a majority in both groups reported eating what they should (56.6% of participants with no disabilities and 41.0% of those with disabilities), participants with disabilities were almost 5 times more likely to report that they were eating less than they should (23.1% vs 4.8% for those with no disability) and almost 40% in both groups reported eating more than they should.

Table 4. Dietary, eating and drinking habits by subgroup. Participants were asked to select all the statement/s which best describe them over the last 3 weeks. Significant group differences are marked by an asterisk (*). Percentages are based on the total number of valid responses given (*n*) and exclude 'Prefer not to say' responses. [3]Result of Fisher's exact test

		No disability % (*n*)	**≥1 disabilities % (*n*)**
I eat fruit and veg 2+ times a week	*n*	83	38
	Yes	95.2 (79)	86.8 (33)
	No	4.8 (4)	13.2 (5)
		p = .137[3]	
I eat breakfast daily or most days	*n*	83	38
	Yes	79.5 (66)	71.1 (27)
	No	20.5 (17)	28.9 (11)
		$\chi2$ (2, 121) = 1.05, p = .305, φ = -.093	
Diet	*n*	83	39
	My diet has improved	27.7 (23)	15.4 (6)
	My diet has stayed the same	56.4 (47)	64.1 (25)
	My diet worsened	15.7 (13)	20.5 (8)
		$\chi2$ (2, 122) = 2.31, p = .315, *Cramer's V* = .138	
Diet habits	*n*	83	39
	I eat what I should	56.6 (47)	41.0 (16)
	I eat less than I should	4.8 (4)	23.1 (9)
	More than I should	38.6 (32)	35.9 (14)
		$\chi2$ (2, 122) = 9.60, p = .008*, *Cramer's V* = .281	
Water intake	*n*	83	39
	Drinking enough	51.8 (43)	51.3 (20)
	Drinking less than I should	47.0 (39)	46.2 (18)
	Drinking more than I should	1.2 (1)	2.6 (1)
		p = .860[3]	

4. Discussion

Existing evidence suggests that prior to the pandemic, unhealthy behaviours were more prevalent in people with disabilities,[19-21 32 33] and as a result there was concern that this group would be disproportionately affected by the pandemic.[34] This study provides a snapshot of a range of health-related behaviours in people with disabilities compared to people with no disabilities approximately one year into the COVID-19 pandemic. Notable group differences were found for exercise frequency, time spent self-isolating and the amount of food eaten.

Even before the pandemic people with disabilities were more likely to be physically inactive than people with no disabilities (39.8% vs 20.5%).[19] In contrast, 25.6% of participants in the current study reported not exercising at all in the 3 weeks before the study. This is perhaps unsurprising considering the impact of the pandemic on exercise. One Norwegian study reported that 66% of their participants with physical disabilities reported a decrease in exercise during the pandemic compared to pre-pandemic times.[35] While people with disabilities have been found to be more likely to report a negative impact of the pandemic on their ability to exercise due to health concerns and lack of exercise space,[19] a decrease in physical activity (doing at least 30 min of physical activity 5 times a week) was found in both groups, from 26% to 23% between April and September 2020 among people with disabilities and from 36% to 31% among people with no disabilities. In contrast, 46.2% of participants with disabilities reported that they had participated in some kind of exercise at least 3-4 times a week in the current study. This is considerably higher and may relate to the lower exercise frequency given in the response and to the fact that exercise was not defined in the current study, which may have resulted in different definitions of exercise for different participants. Reflecting existing evidence of a negative impact on physical activity during the pandemic in this group,[19 36] participants with disabilities were around 3.5 times more likely to not exercise at all than participants with no disabilities. This may reflect challenges imposed by lockdown restrictions including disruption to public transport and reduced access to professional and social support for attending gyms,[36] and existing barriers to physical activity.[19 37] The most common types of disability in this sample were visual impairment/blindness, disability affecting mobility and mental health conditions. Participants with impaired mobility were more likely to be physically inactive (no exercise at all) than those with VI (n=9, 45.0% compared to n=3, 11.5%) and less likely to have participated in regular exercise (3-4 times a week) (n=8, 40.0% compared to n=16, 61.5%). However, it must be noted that it was not possible to control for comorbidity in this study and some participants may have both types of disability. Severe visual impairment, fear of falling, inaccessible facilities and lack of inclusive environments are just a few factors known to minimise time spent exercising in those with visual impairment.[38-40] Participants with mobility-related disabilities may be less likely to participate in frequent regular exercise compared to other impairments, such as hearing impairment.[41] Encouragingly, at least three quarters in both groups reported getting some form of exercise and a majority of participants in each group reported exercising 3-4 times a week. One year into the pandemic, this may suggest an adaptation to the restrictions on exercise imposed by the pandemic. It may also reflect the presence of participants recruited through contacts in the sight loss and military sectors. Members of the charity Blind Veterans UK, for example, were actively supported to participate in sports and recreational activities during the pandemic through remotely delivered exercise sessions.

Statistically significant group differences were also observed in the length of time participants had spent self-isolating. Participants with disabilities were around three times more likely to have been self-isolating for more than 6 months than those without disabilities. This is perhaps unsurprising given the increased risk of COVID-19-related complications for those living with a disability,[17] and advice for vulnerable adults to shield during the pandemic. This is of concern due to the impact of self-isolating on mental health and experiences of loneliness.[42 43] White and Van Der Boor[44] reported higher levels of anxiety and depression and lower well-being in UK adults who had been self-isolating before a lockdown; these adults reported feeling more isolated than usual during lockdown. However, findings reported in our previous article[29] indicated that isolation did not contribute to feelings of loneliness in this sample population. Over three quarters of participants without disabilities indicated that they were not self-isolating, compared to around half of participants with disabilities. This is despite stay-at-home orders having been implemented across the UK during December 2020/January 2021. There is evidence of differing attitudes towards dealing with the pandemic, with those with disabilities more likely to report having concerns about leaving home compared to those without disabilities.[45]

There was a statistically significant group difference in the amount of food eaten but not any of the other dietary indicators. Eating habits in this sample indicate that undereating was almost five times more likely in those with disabilities. Prior to the pandemic, associations had been drawn between disability and undernutrition.[46] Existing barriers to food preparation[20 21] and additional challenges accessing food shopping during the pandemic,[22] may have contributed to the undereating within this group. However, in general, participants in both groups were adhering to healthy dietary habits with most eating breakfast and fruit and vegetables regularly and drinking enough water. Whilst there was no statistically significant group difference in relation to changes in diet, those with disabilities were slightly more likely to state that their diet had worsened.

There were no statistically significant differences in alcohol consumption and changes in smoking between participants with and without disabilities. Over 90% of participants in both groups were non-smokers. This is higher than the prevalence of non-smokers reported by Fancourt, et al.[27] The prevalence of smokers in both groups is also around half of that reported for the general population (13.8%) in Great Britain in the first quarter of 2020.[47] It is unclear if this reflects a mode effect, social desirability bias or a lower prevalence in this sample. To our knowledge, there is limited research exploring alcohol consumption and smoking among people with disabilities. Smoking was found to be more prevalent in UK adults with disabilities than those without disabilities prior to the pandemic[33] and research from the UK found that people without chronic physical conditions were less likely have increased from light to moderate smoking and more likely to have stopped smoking than those with chronic physical conditions during the pandemic.[27] Due to the small number of smokers in the current sample, comparisons cannot be drawn.

While the prevalence of more frequent drinking was similar in both groups, participants with disabilities were around 1.4 times more likely to be non-drinkers than participants with no disabilities. This reflects existing evidence from the US which found a lower prevalence of alcohol abuse among people with disabilities prior to the pandemic.[48] But it contradicts evidence from another US study conducted in February/March 2021 which found higher levels of alcohol consumption before and during the pandemic in people with disabilities.[49] Results from a UK panel study carried out during the

pandemic showed that 30% of participants reported not drinking alcohol.[2] This compares to the proportion of non-drinkers among participants with no disabilities in this study but is lower than the proportion observed for participants with disabilities. The same panel also found that alcohol consumption remained stable during the pandemic, but an increase was found to be more likely for people with chronic health conditions than those without.[27] Changes in alcohol consumption were not explored in the current article. Considering early evidence of an increase in alcohol consumption in people with disabilities during the pandemic, future research may be required to monitor drinking behaviours amongst these individuals as the pandemic continues.

This study addresses the lack of data surrounding alcohol consumption, smoking and diet in UK adults with disabilities during the pandemic. There are some limitations of this study. Firstly, participants were a convenience sample meaning that findings cannot be extrapolated to the general population. Similarly, the use of a web-based survey could exclude members of certain subgroups. Additionally, findings may be more representative of our specific sample of participants who had been receiving support throughout the pandemic and not of people with disabilities in general. Secondly, there was no definition for exercise provided in the survey, meaning that the question was open to interpretation. Therefore, the responses are subject to individual definitions of exercise. To limit this, future studies should define exercise according to a certain length of time and/or intensity. Thirdly, the sample consisted of considerably smaller numbers of respondents reporting disabilities than those without disabilities. While it is encouraging that there were few differences between our groups in terms of health behaviours, it must be noted that pre-pandemic results are not available. For example, participants who said that their diet had stayed the same may have been referring to the maintenance of an unhealthy diet. Existing studies have provided some longitudinal analysis, by either comparing responses at two timepoints during the pandemic,[2 27] or making comparisons to pre-pandemic times. Whilst data was collected at an earlier point in the pandemic, longitudinal analysis could not be carried out due to changes made to survey questions between surveys. Current results, therefore, cannot confirm whether the findings reflect the impact of the pandemic or not. This study instead attempts to quantify the behaviours being exhibited by those with and without disabilities following a full year of living with pandemic restrictions. Existing literature has so far only explored the impact on exercise and access to care. This report provides novel data on behaviours such as smoking, alcohol consumption and eating habits in people with disabilities.

Future studies should attempt to determine effects on health habits during the pandemic, and any long-term impacts, of having different types and numbers of disabilities. Similarly important is the inclusion of ethnic diversity of study participants. While the survey did include a question asking about participants' ethnicity, the majority of respondents in the already small-sized sample were white, so ethnicity-based comparisons could not be carried out. Given that there are known differences in how the pandemic has affected different ethnic groups, further research would indeed be beneficial. Research may also seek to identify if barriers to participation in physical activity for people with disabilities were pre-existing or if lockdown posed additional challenges. Further exploration of the level and cause of undereating in those with disabilities may also be valuable.

5. Conclusions

Despite concerns about the disproportionate impact of the COVID-19 pandemic on people with disabilities, this study offers a mixed picture. While those with disabilities fared significantly worse in terms of exercise frequency, time spent in self-isolation and food consumption, this study found no statistically significant differences in relation to smoking, changes in diet, water intake, fruit and vegetable and breakfast consumption, and alcohol consumption. Furthermore, participants with disabilities were more likely to be non-drinkers. Implications for clinical practice are that people living with a disability may benefit from additional support and guidance relating to diet and exercise as we transition through different phases of the ongoing pandemic.

Author Contributions

Conceptualization, R.G., S.H. and N.H.; methodology, R.G., T.K., C.C., N.H., S.H.; formal analysis, N.H. and L.G.; investigation, R.G. and N.H.; resources, R.G., T.K., C.C., N.H., S.H. and L.G.; data curation, N.H.; writing—original draft preparation, S.H. and N.H.; writing—review and editing, S.H., N.H., C.C. and L.G.; visualization, S.H. and N.H.; project administration, R.G.; funding acquisition, R.G. All authors have read and agreed to the published version of the manuscript

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Data availability statement

Data are available upon reasonable request by contacting the corresponding author. The data are not publicly available because participants were not asked if they consented for their data to be shared outside of the research teams involved in this study.

Ethics statements

Ethics approval

In accordance with the local legislation and institutional requirements (The Medical Sciences Interdivisional Research Ethics Committee at the University of Oxford), ethical review and approval was not required for the study on human participants. Written and informed consent was provided by members of the public that agreed to participate in this study.

Competing Interests

All authors declare: no support from any organisation for the submitted work, no commercial or financial relationships with any organisations that might have an interest in the submitted work in the previous 36 months; no other relationships or activities that could be construed as having influences the submitted work.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectionalreporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	2
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2

Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	3,4
Objectives	#3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	#4	Present key elements of study design early in the paper	5,6
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	6
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5,6
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	5,6

Bias	#9	Describe any efforts to address potential sources of bias	5,6
Study size	#10	Explain how the study size was arrived at	6,7
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	6
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	6
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	6
Statistical methods	#12c	Explain how missing data were addressed	6
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	6
Statistical methods	#12e	Describe any sensitivity analyses	n/a
Results			
Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	5,6

		separately for for exposed and unexposed groups if applicable.	
Participants	#13b	Give reasons for non-participation at each stage	n/a due to online nature of study
Participants	#13c	Consider use of a flow diagram	n/a
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	7,8
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	8, can be calculated using the n for each variable
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	9,10,12
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a not relevant

Main results	#16b	Report category boundaries when continuous variables were categorized	n/a not relevant
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a not relevant
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	8-12
Discussion			
Key results	#18	Summarise key results with reference to study objectives	12-14
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14,15
Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
Other Information			
Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15