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Legal restrictions and mitigation strategies amongst a disabled population during COVID-19

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ABSTRACT

The impact of physical disability on protective behaviors during COVID-19 has been little studied. This retrospective study compared the 699 the self-declared behaviors of 699 people with disabilities before and after the relaxation of COVID-19 restrictions in England. We found that people with disabilities in England showed high compliance with protective behaviors and mitigation strategies during a period of legal restrictions. Following the lifting of restrictions, respondents engaged in less social mixing, fewer distancing and hygiene behaviors and were less likely to use face coverings. Hierarchical regressions revealed that socio-economic status, age, and gender moderated protective behaviors: while those with higher socio-economic status were more relaxed with regard to hygiene and distancing behaviors, they were more cautious about mixing with others after the end of restrictions. Age, (male) gender, and being unvaccinated were positively associated with relaxation in the use of facemasks in public places, not needing a carer with fewer out-of-home visits. Taken together these findings suggest that the removal of restrictions had an unequal impact on the population of England, placing a disproportionate burden on some people with disabilities.

1. Introduction

People with disabilities (PwD) are disproportionately vulnerable to disasters; this includes but is not limited to negative mental health sequalae (Stough, 2009; Stough and Kelman, 2018). A UK study during COVID-19 found that PwD are at greater risk of severe outcomes and death than the general population (Bosworth et al., 2021). The global pandemic has disproportionately affected PwD, in terms of not just access to healthcare, but also to support services and networks, the ability to remain physically active, and their loneliness and mental health (Czeisler et al., 2021; Jesus et al., 2021; Okoro et al., 2021; Wang et al., 2022). German data show that PwD generally are more engaged with protective strategies (Lippke et al., 2022). However, the impact of an individual's disability status on their behavior and psychological well-being when protective measures are relaxed has not previously been investigated. The heightened vulnerability of PwD would suggest that it is especially important for public health measures to take account of the differential impacts of the pandemic, and of the removal of protective behaviors, as we begin a return to "normal" life.

At all points during the coronavirus outbreak in the UK, the individual devolved nations were answerable for mitigation policies in their countries, with the UK Prime Minister Boris Johnson, responsible for England. From May 17, 2021 restrictions in England included maintaining social distancing in restaurants and bars, mandatory use of face coverings in indoor public venues and on public transport, and indoor restrictions on groups larger than six. In the days leading up to July 19, 2021, UK Prime Minister Boris Johnson announced that all legal mandates on social mixing and other mitigation strategies in England would be removed from that date (widely termed "Freedom Day"). While initial survey data, of the English population, from the Office for National Statistics suggested only a modest decline in protective behaviors (Office for National Statistics, 2021) combined retrospective survey and field observations carried out at locations around London (12–27 July) (Davies et al., 2021) reported a notable decline in use of face coverings (14%) and social distancing (11%) in England following the relaxation.

We assessed the impact of the removal of these legal restrictions on protective and mitigation strategies amongst a sample of PwD. Previous research indicates that females (Brug et al., 2004) and older individuals (Brankston et al., 2021) perceive themselves as more vulnerable to infectious diseases, and we therefore expect our female respondents, and older participants, to engage in greater protective behaviors and mitigation. The socio-economically advantaged are more likely to afford not

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attending their workplace and therefore also more likely to show greater engagement with protective behaviors and mitigation strategies (Papageorge et al., 2021). We also suggest that PwD who are more severely disabled, and who are clinically extremely vulnerable (Office for National Statistics, 2020; Taillé et al., 2021), will better engage with protective behaviors and mitigation strategies than those not in these categories. Drawing on earlier studies conducted during outbreaks of the Middle East Respiratory Syndrome (MERS) we predict that anxious individuals will also be more compliant with mitigation strategies (Leung et al., 2005). Finally we hypothesize that vaccination status will not substantially impact mitigation behavior (Mantzari et al., 2020). We address two related questions: 1) how does level of physical impairment relate to changes in engagement with protective behaviors before and after July 19? 2) How do the above demographic factors and resources (including mental health), moderate any such changes?

2. Methodology

2.1. Recruitment and sample

We recruited self-identified people with physical disabilities. In line with advice on conducting health behavior research during the pandemic (Hlatshwako et al., 2021) we collected data using an online survey participant pool (Prolific) combined with individuals recruited via relevant charities (Scope, The RNIB, and Multiple Sclerosis UK) and social networks.

After excluding individuals who failed an attention check (N = 5) and who had either no disability, or nonphysical disabilities (N = 18) we analyzed a final valid sample of 699 respondents (M age 42.5 years (SD = 14.4), 542 females, 148 males). Further descriptive statistics are presented in Table S1. All participants provided electronic informed consent. Ethical approval was provided by the provided by the Departmental Ethics Panel, Department of Psychology, University of Warwick, UK.

2.2. Measures

Participants indicated age and gender as well as whether they had pre-existing mental health conditions or needed a carer to assist with daily activities. *Vaccination status* was measured by asking individuals how many vaccinations they had received (ranging from 0 to 3). We then created a binary variable, separating individuals who had received any number of vaccinations, from those who h had received none. To assess *clinically extremely vulnerable* status individuals provided a binary response (yes/no) to the question, "have you received a letter from the NHS or your GP informing you that you are clinically extremely vulnerable to the coronavirus (COVID 19)?" *Anxiety* was measured using the GAD-7 (Kroenke et al., 2007; Shevlin et al., 2022; Spitzer et al., 2006) (α = 0.90).

To assess *disability status* we used The Washington Group Short Set on Functioning – Enhanced (WG-SS Enhanced) (The Washington Group on Disability Statistics, 2020) which has been extensively used and validated elsewhere (Altman, 2016) (α = .77). This measures impairment across different domains including vision, hearing, upper body strength, self-care, and mobility. To avoid redundancy with our assessment of mental health scale, we removed the anxiety and depression subscales from the WG-SS Enhanced. We additionally computed a single general binary indicator of severe disability (yes, no). This indicator was calculated using SPSS syntax available on The Washington Group's website (The Washington Group on Disability Statistics, 2021). Individuals were classified with severe disabilities if any one domain was coded "a lot of difficulty" or "cannot do at all."

Finally, a recent review (Seale et al., 2020) suggests that individuals' motivations for engaging in protective behaviors are not uniform, but instead differ depending on the type of behavior engaged. Analyses from the UK Office for National Statistics further find that individuals display different rates of engagement across different protective behaviors (Office for National Statistics, 2022; 2021). In addition, variation in individual physical abilities may also influence an individual's capability to engage with a certain form of protective behavior (e.g. social distancing could be easier for a person who uses a wheelchair than someone with a visual impairment; the individual with visual impairment will likely be more capable of using face masks than somebody with poor fine motor skills) (Epstein et al., 2021). Analyzing behaviors together might cause us to miss such impairment-level differences in engagement with protective behaviors. We adopted questions to assess *engagement with recommended preventive behaviors,* from the ONS Opinions and Lifestyles Survey: Covid- Module 19, a repeated cross-sectional study conducted in the UK, to assess opinions, attitudes, and behaviors. We adopted these questions because of their extensive validation and to allow future researchers to make direct comparisons between our sample with disabilities, and the general population. This measure of 21 items allocated behaviors into four categories (Agarwal et al., 2021): distancing and hygiene (frequency with which individuals engage with social distancing, and good personal and environmental hygiene, such as hand washing, and ensuring good ventilation) (α = 0.80) face covering use (frequency of use of face coverings, in work or education, and other enclosed public spaces) (α = 0.70) social mixing (the frequency with which individuals mixed with others in different age bands) (α = 0.71) and out of home visits (the frequency with which individuals visited different types of locations outside of their home) (α = 0.77). These are listed in S2.

2.3. Analytic procedure

We first ran a confirmatory factor analysis (CFA) to confirm category fit for the four behavioral outcomes (Agarwal et al., 2021). Having verified underlying assumptions (Madley-Dowd et al., 2019) we used multiple imputation for mental health, and disability variables in all subsequent analyses. Paired t-tests then assessed changes in each grouping of preventive behaviors and multivariate multiple regressions examined changes in behavior as a function of each disability impairment. Finally, we performed hierarchical multiple regression, entering pre-existing factors in step one and anxiety in a second step. For each regression analysis we applied rake weights using the SPSSINC RAKE add-on, to match our sample to census data for England (by age, gender). In each case we report the full models with all predictors included. All analyses were conducted using SPSS version 27, except for the CFA, which was conducted using the Factor module, in JASP 0.16 (JASP Team, 2021; Love et al., 2019; Rosseel, 2012).

3. Results

3.1. Descriptive data

3.1.1. Behavior changes, by domain

A CFA with MLR to examine the 21 behaviors confirmed a four-factor structure (eigenvalues 24.73%, 11.31%, 9.76%, and 8.24% respectively). Model fit was deemed appropriate given typical cut-offs (Kyriazos, 2018): RMSEA $\leq$0.06 (90% CI $\leq$ 0.06), SRMR $\leq$0.08, CFI $\geq$0.95, and TLI $\geq$0.95 (Hu and Bentler, 1995).

3.1.2. Temporal changes in behavior, by domain

Examining temporal changes (before vs after the relaxation of restrictions on July 19), respondents engaged in fewer distancing and hygiene behaviors and wore face coverings with reduced regularity. Our analyses showed a significant decrease in overall mixing after July 19th, but no change in visiting various locations (see Table 1). Item analyses (paired t-tests) demonstrated that individuals reported lower nonphysical contact with children before compared to after the removal of restrictions (Ms = 1.48 (SD = 0.90) vs. 1.35 (0.72), $t(795) = 4.20$, $p < .001$). A similar decline was evident for nonphysical contact with adults

Table 1
Changes in engagement with protective behaviors across domains, before and after July 19.

Outcome	Before July 19	After July 19	95% CI for Mean Difference				
	M	M		SD	t	df	*P*
Hygiene and distancing behavior[a]	20.96	20.26	-.88, −.52	2.30	−7.50	605	< **.001**
Out-of-home visits[b]	11.46	11.66	-.07, .47	3.42	1.46	624	.145
Social mixing[c]	9.09	8.87	-.38, −.07	2.1	−2.77	677	**.006**
Face covering use in public places[d]	3.93	3.76	-.20, −.12	.47	−7.59	488	< **.001**

We report all analyses above using original data. In our questionnaire we asked about changes in the use of facemasks in two distinct settings, in work and education, and in other enclosed public spaces. However, given that over 80% of respondents reported not travelling to work or school, we removed this measure from our analysis, and only report use of face coverings in other indoor public locations.
Notes.
[a] Maximum possible score on this domain was 25.
[b] Prior to July 19 the maximum possible score on this domain was 35, however in the after July 19 questions this value increased to 42, given that it was now possible to visit nightclubs.
[c] Maximum possible score for all the behaviors in this cluster was 30.
[d] Maximum possible score in this domain was 5.

(Ms = 2.04, (SD = 0.998) vs. 1.95 (1.04), $t(671) = 2.61$, p .009).

3.1.3. Impact of domain of functional impairment on compliance with protective behaviors and mitigation strategies

Additional analyses examined specific forms of impairment on behavioral changes for each of the four dimensions. The extent of impairment did not predict changes in social mixing, distancing and hygiene behavior, or face covering use, but greater difficulties with upper body movements did predict greater caution about out-of-home visits (Table S3).

3.1.4. Predictors of behavioral changes

Regressions (Table 2) demonstrated that higher socio-economic status predicted greater changes with regard to hygiene and distancing behaviors. Conversely, increasing age, male gender, and being unvaccinated were each associated with greater relaxation in the use of facemasks in public places. Socio-economic status predicted continued caution with regard to social mixing, and not needing a carer was associated with fewer out-of-home visits after the end of legally mandated restrictions.

4. Discussion

We report here one of the first studies to examine compliance with protective behaviors among people with disabilities. We document changes in compliance with these behaviors upon the removal of legal stipulations, during a time of major pandemic. Most individuals were cautious before July 19 and were following recommended mitigation strategies: over 60% of individuals often or always engaged with social distancing, wore face coverings, and regularly washed their hands. This is in line with findings from a German study of PwD showing generally excellent compliance with mitigation strategies (Lippke et al., 2022). While we found some evidence of a decline in hygiene and distancing behaviors and the use of facemasks this was smaller than has been observed with the general population (Davies et al., 2021; YouGov, 2020), and is broadly in accordance with research showing compliance with mitigation strategies falls over time as a function of legal restrictions (Gao et al., 2021; Smith et al., 2022; Wright and Fancourt, 2021).

Much previous research has shown that higher socio-economic status is associated with better engagement with social distancing and hand hygiene behavior, amongst other protective behaviors (Atchison et al., 2021; Azlan et al., 2020; Gibson Miller et al., 2020; Mamelund et al., 2021). It is puzzling therefore that our study finds individuals who were higher in socio-economic status relaxed their engagement with hygiene and distancing behaviors to a greater extent than those who were in lower socio-economic status groups. This suggests several potential alternative explanations. Firstly, studies investigating the influence of socio-economic status on social distancing and hygiene behaviors have ordinarily been conducted with samples of the general population, with no breakdown according to disability status. It is therefore not inconceivable that socio-economic status differentially impacts hygiene and distancing behaviors among individuals with disabilities, compared to those without. Secondly, further studies have suggested that personality variables (Wright et al., 2022) and changes in perceived trust in government (Fancourt et al., 2020) can be potentially important predictors in engagement with hygiene and distancing behaviors, and it may be that these, or other unmeasured third variables, could be contributing to this association. Finally, previous work has also suggested that predictors of compliance (Wright and Fancourt, 2021) with protective behaviors change over time. Longitudinal analyses will be required to help to clarify the potential relationship between socio-economic status, and changes in hygiene and distancing behaviors.

Use of face coverings in public places was almost at ceiling rates both before and after July 19, and we see that individuals exhibited high rates of compliance with this element of the guidance both before and after the lifting of restrictions. Although Goldszmidt et al. (2021) find that vaccination status did not influence usage of facemasks we found that individuals who are vaccinated use facemasks more regularly than those who have not received any vaccination, in accord with new data from the United States (Calamari et al., 2022). Consistent with previous research we also found that males reduced use of facemasks to a greater extent than females (Haischer et al., 2020; Howard, 2021; Lin et al., 2021). The (very small) age effect we find in our study is in accordance with a recent multinational study (MacIntyre et al., 2021) suggesting that older individuals were most likely to become fatigued with (and thus reduce engagement with) facemasks over time. However, given the small size of this effect in we advise caution in interpreting this finding.

Our finding that individuals engaged in less social mixing after the release of restrictions is at odds with national survey data showing that social contacts for the general population remained steady (Jarvis et al., 2021) or increased (Office for National Statistics, 2021). However, we note that this decline was only in non-intimate (non-physical) contact, with children and adults. In our study, only socio-economic status was a significant predictor of changes in the numbers and age groups of people visited. Specifically, individuals who were higher in socio-economic status tended to visit other people less. Individuals who were higher in socio-economic status were potentially more able than others to work from home (Moehring et al., 2021), and also the use the Internet and technology to maintain social relationships, in lieu of in-person visitation. Thus, individuals with pre-existing resources, in this case financial resources were better able to comply with recommended protective behaviors. There is substantial regional variation in movement patterns in the United Kingdom (Ross et al., 2021) with economically advantaged regions showing less out-of-home movement. Thus, it may well be important for future studies to incorporate geographical variation in

Table 2
Full models including all predictors of behavioral changes.

Dependent variable	Predictor	Unstandardized Coefficients		t	*P*
		β	Std. Error		
Hygiene and distancing	Constant	−1.54	1.21	−1.27	.20
	Age	. 00	.01	.44	.66
	Gender	.03	.22	.13	.90
	Previous vaccination	.36	.38	.95	.35
	Carer	.02	.27	.06	.95
	Clinically extremely vulnerable	-.11	.27	-.39	.70
	Previous Covid	-.22	.18	−1.26	.21
	Existing mental health	-.22	.22	−1.00	.32
	Disability	.07	.23	.31	.76
	SES	.14	.04	3.18	**.002**
	GAD	-.03	.02	−1.29	.20
Face coverings in public places	Constant	-.95	.28	−3.42	< **.001**
	Age	.00	.00	2.08	**.038**
	Gender	.11	.05	2.10	**.036**
	Previous vaccination	.23	.09	2.52	**.012**
	Carer	.11	.06	1.74	.082
	Clinically extremely vulnerable	-.07	.06	−1.21	.23
	Previous Covid	.01	.04	.27	.79
	Existing mental health	-.04	.05	-.78	.44
	Disability	.03	.05	.59	.55
	SES	.01	01	.46	.65
	GAD	.01	01	1.66	.10
Social mixing	Constant	.62	.94	.67	.51
	Age	-.01	.01	−1.48	.14
	Gender	.08	.17	.49	.63
	Previous vaccination	-.11	.28	-.39	.70
	Carer	.21	.19	1.11	.27
	Clinically extremely vulnerable	.29	.19	1.51	.13
	Previous Covid	-.01	.15	-.06	.95
	Existing mental health	-.02	.17	-.13	.90
	Disability	-.11	.18	-.59	.55
	SES	-.08	.03	−2.30	**.022**
	GAD	-.02	.02	−1.25	.21
Visit	Constant	2.50	1.52	1.65	.10
	Age	.01	.01	.68	.50
	Gender	.10	.28	.35	.70
	Previous vaccination	.42	.45	.93	.35
	Carer	-.75	.33	−2.30	**.022**
	Clinically extremely vulnerable	.43	.31	1.35	.18
	Previous Covid	-.03	.23	-.13	.89
	Existing mental health	.10	.29	.35	.73
	Disability	.55	.29	1.90	.058
	SES	-.10	.05	−1.90	.058
	GAD	-.03	.03	−1.35	.18

Note: Values in **bold** are significant at $p < .05$ level or below.

socio-economic status, and related factors, to gain a more nuanced insight into the behavioral changes of people with disabilities.

Finally, we observe that individuals who did not need a carer increased their rates of visiting locations outside of the home, after the legal mandate was removed. Individuals who needed a carer may not have been able to visit out-of-home locations during the pandemic *unless* they had access to the care and support services they needed. Over the course of the pandemic qualitative research has shown that one of the major barriers to good mental health and social participation among individuals with disabilities, was a reduction in the availability of care and support services (Shakespeare et al., 2021a, 2021b). The relaxation of restrictions may have meant that access to necessary care services improved for people with disabilities, thus enabling them to become active participants in society once again.

5. Conclusions and future directions

This study of people with disabilities suggests that compliance with protective behaviors was high prior to the relaxation of restrictions in July 19, and generally remained so. In this sample of self-identifying PwDs, we have shown high levels of engagement with personal protective behaviors, similarly to a study conducted in Germany (Lippke et al., 2022). People with disabilities engaged in fewer hygiene and distancing behaviors after July 19, less social mixing and were less likely to wear face coverings, similar to the pattern observed amongst the general population in the UK (Davies et al., 2021). There was no change in the tendency to make out-of-home visits. Thus, we can see that changes were not uniform across behavioral domains after July 19, with individuals showing stronger engagement in some, but not others.

Across behavioral domains, socio-economic status, gender, age, and vaccination status, appear to be important predictors of behavioral changes. The directionality of these effects varies according to behavioral cluster, and require further investigation to unpick underlying factors. Our initial findings also indicate differences in behavior post the ending of restrictions amongst different groups of people with disabilities; however, we note that we only had only small numbers of people who had severe disabilities in some domains. Therefore, it is likely to be especially profitable if future researchers target groups with severe disabilities, to gain a more nuanced and deeper picture of how these groups manage compliance with potentially extremely disruptive, mitigation strategies. Ethnicity has also been shown to impact during the Covid 19 pandemic (Atchison et al., 2021; Barrett and Cheung, 2021; Schüz et al., 2021) as well as other pandemic outbreaks in the UK (Rubin et al., 2009, 2010). Given that our sample was 94% self-identified white-British, future studies should certainly aim for more ethnically diverse samples.

Our work suggests that the impact of "Freedom Day" was decidedly unequal, and not everybody was freed in the same way and to the same extent. Indeed, it seems that in putting the welfare of those without disabilities and mentally healthy individuals above the more vulnerable, people with disabilities continued to be cautious about mixing and making visits outside the home.

Given the potentially severe anxiety symptoms exhibited in our sample, it will be important for public health authorities to address the concerns of PwD as part of developing a sustainable strategy for living with the virus, especially in light of recent data suggesting PwD are more concerned about the future then individuals without disabilities (Office for National Statistics, 2021). Indeed, as of February 2022, six percent of PwD thought life had returned to normal compared to eleven percent of people without disabilities; sixteen percent of PwD believed that their lives would never return to normal, whereas this figure was ten percent for individuals without disabilities. Although we now have several vaccines that are both highly efficacious and safe (Krause et al., 2021) it is likely that nonpharmaceutical interventions and engagement with mitigation behavior is going to remain important in the future (SPI-M-O Chairs, 2021; Van Kerkhove, 2021). As a result, low-cost non-pharmaceutical interventions such as ensuring use of face coverings, with good ventilation, and physical distancing in indoor crowded locations, continue to be required, particularly amongst those who are especially vulnerable to morbidity and mortality.

Credit author statement

Tarandeep S. Kang: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration, Funding acquisition. Robin Goodwin: Methodology, Validation, Formal analysis, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no conflict of interest as authors, and that the funder played no part in the design of the study, writing or decision to publish.

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Appendix A. Supplementary data

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