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## Original Article

# The effects of COVID-19 restrictions on physical activity and mental health of children and young adults with physical and/or intellectual disabilities



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## ABSTRACT

**Background:** COVID-19 has caused unprecedented restrictions, significantly affecting the most vulnerable groups in society, such as those with a disability.

**Objective:** The aim of the study was to investigate the effects of COVID-19 lockdown restrictions on physical activity and mental health of children and young adults with physical and/or intellectual disabilities.

**Methods:** The study was a cross-sectional design. Parents/carers completed an electronic survey in the UK between June–July 2020 on behalf of their child. Through Likert scales and free-text questions, the survey asked about physical activity levels and mental health during lockdown compared to before, access to specialist facilities and equipment to aid with physical activity, and the short- and long-term concerns around ongoing lockdown restrictions.

**Results:** Generally, respondents reported negative effects of lockdown restrictions, with 61% reporting a reduction in physical activity levels and over 90% reporting a negative impact on mental health (including poorer behaviour, mood, fitness and social and learning regression). Many respondents cited a lack of access to specialist facilities, therapies and equipment as reasons for this, and raised concerns about the long-term effects of this lack of access on their child's mental health and physical activity levels.

**Conclusions:** The survey highlights the negative impact of the COVID-19 lockdown on the physical activity levels and mental health of children and young adults with disabilities and highlights the importance of addressing the needs of the disabled community as restrictions are eased.

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## Introduction

The emergence of the SARS-CoV-2 virus (COVID-19) has led to a worldwide pandemic,<sup>1</sup> which was declared a public health emergency on January 30, 2020. This unprecedented challenge led to global Governments enforcing restrictions to help abate the rate of infection,<sup>2</sup> such as limiting participation in normal daily activities, travel and access to many forms of exercise (e.g., gyms were closed, group gatherings were banned, and increased social distancing was

recommended).<sup>3</sup> In the UK, lockdown restrictions began on March 23, 2020, which prohibited people from leaving their home, with the exception of essential activities such as buying food, accessing healthcare and to take part in up to 60 min of outdoor exercise per day. However, despite this provision for physical activity, evidence suggests that people of all ages had significantly reduced levels of physical activity during the COVID-19 pandemic compared to before<sup>4</sup> with subsequent negative impacts on mental health and wellbeing.<sup>5</sup>

One community particularly vulnerable to the effects of COVID-19 restrictions is those with a physical and/or intellectual disability, where the impact of reduced physical activity opportunities and provisions is likely to profoundly affect physical activity and mental

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health.<sup>6</sup> In the UK, 11 million people have a registered disability, which is often accompanied by secondary diseases such as, coronary heart disease, diabetes and obesity,<sup>7</sup> but long-term moderate or high levels of physical activity have been associated with lowering the risk of these mortalities.<sup>8</sup> As such, the WHO recommends children and young people aged 5–17 years with a disability should accumulate at least 150 min of moderate to vigorous-intensity physical activity per week wherever possible. In addition, physical activity is known to be beneficial to our mental health, improving perceptions of competence, self-confidence and self-esteem, and may also serve to provide social support for people with a disability.<sup>9</sup> Whilst there is no definitive exercise recommendation for mental health in disability, the general message of 150 min per week, in line with physical activity recommendations, is supported by literature.<sup>9</sup> However, the school closures and isolation measures put in place to slow down the spread of COVID-19 in the UK may have adversely affected disabled children and young adults more than most in terms of being able to meet the physical activity requirements for optimal physical and mental health.

The imposed restrictions have prevented access to a wide range of exercise facilities (including gyms, swimming pools and play areas). Whilst this has presented problems for all those who would normally exercise within these facilities, several initiatives were introduced through social media and television to facilitate physical activity for children and adults at home.<sup>6,10</sup> However, for those with a disability, environmental barriers such as transportation, accessibility to sports facilities and cost<sup>11,12</sup> are known to inhibit the amount of exercise that these individuals participate in under normal circumstances, and these are likely to have been exacerbated during lockdown due to a lack of access to specialist equipment, facilities and therapies. Even before lockdown, 81% of people with a disability reported they would like to do more activity (in comparison to 57% of people without a disability), but only 40% feel they are given opportunities to do so.<sup>13</sup> Therefore, it is likely that the COVID-19 restrictions will have exacerbated both the environmental and personal barriers experienced by people with a disability, preventing them from taking part in physical activity. Indeed, a number of authors have already raised concerns about the impact of COVID-19 on the health and wellbeing of people with a disability as well as access to resources and funding<sup>14,15</sup> but the impact, as reported by those with a disability, is currently unknown.

This study aimed to investigate the perceptions of parents regarding their child's 1) level of physical activity and 2) mental health before, and three months into the lockdown restrictions to contain the COVID-19 pandemic. This is important to help inform decision-making to enable all those in the disabled community to engage in physical activity during the ongoing pandemic and in the future. Specifically, we hypothesised that both physical activity levels (in terms of time spent being physically active and the intensity of the activity engaged in) and mental and behavioural health would have significantly declined during the lockdown restrictions compared to before.

## Methods

### *Survey development and promotion*

The study followed a cross-sectional design. The anonymous online survey (Jisc online surveys, <https://www.onlinesurveys.ac.uk>) was assembled by a steering group of multidisciplinary scientists and reviewed by health service providers and parents of children with disabilities. It was opened on June 17, 2020 and closed on July 17, 2020. The link to the online survey was disseminated

through health service providers and charities throughout Gloucestershire, UK, as well as through social networks such as Facebook™, WhatsApp™ and Twitter™. The survey included 54 questions with Likert scales and free-text answers.

### *Data privacy and consent*

Parents/carers (respondents) voluntarily completed the anonymous survey on behalf of their child. For parents who had more than one child with a disability, separate surveys were completed for each child. Since some children would not have been able to provide an assessment of their physical activity and mental health, it was decided that respondents would be the parents/carers to allow children and young adults with intellectual disabilities and non-verbal communication to be represented in the study.<sup>16</sup> Parent reporting has previously been shown to demonstrate excellent agreement and concordance with child reported scores of activity levels in those with a disability.<sup>17</sup>

All respondents gave their electronic informed consent before being directed to the survey questions. The procedures were clearly explained, and respondents could stop the survey at any point before the submission process to avoid their data being stored. Responses were only stored if the respondents clicked the "submit" button at the end of the survey. Respondents were not permitted to provide their name or contact information. This research received ethical approval from the Research Ethics Committee at the University of Gloucestershire, in line with the principles of the Declaration of Helsinki.

### *Survey questions*

The electronic survey, to assess the effects of COVID-19 restrictions on physical activity and mental and behavioural health was created by adapting validated questionnaires (International Physical Activity Questionnaire Short Form; IPAQ-SF), Strength and Difficulties Questionnaire<sup>18</sup> and other COVID-19 surveys ("Coronavirus: Impact on young people with mental health needs", [youngminds.org](http://youngminds.org)). The survey was split into several sections: (a) demographics; (b) the impact of COVID-19 restrictions (c) physical activity levels before and during lockdown restrictions (d) access to physical activity during lockdown restrictions (e) the impact of access restrictions on mental health (f) the impact of lockdown on relationships and behaviour (g) short and long-term concerns about COVID-19. For items (e) and (f), the survey demonstrated high internal consistency for questions around the impact of access restrictions on mental health (Cronbach's alpha 0.83) and the impact of lockdown restrictions on relationships and behaviour (Cronbach's alpha 0.94).

The survey structure and specificity of questions were created to minimise recall bias. For example, respondents were asked to recall general events from a typical week before lockdown rather than a specific moment in time, which has been shown to improve recall ability.<sup>19</sup> Respondents were also asked to recall events from lockdown that happened in the last 7 days. This short time frame has also been shown to aid recall ability.<sup>19</sup> Finally, respondents had as much time as they wanted to complete the survey so were under no time pressure to recall events.<sup>19</sup>

### *Demographics*

Respondents were asked to provide the age, and primary diagnoses of their child using a free-text answer response and to record biological sex as a categorical answer ("male", "female", "other"). A categorical response ("yes", "no" or "not sure") was also recorded for whether each child had a physical and/or intellectual

impairment, which were then qualified in terms of their severity using Likert scales (ranging from “mild” to “severe or profound” for intellectual impairments and ranging from “non-ambulant” to “fully ambulant” for physical limitations, see [Appendix 1](#)).

### *The impact of COVID-19 restrictions*

Respondents were asked about the impact of lockdown on levels of physical activity and exercise compared to a typical week before the COVID-19 restrictions were introduced by stating whether their child’s activity was “much less”, “a bit less”, “no change”, “a bit more”, “a lot more” or “don’t know”. They were then provided with a definition of mental health (as “how we think, feel and act. Poor mental health can make it difficult to cope, you might feel sad and might not be able to control how you act”) before being asked to report on their child’s current mental health, by selecting: “very poor”, “poor”, “ok”, “good” or “very good”. A separate Goodness of Fit Chi-Square test was performed to assess differences between the reported categories for physical activity and mental health.

### *Physical activity*

The same 12 physical activity questions (adapted from the modified short-IPAQ) were used to ask about the period before lockdown and then during lockdown. Respondents were asked to select the number of days per week (1–7 or “does not apply”) that their child participated in at least 10 min of light/moderate and vigorous physical activity, and for how long each day (“less than 30 min”, “30–60 min”, “1–2 h”, “3–4 h” or “4 or more hours per day”). They were then asked to record the amount of time their child spent sitting on average per day (less than 2 h, 2–4 h, 4–6 h, 6–8 h, 8–10 h, more than 10 h).

Each physical activity item (time spent sitting per day, number of days per week and time spent doing light/moderate and vigorous activity) was compared before and during lockdown using a series of Wilcoxon tests. Total weekly physical activity ( $\text{MET} \cdot \text{min} \cdot \text{week}^{-1}$ ) was also estimated by multiplying the number of days vigorous or light/moderate physical activity was performed, by the time spent at this intensity and then by a MET value that was specific to each category of physical activity (8.0 for vigorous activity and 4.0 for light/moderate activity). As time spent and number of days were categorical variables, the mid-point of each category was taken to calculate the MET score. The difference in MET scores was also compared before and during lockdown using a Wilcoxon test.

### *Access to physical activity*

Access to physical activity was investigated across 7 items, which asked respondents what had prevented physical activity during lockdown, including which facilities and therapies they had missed most and the impact of this on their child. They were asked to note, with a free-text answer, whether they had found any new ways to keep their child active. Free-text answers were subjected to both manifest and latent content analysis<sup>20</sup> to identify, infer and quantify words presented within the free text answers.

### *Mental health, relationships and behaviour*

To understand the specific impact of restrictions on factors influencing mental health, respondents were asked about the impact of access restrictions (to school, outside space, play and exercise, specialist equipment/facilities, specialist therapies/classes; see Supplementary Materials) on their child’s mental health. In this first section, respondents were asked how the lockdown restrictions had affected their child’s mental health using a 6-point

scale (“much worse”, “bit worse”, “no change”, “bit better”, “much better”, “does not apply”).

In the subsequent section, respondents were asked how lockdown restrictions had affected their child’s relationships and behaviour. This second section contained 10 items (adapted from the Strength and Difficulties Questionnaire), which asked respondents to rate how confidence, social interactions, relationships, independence, behaviour and mood had been affected by the lockdown measures (compared to before) using a 6-point scale (“much worse”, “bit worse”, “no change”, “bit better”, “much better”, “does not apply”). For both of these sections, the scales were converted into scores. Minus scores were assigned to the scale points indicating a worsening (–2 for “much worse” and –1 for “bit worse”), zero was assigned to represent “no change”, and positive numbers were assigned to scale points indicating an improvement (1 for “bit better” and 2 for “much better”). Scores from each item were then averaged for each respondent to create an overall score for each of the two sections.

### *Sub-group analyses*

Respondents were also asked to rate whether lockdown restrictions had negatively (“yes”, “no”) or positively (“yes”, “no”) impacted their child. Based on this response, two sub-groups were created: those who reported seeing positive changes in their child during lockdown and those who reported negative changes. The groups were compared using a series of Mann-Whitney U tests to assess between-group differences in 1) the nature of the disability, 2) physical activity levels 3) the impact of access restrictions on mental health 4) relationships and behaviour. All statistical analyses were performed using SPSS Statistics 25.0 (IBM SPSS Statistics, New York, NY) with an alpha level of 0.05.

### *Short and long-term concerns about COVID-19*

The final questions of the survey, which allowed free-text answers, asked respondents to provide information about their short-term (next 3 months) and long-term (3–12 months) concerns around the restrictions, and what they felt could be done to improve physical activity and mental health for children and young adults with disabilities. Conventional content analysis was employed as an initial engagement with the free-text.<sup>21</sup> Free-text answers were downloaded to a large body of text, separated into the responses of each individual respondent. Words that are part of common grammar (for example “is”, “are”, “be” etc.) were subsequently removed from the text, as were words that were not contextually specific (for example “about”, “after”, “time” etc.) using a *wordfreq* command. Collectively, the individual responses were mined for salient words to be used as codes that could represent similar meaning but with different articulations, thus moving methodological focus from manifest to latent analysis. Inter-rater reliability was achieved through such codes being developed and agreed by the two leading authors.<sup>22</sup> Once completed, frequency distribution tables were used to tabulate, describe and summarise the properties of the codes generated. Frequency distribution of individual words and synonyms is one of the core most common forms of conventional content analysis.<sup>20</sup> The results are presented using Wordle (IBM), which creates a visual representation of text data in a word (data) cloud. Word frequency is used to establish different weightings, with larger fonts indicating higher frequencies of the word in the free-text answers.<sup>23</sup> This visually descriptive methodology allows the identification of the most dominant codes developed through the free-text answers.

## Results

A total of 125 respondents completed the survey, which was a response rate of approximately 31%. Three respondents provided incomplete surveys (data missing included free-text answers and behavioural health) so were excluded from the current study (see Table 1 for the breakdown of the demographic characteristics). It is important to note that some of the respondents recorded both physical activity and intellectual disabilities for their child.

### The negative impact of COVID-19 restrictions

The results of the survey showed that 61% of respondents had observed negative physical changes in their child since lockdown began in March 2020. Over half of the respondents reported that their child had done less physical activity during lockdown, compared to before, with only a small proportion showing no change or an improvement in the amount of exercise performed. A Chi-Square Goodness of Fit demonstrated a significant difference between expected and observed values ( $X^2 = 33.433, P < 0.001$ ). Over 90% of respondents also reported that their child’s mental health had declined over this period of lockdown with none reporting improvements in mental health. A Chi-Square Goodness of Fit demonstrated a significant difference between expected and observed values ( $X^2 = 82.691, P < 0.001$ ).

The greatest negative impact of the lockdown restrictions was a trend towards more negative behaviour. Respondents reported aggressive, self-harming and anxious behaviours as a result of lockdown, as well as low mood states, more sedentary behaviours and learning and social regression. There were also some reports of weight loss and muscle weakness as a result of lockdown restrictions (Fig. 1).

### Physical activity

MET values of vigorous intensity physical activity were 48% lower during lockdown than before ( $z = -4.334, P > 0.001$ ). Whilst the days where individuals did take part in vigorous intensity physical activity reduced from 2 days before lockdown to 0 days during lockdown (median values;  $z = -4.699, P < 0.001$ ), the

amount of time spent doing vigorous physical activity was not significantly different and remained at less than 30 min ( $z = -1.040, P = 0.073$ ). Additionally, MET values of light/moderate intensity physical activity were 38% lower during lockdown than before ( $z = -5.434, P > 0.001$ ). The days where the individuals took part in light/moderate intensity physical activity reduced significantly from 5 days before lockdown to 3 days during (median values;  $z = -3.979, P < 0.001$ ), but the amount of time spent doing physical activity at this intensity was not significantly different and remained at 30–60 min ( $z = -1.102, P = 0.070$ ). Unsurprisingly, reduced overall physical activity was accompanied by a significant increase in the number of hours spent sitting during lockdown, which went from 2 to 4 h per day (median values) before the restrictions to 4–6 h per day after ( $z = -5.650, P < 0.001$ ).

Most respondents cited a lack of access to facilities, activities and equipment as reasons for this reduction in physical activity (see Fig. 3 for a breakdown of some of the key facilities that were most missed). A smaller number reported reasons around weather, motivation, fear of going out and the restrictions themselves as reasons for the reduction in physical activity (Fig. 2).

### Mental health, relationships and behaviour

In line with the results of physical activity, the majority of responders also reported their child’s mental health was worse during lockdown. Specifically, 42% of respondents rated mental health as “much worse” during lockdown than before in relation to a lack of access to school, special facilities and classes, outdoor play and exercise and a further 23% rated it “a bit worse”.

Respondents additionally rated relationships and behaviour as being worse during lockdown than before (32% rated maintenance of previous friendships, overall independence, and overall mood, relationships and behaviour as being “much worse” during lockdown than before and 42% rated it a “bit worse” during lockdown than before). Since respondents were completing the survey on behalf of their child, they were also asked how confident they were that their answers represent their child’s current state of mental health and wellbeing. Of the responders, 96.4% were “very confident” or “somewhat confident”.

### Positive impacts

Although the majority of respondents reported negative impacts of lockdown, 18% reported that their child had done “much more” physical activity in the last 7 days compared to before, with 16% reporting positive physical changes and 7% reporting that their child had actually been more active during lockdown. Some of the new ways that some families had found to keep their child active included indoor and garden play, cycling, daily walks, more home-based physiotherapy, PE (Physical Education) with British Fitness Trainer and TV presenter Joe Wicks and other online exercise classes such as Karate. To assess differences in the nature of the disability, differences in physical activity levels, and differences in mental health, relationships and behaviour, between the group who reported positive changes in lockdown compared to the group who reported negative changes, a series of Mann-Whitney U tests were performed. The first test showed a significantly higher number of children and young adults with a physical disability were in the group who reported positive changes ( $z = 2.140, P = 0.032$ ). Second, when looking at those who had reported doing “a lot more” physical activity during lockdown, there were a significantly higher number of respondents in the group who reported positive changes ( $z = -5.780, P < 0.001$ ). They reported that light/moderate physical activity had increased from 1 day at less than 30 min per day, to 3 days at less than 30 min. In comparison,

**Table 1**  
Demographic characteristics ( $n = 125$ ).

Variables	Percentage
<b>Age (y)</b>	<b>12.3 ± 4.3</b>
<b>Sex</b>	
Male	<b>64.0%</b>
Female	<b>36.0%</b>
<b>Primary diagnosis</b>	
Autism spectrum disorder	41.0%
Downs syndrome	4.0%
Profound multiple learning disabilities	6.0%
Cerebral palsy	29.0%
Muscular Dystrophy	3.0%
Arthritis	2.0%
Other	14.0%
<b>Physical impairments</b>	<b>33.6%</b>
Non-ambulant, wheelchair users	28.6%
Semi-ambulant	47.6%
Fully ambulant	23.8%
<b>Intellectual impairments</b>	<b>76.0%</b>
Mild	2.1%
Moderate	28.4%
Severe	69.5%

<sup>a</sup> Other primary diagnoses included: Williams syndrome, Tuberous sclerosis Ehlers-Danlos syndrome, undiagnosed disorder, osteoporosis, attachment disorder, hypermobility syndrome, GRIN1-related neurodevelopmental disorder.



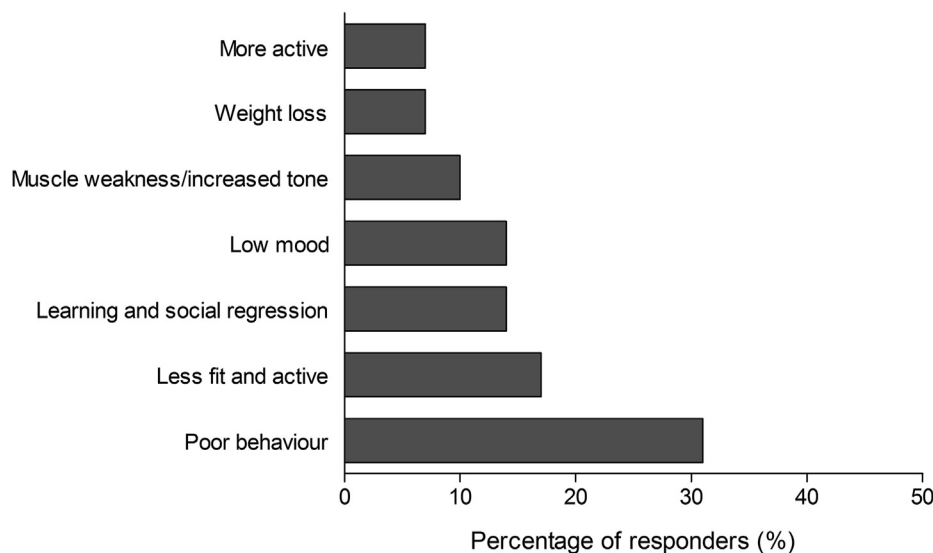


Fig. 1. The reported impacts of lockdown on children and young/adults with disabilities.

the group who reported negative changes during lockdown restrictions, had a decline in light/moderate physical activity from 6 days at 30–60 min per day, to 3 days at 30–60 min. Finally, there were no significant differences in the scores of mental health as a result of access restriction ( $z = -0.352, P = 0.725$ ) or the scores of the relationships and behaviours section ( $z = -0.350, P = 0.726$ ) between those who reported positive changes in lockdown compared to those who reported negative changes.

*Short- and long-term concerns*

Many of the respondents reported short- and long-term concerns around the impact of the lockdown restrictions (Fig. 4). A deterioration in learning, behaviour and fitness were the most frequently reported concerns of parents/carers.

The survey also asked respondents to comment on the things that would help their child maintain a good level of physical and

mental health over the coming months (Fig. 5). Suggestions were largely around access, including school, therapy, activities, facilities and respite for parents/carers.

**Discussion**

The global spread of the SARS-CoV-2 infection (COVID-19) led the UK Government to apply unprecedented measures restricting people to only leave their home for essential work/activities and outdoor exercise. As a result, a variety of specialist facilities were forced to close and there were restrictions on access to specialist activities or therapies, which those individuals with physical and intellectual disabilities heavily rely upon to support their physical activity needs.<sup>24</sup> This study is the first to our knowledge to investigate the effects of these restrictions on the physical activity and mental health of children and young adults with physical and/or intellectual disabilities.

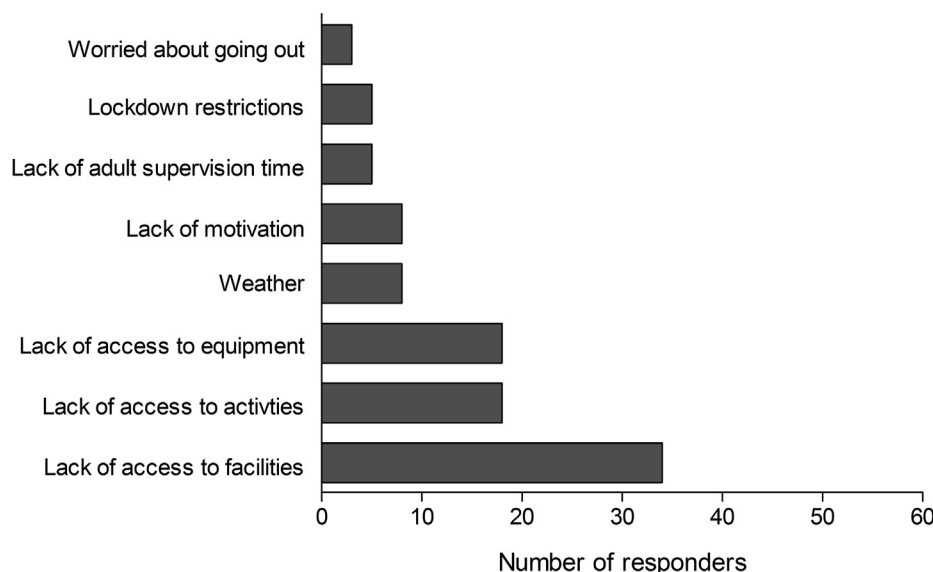


Fig. 2. The reasons for reduced physical activity during lockdown in children and young/adults with disabilities.

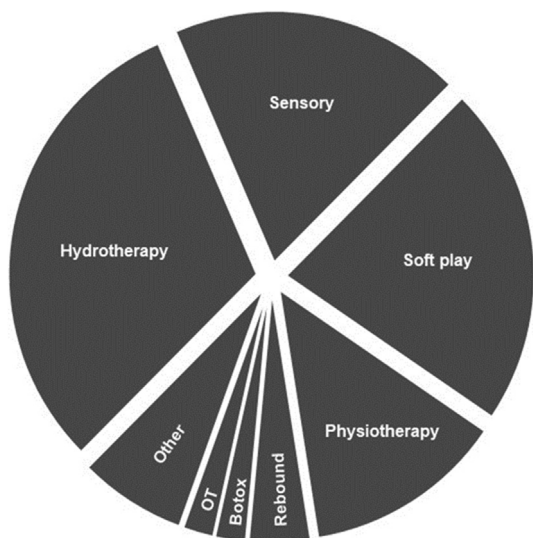


Fig. 3. The facilities, equipment and activities missed most by children and young adults with disabilities during lockdown. Other = Racerunning, Climbing.

The WHO recommends that those with a disability should practise at least 150 min per week of moderate-to-vigorous intensity physical activity where possible, or at least engage in regular physical activity according to their abilities and avoid inactivity. According to our data, only 65% achieved this recommendation. Moreover, whilst a small proportion of respondents reported an increase in physical activity, overall, the lockdown restrictions had a significant negative effect on both physical activity levels and mental and behavioural health, in line with our hypotheses. Specifically, we found an overall decrease in the number of days individuals took part in both light/moderate and vigorous activity, and an increase in sitting behaviour to 4–6 h per day, a threshold which has been suggested to increase disease and mortality risks.<sup>25</sup> To date, there have only been a small number of studies published in this area, but the current results are consistent with findings for adults<sup>5</sup> and children and young adults without a disability.<sup>26</sup> In the latter study, the proportion of children taking part in less than 30 min of physical activity per day had declined from 96% to 84% during lockdown, compared to a larger decline of 65%–35% in the current study. The authors also found that the proportion of children taking part in greater than 3 h of physical activity per week had declined from 10% to 6% compared to 3%–0% in the current study. Thus, overall, the effects appear to be relatively universal, but the decline in physical activity levels appear to be more pronounced in the current study with children and young adults with disabilities.



Fig. 4. A word cloud demonstrating the respondents short- (3 month) and long-term (6 month) concerns for their child (a total of 233 concerns were raised across 125 respondents: Deterioration (66), Fitness (55), Behaviour (42), Learning (21), Progress (18), Wellbeing (18), Motivation (15), Mental Health (10), Walking (6)).



Fig. 5. A word cloud demonstrating what respondents felt would help improve their child's physical activity and mental health over coming months (a total of 177 suggestions were given across 125 respondents: School (52), Therapy (48), Respite (29), Equipment (20), Activities (18), Routine (10)).

During lockdown, a variety of initiatives were created to increase physical activity levels in line with WHO recommendations such as PE with British Fitness Trainer and TV presenter Joe Wicks, and other online classes that could be done in the home (e.g., carrying/moving heavy loads or stair walking). However, the nature of these exercises did not take into account the extra support or requirements of those with an intellectual or physical disability. Indeed, respondents reported that access to specialist facilities and equipment had hindered physical activity levels. Given that there are already a variety of personal and environmental barriers to these individuals participating in physical activities,<sup>11,12</sup> the current findings highlight a need for research investigating ways in which physical activity can be made more accessible in the home. Whilst this is particularly important if further lockdown restrictions are put in place, it would also be beneficial under 'normal' circumstances.

Interestingly, a small number of respondents actually reported seeing "positive" changes in their child – and even an increase in physical activity levels during lockdown. However, our analysis showed that this sub-group were performing less light/moderate physical activity (once a week) before lockdown, compared to the whole group median (5 days a week), which then increased to 3 days per week during the lockdown restrictions. These respondents also reported spending more time playing in the garden and cycling, and some did report being able to take part in online fitness classes. Further research is needed to explore this finding in more depth to understand whether this increase may become more permanent once the global pandemic is contained.

It is significant to note that physical activity does not just benefit physical health, there is also a strong association between physical activity levels and mental health. In the general population, this link is incredibly important, but in those with a disability it is integral given that many of the conditions that these individuals have live with tend to have a negative impact on their mental health.<sup>9</sup> Overall, respondents reported a negative impact on the mental health of their child during (compared to before) the lockdown restrictions. Interestingly, even the subgroup of respondents who reported positive physical changes in their child during lockdown, namely engaging in more family and outdoor activities, also still reported mental health over the lockdown period to be "a bit worse". This is in line with other research during the pandemic, which showed a decrease in mental health. For example, 26.9% of parents reported a worsening of mental health in their child and 14.3% reported worsening in their children's behavioural health during the period of lockdown compared to before.<sup>27</sup> There are a number of reasons for a decline in mental health and an increase in

behavioural problems. First, the pandemic is likely to have been a stressful time for all not only in terms of the restrictions themselves, but also the worry of the pandemic. With our sample, the lack of access to facilities and specialist teams is likely to have also contributed to this negative impact on mental health not just in terms of the reduction in physical activity, but also not getting out of the home as much and reducing social contact. For example, it has been shown that social engagement with other individuals who are experiencing the same understanding of their disability enables a sense of emotional connectiveness with people,<sup>28</sup> that an individual may not get within just their family circle. Furthermore, it has been recognised that participating in physical activity with peers who share common attributes can be a rewarding experience that creates personal satisfaction,<sup>29</sup> good self-esteem,<sup>30</sup> a feeling of expertise<sup>31</sup> and a sense of belonging.<sup>32</sup> It warrants further investigation as to whether the mental health benefits of physical activity are correlated with social contact. Specifically, for children and young adults with disabilities, doing physical activity in isolation or with people who do not share the same attributes, caused by lockdown restrictions, may not be as beneficial to mental health as it is to physical health.

#### Limitations and further research

Whilst the current study investigated the immediate influence of the lockdown restrictions on physical activity and mental health, the long-term impact of the restrictions was beyond its scope, but this is an important area for further research. First, to explore whether lessons can be learned from the current findings with an emphasis on research into how more physical activity could be done in the home to enable more children and young people with disabilities to achieve the WHO's recommended physical activity levels. Second, to investigate the influence on these individuals as the restrictions ease and specialist facilities re-open.

A second key limitation of the current research was that the findings were based on perceived parental/carer report and not on independent observations. This was necessary to ensure the study encapsulated a wide range of physical and intellectual disabilities. Parents did report feeling "confident" that their answers reflected the mental health of their child and this has previously been shown to demonstrate excellent agreement and concordance with child reported scores of activity levels in those with a disability.<sup>17</sup>

A third key limitation of the current research is that the assessment of change in mental health and physical activity levels involved retrospective reporting from before lockdown and were therefore subject to recall bias. Whilst techniques to minimise the effects of recall bias were employed,<sup>19</sup> it could not be entirely avoided given the nature of the study. Notwithstanding these methodological limitations, the findings have some important implications for the development of intervention programmes to mitigate the negative impact of COVID-19 on children and young adults with disabilities.

The results presented in the current paper are expected to be generalizable to children and young adults with a physical and/or disability living in UK. Although this pandemic has been unprecedented in terms of infection rate and mortality<sup>33</sup>, results presented in this study could help with implementing adequate steps to tackle declining physical activity and mental health for children and young adults with a disability in future pandemic crises. However, the relatively large decline in physical activity and mental health due to restrictions, should be considered in light of the fact that in normal circumstances, many receive access to specialist facilities, treatments, and therapies that may not be available to those in other countries. Therefore, generalizing the results outside of the UK, requires first, a comparison of existing provisions for people

with disabilities in other countries. Second, global Governments have controlled the spread of COVID-19 in different ways, some less restrictive than others, and not every person with a disability in the world will have experienced COVID-19 restrictions in the same way. This further limits the generalisability of these findings to the UK.

#### Conclusion

Overall, this research has demonstrated the negative impact of the lockdown restrictions on the physical activity and mental health of those with physical and/or intellectual disabilities. Further research is needed to assess what support these individuals may need as these restrictions are eased. While the future remains uncertain, there is an opportunity to review the access and provision for people with a disability and challenge the inequalities that prevent many people with a disability from accessing physical activity under normal circumstances and, in particular, during the COVID-19 pandemic. This is needed to ensure the imposed restrictions do not have lasting consequences on physical activity and mental health for the disabled community.

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None.

#### Declaration of competing interest

The authors declare no conflict of interest.

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#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.dhjo.2021.101064>.

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