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Original Article

Impact of the COVID-19 pandemic on therapy service delivery and functioning for school-aged children with disabilities in the United States



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ABSTRACT

Background: The COVID-19 pandemic caused wide-scale disruptions to therapy services for children with disabilities in the United States.

Objective/Hypothesis: We evaluated changes in therapy service delivery during the first four months of the pandemic, examined the impact of these changes on children's functioning, and analyzed factors predicting the loss of in-person services and receipt of teletherapy services.

Methods: We undertook an anonymous cross-sectional online survey of parents/caregivers of children with a disability aged 5–17 years. Changes in therapy service delivery and children's functioning were descriptively summarized. Logistic regressions examined individual and contextual predictors of loss of therapy services or receipt of teletherapy services.

Results: 402 parents of children aged 5–17 years old with one or more disabilities participated; 42% of children lost access to all therapy services, and 34% of children received at least one therapy service via telehealth. Children receiving a greater number of services pre-COVID and having access to more technological devices pre-COVID were significantly more likely to receive teletherapy. Over 40% of parents attributed declines in their child's motor, behavior, social, and communication skills to changes in therapy services; this impact was greater for children with multiple diagnoses.

Conclusions: Findings underscore the negative impact of therapy service disruptions on children with disabilities.

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Rehabilitation services support children with motor and intellectual disabilities to gain new skills, improve functioning, and reduce the risk of preventable comorbidities.¹ Timely access to therapy services is essential to support children's development and well-being. This access was significantly impacted by the extensive mitigation measures declared by the World Health Organization on March 11, 2020, to slow the spread of COVID-19.^{2–6} Indeed, in the first four months of the pandemic (March to June 2020), therapy service disruption was reported worldwide.^{5,7–14} These disruptions included services provided through public schools,¹⁵ as schools in 48 states closed in the United States from March to June of 2020.¹³ The range of disruptions included a total lack of access to services,¹¹

a decrease in services,^{5,8–10,14} a switch to a telehealth model of service provision,^{16,17} and the need for parents to take over as primary therapy providers.⁷ In addition to the substantial impact on parental and caregiver mental health,^{18–21} the lack of (or decreased) access to therapy services negatively affected the physical and mental health^{7,9,20,22–26} and behavior^{21–23} of children with disabilities.

To provide therapy services during the early months of pandemic lockdowns, many therapy services shifted from in-person to telehealth models of care. Telehealth is defined as a remote clinical intervention provided to patients or families asynchronously or in real time.²⁷ Despite strong evidence supporting its efficacy,¹⁷ telehealth service delivery was not a common pre-pandemic pediatric rehabilitation model. The potential advantages of telehealth models include reducing geographical barriers to care,^{17,28} increasing comfort for children participating in therapy in familiar settings and within their daily routines,²⁹ enhancing

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caregiver engagement and role recognition,¹⁶ and reducing health care costs.²⁹ A telehealth model also enables the integration of online therapeutic games or applications that may motivate children to participate in longer durations of therapy and that can be undertaken asynchronously and monitored remotely by therapists.¹⁶ Internationally, the number of therapists involved in telehealth increased from 4% pre-pandemic to 70% during the pandemic.¹⁷ In the United States, between 56 and 72% of families of a child with a disability reported access to telehealth services during the pandemic.^{5,8} However, the abruptness of the switch to telehealth service delivery, combined with therapist inexperience in this model of care, led to a significant burden on families to provide therapeutic activity for their children.^{6,18} Reported parental satisfaction with telehealth services was low.¹⁹ Socioeconomic disparities in access to telehealth services were evident worldwide, including inequities in equipment availability, internet access, technical support, and technological literacy.^{6,15,17,29,30}

In the 18 months since its onset, the impact of therapy disruptions on children with disabilities during the pandemic's early months have been well-documented.^{3–17} Yet the potential links between individual or environmental factors and access to services between March and July of 2020 remain unexplored. Many individual and environmental factors may have influenced access to therapy during the pandemic's early months, including age, disability severity, therapeutic goals, availability of technological devices,²⁹ and whether therapy services were previously received through school or outside of school.⁵ In addition, little is known about the potential differential impact of therapy service disruption on children's functioning in different domains, including endurance, mobility, gross motor skills, fine motor skills, communication skills, and behavior. The impact of service disruptions on children's functioning may be more significant for children with multiple diagnoses or severe disabilities due to their increased vulnerability to skill regression.¹ Finally, in the United States, systemic racial and ethnic health disparities may have led to a disproportionate impact on rehabilitation services for Black, Latinx and Native American populations as compared to White Americans.³¹

This study aimed to contribute to the body of knowledge about the impact of the COVID-19 pandemic on children with disabilities and their families in the United States by: (1) describing changes in therapy service delivery in the first 4 months of the pandemic (March–June 2020); (2) identifying factors predicting the loss of in-person services and receipt of teletherapy services; and (3) describing the impact of therapy service changes on children's functioning.

Methods

This study employed a cross-sectional survey for parents/caregivers of school-aged children and youth (5–17 years old) with physical or developmental disabilities receiving therapy services and living in the United States. Survey data were collected and managed using REDCap, a secure online software platform.³² Survey questions were divided into four sections as follows (full text of select survey questions representing different question types are provided in the Appendix):

1) **Demographics.** Caregivers answered demographic questions about their child, including medical diagnoses, school setting, associated difficulties, age, race/ethnicity, mobility, and primary communication modality. Caregivers indicated their child's medical diagnoses by selecting from a list of 12 common disabilities in children and were prompted to write in any other

medical diagnoses not included on the list. Caregivers also checked applicable areas of difficulty associated with their child's disability/disabilities (e.g., feeding problems, speech disorder, vision impairment) from a list of eight choices with an option to list additional areas of difficulty. Mobility was rated on a 5-level scale based on the Gross Motor Function Classification System (GMFCS).³³ Caregivers indicated their child's primary communication modality as speaking, gestures/eye gaze, sign language, augmentative-alternative communication device, or other.

- 2) **Therapy services pre-COVID and during COVID.** We focused on physical therapy (PT), occupational therapy (OT), speech therapy (SLP), and behavioral therapy (BEH) services. Caregivers were asked parallel sets of questions about their child's therapies before COVID and during the first 4 months of the pandemic that overlapped with the end of the 2020 school year in the United States (March–June 2020). For each time point, parents selected the therapies (i.e., PT, OT, SLT, Behavior, Other) that their child received. Branching questions asked parents to select the location(s), frequency, and format of each therapy. If a child received a therapy service in multiple locations (e.g., PT in school and in a private clinic), the frequency and format of therapy at each location were collected. Caregivers who indicated their child was receiving any therapy via telehealth during the pandemic were prompted to answer subsequent questions about their perspectives on teletherapy for each therapy service received in this modality. Because of the survey's length, we limited the in-depth questions about therapy service changes to OT, PT, SLT, and behavior therapy in order to reduce the time burden on participants.
- 3) **Use of devices pre-COVID and during COVID.** Caregivers were also asked parallel sets of questions about their child's use of technological devices and given examples of the types of devices of interest (i.e., computer, iPad/tablet, video gaming consoles, virtual reality headsets, smartphone, e-reader, TV, or other devices) for therapy, educational, and social/recreational purposes pre-pandemic and during the pandemic.
- 4) **Impact on functioning.** Caregivers were asked, "How have changes in therapy service delivery during the COVID-19 pandemic impacted your child's functioning?" and "How have changes in access to opportunities, settings and/or equipment during the COVID pandemic impacted your child's functioning?". For both questions, parents rated impact on a 5-point scale (i.e., 1 = significant decline, 2 = some decline, 3 = no impact, 4 = some improvement, 5 = significant improvement) for seven functional domains: endurance, mobility, gross motor skills, fine motor skills, communication skills, and behavior.

The survey included 938 possible multiple choice and open-ended questions, nested so that participants only answered questions relevant to previous responses. Prior to its distribution, the survey was pilot tested with 5 parents of children with disabilities to determine feasibility and gather feedback on question wording from stakeholders. The survey was approved by the Northeastern University IRB (#20-05-16). The survey took approximately 30 minutes to complete, and participants were given the option of entering a raffle for a \$100 gift card as compensation. Survey questions were designed for caregivers to provide information about only one child with a disability; however, they were able to complete the survey a second time for another child if desired. Participant responses to open-ended questions and findings related to perceptions of teletherapy and device use, as well as additional questions about device use, will be reported in subsequent publications.

Recruitment and sampling

The survey was promoted nationally through ads posted on social media platforms and other websites of interest to the target audience. Recruitment ads specifically targeted parents or caregivers of children with disabilities who were receiving therapy services. For example, we undertook multiple paid Facebook campaigns using optimization metrics to display video and static ads to those likely to have children meeting our inclusion criteria (e.g., people who “liked” major national children’s hospitals and/or disability-focused organizations). In addition, representatives from relevant community and rehabilitation groups and from researchers’ networks were contacted by email and invited to share the survey link with interested parties, using snowball sampling. The survey was available online for 6 weeks in June–July 2020.

Statistical analyses

Descriptive statistics were used to summarize changes in the number of children receiving each therapy service in either in-person or teletherapy format pre-COVID and during March–June 2020, as well as to summarize caregiver ratings of teletherapy effectiveness.

For participants whose children received at least one therapy prior to the pandemic, we used a multiple logistic regression approach to identify child, family, and demographic factors predicting therapy service access during the pandemic. Two sets of logistic regression models were conducted with outcome variables of loss of all therapy services and receipt of teletherapy services, respectively. For each outcome variable, we began with a full model containing eight predictor variables representing different constructs theoretically related to the likelihood of therapy receipt during the pandemic: age, number of diagnoses, race, number of different therapy services received pre-COVID (i.e., PT, OT, SLT, Behavior, and/or Other therapy; maximum of 5), mobility status, primary communication modality (verbal vs nonverbal), whether pre-COVID therapy was received outside of school, and the number of devices to which the child had access pre-COVID.

To describe the impact of therapy service changes on children’s functioning, caregiver responses were descriptively summarized for each of the seven functional domains. Because children with multiple diagnoses are likely to be particularly vulnerable to disruptions in therapy services,¹ Wilcoxon rank-sum tests were conducted to compare reported functional changes between children with multiple diagnoses and those with a single diagnosis.

Results

Participants

Of 678 parents/caregivers who consented to take the survey, 402 (59%) completed the demographics and therapy services sections, and 318 (47%) completed the entire survey. [Table 1](#) summarizes participant demographics. Participants were from 48 states. Children had an average of 2.1 (SD 1.7) diagnoses and were receiving an average of 1.7 (SD 1.2) different therapy services prepandemic. “Other” therapies reported by parents, but not analyzed, included music therapy, hippotherapy, and psychological counseling. Three-hundred two (75%) children reportedly attended public school in spring 2020; others attended special education schools (33, 8.2%), charter schools (22, 5.5%), private schools 19, (4.7%), were homeschooled (13, 3.2%) or other school settings (13, 3.2%). Participants reported an average of 2.1 (SD 1.7) associated difficulties; for example, 307 (76%) reported speech or language disorder, 94 (23.4%) reported intellectual disability, 77

(19.5%) reported vision impairment, and 34 (8.4%) reported hearing impairment.

Changes in therapy service delivery

Of the 402 participants, 343 children received at least one therapy service prior to the pandemic (PT = 118, OT = 195, SLT = 246, BEH = 97). The 59 children who were not receiving at least one therapy service prior to the pandemic were excluded from subsequent analyses. [Fig. 1](#) summarizes changes in access to and mode of therapy services during the first four months of the pandemic. There was a 65% decrease in the number of children receiving PT, a 58% decrease in OT, a 47% decrease in SLT, and a 55% decrease in BEH. Forty-two percent of children lost access to all therapy services at some point during the first four months of the pandemic. Thirty-four percent of children received at least one therapy service via telehealth (PT = 18%, OT = 25%, SLT = 32%, BEH = 26%).

Factors predicting loss of in-person services and receipt of teletherapy services

Multiple logistic regression models were based on the 343 participants whose child received at least one therapy service pre-COVID. The first analysis examined predictors of losing all therapy services. In the full model, including all eight child, family, and demographic variables, none of the variables significantly predicted the loss of all therapy services. Mobility status approached significance (odds ratio (OR) 1.24, 95% confidence interval (CI) 0.98–1.58, $p = .07$) and might warrant future investigation.

The second analysis examined predictors of children’s receipt of therapy services. In this analysis with the full eight-variable model, two variables emerged as significant predictors of receiving teletherapy controlling for the other factors: the number of therapies the child received pre-COVID ($p = .001$) and the number of devices the child had access to pre-COVID ($p = .004$). In a reduced model containing only these two variables, both remained significant independent predictors of receiving teletherapy: the number of therapies the child received pre-COVID (OR 1.57, 95% CI 1.23–1.98, $p < .001$) and the number of devices available to the child pre-COVID (OR 1.24, 95% CI 1.06–1.45, $p = .007$). These findings indicate that for each additional therapy type children were receiving pre-COVID, they were 57% more likely to receive teletherapy during the pandemic. For each additional device children had access to pre-COVID, they were 24% more likely to receive teletherapy during the pandemic.

Impact of therapy service changes on children’s functioning

Of 343 participants whose children were receiving at least one therapy pre-COVID, 271 completed the two survey questions regarding how COVID-related changes in (1) therapy service delivery and (2) changes in access to opportunities, settings, or equipment impacted their child’s functioning. [Fig. 2](#) shows descriptive results. In response to the first question, over half of participants reported “some” or “significant” decline in their child’s functioning due to changes in their child’s therapy services in four out of seven domains: endurance (53%), communication skills (52%), social skills (62%), and behavior (57%). Similarly, in response to the second question, over half of participants reported “some” or “significant” decline in their child’s functioning in 3 out of 7 domains due to changes in their child’s access to opportunities, settings or equipment: communication skills (53%), social skills (64%), and behavior (57%).

Results of Wilcoxon rank-sum tests ([Table 2](#)) showed that parents/guardians of children with multiple diagnoses reported significantly greater declines in their child’s functioning due to

Table 1
Demographic characteristics of participants.

Characteristics		N	%
Gender	Female	135	33.58
	Male	267	66.42
Age	5–9	229	56.97
	10–13	104	25.87
	14–17	69	17.16
Race	Asian/Pacific Islander	6	1.49
	Black	45	11.19
	Latino	40	9.95
	Multiple	51	12.69
	Other	15	3.73
	White	245	60.95
Ethnicity	Latino	67	16.67
	Non-Latino	335	83.33
Diagnosis	Attention Deficit Disorder	148	36.82
	Autism Spectrum Disorder	124	30.85
	Cerebral Palsy Stroke	63	15.67
	Developmental Coordination Disorder	29	7.21
	Developmental Delay	144	35.82
	Down Syndrome Other Genetic Disorder	63	15.67
	Other Diagnosis	91	22.64
	Mobility Status	Ambulatory	369
	Nonambulatory	33	8.21
Primary Communication Mode	Verbal	348	86.57
	Nonverbal	54	13.43
Region	Northeast	141	35.07
	Midwest	85	21.14
	South	102	25.37
	West	74	18.41
Number of Diagnoses	1	125	31.09
	2+	277	68.91
Number of children receiving therapy outside of school prepandemic	Yes	187	46.52
	No	215	53.48
Number of devices available at home prepandemic	1	66	16.42
	2–4	252	62.69
	5+	84	20.9

changes in therapy service in all domains except communication, compared to parents of children with one diagnosis. Parents of children with multiple diagnoses also reported significantly greater declines in their child’s functioning in all domains due to changes in their child’s access to opportunities, settings, or equipment.

Discussion

This study explored pandemic-related changes in therapy service delivery and the resulting functional impacts for school-aged children with disabilities in the United States. There were three main

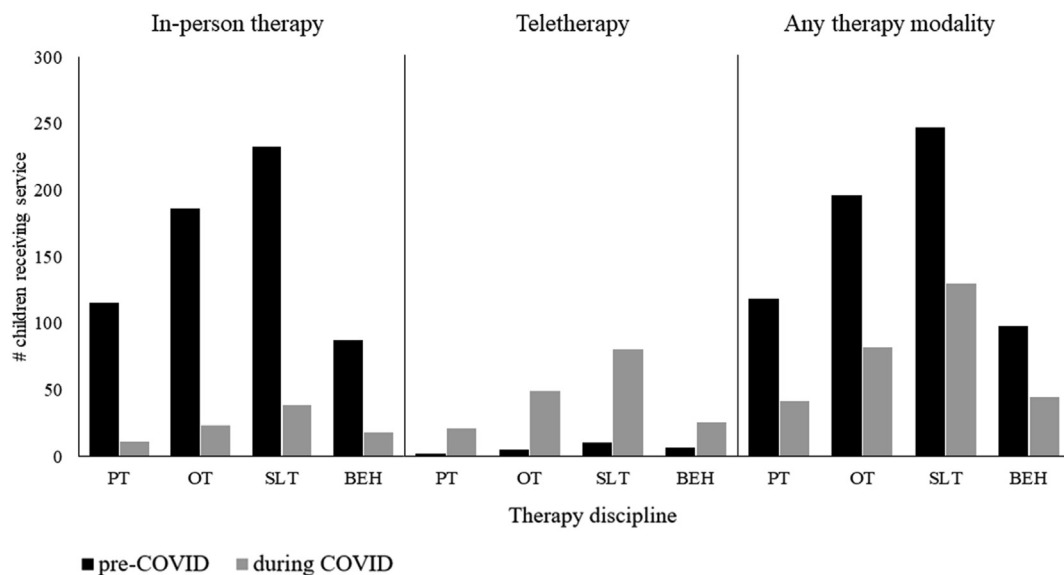


Fig. 1. For each therapy discipline, change in the number of children receiving in-person therapy services (left), receiving teletherapy services (center), and receiving therapy services in any modality (right) from pre-COVID to during the first four months of the pandemic in the US. (PT = physical therapy, OT = occupational therapy, SLT = speech-language therapy, BEH = behavioral therapy).

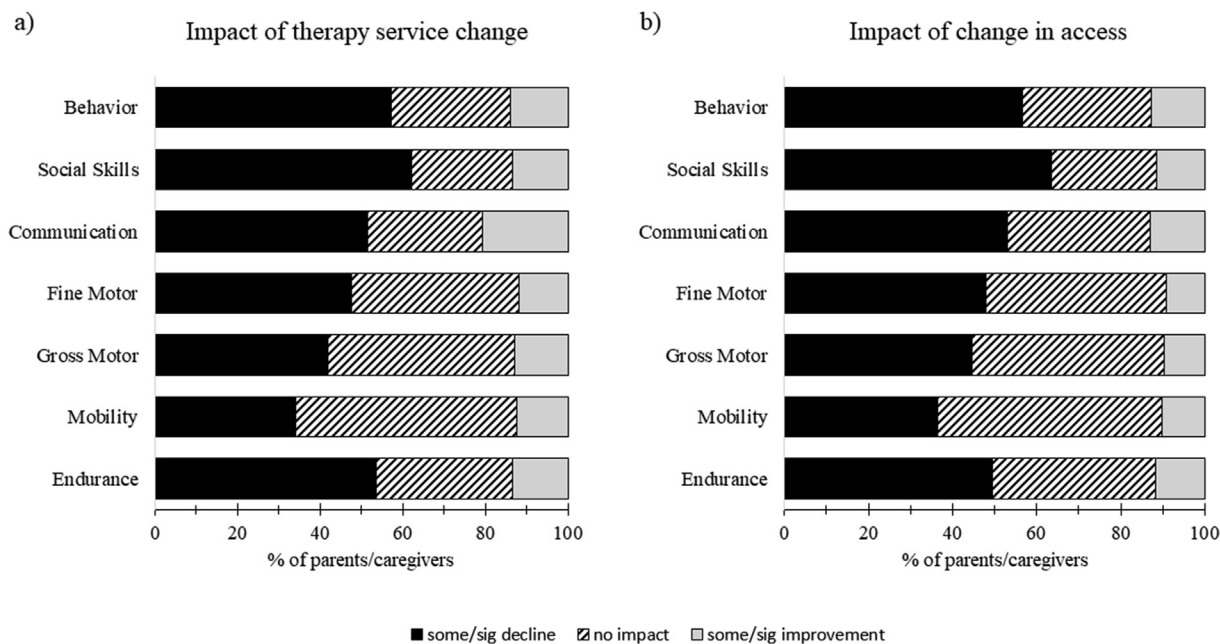


Fig. 2. Parent-reported changes in children's functioning across seven domains in response to questions: (a) "How have changes in THERAPY SERVICE DELIVERY during the COVID-19 pandemic impacted your child's functioning in the following areas?" and (b) "How have changes in ACCESS to opportunities, settings and/or equipment (e.g. stander is only available at school) during the COVID-19 pandemic impacted your child's functioning in the following areas?"

findings: (1) Children experienced a dramatic loss of therapy services; (2) Teletherapy service delivery increased substantially yet was only received by a small proportion of children; and (3) While changes in access to therapy services, opportunities and equipment led to declines in children's functioning across many domains, the impact was greatest for children with multiple diagnoses.

Our results showed that, in the early months of the pandemic, the greatest proportion of service loss was for PT (for 65% of children), although rates for loss of OT, SLT, and BEH services were also high, impacting about half of the children studied. Importantly, 42% of children lost access to all therapy services. These findings align with and surpass rates of service loss or disruption in other studies with smaller sample sizes, including Murphy et al.,⁵ who reported that 27–35% of children with disabilities lost PT, OT, or BEH services, and Sutter et al.¹¹ who reported a 36% decline in the number of children receiving any therapy. Interestingly, there was no clear relationship between the loss of all therapy services and any of the demographic or environmental factors examined. It is possible that geographic factors, such as differences in state regulations on service provision, may have had a greater influence on the loss of all therapy services.

Consistent with prior literature,^{5,16,17} results demonstrated a substantial shift from in-person therapy to teletherapy services

during the pandemic. Results showed up to 10-fold increases in the number of children receiving teletherapy across disciplines; however, only one-third of study participants received teletherapy. Children who received more types of therapy and had home-based access to more devices (such as computers, smartphones, and tablets) pre-COVID were significantly more likely to receive teletherapy services during the early months of the pandemic. These findings may suggest that children who are more severely involved and required multidisciplinary therapy were more likely to receive teletherapy. Murphy et al.⁵ found that access to telehealth was significantly associated with service delivery location; specifically, families receiving school-based services reported less access to telehealth as compared to those who received services in other settings. Indeed, our findings add to the knowledge base about the relationship between telehealth accessibility and demographic factors.^{17,29} There is an urgent need to promote accessible and equitable telehealth.³⁰ Future research should explore the barriers to telehealth that may be specific to children with disabilities, for example, the need for adaptations and accommodations in technology access, as well as targeted support for parents' educational needs.^{5,34}

Results of this study also highlight the substantial impact of therapy service disruptions on the functioning of children with

Table 2

Results of Wilcoxon rank-sum tests comparing parent/caregiver reported functional changes in children with multiple diagnoses and those with one diagnosis due to (a) changes in therapy service delivery (left) and (b) changes in access to opportunities, settings, and/or equipment (right).

Functional Domain	Impact of therapy service delivery changes					Impact of change in access to opportunities, settings and/or equipment				
	Multiple Dx (Mdn)	One dx (Mdn)	W	p	r	Multiple Dx (Mdn)	One dx (Mdn)	W	p	r
Endurance	2	3	5165.5	<.001	-0.26	2	3	6055	0.02	-0.15
Mobility	3	3	6033.5	0.03	-0.14	3	3	6137	0.02	-0.15
gross motor skills	2	3	6342	0.02	-0.15	2	3	5996	0.002	-0.19
fine motor skills	3	3	5788	<.001	-0.24	2	3	6512	0.02	-0.15
social skills	2	2	6703	<.001	-0.20	2	2	7012	0.007	-0.16
communication skills	2	3	7713	0.14	-0.09	2	3	7274	0.04	-0.13
behavior	2	3	6966.5	0.02	-0.15	2	2	7012	0.03	-0.13

disabilities. Almost half of the caregivers reported declines in their child's functioning across all domains. These declines were amplified for children with multiple diagnoses compared to children with only one medical diagnosis. The cumulative effects of multiple challenges may make children with multiple diagnoses more dependent on therapy services for maintaining or improving function and therefore less resilient and more vulnerable in the face of therapy loss. Their greater care needs may also leave parents with less time to take over the roles of therapists. Children with multiple diagnoses may depend on therapeutic equipment for functioning that is not always available in the home setting. They may also have a more challenging time participating in telehealth and have therapy goals that require the "hands-on" interventions less amenable to this mode of service delivery.

Communication was the only domain for which parents of children with multiple diagnoses did not report greater functional declines resulting from therapy services changes compared to parents of children with one diagnosis. This may partially be because fewer children lost access to speech-language services than other therapies. It may also suggest that SLT, which generally involves minimal hands-on support, is a more natural fit for telehealth service delivery than other disciplines. Parents may also be better able to support children's communication skills in the home environment, compared to other functional skills that may be more dependent on other environments (e.g., social skills are impacted by lack of access to peers; gross motor, mobility, or endurance skills are impacted by lack of access to suitable physical environments). Indeed, we know the sedentary time and screen time have increased for typically developing children and adolescents during the pandemic.³⁵ We did not ask parents to distinguish between the potential impact of increased sedentary time as compared to loss of services or decreased participation opportunities on children's functioning. Regardless of contributing factors, it is clear that maximizing participation opportunities for children with disabilities in a pandemic context can require significant planning and resources. For example, Anaby et al.³⁶ described how they adapted participation options to pandemic restrictions through a mix of virtual activities and community activities that enabled social distancing.³⁶

This study had several strengths and limitations. In comparison to other datasets evaluating the impact of the pandemic on children with disabilities in the United States, our survey asked parents to consider the impact of therapy service loss on a more comprehensive range of functional domains and explored factors predicting the loss of therapy services and receipt of teletherapy services. Our sample was larger than prior published US surveys^{5,37}; however, it was limited to English-speaking families, and there was uneven geographic representation across the country, with more participants coming from the Northeast than other regions. As we focused on children aged 5 and older, we missed the opportunity to understand the impact of service delivery disruptions on preschool-aged children. We also did not specifically ask about home rehabilitation programs that may have been provided by therapists to maintain continuity in activities in the absence of traditional interventions.³⁸ We did not evaluate the psychometric properties of our survey, nor did we include standardized measures of changes in functioning. Finally, our survey only covered the initial months of the pandemic. Additional effects of loss or disruption of therapy services may be more apparent to parents at a longer time scale.²⁸

Conclusion

In conclusion, the findings of this study demonstrate that school-aged children with disabilities in the US experienced a

dramatic loss of in-person therapy services with resulting declines in functioning early in the COVID-19 pandemic. Teletherapy access was relatively low overall and was more likely to be received by children who received multiple therapies and had greater home access to devices pre-pandemic. Parents reported greater functional declines in children with multiple diagnoses, highlighting the vulnerability of these children and reinforcing the need for more research focused on supporting these children via telehealth and helping them to regain functional losses as the pandemic recedes. Guiding principles for therapists engaging in digital practice have been proposed by the World Confederation of Physical Therapy.³⁹ These can be supplemented by greater understanding about how to deliver family-centered telehealth to meet children's needs, as these factors are known to support children's skill progression.⁴⁰ Innovative approaches to telehealth service delivery arising from the pandemic offer promising possibilities in this regard.⁴¹ Even after the major effects of the COVID-19 pandemic are behind us, telehealth will likely remain a predominant service delivery model.⁴² Study findings will inform efforts to understand how to increase effectiveness and accessibility of teletherapy and advocate for services to mitigate the impact of pandemic-related service loss on the vulnerable population of children with disabilities.

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Conflicts of interest

The authors have no financial or personal interests that might be perceived as posing a conflict or bias. This work has not been previously published or presented.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.dhjo.2021.101266>.

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