

Facilitators and Barriers for Telerehabilitation in Children and Adolescents with and without Impairment - A Scoping Review

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ABSTRACT

With the means of telerehabilitation, evaluation, diagnosis, and treatment of patients in faraway places has become easier with the use of telecommunications networks. Telerehabilitation is a sub-branch of telemedicine which includes remote management and rehabilitation using new telecommunication network. We Identified studies published between 2015 to 2023 for the scoping review. Databases selected were PubMed, Embase, Web of Science, Science Direct and Scopus. The data was extracted from the selected articles and was presented in Microsoft excel. Several benefits of telerehabilitation were reported such as increased accessibility to the services available, with increased flexibility in scheduling. It was also found to be cost effective, along with reducing the commute time to almost zero. Conversely, limitations to telerehabilitation that came to light were that access to internet and device access was not as attainable was thought, along with few cultural considerations.

Keywords: “Telerehabilitation” or “Telemedicine” or “Telehealth” & Children or “Adolescents” or “School going Children”

INTRODUCTION

Healthcare professionals no longer need to be present because networks have made it possible to deliver essential health services from a distance in recent years thanks to telecommunication. (Asma Alonazi, 2021). US Department of Health and Human Services define Telehealth as “the use of electronic information and telecommunication technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration”. The definition consists of a variety of media such as text messages, telephone or video conferencing, the delivery of which can be either in real time i.e. synchronous or store and forward

manner i.e. asynchronous means (Tal Krasovsky et al., 2021).

With the means of telerehabilitation, evaluation, diagnosis, and treatment of patients in faraway places has become easier with the use of telecommunications networks. Telerehabilitation is a sub-branch of telemedicine which includes remote management and rehabilitation using new telecommunication network. Treatment of neurological, cardiorespiratory, and musculoskeletal dysfunctions is known to be possible and can facilitate better recovery of these issues irrespective of the geographic location (Noll et al., 2016) The delivery of therapeutic services via telerehabilitation is furthermore made possible b

y internet-based programs. (Sara Benham et al., 2017).

The evidence suggests that telerehabilitation can be similar or more effective than the traditional techniques of rehabilitation for treatment of musculoskeletal conditions. Telerehabilitation helps to reduction of pain and improvement in the Physical Function. Additionally, telerehabilitation can also enhance quality of life in osteoarthritis of the knee, low-back pain and total joint replacement of hip as well as the knee (Minghelli B, 2021).

There are about 240 million children around the world living with disability (UNICEF 2022). Many of these are developmental disabilities such that they affect the children's daily living, participation, and hamper their quality of life too. Thus, requiring appropriate and comprehensive rehabilitation so as to improve their involvement in the society and get the most out of what the world has to offer (Tatiana Ogourtsova, 2023)

It was observed that during the years of 2020 and 2021, in regards with children the most noticeable impacts were the shift of education being from face-to-face classroom based on remote learning. Thus, it also became particularly important for therapists to inculcate telehealth and telerehabilitation as a means of treatment delivery (Ted Brown et al., 2022)

Likewise, there has been a tremendous surge in the adoption of telerehabilitation, with the number of professionals utilizing it rising from just 4% before the COVID-19 outbreak to almost 75% at present. The increased utilization of telerehabilitation in the field of pediatric healthcare should be regarded as a chance to enhance the available service choices. (Tatiana Ogourtsova et al., 2022).

According to research reports, telerehabilitation is an emerging feat of the current times and the regimes of the therapy are conveniently transferred to the comforts of home setting (Daniela Sarti et al., 2021). It has been suggested that telerehabilitation may be an effective way to

overcome challenges in providing healthcare. (Kelly Tanner et al., 2020).

Telehealth has been reported to be in us in the field of medicine since the 1950s and has been beneficial with several positive results. Especially for individuals living in rural areas, with longer commutes to the clinic and hospital, and immunocompromised individuals prone to acquire community infections easily.

However, along with these pros it's necessary to consider the barriers to pediatric telerehabilitation as well which appear in the form of willingness to participate in telerehabilitation, adherence to a programme, and appropriate use of technology to gain access to telerehabilitation.

MATERIALS & METHODS

1. Research Question

a) What are the Facilitators and Barriers for Telerehabilitation in Children and Adolescents with and without Impairment

2. Search Strategy:

We Identified studies published between 2015 to 2023 for the scoping review. Databases selected were PubMed, Embase, Web of Science, Science Direct and Scopus. The target population of this scoping review was children and adolescents with and without impairment. The keywords for this topic were broadened to school going children and adolescents. Similarly, Telerehabilitation.

The keyword was expanded to Telemedicine, Telehealth or Mobile Health. The Medical Subject Headings for key words were analyzed carefully by reviewers. The final keywords used in this review were "Telerehabilitation" or "Telemedicine" or "Telehealth" or "Mobile Health" with respect to Telerehabilitation. With respect to Children; the Keywords used were "Adolescents" or "School going Children"

The inclusion criterion was full text articles written in English and identified from peer reviewed journals. The studies that involved intervention via videoconferencing or internet were selected. The data was extracted from the selected articles and was presented in Microsoft excel. The information compiled was Author,

Publication Year, Study Design, Intervention, Type of digital technology, Results and Discussion.

RESULT

The charted data was then presented in accordance with stated research question.

Table 1: Key attributes of the studies incorporated in Scoping Review

Author, Year	Country	Study Design	Intervention
Sara Benham et al., 2017	Philadelphia, USA	Mixed method case report	Using Timocco programme, a motion capturing internet based software
Daniela Sarti et al., 2021	Milan, Italy	Online Survey	Two questionnaires administered to assess the well-being of children (SLD, CP, Normotypical) participating which were classified into three groups (Telerehabilitation, No Telerehabilitation, Normotypical Control). Questionnaires being, CIT for children and SPANE
Ted Brown et al., 2022	Australia	Observational Study	Telehealth, tele- early interventional, school based telerehabilitation
Tal Krasovsky et al., 2021	Israel	Survey	CETS, a custom-built feedback questionnaire on telerehabilitation for clinicians, and parents completed the client version of the TPI-C following sessions.
Kelly Tanner et al., 2020	Ohio, USA	Interventional Study, Telerehabilitation Sessions	Telerehabilitation services were implemented and 11 item Likert scale patient satisfaction survey was used, while during the covid 19 pandemic, post telerehabilitation visit completion, clinicians sent an 8 item, Likert scale REDCap survey to the patient/ caregiver through secured electronic means to be filled.
Peder Bilde et al., 2011	Copenhagen, Denmark	Interventional study	Home based training program delivered through the internet for 20 weeks to 9 children with cerebral palsy (aged 9 to 13 years) . Evaluation of motor, cognitive and perceptual abilities done before and after receiving treatment was carried out.
Rachel Bican et al., 2021	Ohio, USA	Interventional study	Telerehabilitation sessions were provided and a survey questionnaire with 20 questions which consisted of questions under three heads that are technology, clinical care quality and caregiver involvement was circulated amongst therapists via REDCap tools.
Jamie Hall et al., 2021	USA	Survey Study	Paediatric physical therapists were asked to answer three open ended questions and one multipart Likert scale question which was to be filled anonymously. Responses were collected and analysed.
Agnieszka Sobierajska-Rek et al., 2021	Poland	Telerehabilitation session	Implementing respiratory exercises through an online channel to boys with DMD and the participants were then asked to fill an online survey form to evaluate the home programme via telerehabilitation.
George J. DuPaul et al., 2018	Pennsylvania, USA	Interventional Study	Face to face and online sessions were conducted for families with preschool children who were at the identified risk for ADHD. Children were randomly assigned into these two groups. Parents received 10 sessions of BPT and were assessed pre, mid and post treatment. Along with this was another third group which was a waitlist control group (WLC).
Brooke Ingersoll et al., 2017	Michigan, USA	Interventional Study	ImPACT Online a telehealth programme was used to train parents to apply evidence-based interventions to their child with Autism Spectrum Disorder (ASD).

Table 2: Details of the studies incorporated in Scoping Review

Author, Year	Country	Results	Discussion
Sara Benham et al., 2017	Philadelphia, USA	The study demonstrated the usefulness and feasibility in administration of Timocco programme such that it was effective in enhancing skills by revealing enhanced scores in pre and post assessment comparison of the BOT2-SF*.	Interviews with the children and research assistants participating highlighted few certain areas requiring improvement, such as: Interview with – a. children – preferred setting of the programme differed from children to children - penchant to specific characters from the programme showed an effect in conducting activity, compliance showed changes. - lack of personalization b. research assistant – necessitate one on one interaction since kids tend to sway from continuing required to improve skills. - requires OT assistance, parents/ teachers can find it

			difficult to operate. Thus, can be used as an adjunct to on-going therapy and not the whole therapy in itself.
Daniela Sarti et al., 2021	Milan, Italy	Children with SLD and CP who received telerehabilitation showed the highest score on Learning Scale in CIT as compared to the other two groups. Though no significant differences were observed in the scores for SPANE between the three groups.	Remote activity on telerehabilitation requires adequate commitment so that fruitful results can be procured. Similarly, children ought to be more upfront and active in regards to the ongoing telerehab. It was observed that a family environment was equally important to get the best out of telerehabilitation. The cost of telerehabilitation was considered a starting point for a conversation. On the other hand, organized care and assistance of this rehab has proved to attain positive effects in children with special needs with no reports of difficulties in operating the seemingly new telerehabilitation.
Ted Brown et al.,	Australia	The study focused on the impact of Covid 19 pandemic on children's occupational routines and repertoires such that telerehabilitation and telehealth was demonstrated to be stimulating in promoting health benefits and occupational routines. In sum, it has also helped in developing new insights of rehab into children's lifestyle.	Overall discussion highlights the fact that telehealth and telerehabilitation enhanced the environment at improving routines amongst children and also curtailing the ill effects which pandemic brought its way into the society, such that they had to be eliminated.
Tal Krasovsky et al., 2021	Israel	The measures that were taken and responses of clinicians and families to the switch to telerehabilitation in a pediatric rehabilitation context were documented in the current study.	Many medical professionals confirmed that the kids were more easily distracted. In regards to home environment and technology. On the other hand, environmental factors such as participation of the siblings or features of the home were described as facilitators of treatment. Optimal use of technology was observed to be lacking as a result of limited skill sets in regards to the same and lack of training for telerehabilitation to the therapists. Thus, this emphasizes the idea of training for telerehabilitation to improve its usage.
Kelly Tanner et al., 2020	Ohio, USA	The findings showed that for the 2019-year, Average patient satisfaction survey responses were 98.97%, while the average positive response rate during the COVID 19 epidemic was 97.73%.	The study indicated telerehab for the pediatric population to be feasible and acceptable by the families of the children. Telerehab was also found to be benefiting immunocompromised or medically fragile children who are prone to acquiring infections, as they can safely gain access to therapy from the comforts of their home. Also, for those having to travel long hours especially from the rural areas to the clinic, telerehab was realized to be profitable. But at the same time, it was observed that efforts need to be undertaken to educate families on the components of telerehab & set up technology for optimal and appropriate use.
Peder Bilde et al., 2011	Copenhagen, Denmark	Out of the 1260 training days, children trained for more than 30 minutes on 783 of those days, or 62% of them. All of the families stated that their children exhibited symptoms of greater everyday mobility, higher muscle strength, and an improvement in a number of living skills after 20 days.	Home based training was found out to be feasible, along with being able to engage children with CP into a more intensive training program than what is offered by conventional training. Although certain hurdles experienced were that the children needed some amount of persuasion by their parents for training, and that children found it hard work to continue training everyday. Repetition of already known training was regarded as a reason for this. Internet based home training was clear to portray its positive effects in uplifting children with CP and motivating them to go on with their training.
Rachel Bican et al., 2021	Ohio, USA	In regards to the survey, the results showed 89.2 to 99.7% positive responses for questions regarding technology. Whereas for clinical care quality, 69.1% positive responses with quality being equal, and 17.5% responses reporting quality not being equal to in-person clinic visits. As for caregiver participation, 92.5% responses reported caregivers to be present and actively participating.	When treating children through telerehabilitation, one crucial factor to be considered was language, as it is possible that language interpretation can act as a barrier in providing beneficial telerehabilitation. Benefit of telerehabilitation was imbibing a specifically curated therapy programme into everyday activities by observing individual home environment and routine, thus making therapy more fruitful through personalization.
Jamie Hall et al., 2021	USA	The quantitative findings attributed with the qualitative findings in denoting that the gains from telerehabilitation are directly proportional to caregiver involvement and appropriate use of technology and access to technology.	The study highlighted the involvement of caregivers in the delivery of telerehabilitation. 'Zoom fatigue' was a barrier to telehealth that was put forth. Resilience was a factor deemed necessary to continue providing services. Environmental setup, funding and training are few of the listed limitations. In addition to this, telerehabilitation was found to reduce travel costs,

			provide flexible scheduling and decreased costs.
Agnieszka Sobierajska-Rek et al., 2021	Poland	Out of 45 respondents to the online survey, 44 found it possible to carry out respiratory exercises through telerehabilitation. Along with this the mean general satisfaction rating was around 4.07 out of 5.	The most important finding of the study was that the implementation of respiratory exercises through telerehabilitation was acceptable amongst the boys with DMD. The study deemed it necessary for caregivers to be present during the session as their assistance was required. Modifications to exercises were required in patients with more severe conditions.
George J. DuPaul et al., 2018	Pennsylvania, USA	High attendance to sessions was reported by both groups. Both f2f and the online group had higher knowledge on post treatment assessment as compared to WLC. Higher intervention fidelity by parents in f2f treatment that online treatment was reported on mid treatment assessment.	According to the study, online treatment was found to be a practicable delivery option in view of certain limitations such as to help families that face difficulties finding therapy providers, in case of scheduling issues, and costs associated with F2F treatment. Along with this another important advantage associated with online treatment was flexibility with scheduling such that schedules for individual sessions can be made at times that work for the family and the therapist.
Brooke Ingersoll et al., 2017	Michigan, USA	The responses indicated that the ImPACT Programme was beneficial with providing accessibility to the programme along with ease in learning interventions. At the same time certain barriers to the programme were detected such as technological barriers, online community support was found to be lacking as well as the need for a therapist's help was found to be imperative which was missing.	According to the study, the most consistently found barriers were the stressors at home and difficulty in setting a schedule to complete the program which in turn was found to affect the parent participation negatively. It was reported to simplify certain training components in the program for ease of use, along with indication for therapist support which was found lacking. The study also indicated a desire to grow the online community support. Nevertheless, the study showed a great level of treatment acceptability.

* Bruininks-Oseretsky Test of Motor Proficiency Short Form (BOT2-SF): to identify each participant's gross and fine motor skills abilities.

* SLD: Speech Learning Disability

* CP: Cerebral Palsy

* SPANE: Scale of Positive and Negative Experience

* CIT: Comprehensive Inventory of Thriving

* CETS: Clinician Evaluation of Telerehabilitation Service

* TPI-C: Therapist Presence Inventory

* RED Cap: Research Electronic Data Capture

* DMD: Duchenne Muscular Dystrophy

* CP: Cerebral Palsy

* BPT: Behavioral Parental Training

DISCUSSION

It is presumable that telehealth service adoption rates are low because of challenging business (reimbursement) models and poor levels of clinician acceptance. The use of telehealth necessitates new competencies, which may explain why clinician adoption is low in this area from clinical staff, such as “knowledge about what to do if the technology does not work”, or “to communicate clearly in videoconferencing”. The need to acquire new skills could worry medical practitioners and hinder the effective adoption of technology. (Tal Krasovsky et al., 2021).

Many therapists who were asked to describe obstacles to telerehabilitation

sessions confirmed to the kids' heightened distractibility. When a child is known to have had attentional or cognitive problems before COVID-19, it is possible that this distractibility was not unique to telehealth in certain situations. In some situations, distractions were attributed to the home environment (such as siblings or other sources of noise) or to technology (such as trouble following the therapist's instructions because of communication issues or the child's increased mobility).

In order to identify the child's functional status, which is crucial in rehabilitation settings, clinicians experienced difficulty doing a formal functional assessment. The ability to practice and comprehend the level

of performance of motor activities has occasionally been stated as being constrained by environmental variables like a small room or a lack of equipment. Our findings also indicated that with younger children, it was more difficult to convey feedback, grade levels of difficulty, and parental advice.

This shows that in order to optimize the potential advantages, additional consideration should be given when tailoring telerehabilitation therapies to younger children. Because they did not receive telerehabilitation training, therapists may not have been able to exploit the technology to its full potential. In fact, the evidence currently available supports the hypothesis that technology and training may be crucial for enhancing these aspects of telerehabilitation usage, suggesting that assessment in telerehabilitation may be practical and valid for neurological and orthopedic diseases (even in children). (Tal Krasovsky et al., 2021)

Several benefits of telerehabilitation were reported such as increased accessibility to the services available, with increased flexibility in scheduling. It was also found to be cost effective, along with reducing the commute time to almost zero. Conversely, limitations to telerehabilitation that came to light were that access to internet and device access was not as attainable as thought, along with few cultural considerations. Certain communication barriers were also reported. Telerehabilitation required imperative training to both the therapists and caregivers for its effective functioning along with funding which was found out to be necessary at certain stages. One factor worthy of note is that both families and caregivers are involved in early intervention of telerehabilitation thus making it a family-centered approach which is considered as a

best practice in pediatric physical therapy (Jamie Hall et al., 2021).

Additionally, it was mentioned that kids with autism spectrum disorders or attention deficit disorders would have trouble comprehending and completing the exercises. For these kids to benefit from the procedure, it is then necessary to combine in-person care in the clinic with the at-home program. (Agnieszka Sobierajska-Rek et al., 2021).

The highest percentage of telerehabilitation visits, at about 95.2%, was found to be beneficial for children who needed physical therapy and were born prematurely or with low birth weight. This population is particularly vulnerable in the first year of life and may be more susceptible to infections when exposed to the community. Caretakers and families may have chosen telerehabilitation in this case to encourage social seclusion and the children's safety. (Rachel Bican et al., 2021).

CONCLUSION

Several benefits of telerehabilitation were reported such as increased accessibility to the services available, with increased flexibility in scheduling. It was also found to be cost effective, along with reducing the commute time to almost zero. Conversely, limitations to telerehabilitation that came to light were that access to internet and device access was not as attainable as thought, along with few cultural considerations.

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