Artificial Intelligence in Rehabilitation Targeting the Participation of Children and Youth with Disabilities

Signature of the Researcher:

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1. Research Question:

Will there be any effective change of Artificial Intelligence in childrens with disability?

2. Introduction:

Artificial intelligence (AI) is defined as area of science and engineering concerned with the computational understanding of what is often referred to as intelligent behaviour, as well as the design of artefacts that display such behaviour. The modern field of AI began at Dartmouth College in 1956. AI will have a huge impact on our society and experts say that now is the time to prepare for a rapidly-changing, AI-powered economy. These devices behave more like socially inter active beings than machines – communicating via spoken [1].Robots have been used in interventions on children at different levels of impairment in different ways including supporting therapeutic activities, being personal assistants, facilitating social integration, supporting school activities, and promoting exploration, learning, and engagement in play [2]. The use of robots to promote development in children with disabilities has been oriented to address the needs of children with motor, cognitive, and developmental disorders.AI has begun to impact the ways that many children live, learn, and play. Prior work has shown that young children perceive and respond in rich ways to the non-verbal cues of social robots including back-channeling, attentive behavior, and vocal expressivity and tend to ascribe emotional states, mental states, intentionality, and morality to intelligent social artifacts.Robotics are applied mainly on children with cerebral palsy (CP) as support during therapeutic activities to increase mobility, improve motor control [3,4], gait and as a aiding device.The AI devices used in medical field includes sensor devices, robotic devices, clinical decision support systems,3D motion analysis [5] SWORD health, KAIA health, PHYSITRACK [6]. There are two types of AI applications in medicine: virtual and physical. Machine Learning is a virtual component that is represented by mathematical algorithms that increase learning via experience. Unsupervised, supervised and reinforcement learning are the types of machine learning [7]. Physical items, medical devices, and more complex robots participating in the delivery of care represent the second type of AI application in medicine. The utilisation of robots as consultants is maybe the most promising technique

example, a robot companion for the elderly those who are cognitively impaired or have restricted mobility The most advanced types of this technology are Japanese care bots. In surgery, robots are utilised as assistants or even as surgeons as solo artists. One of the most striking examples One of the benefits of robots is their capacity to communicate with and interact with humans teach children with autism [8].The aim of this thought piece is to explore the interface between AI and disability, and the ethical dilemmas which this raises, much has been written on artificial intelligence's (AI) potential to assist and even transform disabled children lives. Many advancements have been developed, including AI-powered robotic arms and other prosthetic limbs, decision-making tools for physicians and the disabled, and route planning software for persons with visual impairment. Many people benefit from the usage of such instruments, which increase our accessibility and change our life [9]. The term disability is defined in Title 42 of the United States Code 12102, also known commonly as the Americans with Disabilities Act. This definition is long winded and very detailed, which is best summarized by the first subsection: "The term 'disability' means, with respect to an individual — (A) a physical or mental impairment that substantially limits one or more major life activities of such individual; (B) a record of such an impairment; or (C) being regarded as having such an impairment. Disability is of two types, physical and mental. Physical disability ¬- With the definition of from a physical disability. Just looking at the two words that make up the term mental what a general disability is we can take a look at what a physical disability is specifically so we can have a definition that is clear when the term physical. Mental disability - With the term physical disability defined we can now look at what a mental disability is and how it differs disability we can see that this disability affects the person's mind and not their body [10].

a. Background and Need for the Study:

It is a newly developed concept made for usage in disability population to make lesser dependent. the need for the study is to found how effective artificial intelligence can be and its cost effectiveness to use in wide range of populations.

b**. Aim**:

- To improve key pediatric rehabilitation outcomes in daily life activities such as participation of children and youth or other diagnosed health conditions with help of artificial intelligence.
- To simplify steps in therapeutic process and possibly decrease provider and patient burden as well as afford for providers to customize their rehabilitation services.
- To deliver family centered and function -focused intervention to service eligible youth, children and families.

c. **Objective:**

- To examine how AI is integrated into pediatric interventions targeting participation of children, youth with disabilities or other diagnostic health conditions in valued activities and to identify gaps for future research.

d. **Hypothesis:**

Null hypothesis: There will be no significant effectiveness of Artificial intelligence in rehabilitation targeting the participation of children and youth with disabilities

Alternative hypothesis: There will be significant effectiveness of Artificial intelligence in rehabilitation targeting the participation of children and youth with disabilities

3. Review of Literature:

Vera C Kaelin et al., (2020), concludes that there is an increasing amount of research on interventions using AI to target participation of children and youth with disabilities or other diagnosed health conditions, supporting the potential of using AI in pediatric rehabilitation. Based on our results, three major gaps for further research and development were identified: 1) A lack of remotely delivered participation-focused interventions using AI; 2) a lack of individual goal-setting

integrated in interventions; and 3) a lack of interventions tailored to individually reported participation needs of children, youth and/or families.

Randi Williams et al., (2019), in his study concludes that preschool-aged children can learn about AI concepts through appropriately framed content. Growing up with such sense of empowerment about AI concepts and technologies is crucial even for young children as they are already starting to interact with smart toys and smart speakers at home.

Tel Aviv University et al., (2012), in his study concludes that the RE-ACTION system shows promise as a relatively lowcost rehabilitation system, due to its use of relatively affordable equipment and potential to compliment traditional rehabilitation to improve upper-limb function and activity participation, with enjoyment of participation of children with hemiplegia across levels of cognitive and motor ability. It is not possible from our data, and the limited number of subjects, to say which aspects of motor efficiency were specifically influenced by the system. It was apparent that the interaction of movement trajectory, accuracy and speed are all important factors required to develop proficiency in movement skill.

4. Subjects and Methods:

a. Study design: Quasi Experimental study
b. Subjects: subjects will be taken from physiotherapy OPD, saveetha medical college hospital
c. Sampling technique: convenient sampling technique
d. Sample size: 30 participants
e. Inclusion criteria:

children with disability referred from paediatrician.
Age group 6-12 years
Both genders

f. Exclusion criteria:

Children who are functionally independent.
Hyperpyrexia
Hyperreflexia
Lack of neck & Trunk control

g. Study procedure: Total subjects with disabilities were selected based on the inclusion and exclusion criteria and informed concern were obtained from the parent . They were explained about the safety and simplicity of the procedure. All 30 samples were selected using convenient sampling techniques. An experimental study on group of 30 subjects of disability children was made to walk with the use of bionics device .For this group pre -test and post -test values was noted and consider as an outcome measure. The outcome measure is FIM scale and the data collected and tabulated was statistically will be analyzed.

h. Materials Required: AI Device
i. Outcome Measure: FIM scale

5. Intended Data Analysis procedure:

The collected data will be tabulated and analysis using descriptive and inferential statistics to all parameters mean and standard deviation will be used.

6. Time line:

a. Proposal development : 1 Month
b. Subject recruitment : 1 Month
c. Intervention :4 weeks
d. Analysis and report writing : 2 weeks
e. Dissemination : 2 weeks

7. References:

1.Cook A, Encarnac¸~ao P, Adams K. Robots: assistive technologies for play, learning and cognitive development. Technol Disabil. 2010;22:127–145.

2.Encarnacao P, Adams K, Cook A. Robots: Assistive technologies for play, learning and cognitive development.

3.Marti P, Iacono I. Learning through play with a robot xompanion. Assist Technol Res Ser. 2011;29:526 – 533

4. Ladenheim B, Mast J, Monterroso L, et al. Robot-aided therapy in pediatrics: 6 months after. In: Conference: 65th Annual Meeting of the American Academy for Cerebral Palsy and Developmental Medicine; 2011; Las Vegas, NV. p.83–84

5. Labruyere R, Gerber CN, Birrer-Brutsch K, et al. € Requirements for and impact of a serious game for neuropediatric robot-assisted gait training. Res Dev Disabil. 2013;34:3906–3915

6. Vera C Kaelin, Mina Valizadeh, Zurisadai Salgado, Natalie Parde, Mary A Khetani . Artificial Intelligence in Rehabilitation Targeting Participation of Children and Youth with Disabilities. Journal of Medical Internet Research (2020) doi.10.2196.25745.

7. Randi Williams, Hae Won Park, and Cynthia Breazeal. 2019. A is for Artificial Intelligence: The Impact of Artificial Intelligence Activities on Young Children's Perceptions of Robots.4th may 2019. doi:10.1145/3290605.3300677.

8. Appendix

a. Copy of Scales and scores if any to be attached

TABLE 1

Levels of Scoring:
Independence:
7- Complete independence
6- Modified independence

Modified dependence:
5- Supervision
4- Minimal assistance (client 75%+)
3- Moderate assistance (client 50%+)

Complete dependence:
2- Maximal assistance (client 25%+)
1-Total assistance (client 0%+)

9.b. Information sheet to be attached

1. Title of the research project: **ARTIFICIAL INTELLIGENCE IN REHABILITATION TARGETING THE PARTICIPATION OF CHILDRN AND YOUTH WITH DISABILITIES**

2. **Description of the study:** This study will analyze the effectiveness of Artificial intelligence in rehabilitation targeting the participation of children and youth with disabilities.

3. **Possible risk of the participant**: No risk is involved in this study.

4. **Benefit of the study**: Individuals will be benefited from this study.

5. **Compensation to the participant**: No compensation will be provided during or at the end of the study.

6. **Confidentiality**: Information received from the patients will be kept safe and only used for research purposes.

7. **Participant right to withdraw from the study**: Individuals can withdraw at any time of the study

8. **Complaints regarding the study should be reported to:** Any complaints regarding the Study can be informed to the Clinical Incharge of Saveetha physiotherapy department, SMCH.

9. **Detailed information and clarification can be obtained from:**

Name: Jai. G

Address: UG, IV semester, SCPT, SIMATS.

E mail: liberojai47@gmail.com

10. **(Principal investigator), JAI.G have explained clearly to the participant all the above details. All questions can and clarifications by the participant has been fully answered.**

11. Signature of the principal investigator with date:

APPENDIX

SAVEETHA COLEGE OF PHYSIOTHERAPY

SIMATS, Chennai-602105

9.C. Informed Consent Form

I----------Agree to take part in the study conducted by JAI.G under graduate student of Saveetha College of Physiotherapy, SIMATS.

TITLE: **ARTIFICIAL INTELLIGENCE IN REHABILITATION TARGETING THE PARTICIPATION OF CHILDRN AND YOUTH WITH DISABILITIES**

I acknowledge that the study has been explained to me and I agree to participate and I am willing to provide information about my health status to the investigator. I allow the investigator to have access to my medical records, pertaining to the purpose of the study. Participate in the analysis program. Make myself available for further analysis required. I have been informed about the purpose producers and measurements involved in the study and my queries towards the study have been clarified. I have been informed that this study consists of a grouping and I also agree to come regularly for the study period of 4 weeks.

I Provide consent to the investigator to use the still photographs with masked face for educational purposes only. No funds / fees / remuneration is taken from the subjects on the course of the study.

I understand that my participation is voluntary and can with draw at any stage of the study.

Place:

Date:

Signature: