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COMMENTARY

Do children with cerebral palsy dream of electric legs? The effects of robot-assisted gait training

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More than 15 years have passed since the first descriptions of the use of robot-assisted gait therapy (RAGT) in children with cerebral palsy (CP). However, research into its effects on gait compared to standard therapy or non-robotized treadmill training with or without body-weight support, has up until now not demonstrated the superiority of RAGT over these conventional treatments.[1] These robotic devices were developed to provide intensified gait training, by permitting increased repetitions of stepping practice while decreasing the need for direct assistance by human therapists. Ultimately this aimed to improve gait outcomes for children with CP, by providing robotized treatment at an age of continuous motor learning and ongoing development of walking capacity. The development of RAGT over the last decade has seen the emergence of new machines, allowing for greater customization of training modes. This includes adjusting parameters such as speed, body weight support, degrees of freedom, and gait guidance via a variety of hardware and actuator combinations, and incorporating interactive interfaces for performance enhancement through exercise-based gaming.

Choi et al. investigated the effect of RAGT intensity on motor outcomes in children with CP[2] by varying training speed and body weight support, noting that previous studies did not vary the intensity of treatment between study groups, although, as for a number of therapeutic approaches, training intensity could have a significant bearing on its efficacy. They reported differences between study groups, favouring high- and comfortable intensities for standing and walking functional outcomes, and low-intensity for improved balance. These findings warrant further confirmation, considering not only the statistical significance but also the effect sizes of this study's within-group comparisons and bearing in mind its exploratory nature with low sample sizes. Whether this should take the form of further randomized controlled trials has been challenged. Taking into account the degree of customization and individualization RAGT may require to achieve optimal outcomes, alternative research methods based on machine learning applied to the large amounts of data derived directly from RAGT sessions and robotic feedback have been deemed an alternative to classic clinical research paradigms.[3]

Awaiting this future research and the identification of hypothetical individual markers that could enable appropriate patient selection and further optimize treatment outcomes by the personalization of training modes, and considering the current equipoise in clinical outcomes between robotic and non-robotic gait treatments, two aspects require further consideration when balancing the role of RAGT in the care of children with CP. The first consideration is economic, with the necessity to confirm the hypothesized cost-effectiveness of RAGT compared to human treatment in a situation of equal clinical efficiency.[4] Robotic devices for gait rehabilitation come with significant acquisition and maintenance costs. It has yet to be demonstrated that the supposed gains in operational efficiency thanks to robots (a term derived from the Czech 'robota', translating as forced labour) compared with treatments provided by humans only can pay for this investment in the long term.

The second and certainly most important aspect is the user-experience of paediatric RAGT, adults having reported their own ambivalence when undergoing intensive RAGT after stroke.[5] If on one hand they report being inspired and motivated when using these devices (possibly through a degree of socially-driven technophilia), they also mention the strains, discomfort, and disappointments sometimes associated with this treatment. Research on RAGT in CP has not yet given the users/children the voice they deserve, to ensure that clinical practice aligns with the true aspirations and motivation of the end-users, who may not all dream of electric legs.

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DATA AVAILABILITY STATEMENT

Not required.

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