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ANKLE PROPULSIVE TORQUE DURING WALKING IN CHILDREN WITHOUT AND WITH BACKPACK LOADING CARRIAGE

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Background: School-aged children often carry significant weight due to the school supplies required for daily activities. This overload can lead to biomechanical, structural, and strength changes, impacting musculoskeletal development and posture.

Objectives: Compare the propulsive ankle torque during walking without load and with 10% of the body mass in children aged 8 to 10 years.

Methods: A cross-sectional study approved by the local ethics committee was conducted with healthy children. Fifteen children (53.3% boys) (9.6 ± 0.5 years; 33.1 ± 4.5 kg; 1.36 ± 0.5 m) participated in the study. Gait analysis was performed at a 5km/h control speed in a biomechanics laboratory equipped with a motion capture system (Vicon, EUA) using reflective markers, specifically the Plug-in-Gait model from Vicon Motion Systems. The system's cameras recognized these markers, and the children were evaluated under two conditions: walking without a backpack and walking with a backpack carrying a load equivalent to 10% of their body weight. Familiarization with the testing area was conducted, and data from seven valid trials were collected for each proposed condition. A trial was considered valid when the child walked a distance of 10 meters and stepped on a force platform. The ankle plantarflexion torque without and with a backpack with 10% were compared using a paired Student's t-test and the effect size was calculated by Hedges' g, with a significance level set at $p < 0.05$, using the Statistical Package for the Social Sciences.

Results: The ankle plantarflexion torque with a backpack with 10% of the body weight was significantly higher (1.2 ± 0.1 N.m/kg) compared to the ankle plantarflexion torque without a backpack (1.1 ± 0.1 N.m/kg) ($p < 0.001$; Hedge's $g = 0.94$, 95% CI = 0.36 to 1.43).

Conclusion: A slight increase in plantarflexion torque was observed when children walked while carrying an additional 10% body weight in a backpack. During prolonged walking, this may lead to increased energy consumption, potentially causing overload and fatigue, even with a relatively small load. This suggests that carrying a backpack with an additional 10% of their body weight may cause muscular overload.

Implications: Children's weight in their daily activities should be kept below 10% of their body weight to prevent high biomechanical loads and muscular overload during gait.

Keywords: Gait, Torque, Child Health

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EMPOWERING MOBILITY: CO-DESIGNING ASSISTIVE SOLUTIONS FOR CHILDREN WITH SEVERE DISABILITIES - A CASE REPORT

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Background: Independent mobility plays a crucial role in child development, contributing to motor, cognitive, and social skills. Children with severe disabilities often face limited mobility opportunities, impacting their ability to explore their environment. The ADAPT project, a university-based community and research initiative, aims to promote independent mobility for children and adolescents with disabilities through low-cost assistive mobility solutions. The project follows the principles of Patient and Public Involvement (PPI), ensuring that families are actively engaged throughout the process. This case report highlights the impact of co-designing a motorized mobility device for twins with severe disabilities, emphasizing the role of PPI in assistive technology development.

Objectives: The primary objective was to analyze the impact of family involvement in the development and implementation of a customized motorized mobility solution for twin brothers with cerebral palsy, visual impairments, and cognitive disabilities (Gross Motor Function Classification System – GMFCS level IV). A secondary objective was to assess the mother's perception of the intervention's effectiveness and feasibility through qualitative feedback.

Methods: This study employed a case report methodology, using a co-design approach that actively involved the children's mother throughout the development process. Initial assessments were conducted to understand the children's functional abilities and specific needs. A commercially available ride-on toy was modified to include accessible controls, postural support, and visual enhancements based on continuous feedback from the mother. Data collection was based on qualitative reports from the mother, obtained through semi-structured interviews conducted at different stages of the intervention. Follow-ups were performed to monitor the device's usability and its integration into the family's daily routine.

Results: The co-design process resulted in a single adapted ride-on vehicle that could be used by both children at different times, addressing logistical challenges for the family. Key modifications included a centrally positioned activation button with LED lighting for enhanced visibility, an ergonomic seating system to provide adequate postural support, and lightweight motorization to facilitate handling. The mother reported increased participation of the children in daily activities, greater motivation to interact with their surroundings, and improved cognitive engagement. Additionally, she highlighted the ease of integrating the device into their routine and its potential role in preparing the children for future use of powered wheelchairs.

Conclusion: This case report reinforces the importance of PPI in assistive technology development. Family involvement throughout the co-design process ensured that the adapted mobility device was functional, accessible, and aligned with the children's needs. Future research should explore long-term benefits, including the impact on motor development and the transition to more advanced assistive mobility devices.

Implications: This study highlights the significance of integrating PPI principles into rehabilitation and assistive technology development. The findings suggest that co-designed, low-cost assistive mobility solutions can enhance the quality of life and autonomy of children with severe disabilities. Additionally, the approach provides valuable insights for healthcare professionals and

polymakers on the role of family engagement in pediatric rehabilitation and accessibility programs.

Keywords: Power mobility, Disability, cerebral palsy, Family engagement in research

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MANUAL PERFORMANCE AND FUNCTIONALITY OF CHILDREN AND ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

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Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects communication, social interaction, and can impact motor skills. Children with ASD may exhibit clinically relevant motor deficits, compromising daily activities such as grasping objects and writing. These limitations can affect functionality, thereby reducing autonomy and social participation. Functionality, understood as the ability to perform daily tasks independently, is often associated with fine motor skills. However, the relationship between manual performance and functionality in children and adolescents with ASD has not been sufficiently explored in the literature.

Objectives: To associate the functionality of daily activities with the manual performance of children and adolescents with Autism Spectrum Disorder.

Methods: A cross-sectional, quantitative study that was submitted to and approved by the Research Ethics Committee. The study included children and adolescents aged 6 to 15 years, of both sexes, diagnosed with Autism Spectrum Disorder, classified as support level I or II, who have normal or corrected vision and do not present movement restrictions in the upper limbs. To assess functionality, the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) was used and applied with the parents, and to evaluate manual performance, the Block Design Test was conducted with the children.

Results: The data were presented as mean and standard deviation. Normality was initially observed through the Shapiro-Wilk test. To associate manual performance with the functionality of daily activities, Pearson correlation tests were conducted. The data were organized using the Statistical Package for the Social Sciences (SPSS) version 20.0, with a significance level set at $p < 0.05$. The correlation between manual performance and the functionality of daily activities did not show a significant difference for the association between performance with the right hand and daily activities [$r = 0.17$, $p = 0.57$], while the association between performance with the left hand and daily activities was [$r = -0.02$, $p = 0.96$].

Conclusion: This study did not find a significant association between manual performance and the functionality of daily activities in children and adolescents with ASD. These results suggest that other factors, such as sensory and cognitive aspects, may influence the

functionality of this population. Future research should investigate these variables, as well as include larger samples and longitudinal analyses, in order to better understand the determinants of functionality and manual performance in children and adolescents with ASD.

Implications: Despite the findings, it is important to consider that the sample size was relatively small ($n = 14$), which may have influenced the results and limited the generalization of the data. Nevertheless, these results may guide more effective interventions in physical therapy, education, and social inclusion for children and adolescents with ASD.

Keywords: Autism Spectrum Disorder, Motor Skills, Daily Activities

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TRAJECTORY OF FUNCTIONAL SKILLS IN CHILDREN BORN WITH BIOLOGICAL RISK IN THE FIRST 2 YEARS OF LIFE: PROSPECTIVE STUDY

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Background: Children with biological risk for motor delay are those born with certain adversities (e.g., prematurity, low birth weight, perinatal complications, etc.) and may experience limitations in daily activities. Despite existing evidence, knowledge about the developmental trajectory of functional skills in real-life contexts during the first two years of life is still limited.

Objectives: To verify the development trajectory of functional skills (mobility, daily activities and social-cognitive) of children with biological risk at 12 and 24 months of age.

Methods: This was a prospective, observational multicenter study. Eighteen infants with biological risk and their families participated in the study (mean gestational age: 37.55 weeks- SD 3.12 weeks; birth weight: 3.01 kg- SD 0.905g; stay in NICU: 8.55 days; 61.11% received oxygen therapy, and 27.77% required cardiopulmonary resuscitation). Functional abilities were assessed using the Pediatric Evaluation of Disability Inventory - Computer Adaptive Test (PEDI-CAT) - speed version. The normative score (scores between 30 and 70 are within the expected range for age) and the continuous score (individual functional progress) for each domain were used. The paired t-test was applied to compare the children at 12 and 24 months, considering a significance level of 5%.

Results: The children exhibited an average normative score above 50 for all skills. At 24 months, children had higher continuous and normative scores for daily activities than at 12 months ($p = 0.024$ and $p < 0.001$, respectively), and higher continuous scores at 24 months in mobility ($p < 0.001$) and social-cognitive domain ($p < 0.001$).

Conclusion: The children evaluated showed functional progress in mobility, daily activities and social-cognitive. Furthermore, these children did not show motor delay in these activities.

Implications: Understanding the trajectory of functional skills in a real-life context enables the monitoring of adaptive behaviors and the identification of potential delays in important domains of