

ORIGINAL ARTICLE

# Functional Outcomes Associated With Adaptive Seating Interventions in Children and Youth With Wheeled Mobility Needs



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## Abstract

**Objective:** To determine the parent-reported functional outcomes associated with adaptive seating devices for wheeled mobility devices used by young people aged 1 to 17 years.

**Design:** Longitudinal case series.

**Setting:** Homes of participating parents.

**Participants:** Parents (N=70, 63 mothers, 6 fathers, 1 grandmother) who had children with adaptive seating needs.

**Intervention:** Adaptive seating system for wheeled mobility devices.

**Main Outcome Measure:** Family Impact of Assistive Technology Scale for Adaptive Seating (FIATS-AS).

**Results:** All parents completed the FIATS-AS 4 times—2 times before and 2 times after their child received a new adaptive seating system. Mixed-design analysis of variance did not detect significant mean differences among the FIATS-AS scores measured at baseline and 2 and 8 months after receiving the seating system ( $F_{2,134} = .22, P = .81$ ). However, the FIATS-AS detected a significant interaction between age cohort and interview time ( $F_{4,134} = 4.5, P < .001$ , partial  $\eta^2 = .16$ ). Post hoc testing confirmed that 8 months after receiving the seating system was associated with a large improvement in child and family functioning for children <4 years, maintenance of functioning for children between 4 and 12 years, and a moderate decline in functioning for youth between 13 and 17 years.

**Conclusions:** Adaptive seating interventions for wheeled mobility devices are associated with functional changes in the lives of children and their families that interact inversely with age. Future controlled longitudinal studies could provide further empirical evidence of functional changes in the lives of children and their families after the introduction and long-term use of specific adaptive seating interventions.

Archives of Physical Medicine and Rehabilitation 2014;95:825-31

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Assistive technology (AT) devices are widely used to optimize functional performance for children and youth with physical

disabilities. However, the impact of specific AT interventions lacks convincing empirical evidence.<sup>1,2</sup> In part, the challenge for AT researchers as evidence generators has been the lack of AT-specific measurement models and tools that detect important and meaningful AT outcomes. The Consortium for Assistive Technology Outcomes Research (CATOR) has conceptualized a useful framework to inform the development of AT device-specific outcome models.<sup>3</sup> In particular, the CATOR outcomes framework provides

Supported by the Canadian Institutes of Health Research (grant no. PCY-86886), Holland Bloorview Kids Rehabilitation Hospital Foundation, Child Health BC, and BC Child and Youth Health Research Network.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

a useful foundation to understand health outcomes of adaptive seating interventions for children with seating and wheeled mobility needs.

Adaptive seating devices are often provided to enhance postural stability and thereby improve volitional arm and hand function, and avoid spastic postures in children with disabilities.<sup>4</sup> Pediatric seating therapists typically assess children's needs and recommend seating interventions that promote proper positioning and seated stability to enhance the functional performance of personal care, play, social interaction, and wheelchair propulsion.<sup>4</sup> Further, they prescribe custom seating technologies to help reduce the risk of pressure ulcers<sup>5</sup> and the progression of deformities.<sup>6</sup> Because seating systems for wheeled mobility devices are costly for government funders, social service agencies, and families, clinical services need to measure and monitor functional outcomes to ensure that these resources are used judiciously.<sup>7-9</sup>

Our research team developed the Family Impact of Assistive Technology Scale for Adaptive Seating (FIATS-AS).<sup>10,11</sup> The FIATS-AS is a 64-item, parent-report questionnaire that measures the effects of adaptive seating interventions on the lives of children and their families. Parents indicate their degree of agreement with items on a 7-point Likert scale. Items are assigned to 1 of 8 dimensions (subscales), whose mean ratings are summed to provide an overall level of child and family functioning in areas that may be influenced by adaptive seating interventions.

The FIATS-AS measures aspects of child and parent wellness, including child contentment, parental concern for child safety, and caregiver burden. Other dimensions tap into aspects of child activity and participation, such as the extent to which the child can perform activities independently, whether the child has control over their own actions, and whether the child takes part in social situations. We demonstrated the content validity and face validity of the FIATS-AS<sup>10</sup> and completed a study involving 50 parents of preschoolers with cerebral palsy to show that the FIATS-AS had acceptable internal consistency and excellent test-retest reliability.<sup>11</sup> Further, we demonstrated that the FIATS-AS could detect an important, positive change in the lives of the child and family when young children who could not sit independently used special purpose seating devices at home for only 6 weeks.<sup>12</sup>

In the study reported here, we expanded the utility of the measure by examining its ability to detect important changes in the lives of children and their families after the use of new adaptive seating systems. This study was designed to answer the primary research question: "Are important functional changes in the FIATS-AS detected for young people, aged 1 year to 17 years, and their families during the 8 months after the provision of a new adaptive seating system for a wheeled mobility device?" Further, we decided a priori to estimate the functional impact of adaptive seating systems across 3 age cohorts— young children (1–3y), preschool/school age children (4–12y), and adolescents (13–17y)—as recommended in an overview of adaptive seating systematic reviews.<sup>2</sup>

As a secondary objective, we estimated the internal consistency and test-retest reliability of the FIATS-AS to confirm earlier findings.<sup>11</sup>

## Methods

Seventy parents participated as part of a larger study involving 94 parents whose children had wheeled mobility needs. The larger study was designed to estimate the reliability and examine the convergent construct validity of the FIATS-AS. We also conducted a linguistic validation and reliability substudy with a different cohort of 36 French-speaking parents to confirm the measurement equivalence of a French version of the FIATS-AS.<sup>13</sup> For the substudy reported here, we chose a repeated-measures, within-subjects design to examine changes in child and family outcomes after the introduction and use of new adaptive seating devices. We received ethical approval for this study from institutional research ethics boards and committees at our coordinating institution and at each recruitment site.

## Participants

We invited mothers, fathers, or other primary caregivers (hereafter referred to as parents) of children and youth between the ages of 1 and 17 years, 11 months who had been assessed to receive a new adaptive seating system for a wheeled mobility device through 1 of 12 participating rehabilitation services based in Canada's 3 most populous provinces: Ontario, Quebec, and British Columbia. Wheelchair seating systems were considered new if a back and seat would be provided for the first time, or if they would be entirely replaced because of the child's growth or a change in postural control. Wheeled mobility bases included specialty strollers, manual wheelchairs, and power wheelchairs for everyday mobility at home and in the community. Parents were eligible if they reported providing at least 5 hours of direct care daily for their child and had the ability to read and understand English and/or French. Only 1 parent was recruited per child.

## Sampling procedure

In each of the 12 sites, seating practitioners introduced the research study to parents after determining that the child needed a new seating system. The site research therapist provided interested parents with information about the study after confirming their basic eligibility. They sought consent to participate after a screening phone call or meeting in 1 of the clinics. Of the 116 parents telephoned, 15 parents declined, 5 were unreachable, and 2 were deemed ineligible because the children no longer needed a new seating system. Parents who agreed to participate provided signed consent. Ninety-four parents took part in the larger reliability and validity study, and 70 of these parents provided longitudinal data to answer the primary research question.

## Protocol

Research investigators trained and provided written guidelines to 11 research therapists (10 occupational therapists and 1 physical therapist) to ensure consistency in appointment scheduling and rigor in measurement administration and data collection. Each recruitment site had up to 3 research therapists available to conduct interviews. [Table 1](#) outlines the appointment schedule, measures, and measurement purposes. Site research therapists scheduled 4

### List of abbreviations:

ANOVA	analysis of variance
AT	assistive technology
CATOR	Consortium for Assistive Technology Outcomes Research
FIATS-AS	Family Impact of Assistive Technology Scale for Adaptive Seating
GMFCS	Gross Motor Function Classification System
HUTCH	home use of technology for children

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