



# Wheelchair Performance

in a Clinical Field Trial

# “She reached up and gave me a hug.”

the child’s mother said with tears in her eyes. “She’s never done that before.” Remarkable benefits may come to children and caregivers when they receive good provision services and a supportive wheelchair with tilt.

Supportive tilt wheelchairs have challenges with transport, cost, durability, expandability, usability, and use in rural areas. Affordability is a major barrier for millions of children worldwide. The Cub wheelchair, recently developed by Participant, opens new possibilities for outdoor adventures and for service to many unserved kids.

The tilt, postural support, folding, and all terrain features work as a system supporting health and mobility as well as create new opportunities for inclusion and participation in the community. Families reported an increase in their child playing with friends, eating independently, visiting with relatives, and learning at school.

The purpose of this report is to share the results of a clinical field trial of eleven children over six months in rural and urban India, and to generally reference anecdotal reports from other users such as the cover photo of Artem from Ukraine. At the time of writing Cub has been provided in dozens of countries and some of those users are shown here, with their permission. Participant is grateful for the support of caregivers, users, and partners who have helped to reach this point.

Experts from around the world agree that children who cannot sit up by themselves, reposition themselves, or hold up their heads, need a supportive seat with a minimum of 45 degrees of tilt.

“For a user who needs this type of wheelchair, I want the user to achieve increased independence, pressure relief, proper alignment of body postures and accommodation to manage contractures, and decrease spasticity,” said Dave Calver, who is an Occupational Therapist and Supportive Seating Trainer (TOT WSTP-I).

Often, with the ability to tilt, users will have increased alertness, head control, hand and arm control, and alertness. And, there are important, harder to quantify, benefits to digestion, breathing, and blood pressure. Before receiving an appropriate wheelchair, children often cannot sit without sliding out of chairs or can only sit for a short period. Afterwards, the child can sometimes sit independently and comfortably for extended periods, which is great for socializing with friends, school, and this gives caregivers a break.”

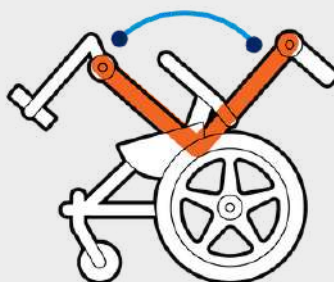
Dave has worked with children in many places around the world and is a co-designer of Cub. “With Cub, we attempted to develop a chair with all terrain capability, the transportability of a stroller, and easily adjustable positioning features to make the users, caregivers and providers happy!”

## TILT AND RECLINE

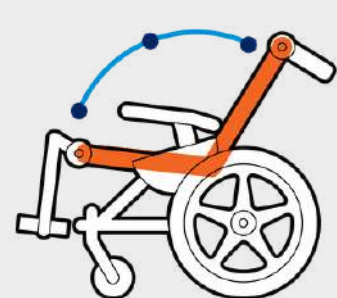
Fig. 1. Tilt-in-space wheelchairs.



Upright Position



Tilt



Recline

# To understand the real world usefulness of the wheelchair,

a field trial was arranged with an independent, expert testing partner. Data was collected from caregivers for eleven children over a period of six months. The group was diverse:

- Rural and urban settings
- Diagnoses included: cerebral palsy, Duchenne muscular dystrophy, or spinal cord injury
- Can self propel with handrims and children who do not self propel
- New wheelchair users and previous chair users
- Wide range of body heights
- Boys and girls
- Wide range of family income

The data was collected in two formats: Likert scale and open response. Responses to the first set of questions used the Likert scale with five options from 'very satisfied' to 'very unsatisfied'.

## CAREGIVER FEEDBACK



A second set of questions allowed for open ended responses to prompts on a variety of topics from caregiving load to topics such as independent eating and playing. Responses were collected before receiving the new wheelchair and again after six months. Realizing the importance of the caregiver’s experience, the topical questions asked responses for the user and separately for the caregiver.

	Most frequently mentioned problems before receiving Cub	Results After receiving and using Cub
User Reports	inability to sit upright; difficulty with feeding and ADLs; falling out of the wheelchair; cannot go outdoors; difficult to go to school; difficult to use arms, hands, or neck	improved sitting posture; can sit for an extended period; alertness improved at school/home; can self-feed; improved hand function; more happy and confident; engagement with friends
Caregiver Reports	challenges with feeding; difficult to lift/carry the child; attention not available for household activities, siblings, shopping for food; challenges with time burden of care; worry about the child falling from the wheelchair or furniture; challenging to take the child on errands, school, doctor, etc.	able to take child outdoors or on errands; easier feeding and ADLs; attention available for other household activities; child plays independently; good feeling that child is sitting comfortable; decreased stress/worry about falling, etc

All eleven caregivers responded “Yes” to a question about improvements in education. Ten of the eleven caregivers responded that they would be willing to pay for the wheelchair. All caregivers indicated that they “can spend more time on other activities” when their child uses the wheelchair and most indicated a decrease in the overall caregiving load. Seven of the caregivers noted challenges with feeding the child, which can be quite time consuming. Four of the seven children experienced significant improvements and were able to feed themselves independently while seated in the wheelchair, an achievement that was celebrated by the caregivers.

# Analysis

The new features in the design achieved most of the intended clinical goals. The children have remarkable new capabilities to sit for extended periods and eat independently, indicating significant and practical improvements in hand, arm, and neck function. In comparison to solutions commonly used in high income countries, the cost to achieve these goals appears to be low and is worthy of additional study.

The study group involved a variety of diagnoses, functional abilities, postural support requirements, living environments, lifestyles, overall body heights and body measurements, and product expectations based on prior experience. The product was able to serve this wide range of needs with a simple all-in-one-box solution. It is critical to note that the field partner is highly skilled and customized the chairs to meet the unique needs of each child.



Caregivers experienced psychological benefits. Because the caregiving load was reduced, they experienced newly available time to focus on other tasks. Both of these are consistent with the normal expectations for a wheelchair provision of this type. Caregivers experienced less stress and negative feelings; and had more positive feelings related to being parents.

Caregivers explained that because the child can eat and play independently, they were freed up to focus on other activities, like siblings, shopping, and other household activities. Caregivers reported a decrease in the cost of care. Newly freed up time can result in an increase in family income.

Overall the group had very positive experiences with the new wheelchair and the rural group expressed greater willingness to pay, higher overall satisfaction, and reported more mobility. This is promising information because most unserved children live in rural environments.

Additionally, families living in rural environments often have lower household incomes, so the increased willingness to purchase the wheelchair by rural families in the trial demonstrates the perceived value of the product and the significance of the benefits it brings to their children and families.



Public and private transportation is a common global barrier for those using mobility devices. Therefore, Cub was evaluated for transportability. Some feedback was provided that users/caregivers need additional training on how to fold, while other families reported the folding mechanism allowed for them to have easy access to public/private transportation systems.

Willingness to Pay (WTP) can indicate the perceived value of the wheelchair. This can inform third party payers who are interested to understand the practical impacts. WTP varied from \$150 - \$600 USD. The highest WTP was among the rural caregivers where average monthly income is \$500 per month. With perspective of the income levels, the WTP shows a high perceived value as it is a large portion of the families' monthly income, and can be considered as a major purchase. A comparable could be a used car for a low income family in a high income country.



# Conclusions

***As observed in this study of eleven families, the new wheelchair is successful as a seating and mobility solution. The desired clinical objectives were achieved and satisfaction was high across the diverse group.***

Data from the study group shows that Cub is appropriate for the Indian context, which was a primary study question. The group demonstrated and reported impacts which are normally expected with clients who had a successful wheelchair provision and achieved clinical objectives. The group's high willingness to pay, especially in the rural group, further supports the effectiveness of the product.

The children were observed to be happier and they achieved new capabilities to feed themselves, socialize, and engage in educational activities. Caregivers experienced positive psychological benefits and newly available time, associated with an ease in the caregiving load. It is reasonable to conclude that the postural supports and improved mobility contributed to these benefits.

Transportability is a significant global barrier to inclusion for users of wheelchairs in this category. Many families in high income countries use large modified vehicles and vans as a solution. For the caregivers who mastered the folding process, the wheelchair was transportable in the small local vehicles. For access to education, visits to distant family members and many other activities, transportability is required. Though improvements are needed in training for use of the folding mechanism, the data showed that Cub can be an affordable solution.

The new wheelchair product appears to provide an opportunity for a significant total cost reduction to health systems. It is expandable to accommodate children as they grow. The users in the group varied in height demonstrating that the chair can accommodate children as they grow taller. With this expandability, it is conceivable that a child could use the wheelchair for 10 years, assuming that the wheelchair's cushions and positioning system were regularly adjusted and refurbished as needed.