

Fast and Furious: Therapeutic Modular Mobility

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Problem Statement Solution Study

Children who lack the freedom of independent mobility experience resulting negative cognitive effects such as poor depth perception and cause and effect reasoning. These same children also unfortunately tend to be ostracized by their peers, preventing the development of valuable social skills.

Measurement	Modification	Image
Varying abilities to grasp pre-existing steering wheel	Adjustable handlebars for steering	

Skills	Score
Turns switch on and off	
Demonstrates concept of cause and effect (realizes that activating switch is causing movement of car - communicating verbally, expression, or action)	
Demonstrates "Stop" and "Go" concepts. Follows directions of rearing switch at verbal cue of "stop" and pushing switch with verbal cue of "go"	
Maintains contact with switch for a minimum of 5 seconds	
Pushes switch to engage car in motion for 5 seconds	
Navigates car in forward direction for 10 seconds	
Looks in the direction of movement	
Turns a 90 degree corner to the left	
Turns a 90 degree corner to the right	
Navigates towards a toy, stops to play with toy	
Navigates towards a peer, teacher, or parent; stops to interact with individual	
Stops the car on command after engaging car in forward motion	
Stops after bumping into an obstacle	
Stops spontaneously to avoid stationary objects	

Scoring (adapted from Furumasa 2016)	
0	Task no attempted
1	Maximal hands-on assistance on switch with verbal cueing (51-75% assist)
2	Moderate hands-on assistance on switch with verbal cueing (26-50% assist)
3	Minimal hands-on assistance on switch with verbal cueing (25% or less assist)
4	Direct stand-by guarding with verbal cueing with occasional minimal assist to redirect
5	Verbal cueing only
6	Age appropriate supervision

Background

Mainly, we seek to give age-appropriate individual control over mobility. Granting the children the ability to move about independently will help with:

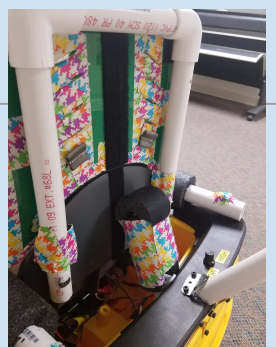
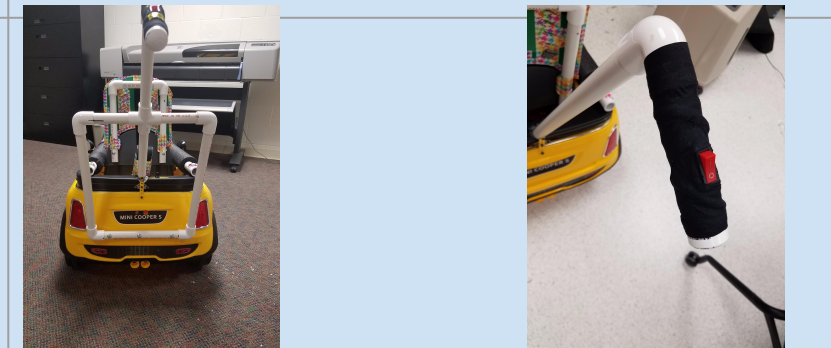
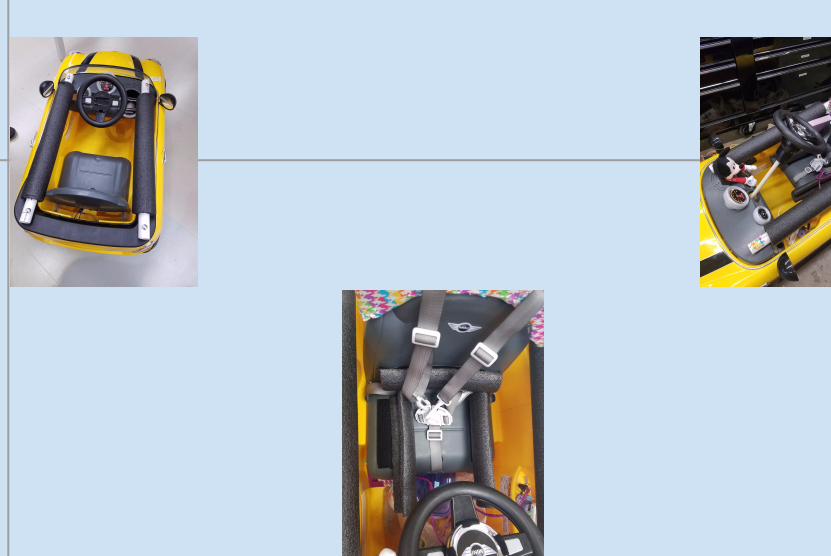
- Conceptualization of cause and effect
- Depth perception
- Cognitive development
- Social development

Conclusion

Our team has successfully constructed a therapeutic powered mobility device to support children with varied conditions. The device has been delivered to High Hopes preschool to help rehabilitate the children there. We hope that it will help many of the children develop at a rate more in line with their typical peers.

Needs Assessment

Provider:	System:
- Easily adjustable seat	- Powered mobility device
- Easy access to battery and motor controller	- Retain strength of initial structure
- Adapt to distinct needs of child	- Low cost
- Easy swap of acceleration options	- Overnight charging
- Easy to sanitize between uses	- Battery last 1-2 hours

Lack of trunk support	Easily adjustable seating (tilting)	
Stray from provider ; danger from obstacles	Easily accessible control for the provider	
Posterior pelvic tilt, splayed legs, weak neck	Arm, hip, lumbar, and head support	

Future Work

- Mass production
- Clean up design
- Make accessible to more regions
- Online Orders

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