

# USER TESTING TO ESTABLISH NEEDS FOR IKE (In-home Kid Exerciser)

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## ABSTRACT

For children with mobility impairments, achieving high levels of physical activity is difficult. Hypertonia and weakness cause impaired movement, which hinders cardiovascular training and overall fitness. Over time, lack of physical activity can lead to secondary conditions such as obesity and cardiovascular diseases that significantly increase morbidity/mortality and reduce quality of life. Physical activity has been clearly linked to reduction of secondary complications, improving both health and function; however, physical, economic, and psychological barriers for this population prohibit access to fitness equipment. There exists a critical need, therefore, for translational rehabilitation technologies that promote safe and effective physical activity and fitness at home. We have developed a motorized elliptical machine, dubbed the Motogaitor™, with speed and cadence control of the elliptical motion, along with an overhead body-weight support harness system. The present document describes the device, along with user testing on children with neuromuscular conditions performed at Lakeshore Foundation and United Ability in Birmingham, Alabama. Based upon the parent feedback, we devised a set of need specifications for a pediatric gait trainer. “Must haves” included adjustable assistance, differential resistance, and adjustable sizing, fits in a home setting, and costs less than \$3000. “Nice to haves” include a heartbeat monitor, a remote control, interactive games, and promotion of proper posture. These need specifications provided direction for the team to design and construct the next generation device, which we call IKE (the In-home Kid Exerciser), which features a freewheel bicycle gear that allows the motor to provide assistance starting the elliptical motion and the user to take over control of the elliptical by moving faster than the motor driven speed.

**Keywords:** mobility impairments, motorized elliptical machine, user testing

## INTRODUCTION

Many conditions such as cerebral palsy, spina bifida, amputations, strokes, multiple sclerosis, arthritis, and spinal cord injuries cause mobility impairments in children. These conditions have severe symptoms that hinder or stop the children’s ability to move. Examples of these symptoms are stiff muscles (spasticity), lack of balance, muscle atrophy, and paralysis. The persistent symptoms make it difficult for the affected children to get adequate exercise. Secondary conditions, such as obesity and cardiovascular disease, increase morbidity/mortality and reduce quality of life for this population, which leads to deterioration in their physical health and their quality of lives [1,2].

Exercise has been clearly linked to the reduction of secondary conditions while improving health and function in people with disabilities [3], contributing significantly to a person’s overall physical and mental well-being [4,5]. Physical, economic, psychological, and knowledge-related barriers, however, further hinder physical activity among people with disabilities. Communities do not provide environments conducive to physical activity for people with disabilities [6,7] and when they do, physical barriers, cost and transportation frequently render facilities inaccessible [8,9]. Lack of professional training of staff may further jeopardize effectiveness [10]. Thus, there exists a critical need for innovative and affordable