



SBIR/STTR SUCCESS

SmartDrive gives wheelchair users more options when it comes to movement and independence.

# MAX MOBILITY, LLC

Repetitive stress injuries are often discussed in the context of workplace or sports injuries, but for wheelchair users repetitive stress injuries are often the result of day-to-day activities. The National Center on Health, Physical Activity and Disability (NCHPAD) reports that shoulder pain is prevalent in 33% to 78% of athletes who are wheelchair users and carpal tunnel syndrome is present in 23% to 73% of wheelchair users. Overuse injuries to the upper extremities are common with wheelchair users because their upper extremities are used for propulsion, transfer, and activities of daily living (ADL).

## PHASE III SUCCESS

\$1 million in grant funding, including 3 SBIR Fast-Track awards, has turned into \$8-9 million in revenue and grew from 3 to 15 employees from Max Mobility's SmartDrive.

## AGENCIES

HHS

## SNAPSHOT

Max Mobility works to give wheelchair users more freedom with less injury by developing products that reduces the number of repetitive pushes done each day without forcing users to give-up their manual push chairs.

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"As an undergrad studying mechanical engineering I realized that I wanted to help people and was turned onto rehab engineering and went on to an internship with Beneficial Designs during graduate school at Stanford," said Dr. Mark Richter, founder and CEO of Max Mobility. "I worked with Beneficial Designs for 10 years where I learned about SBIR and used it to help fund my graduate research. I learned new skills working with grants as well as learning how to fight the fight and solve problems. Plus, it turned into great biomechanical research."

Drawing upon this experience, Dr. Richter founded Max Mobility in 2005 and has turned \$1 million in grants, including 3 SBIR fast-track awards, into \$8-9 million in revenue from SmartDrive this year. The company has grown from 3 employees to 15 and does its manufacturing in-house with some outsourcing of components. Based on a decision to focus on perfecting and commercializing one product, SmartDrive has become the company's most successful offering. However, Dr. Richter's research career has explored many ways to help users overcome what he calls a 'shoulder pain epidemic' among wheelchair users. To solve that problem his research has utilized the SBIR program to explore different approaches ranging from grips and rims to improved ergonomics and chair set-ups.

Max Mobility's SmartDrive Power Assist Device, developed through the NIH SBIR program, helps users overcome some of these challenges by providing a system that can be attached to any standard wheel chair and helps to minimize injuries and pain experienced by wheelchair users. SmartDrive reduces the number of repetitive pushes a user does each day by taking over once the user gets going - it does not do all the work, so users are still getting plenty of exercise and activity while not worrying about the steepness of a ramp or the thickness of carpet.

Dr. Richter notes that there is a 60% chance wheelchair users will have chronic shoulder pain, but most will just tough it out. Typically, anything over 1,500 cycles puts you at risk for repetitive stress injuries – wheelchair users do about 50,000 pushes per day. During his early career Dr. Richter was making good progress research wise, reaching a 30% percent improvement rate on push mechanics/ reduced shoulder pain, but 30% wasn't enough.

"I asked myself, 'How can I make a bigger difference?' and realized that you need a motor to off-load – SmartDrive came from that." Max Mobility received Phase I and Phase II SBIR awards for a Wheelchair Drive System in 2010 and 2011." The initial grant proposal was one thing and then the technology evolved. The SBIR awards afforded us the resources to really get the technology all the way."

SmartDrive has been on the market for almost 3 years and Max Mobility is on its third model. Some of SmartDrive's appeal is its small size, but the addition of new features and capabilities is continuing to expand its reach among new users. By modifying the user interface and using advances in accelerometry to develop a wristband almost any wheelchair user can use the technology. Dr. Richter believes that by continuing to explore new technical frontiers and applying new concepts to the Smartdrive system its user base will continue to grow and fill a huge potential market – all wheelchair users. Dr. Richter credits his experience with problem solving and approaching technical challenges with lessons learned by working on SBIR topics for almost ten years.



The SmartDrive power assist device can power users up steep hills and through thick carpet - it is intuitive to use and will go for miles on a single charge.

"These users don't want power mobility, they want manual push. They're tough. We recognized that the product had to be something they wanted to use, which was challenging," said Dr. Richter. "It had to be lightweight, inconspicuous, users don't want it to look like a power chair, or restrict their chair options. The product had to fit with an active lifestyle, while being durable and portable. It's a tool to use when they want."

Today the company's existing sales revenue is used for further product development. However Dr. Richter would like to break into new technical areas and address additional unmet needs for wheelchair users. Richter believes that his Nashville location provides Max Mobility with a supportive and friendly business environment and provides a lot of good research resources including Vanderbilt University, which he has worked with in the past. Nashville is also home to a major power wheel chair company that has provided additional opportunities for collaboration in this market.