

Element A

Introduction

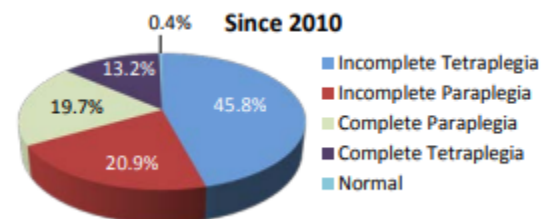
The primary issue regarding spinal cord injuries is the sudden loss of independence. Transportation is the largest concern for patients since it is correlated with employment. This report will discuss the increasing prevalence and significance of this problem along with the current market status for solutions.

Problem Statement

A spinal cord injury damages the nerves in the spinal cord which can cause long-term or permanent loss of function below the waist. Driving with this injury is impossible without special equipment and modifications. As of 2011, 36.5% of people with a spinal cord injury (SCI) in the US are reported to drive a modified vehicle^[1]. Studies show that this low number can be attributed to the high price of around \$20,000 to \$80,000 for modifications^[2]. Most patients feel a decrease in quality of life because of their lack of transportation and fear of driving without another person's help.

Problem Justification

Approximately 291,000 Americans live with a spinal cord injury. About 48% of these people are between the ages of 16 and 30, yet 76% of them remain unemployed ten years later. Of patients with spinal cord injuries, 40% have either partial or complete paraplegia, which is paralysis of the lower body; the other 60% is either partial or complete quadriplegia, which is paralysis of all



¹ JP, L. R. N. (2017). Characteristics of persons with spinal cord injury who drive in Malaysia and its barriers: A cross sectional study. Spinal cord. <https://pubmed.ncbi.nlm.nih.gov/29288252/>.

² Spinal Cord Injury Facts and Figures at a Glance Since 2010 Non-Hispanic White Non-Hispanic Black Hispanic Origin Native American Asian Other Since 2010 Incomplete Tetraplegia Incomplete Paraplegia Complete Paraplegia Complete Tetraplegia Normal. (2010).

four limbs. While some are discharged to a nursing home, the majority (87.4%) are discharged back to their private homes after being treated at a hospital^[3].

Transportation is reported to be the highest barrier in people's lives as it influences employment and access to healthcare. With motor vehicle accidents contributing to 38.4% of SCI causes, fear of driving is the second most common barrier to driving (17%)^[4]. Driving has especially proved to help community integration and increase patient satisfaction. In addition, researched benefits of driving include reduced stress; personal reflection; practice of mindfulness; and increased cognitive functions^[5].

Check which applies to you:

35 responses

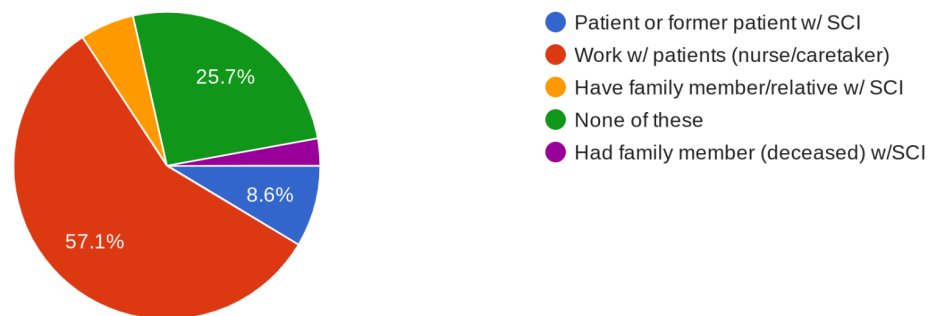


Figure 1: Survey Demographic

In an independent study conducted; nurses, caretakers, patients, and family members of patients were asked about their opinions in regards to the independent driving and solutions for it. Three-fourths of the participants of the survey have a comprehensive understanding of what it is like to live with SCI. It is important to note that the sample was taken in suburban areas, where driving is a necessity. All participants are adults that are well diverse in gender, race, and age.

³ Spinal Cord Injury Facts & Statistics. Spinal Cord Injury Information Pages. (2023, September 5). <https://www.sci-info-pages.com/spinal-cord-injury-facts-and-statistics/>.

⁴ JP, L. R. N. (2017). Characteristics of persons with spinal cord injury who drive in Malaysia and its barriers: A cross sectional study. Spinal cord. <https://pubmed.ncbi.nlm.nih.gov/29288252/>.

⁵ Why is driving so fun: Why driving is fun: Joy of driving: Jardine... (n.d.). Retrieved from <https://news.jardinemotors.co.uk/things-to-do/why-is-driving-so-fun-the-mental-health-benefits-of-driving-a-car#:~:text=In%20her%20book%2C%20%27Drivetime%27,comfortable%20in%20order%20to%20unwind.>

How would you rate (10 being the best) the importance of being an independent driver (ability to drive without someone's help)?

35 responses

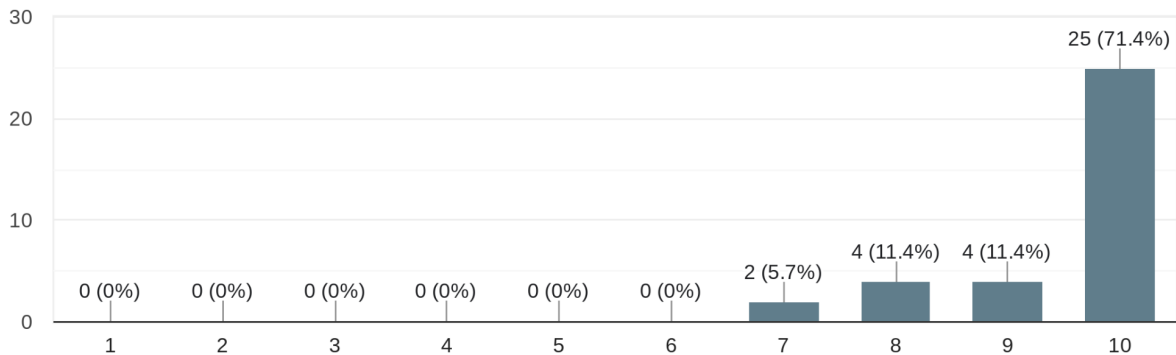


Figure 2: Driver Independence Rating

As shown in Figure 2 above, the importance of independent driving was rated an average of 9.5/10, with the mode being 10/10 and the lowest being 7/10. Loss of independence is a prominent component that people with SCI experience.

How often do you drive?

35 responses

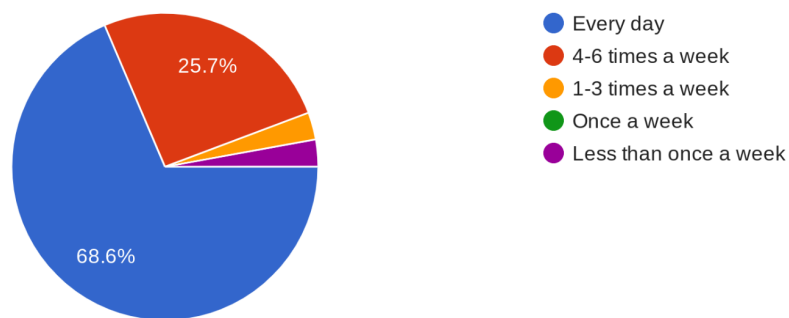


Figure 3: Driving Frequency

Figure 3 displays how often people drive. Especially for people who live in suburban and rural areas, driving is the primary choice of transportation and is an everyday necessity to go to work or to run errands.

What is the value of a solution (how much would you pay for a portable hand-controlled driving aid)?

35 responses

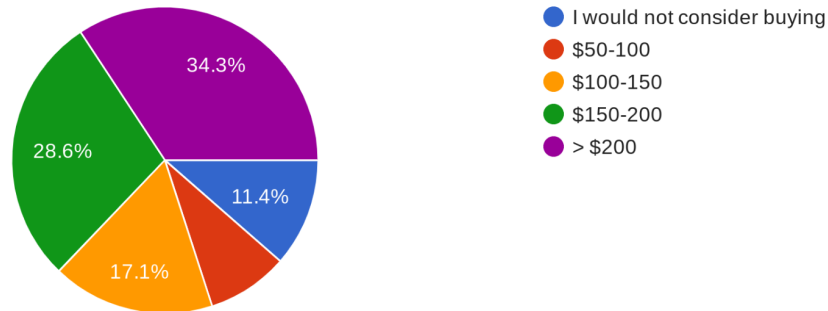


Figure 4: Solution Value

Figure 4 shows that the majority of people (34.3%) are willing to pay over \$200 for a solution. This demonstrates a high demand for a solution and allows for a relatively large budget when designing and building a solution.

Knowledge of the Market

Market Size

The market size for global vehicles for those with disabilities was \$8.34 billion in 2022 and is expected to increase to \$15.2 billion in ten years^[6]. The Americans with Disabilities Act forces public transportation to be accessible for everyone, encouraging car companies to develop specialized vehicles with mobility aids. This expands the industry for assistive technology and encourages more customization possibilities for each person's unique needs.

⁶ (N.d.). Retrieved from <https://www.reportsanddata.com/report-detail/vehicles-for-disabled-market>.

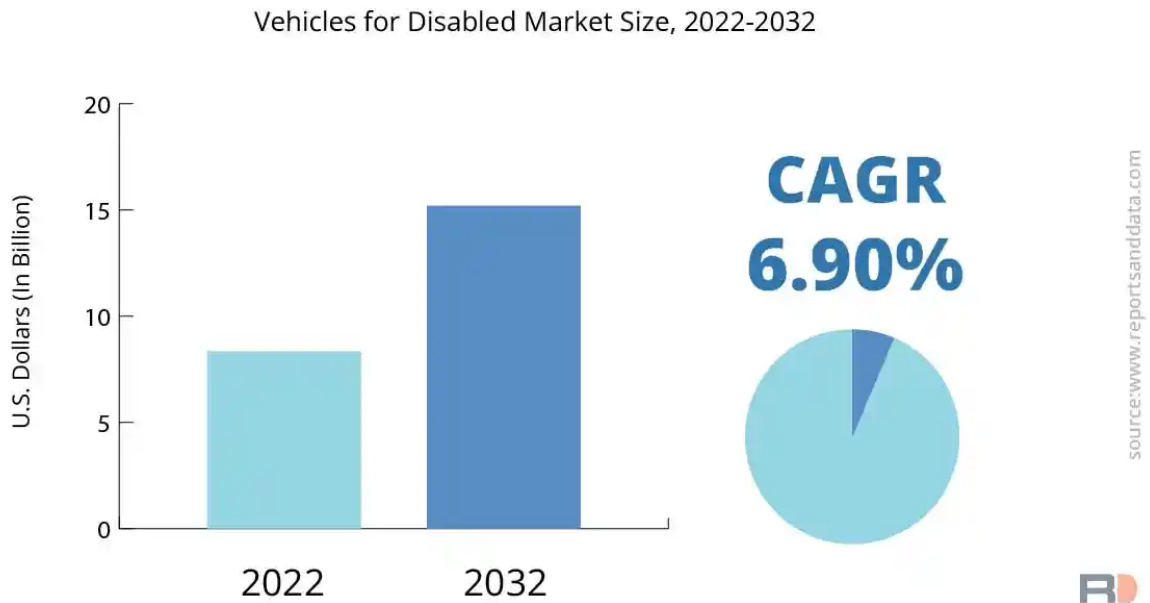


Figure 5: Compound Annual Growth Rate of Market Size

Figure 5 presents the compound annual growth rate (CAGR) is 6.9% which is driven by the increasing number of people with disabilities, more public awareness, and better assistive technology.^[7]

Stakeholders/Consumers

There is a growing demand for driving hand controls due to the advancing technology and aging population. Creating detachable and adjustable controls will cater to their needs. A driving hand control product will be best marketed towards SCI patients who travel often and prefer to drive without others' help. Caretakers are also possible stakeholders because they will be interested in improving the independence of their patients.

- Demographics of SCI patients^[8]:
 - 81% male
 - Between the ages of 16-30 and 65+
 - Alcohol users and engagers in risky behavior
 - People with bone diseases (e.g. osteoporosis)

⁷ (N.d.). Retrieved from <https://www.reportsanddata.com/report-detail/vehicles-for-disabled-market>.

⁸ Spinal cord injury. (2023). Retrieved from <https://www.mayoclinic.org/diseases-conditions/spinal-cord-injury/symptoms-causes/syc-20377890>.

SCI is most often a result of major traffic accidents and serious falls that leave lasting impacts on the body. From the ages of 16 to 30 is when the most reckless driving occurs, causing vehicle crashes with serious injuries. Their younger age contributes to their need for independence and transportation after rehabilitation. Marketing towards patients within these ages of SCI patients will result in the most success for driving hand control products.

Major Competitors

The top three competitors are Sure Grip, MPD (Mobility Products & Design), and MPS (Manufacturing & Production Services). Sure Grip is known for having the easiest push/rock hand controls that provide the longest fatigue-free driving^[9]. It has a higher installation which makes space for other needed controls. MPD's designs include some of the highest quality and most advanced controls^[10]. They focus on the accessibility of the accelerator and easy braking. The MPS push/rock hand controls include newer technology such as the accelerator lock-out feature for increased safety. Depending on the car make and model, modifications and installations of hand controls with these companies can range from \$2,700 to \$8,000.^[11]

- Mobility Assistive Technology Companies:
 - BraunAbility
 - Vantage Mobility International (VMI)
 - Ricon Corporation
 - Revability
 - The Braun Corporation
 - Adaptavan
 - El Dorado Mobility
 - AMS Vans LLC
 - Mobility Ventures LLC
 - Cummings Mobility Conversions & Supply, Inc.

⁹ Mechanical Hand Controls for Wheelchair Vans. (2022). Retrieved from <https://www.mobilityworks.com/hand-controls/mechanical-hand-controls/>.

¹⁰ Mechanical Hand Controls for Wheelchair Vans. (2022). Retrieved from <https://www.mobilityworks.com/hand-controls/mechanical-hand-controls/>.

¹¹ Home. (n.d.). Retrieved from <https://www.braunability.com/unitedaccess/us/en/mobility-products/wheelchair-vehicle-driving-aids/primary-hand-controls-for-cars-wheelchair-vans.html#:~:text=What%20does%20it%20cost%20to,range%20from%20%242%2C700%20to%20%248%2C000.>

Expected Place in the Market

An alternative hand control for disabled drivers catered specifically to patients with spinal cord injuries is being designed. It will be more accessible and affordable compared to current solutions that involve vehicle modifications. There is a plan to design a braking and accelerating hand control that minimizes the use of the lower body when driving. The market for driving hand controls heavily considers the reliability and trustworthiness of a company because it affects the consumers' safety.

Conclusion

With vehicle crashes being the leading cause of spinal cord injuries, driving becomes a point of fear and dependency for those coming out of rehabilitation. To cater to patients suffering with traumatic injuries, new and accessible hand control driving tools are increasing in demand. Independent transportation is a necessity with the primary benefits being access to healthcare, community integration and higher patient satisfaction. There is high demand and constant innovations made to solve this issue.