Many people take reliable transportation for granted, as it is a significant part of smart cities. However, the impaired people, especially those with severe disabilities, confront the challenges with obtaining access to transportation all the time. People with disabilities are often conditioned to social isolation due to inability to fully function in the outside world, which can then lead to depression and other mental issues. Moreover, that can cause proplems with employment, education and income.

Impaired people are dependent on others when it comes to driving a car. According to the Bureau of Transportation Statistics of the USA, more than one third of individuals with a disability report that they are not active drivers, which is significantly more than among people without disabilities. For those using wheelchair, for example, it is required to retrofit a car in order to be mobile. According to Gilani Engineering, an agency from Australia, cost of modyfing a vehicle starts at around $200 and can reach up to $80 000. Besides the financial burden, it is required to have a personalised medical report to meet the needs and to find expert technicians, able to implement the required modifications.

There has been a drastic improvement in technology in the recent years that has significantly alleviated problems of impaired people. Significant impact on devepments is made by transnational corporations such as Uber and Lyft. Uber creates phygital experience through offering autonomous vehicles (AVs) to their customers so that they have an option of going with or without a driver. Thus, impaired people get an opportunity to reach their destination on their own. Autonomous vehicles are an example of the phygital technology as they combine physical – the car itself, some sensors and the transportation environment – with digital – AI algorithms and software, mapping, autonomous control systems. According to California Department of Motor Vehicles, autonomous technology includes a combination of hardware and software, remote and/or on-board, that has the capability to drive a vehicle without active physical control or monitoring by a human operator. Another American company that has been developing their own solution in this field since 2013, is Aptiv. They offer a self-driven taxi that operates using information about the environment from the imaging radars that are located on the car, in this case – Hyundai Ioniq 5. Ever since, they have provided 100 000 public self-driven passenger rides. The idea behind their approach is smart mobility, which aims to help elderly and disabled people to move independently.[[1]](#footnote-1) Josie Archer, one of the employees, says that disabled people often have to schedule their daily activities around a driver or someone to take them to their destination, thus autonomous driving vehicles would drastically improve their lifestyle – they would download an app and the car would go where they need it to go.

Autonomous vehicle on its own is not enough to assist a disabled person, it involves machine learning, artificial intelligence, features that allow to understand spoken instructions, communicate with a person and actively analyze surroundings in real time. For instance, Texas A&M[[2]](#footnote-2) has been working on developing protocols and algorithms to enable people and AVs to communicate effectively. The project involved creating a self-driving car that can store information about the user, their disability, requirements and preferences as well as commonly visited places. When the shuttle arrives to pick up the rider, it could scan the area with lasers, cameras and radar to create a 3-D map of the area in addition to using open-source information. The AV can then send a notification to the user`s smartphone with its location and use facial recognition to make sure it is picking up the right person. It can communicate using audio or written text on the screen to inform the passenger about all the details of the trip. It is aimed to ensure the user`s safety and comfort, while also reducing stress and making the experience as human-like as possible.

The deployment of autonomous vehicles could faces stark reality due to limited technological development and inflexible, restrictive policies. AVs must meet all the requirements of every individual in order to be fully accessible. For instance, the blind and the visually impaired may require refreshable braille and an auditory system, including beacons to inform about the position of a car. On the contrary, people with ambulatory and physical disability, who use a wheelchair, need a ramp or a lift system integrated into the body of a car. Deaf people, being fully capable of driving vehicles even now, need a visual representation of any audible information displayed in Avs.[[3]](#footnote-3)

Another group of people that have issues with transportation is those with intellectual and developmental disabilities. They often rely on care givers in such mundane travels, so AVs could help them get around more independently – both by eliminating the need to navigate on their own and by allowing their care providers to monitor their way through GPS and cameras inside the car. People with mental disabilities might suffer from anxiety and fear before boarding a car or any other means of transportation, alongside with anxiety caused by unfamiliar devices and appliances, so it has to be simplified, and aim to reduce the amount of stress for the users. They can also suffer from motor disorders, which significantly limits their ability to drive. [[4]](#footnote-4) A key study worth mentioning is ‘Willingness of people with mental health disabilities to travel in driverless vehicles’ by R. Bennett, R. Vijaygopal and R. Kottasz, published in 2019.[[5]](#footnote-5) The researchers analyzed 177 answers of mentally disabled people to open-ended questions on their attitude towards AVs and defined three main approaches: freedom, fear and curiosity. People with intellectual impairments talked about freedom as the main association with AVs if they had prior knowledge about it, and if the respondents value the possible autonomy and independence it can offer. They were more willing to give it a try if they believed their condition hindered their everyday life. Fear was found closely linked to anxiety, in this case it can be strengthened by lack of control in a self-driven car. Women are often more anxious about trying new technologies and spatial anxiety (navigating the environment), and the study proves the point. Overall, it is crucial to address and work with the concerns of the potential users of such cars, reducing their fears. Curiosity depends on locus of control, which refers to how much a person believes he can control his life and the results of different events happening. However, curiosity did not have a significant direct impact on the willingness to travel in AVs. Therefore, we believe that autonomous vehicles have a significant potential to facilitate mentally disabled people commuting on an everyday basis, but it requires further technical advancements as well as increased awareness and trust in the technology.

<https://rudermanfoundation.org/wp-content/uploads/2017/08/Self-Driving-Cars-The-Impact-on-People-with-Disabilities_FINAL.pdf>

<https://www.aptiv.com/en/solutions/autonomous-mobility>

1. <https://www.aptiv.com/en/solutions/autonomous-mobility> [↑](#footnote-ref-1)
2. https://www.smithsonianmag.com/innovation/are-self-driving-cars-future-mobility-disabled-people-180965241/ [↑](#footnote-ref-2)
3. <https://rudermanfoundation.org/wp-content/uploads/2017/08/Self-Driving-Cars-The-Impact-on-People-with-Disabilities_FINAL.pdf> [↑](#footnote-ref-3)
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