

Deshpande Center Technology to Improve Ability Program

Improving the quality of life for people with disabilities

Overview.

The Deshpande Center Technology to Improve Ability Program will provide funding and support for MIT faculty, researchers and students to commercialize innovations that improve the quality of life for people with disabilities. This program is made possible by the generous support of the Alana foundation.

Mission and goals

The mission of the program is to improve the quality of life for people with disabilities, with a focus on people with Down syndrome. Innovations could assist a broad range of people, however they need to also benefit people with Down syndrome. Grantees will be provided both funds and mentoring to move their innovations into the commercial world to have impact.

Acceptable technologies

Any technologies will be considered, including hardware, software/applications, tools, internet or device based applications, methodologies, products and services.

Who can be supported

MIT faculty, researchers and students. May include joint innovations with outside collaborators.

Areas of interest

Improving muscle tone and physical ability and activity

Hypotonia (poor muscle tone) is a significant issue for people with Down syndrome. Muscle tone can be improved through exercise and physical activity. The goal is to activate and train muscles to improve tone. Any increase in physical activity would also have health benefits.

- Technologies to engage in physical activities to improve motor skills. Methods to improve oral and involuntary muscle movements (e.g. for digestion).
- Technologies could include hardware, software or games to get and keep individuals involved.

Improving cognitive ability

People with Down syndrome have delayed cognitive development especially in the areas of abstract knowledge, cognitive flexibility, and memory

- Technologies, educational tools, or methodologies to improve learning ability, cognition, and memory.
- Tools to assess cognitive ability.

Improving Communication ability

- Technologies to improve speech, and augmented or alternative communications.
- Technologies that make it easier to both communicate and understand communications.

Enhancing independent living ability

- Technologies that aid transportation and mobility, e.g. making it easier to use/navigate public transportation.
- Tools to make everyday tasks easier, e.g. using appliances, doing laundry.
- Aids to enable better decision making- e.g. healthier meal choices, e.g. via prompts and cues from devices (such as tablets, Alexa devices).

Improving health

- Improved sleep apnea diagnosis tools.
- Most people with Down syndrome will eventually have Alzheimer's disease. Better assessment tools and treatments for Alzheimer's disease.
- Adapting medical equipment for the craniofacial differences characteristic of Down syndrome individuals to make equipment more comfortable and better-fitting
- Infants with Down syndrome are subject to seizures. Technologies to better understand predictors for infantile seizures

Next steps- Applying for grants

To apply for a grant, download and complete the grant application form and budget template and email them to the Deshpande Center.

For questions about the program, please contact the Deshpande Center: 617-253-0943 or via email at desphandecenter@mit.edu

Background on Down syndrome

Cause

Down syndrome is a genetic condition where a person has an extra copy of chromosome 21. This additional chromosome affects physical and cognitive development. There are still gaps in knowledge on the molecular and cellular level of why Down syndrome occurs.

Unmet needs of people with Down syndrome

The unmet needs for people with Down syndrome can be categorized into medical conditions, cognitive ability, physical ability, health, and independence

Many of the medical conditions associated with Down syndrome, including obstructive sleep apnea, infantile seizures, Alzheimer's disease, craniofacial differences, and auto-immune conditions, require more scientific understanding. Down syndrome itself does not have viable gene therapies. In the area of sleep apnea, improved diagnosis tools are needed. Individuals need to be diagnosed annually and oftentimes it takes six months to reach a conclusive diagnosis. Infants with Down syndrome are subject to seizures and there is a need to better understand predictors for infantile seizures to reduce risk. The craniofacial differences characteristic of Down syndrome make some medical equipment uncomfortable and ill-fitting for individuals. This makes assessment and treatment more difficult.

Most people with Down syndrome will eventually have Alzheimer's disease. There is a need for therapies to prevent Alzheimer's, and the development of Alzheimer's assessment scales applicable to the Down Syndrome population.

People with Down syndrome face challenges in learning, memory and communication. There are delays in cognitive development. In some cases, individuals also regress in cognitive ability. There are many unanswered questions with regards to understanding, preventing and treating regression. Overall, improving cognition is a challenge in people with Down syndrome, specifically improving learning ability and memory. Inclusive educational tools and methodologies are needed to improve learning capacity.

Communication involves both cognition and physical oral motor skills. Individuals with Down syndrome have difficulties with speech. Better methodologies are needed to assess a child's ability to communicate. Customized augmented and alternative communication technology could improve communication. Down syndrome affects physiological development. People with Down syndrome have hypotonia (poor muscle tone) that leads to problems with speech and fine motor skills and creates difficulties with involuntary bodily functions such as digestion. There are also issues with reduced physical activity and obesity.

Independence is a key goal for people with Down syndrome. This requires being able to use transportation and having mobility as well as accessibility. Everyday tasks such as laundry or operating a toaster can be challenging for people with Down syndrome. The technologies used to complete tasks are often inaccessible or difficult to operate.

Links to information on Down syndrome

<https://alana.mit.edu/research/about-down-syndrome/>

Cognitive differences

<https://onlinelibrary.wiley.com/doi/abs/10.1002/ajmg.c.31439>

Communication Changes

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2860304/>