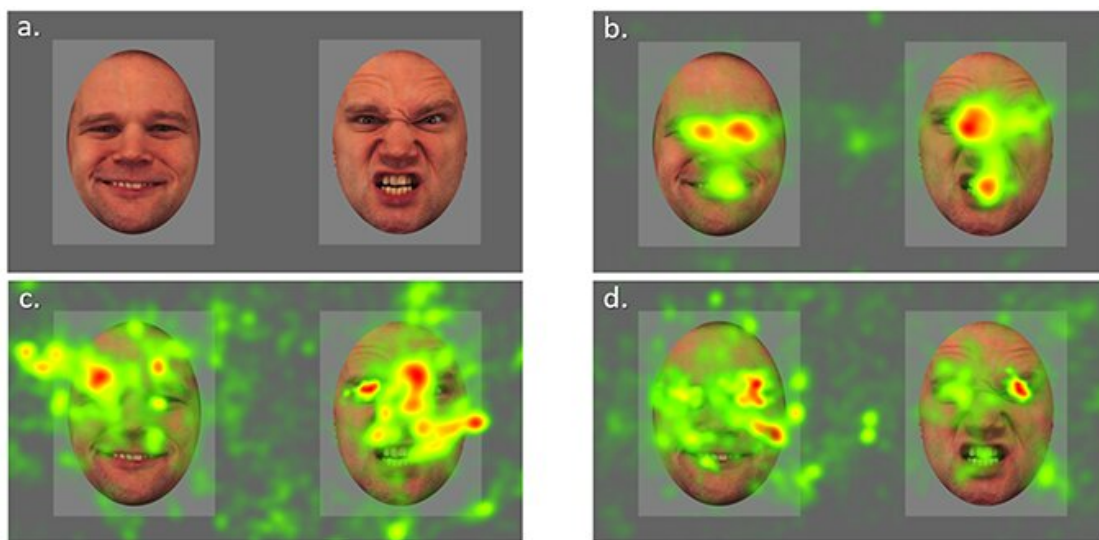


Eye tracking can be used to assess the perceptual abilities of people with multiple disabilities

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Several pairs of images and scenes were presented to these children in order to assess six social-emotional abilities through visual preferences for: biological or non-biological movements, socially salient or non-social scenes, facial area of the eyes or mouth, joy or anger, objects of shared attention or not, pro-social or anti-social behaviors. Credit: Thalia Cavadini / UNIGE

How do we assess the needs of people with severe multiple disabilities? Unable to communicate verbally and physically, this population has nearly no possibility of expressing itself. They are therefore sometimes

considered as "untestable" by the scientific and medical community. Thanks to eye-tracking technology, a team from the University of Geneva (UNIGE) has succeeded in identifying and evaluating certain perceptive and social-emotional abilities in nine children and adolescents with multiple disabilities, opening the way to personalized care. These results can be found in the journal *PLOS One*.

People with multiple disabilities include people with a combination of severe intellectual and motor deficiencies, to which are added various associated medical conditions. The symptoms are expressed in very different ways depending on the individual, but all of them are in a situation of extreme dependence for the execution of the tasks of daily life (washing, dressing, eating). Unable to communicate through language or sensory-motor signs, these people have practically no way to express themselves.

How can their needs and preferences be assessed and personalized assistance provided? Until now, it was often considered that this population was "untestable" and that this type of information could only be collected indirectly through the observations of external evaluators (parents, educators, caregivers). This is generally based on questionnaires measuring certain behaviors in terms of frequency ("never" vs. "always") or intensity ("not at all" vs. "a lot").

Making the eyes 'speak'

Research led by Edouard Gentaz, a professor at the Faculty of Psychology and Educational Sciences of the University of Geneva (UNIGE) and at the Swiss Center for Affective Sciences, shows the opposite. His team demonstrates that eye-tracking—which allows the recording of [eye movements](#) in real time—is a promising tool for the direct evaluation of social-emotional and perceptive abilities in this population. Indeed, the ability to look is one of the only behavioral cues

frequently preserved in individuals with multiple disabilities.

"Eye-tracking has been used for many years to assess the early abilities of babies, who are not yet able to speak and do not yet have [fine motor skills](#)," explains Edouard Gentaz, the study's last author. At the request of the medico-educational institute La Clé des Champs, based in Saint-Cergues (F), the UNIGE scientists tested repeatedly nine single cases with severe multiple disabilities aged 6 to 16, and recorded their eye movements in response to different visual stimuli.

Six abilities assessed

"With eye-tracking, we observed that these children were sensitive to what they saw and that each one of them had his or her own visual preferences," says Thalia Cavadini, assistant professor in the Faculty of Psychology and Educational Sciences, first author of the study and grant holder of the Swiss National Science Foundation (SNSF).

Several pairs of images and scenes were presented to these children in order to assess six social-emotional abilities through visual preferences for: biological or non-biological movements, socially salient or non-social scenes, facial area of the eyes or mouth, joy or anger, objects of shared attention or not, pro-social or anti-social behaviors. Researchers compared the amount of time each participant spent looking at each image. They then compared these results with those of a [control group](#) of 32 two-year-olds without multiple disabilities.

Developing 'serious games'

"This method enabled us to highlight unsuspected individual skills in each of the nine children tested, such as the ability to orient oneself preferentially towards human and socially salient stimuli or the ability to

direct one's attention towards the object that another person is looking at. This discovery opens the way to personalized stimulation and care devices, as long as the ability to look is preserved, which is not the case for all people with multiple disabilities," explains Edouard Gentaz.

Thanks to this work, eye-tracking is now a reliable device for assessing certain perceptual and social-emotional abilities of people with multiple disabilities, while taking into account their individual characteristics. On the basis of this research, "[serious games](#)"—video games with an educational or communicative purpose—adapted to each child tested are also being developed. The objective, in the long term, would be to establish a more fluid communication with this population.

More information: Thalia Cavadini et al, Eye-tracking-based experimental paradigm to assess social-emotional abilities in young individuals with profound intellectual and multiple disabilities, *PLOS ONE* (2022). [DOI: 10.1371/journal.pone.0266176](https://doi.org/10.1371/journal.pone.0266176)

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