Promoting the choice behavior in a person with multiple severe Intellectual and Motor Disabilities with the help of an optical pointer

Alessio Madonna[1], *Giuseppina Matrone*[1], *Elisa Cellucci*[1] & *Carlo Ricci*[2,3]

People with multiple and severe disabilities find it difficult to develop verbal and non-verbal language, thus remaining passive or inadequate in communication (Ricci, Miglino, Alberti, Perilli, & Lancioni, 2017). Increased communication skills would promote active participation.

Sigafoos, Kelli and Butterfield (2007) suggested a distinction between intentional and potential communication. In this latter, it's the partner who attributes intentions, meanings or purposes to the speaker's behavior. Behaviors that in the current or future epochs acquire the status of communication forms are defined as potential communication acts.

In order to facilitate communication, the use of assistive technologies allows individuals to perform functions that otherwise could prove difficult or even impossible to carry out (Lancioni, Sigafoos, O'Reilly, & Singh, 2013).

An example of communicative application is represented by the Walden Personal Communicator (WPC): a hybrid system which uses images and/or physical objects with radio frequency identification technology (RFID), with the aim of promoting the development and increase of communicative and social skills (Ricci, Di Ferdinando, Romeo, & Miglino, 2013).

To overcome motor difficulties in people with severe and multiple disabilities, an ocular pointing-based technology was used to determine the point observed on a screen through the position of the eye. The holding time of the gaze turns out to be an indicator of a choice and expresses a

[1] Sapienza University of Rome, Italy.
[2] Walden Institute Group, Rome, Italia.
[3] Salesian Pontifical University, Rome, Italy.

Correspondence to: Alessio Madonna. E-mail: alessio.madonna@uniroma1.it.

preference (Fleming, Wheeler, Cannella-Malone, Basbagill, Chung, & Day, 2010).

Alessia (A.) is a 6-year-old girl diagnosed as having severe psychomotor retardation and epilepsy. She is partially able to govern the chest, always assisted by machinery such as postural stabilizers, which allow her to freely move the arms by supporting her while standing or sitting. She walks with the support of a walker. Multiple disabilities have prevented her to develop conventional language skills or intentional communication skills; therefore, potential communication behaviors have been identified that could be changed to intentional.

The girl has shown some interest for sensory feedback (auditory, visual, tactile or olfactory). She loves objects that produce noises (deaf sounds, vibrations, music) preferably metallic ones, and she is able to direct her hand towards them, to touch or grasp them, so as to activate the feedback.

At the baseline, latency times of this behavior ranged from 40 s to 1 m and 10 s, with a number of errors equal to about 50%.

An inventory of welcome (S+) and unwanted (S-) objects was created, with their image presented on Android tablet, where A. was asked to touch her favorite image followed by verbal labeling by the operator. Subsequently, the images of S+ and S- were presented simultaneously to allow her to make a choice.

Behavioral observations were recorded using the Behavioral Observation Research Interactive Software (BORIS; Friard & Gamba, 2016).

At the 6-month follow-up, both the errors committed (below 10%) and the latency times of the responses (not less than 30 s) had decreased.

Figure 1 – *Ethogram generated with BORIS Software*

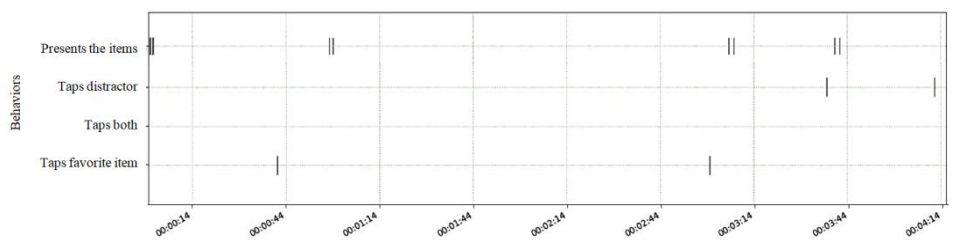
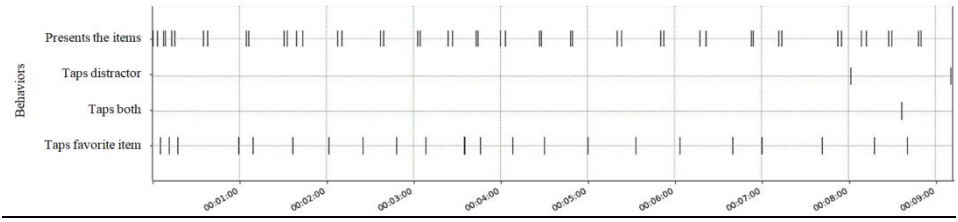


Figure 2 – *Ethogram BORIS at 6 months follow-up*



In the next phase, the WPC was used for the selection of the S+. There was an improvement in the gaze fixation behavior relating to the appreciated object.

After looking at the two proposed tablets, A. directed her gaze towards the S+ and maintained this behavior for at least 3 s. Her greater precision in looking and keeping her gaze on what she liked suggested the usefulness of considering the application of an eye-pointer for the choice of favorite objects.

Evaluation for the use of this technology is currently underway.

References

Fleming, C. V., Wheeler, G. M., Cannella-Malone, H. I., Basbagill, A. R., Chung, Y. C., & Day, K. G. (2010). An evaluation of the use of eye gaze to measure preference of individuals with severe physical and developmental disabilities. *Developmental Neurorehabilitation, 13* (4), 266-275.

Friard, O., & Gamba, M. (2016). BORIS: A free, versatile open-source event-logging software for video/audio coding and live observations. *Methods in Ecology and Evolution, 7* (11), 1325-1330. doi:10.1111/2041-210X.12584.

Lancioni, G. E., Sigafoos, J., O'Reilly, M. F., & Singh, N. (2013). *Assistive Technology*. New York: Springer.

Ricci, C., Di Ferdinando, A., Romeo, A., & Miglino, O. (2013). Migliorare la comunicazione attraverso il Picture Exchange Communication System (PECS) e gli Speech Generating Devices (SGDs): il Walden PECS Communicator (WPC). *Disabilità Gravi*, *2* (3), 105-112.

Ricci, C., Miglino, O., Alberti, G., Perilli, V., & Lancioni, G. E. (2017). Speech generating technology to support request of persons with intellectual and multiple disabilities. *International Journal of Developmental Disabilities, 63* (4), 238-245.

Sigafoos, J., Kelli, M. A., & Butterfield, N. (2007). *Migliorare la comunicazione quotidiana dei bambini disabili*. Trento: Edizioni Erickson.