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Assistive Technologies and Microswitches for Promoting Constructive Engagement by Children with Developmental Disabilities

Editorial

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Children with developmental disabilities may fail to constructive engage with the surrounding world, due to their pathologies and clinical conditions. In fact, they are frequently reported as quite passive, isolated, presenting medical complications, dystonic movements, stereotypic behaviours, seizures, breath difficulties. Accordingly, they dispose of a very poor and limited behavioural repertoire, with few and sporadic capacities and opportunities to positively interact with the environmental events. Their situation may seriously hamper their social desirability, image and status, with negative consequences on their quality of life [1, 2]. Traditional rehabilitative programs within medical centres focused on sensorial stimulation and snoezelen rooms, providing them with positive (i.e. pleasant) environmental stimuli, aimed at enhancing their alert and vigilance, with positive consequences on their mood [3, 4]. The aforementioned interventions, however, do not improve participants' active role, relying them on caregivers and parents' assistance [5]. One way to overcome this issue is the use of assistive technologies (AT) [6]. Thus, by using technological supports (e.g. laptop, voca, speech generating devices) one may encourage positive participation of children involved, fostering their constructive engagement and reducing parents and caregivers' burden [7]. One solution within the AT approach is represented by microswitches [8].

Microswitches are electronic devices ensuring a person who exhibit a very low behavioural repertoire with an independent access to preferred (i.e. positive) stimulation. For instance, a child who is described with congenital encephalopathy and multiple (i.e. combination of sensorial, motor and intellectual disabilities) may be recruited for a microswitch-based program. That is, by producing eye blinking (i.e. adaptive response) recorded by an optic sensor fixed on a glasses frame the child could autonomously receive brief (e.g. 5-10 seconds) of preferred songs, through a control system unit [9]. Although no specific rules exist, one may define basic guidelines for a positive outcome concerning a microswitch-based intervention. Thus, the behavioural response should be already included in the child' behavioural repertoire, consequently easily exhibited by the participant (i.e. without any effort), detectable for the microswitch, produced by verbal and/or physical prompts. The stimulation provided contingently to the performing of the adopted response should be adequately motivating (i.e. it should compensate the response cost). Based on learning principles (i.e. causal association between behavioural response and environmental consequences), the child is expected to acquire the awareness concerning the aforementioned association and increasing his/her responding to access to positive stimulation [10]. Conversely to the sensorial stimulation and snoezelen-based interventions, within a microswitch-based program, participants are requested to produce (i.e. exhibit) an adaptive response to access to pleasant stimuli by themselves [11].

Depending upon the level of intellectual, motor and sensorial levels of functioning concerning the participants involved (all those are customer-tailored solutions), one may design different rehabilitative interventions. Beginning at a very low level of functioning, as described above, one may plan a very basic program with a simple (e.g. eye blinking) response to access to a unique category of stimulation (e.g. pleasant songs). Switching to a more favourable outcome (i.e. higher functioning),one may project at least a basic choice program with two minimal responses adapted and two related microswitches selected to detect those responses, allowing participants to request and choice between two different categories of stimuli (e.g. visual and auditory stimulation). Else, one may encourage a combination of microswitch and VOCA (i.e. vocal output communication aid) program, enabling participants to chose whether independently access to pleasant stimuli or ask for social contact with a caregiver. Otherwise, microswitch-clusters technology will pursue the dual goal of increasing an adaptive response (e.g. manipulation of an object) and, at the same time, reducing a challenge behaviour (e.g. head tilting). Moreover, one may provide individuals who present problems of balance with microswitches and contingent stimuli in their walking devices to promote ambulation responses and/or to foster locomotion fluency as integrative interventions compared to the use of treadmills and/or physiotherapy sessions. Finally, for children who are estimated within the normal range of intellectual functioning and who present extensive motor disabilities or developmental disabilities such as autism spectrum disorders with challenge behaviours (e.g. tantrum behaviour), microswitch-based programs combined with a keyboard emulator or a computer mediated intervention, may be considered to improve literacy access and request and choice access, promoting leisure, communication and occupation skills [12-14].

In light of above, future research perspectives in this topic area should deal with the following crucial points:

a. Further extension to new participants with severe to profound clinical conditions of the aforementioned programs,
b. Planning follow-up and/or maintenance/generalization phases addressed to the acquired skills,
c. Considering indices of happiness as outcome measure of the quality of life of participants involved,
d. Assessing social validation procedures recruiting professionals, parents and caregivers as raters, and
e. Finding out and checking for updated new basic technological solutions, which should be at the same time cheap (i.e. not expensive) and rigorously customer-tailored designed, positively responding to a wide range of participants involved, depending upon their general and clinical conditions [15].

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