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Using Tablets and Augmentative and Alternative Communication Methods to Improve Communication Skills of Persons with Severe Disabilities

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Keywords : Augmentative and alternative communication, severe disabilities, language impairments, tablet, inclusive education.

The research in brief

1. Augmentative and alternative communication (AAC) is used to help people with language impairments to express their thoughts or understand what others want to tell them
2. Tablets seem to be suitable tools to implement AAC in an effective and usable way
3. Participatory research action: 6 months, 4 people with severe disabilities (they say only "yes" or "no")
4. Low-cost Android tablet with 2 free apps (JABtalk and AAC Talking Tabs)
5. Standard symbols or self-made pictures may be imported to create vocabularies
6. Text-to-speech function used to read symbols and whole sentences
7. Pictures taken with each of the 4 people used to build personalized communication tables
8. Personal involvement of the 4 subjects as a key to the success of the experiment
9. Great effort for one-off personalization
10. Work in progress with other subjects

Proposal Information

Augmentative and alternative communication (AAC) is a broad term used to address both methods and techniques that help people with language impairments so that they can supplement or replace natural speech or writing and understand or produce spoken or written language.

AAC is currently adopted to treat several congenital and acquired conditions such as cerebral palsy, intellectual disability, autism, verbal dyspraxia, locked-in syndrome, amyotrophic lateral sclerosis, Parkinson's disease, multiple sclerosis, dementia, aphasia and traumatic brain injuries.

In recent years the development of the information and communication technologies has led to a key development in the application of computers to the AAC: the information technology evolution, through the progressive miniaturization of both the size and cost of devices and the advent of mobile computing, is providing us with low-cost easy-to-use computers, which can be exploited even by people with severe disabilities.

AAC can especially benefit from tablets, which outperform dedicated first generation AAC devices in terms of screen resolution, pixel density, battery life, weight and price.

We have started an experimentation aimed at exploring the potential of AAC on tablets for improving communication skills of persons with severe disabilities.

In the first stage of the project we have selected hardware and software to build some prototypes, which were co-constructed with four adults with severe language (and motor) impairments being treated at a day care center for people with disabilities.

This was done through a *participation action research* performed over a time span of six months. The four subjects were supported by an assistant, who progressively trained them in the use of a tablet and built appropriate personalized symbol tables to help them in basic communicative interactions, such as choosing the activities to be undertaken at the center or their favorite dish from the lunch menu.

The main goal of our exploratory action research was to verify whether the tablet devices with their apps were appropriate to facilitate the communication of people with severe disabilities, such as those treated at the center where the trial took place.

Our conceptual framework is that of the inclusive education, inspired by the United Nations *Convention on the Rights of Persons with Disabilities*, which provides that "States Parties undertake […] to [...] promote research and development of, and to promote the availability and use of new technologies, including information and communications technologies [...] suitable for persons with disabilities", and that the States Parties "shall take effective and appropriate measures to facilitate […] their [of the persons with disabilities] full inclusion and participation in the community"; and that they "shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others".

Methodology or Methods/ Research Instruments or Sources Used

We selected for our program four persons on the ground of two basic criteria: they were able to clearly manifest communication intentionality; when answering to a question; they were able to rather intelligibly express the difference between *yes* and *no* by means of either verbal or non verbal communication (or both). Among these subjects, one had already unsuccessfully been exposed to traditional AAC methods at school, whereas the other three had not even been considered before for AAC interventions. The number of subjects for the trial was limited to four because a single research assistant was available for the experimentation.
To minimize the costs of hardware and software, we opted for a non-iOS platform, which seemed more reasonable to propose to the families for possible future purchase. The Android operating system was selected, due to its diffusion and the number of potential free apps available on the market.
Some preliminary tests were conducted on several tablets; after a first round, screens under the 10" were discarded, because they did not seem suitable for people with limited visual acuity and/or reduced fine motor skills; at the end, we chose a Samsung Galaxy Tab 2 10.1 with Android OS version 4.0.4. Some experiments were also made on a smaller Samsung Galaxy Tab 2 7 (and more recently, after the end of the first trial, on a Google Nexus 2).
Many apps were tried and evaluated with reference to a quality model based on the project needs, that is, the requirement for free license, high customizability, user friendliness, simple and clear interface structure, Italian or English interface, integration of text-to-speech facilities.
Eventually, we opted to use two apps: JABtalk and AAC Talking Tabs. Both allow managing categories, inserting pictures, and generating vocal output; JABtalk provides a tree structure for organizing symbols and pictures that is simply navigated step by step by the user; AAC Talking Tabs consents to building phrases by moving from one picture to another.
With each user we co-constructed a personalized communication table, through a very long and time expensive process: initially we had to get the users familiar with the device and the interaction modalities; then, photographs were taken for any situation, object, or person had to become part of the *vocabulary* of each user; eventually, users were instructed on how to use their tables to answer requests and express their desires or feelings.

Conclusions, Expected Outcomes or Findings

The results of the first step of the project are more than satisfactory.
Given the simplicity of the touchscreen interaction approach, the tablets have proved easy and intuitive to use, even by people who are both physically and cognitively very compromised.
The simple imitation of operator's gestures allowed the subjects involved in the research to easily interact with the device from the first attempts, despite their serious motor impairments, and the finger-driven interface was accepted by them, according to their different abilities.
The ease of use of the interactive platform allowed the persons involved in our experiment to greatly extend their communication opportunities.
The speech synthesis capability helped them to understand and remember the meaning of images and symbols that were clicked, allowing an immediate check of the messages built through the tablet. At the same time, it made it possible to establish communication relations with different people, without the need to explain the method, in a more transparent way than with respect to communication acts based on ordinary AAC boards.
Moreover, we found a significant increase in the intentionality of communication, which was encouraged by the effectiveness of the system and the friendliness of the interface.
Our findings show how even severely compromised people may be educated to communicate with adequately personalized products. This requires one-off customization and great effort in order to be performed, and it can be regarded as a form of inclusive education aimed at acknowledging and enhancing the inherent dignity of the person being involved in the communication project.

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