Building a mobile app to increase daily self-management skills in children with Autism Spectrum Disorder

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Abstract. Despite the enormous progress made in the rehabilitation of people with Autism Spectrum Disorder, today it continues to be difficult to take the results out of the meticulously personalized setting of the therapist. The school and home context still require highly specialized professionals to assist and support caregivers in their daily activities with people with ASD. The clinician's job is, therefore, to optimize procedures already used in the clinical setting and make them effectively usable even in less structured contexts. In this article we will analyze some specific procedures, focusing in particular on social skills and concluding with a proposal currently used by an experimental group of people.

Keywords: autism, behavior analysis, software.

1 Introduction

Autism is a condition that shows itself in the first months of life, but that develops over the entire life span. Some of the most serious difficulties experienced by subjects with ASD concern social skills, particularly in communicative reciprocity, in the ability to initiate and complete exchange and in reading contextual feedback [1].
Strengthening social skills, proposing a path of autonomy outside the rehabilitative structures, is fundamental to accompany the subject in personal growth [2].

In recent years many clinical suggestions have found a place in the daily life of people with this disability [3], in particular, behavioral interventions have found ample space in the school context and the home [4].

1.1 Picture activity schedule

Picture activity schedules take advantage of the general propensity of subjects with ASD to interact with visually cued instructions and consist of a sequence of images (eg symbols or pictograms) that symbolize tasks to complete [5]. Picture activity schedules are a useful strategy to reduce dependence on external prompts, such as instructions, by

increasing the number of answers given independently. The information, visually presented, has important repercussions in time management, in controlling the shift between activities [6] and in communication [7] for subjects with ASD.

We can divide presentation media in low technology and high technology [3]. The advantages of a low-tech presentation are related to the solidity of the support, not requiring constant maintenance (eg. charging the battery) and providing immediate physical feedback. On the contrary, the high-tech presentation allows a greater richness of content, both in terms of number and interactivity: a tablet can talk, show images, sounds, and texts, adjust the information provided based on the physical context or the current time.

In a 2017 study, the two methods of use were compared on a limited number of patients. The study concluded that although the timing of acquisitions between the two media was quite similar, the majority indicated a preference for multimedia support at the expense of paper [8].

1.2 Video Modeling

Video Modeling, defined as “the occurrence of a behavior by an observer that is similar to the behavior shown by a model on a videotape” [9], it's a technique that uses video recording technologies to support the implementation of new behaviors or the reduction of the latency at the start of the activity.

Several studies have tried to compare this procedure with the in vivo modeling: these studies have shown that video modeling often involves a faster acquisition of skills and a greater generalization of what is acquired across different persons, settings, and stimuli. Video modeling is also more efficient in terms of costs and time than classic modeling methods [10].

1.3 Cool VS Not Cool

"Cool vs Not Cool" is a program that allows discriminating an appropriate behavior ("cool") from an inappropriate one ("not cool"). The therapist has the task of showing the two behaviors without underlining their appropriateness, leaving the patient the task of identifying the "cool" from the "not cool" and of verbally describing the reason for his response. When the response is completed, the therapist will provide proper feedback [11].

Unlike the other two methods, “cool vs not cool” allows you to observe not only the appropriate behavior, but also the inappropriate one, and to identify the features common to dysfunctional behaviors.

2 Going hi-tech

To date, there is no single solution for managing the procedures described above. These procedures have pros and cons, so often an operator finds himself using them in a non-exclusive way based on the skill he needs to work on. This paper, therefore, aims to

create an app that, combining procedures in a fluid manner [12], can support both those who work with the patient and the patient himself. The application, called "Visual Agenda", is currently being tested at the Neapolisanit rehabilitation center in Ottaviano, Italy.

After logging in, “Visual Agenda” shows the weekly view. The user can switch to a daily, monthly and three-days view. This visual agenda helps people to self-manage their time because is possible to add an activity on a specific day, in a specific time. For example, we know that we have school from Monday to Friday from 09:00 a.m. to 01:00 p.m., we have karate lesson on Monday from 04:00 p.m. to 07:00 p.m., a football match on Wednesday at the same time and so on.

To add an event to the Agenda, it is necessary to enter into an "Edit Mode" from the lateral menu. Once inserted the password, it's possible to create a new event or modify an existing one on the fly. The events are completely customizable.

Every event can be connected to some activities that are involved in that event. For example, for the event “SCHOOL” there are different activities like: “DO MATH”, “ENGLISH LESSON”, “BREAK TIME” and so on. As the events, also the activities are completely customizable.

It is possible to explain how to carry out an activity through what we call “Targets”. These targets represent the behavioral goal to achieve for that particular activity. Targets can be specified for a particular activity, or they can be common to all. For instance in the activity “DO MATH” we have three targets linked: “TAKE NOTES”, “WRITE MULTIPLICATION TABLES” and “DO COLUMN ADDITION”. The first one could be targeted also by another activity (i.e. “English lesson”) while the last two are specific for Math. This means that in each activity we can import existing targets that we have created for another one.

Every procedure is associated with a symbol. This symbol identifies the related procedure. The related procedure represents how that particular goal must be carried out. The Agenda supports three kinds of procedures. The first one is “Task Analysis”, the second one is the “Video Modeling” and the last one is “Cool vs Not Cool”. In this way, each objective can be carried out with the visual support of a specially designed procedure.

It is possible to edit every event added inside the Visual Agenda. For example, suppose that we want to customize the event school related to Friday 14. So we can click on it and we can add each activity we would like that is related to the event “School”. In our example imagine that on Friday 14 we have Math lesson at 11.00. For this reason, we can simply select and add the activity “Do Math” from our “school” list activities. After that, we can add specific targets for the activity “Do Math” of event “school” about Friday 14. When we import the targets we also import the related procedure but at a later time, we could always replace it with another as we like. In this way, the user is completely helped to manage daily his schedule and assisted in carrying out the specific actions to be performed.

3 Conclusions

In this article, three useful procedures for rehabilitation were explored. Subjects with ASD benefit from visual information [13], show a predilection for smart instruments [14] and need constant support to learn and generalize work. Our application helps them, by allowing a handover between the operator and the person, letting him or her to proceed with the fading of the prompt and to increase the autonomy of the person [15]. Once the experimental phase is complete, new procedures will be added to the app, based on the needs of our users, to provide new tools for daily clinical work.

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