"CareMe": A new way to face Problem Behaviors at School

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Abstract. Problem behaviors (PB) are various kinds of severe behaviors that are common in children with neurobiological disorders, from the most tolerable to the most dangerous for themselves and for others. These Problem behaviors are expressed in various contexts like school, where teachers are often unable to deploy effective intervention strategies. Often there is no connection with specialists, so teachers have no up to date information on the treatment of the child and families are left without support. The goal of this paper is to propose a new smart app for mobile devices called "Care Me" based on the functional assessment methodology (the most useful methodology to identify events that lead to or maintain problematic behaviours). The proposed application help teacher to recognize, record and find a concrete solution to the problem in a simple, fast and efficient way. In our work we will describe the educational methodology and the app design.

Keywords: autism, education, behavior, App, technology.

1 Introduction

Behavior is problematic when it is dangerous for the subject and/or for others, it prevents or limits learning opportunities and "pulls" others away from the subject [1].

People with Autistic Spectrum Disorder (ASD) and intellectual disability (ID) have a significantly higher rate of Problem Behaviors than people of the same age and with typical development [2].

Dekker, Koot, Ende, and Verhulst [3] estimate that 50% of people with ID have some form of problem behavior, in 5-10% of cases described as severe [4]. For "severe behavior" we mean dangerous behaviors for oneself and others. Aggression towards others is a common problem both in individuals with ASD and ID, although they are reported more often and in a more problematic way in individuals with ASD [5]. Recently, Soke [6] identified the prevalence of Problem Behaviors among children with autism over 28%. In some cases there is also a risk of serious injuries or death; a recent survey conducted through interviews with parents indicated that 49% of children with ASD may run away from home after 4 years [7].

It must also be considered that Problem Behaviors can be observed in many other neurodevelopmental disorders, such as ADHD, Oppositional defiant disorder, Conduct disorder and genetic syndromes [8].

Causes of Problem Behaviors are multiple and not easy to understand, but in any case, the best treatment has been scientifically oriented and data-based [9]. We need to consider that problem behaviors in addition to determining a risk for one's own safety and others, limiting learning and social skills of children and consequently do not favor the development of the individual [10].

In a "multimodal" and "multidimensional" perspective of neurodevelopmental disorders [11], the most useful approaches are cognitive behavioral therapy, Developmental Individual Relationship [12], pharmacological treatments [13][14] and applied behaviour analysis (ABA). At the current state of literature, the best treatment for serious Problem Behaviors seems to be ABA-based therapy and pharmacology treatment with atypical antipsychotics [15]. It seems that pharmacological treatments offer a great help for neurodevelopmental disorders and indirectly has consequences on problem behaviors [13].

Applied behavior analysis (ABA) is a scientifically supported approach to addressing problems associated with ASD. The intervention is focused on the analysis and the creation and strengthening of new skills, in order to extinguish maladaptive behaviors[16].

Currently a procedure that so far seems to have achieved excellent results in the history of ABA for treatment of PB is Functional Analysis (FA) [10]

In addition to clinical treatments for Problem Behaviors, the advent of new technologies such as Tablet, Wearables, Smartphone, etc, has opened up the field of learning and treatment with the support of technology, and the use of electronic applications ("apps") on these devices continues to rise [17]. Mobile devices and touch screen technology offer new teaching opportunities for people who work with children with Neurodevelopmental Disorders [18–20]. In this landscape of application concern communication [21][22], learning of social skills [23], school abilities [24, 25], Video modeling [26–28].

In recent years, some studies evaluated the impact of technologies on the lifestyle of caregivers, but most agree that there is a strong abandonment of assistive technologies [29], that parents should be guided by professionals in the use and that more tools are needed to assess the psychological impact of technologies in the life of the child and parents [30].

Problem Behaviors can be considered the true challenge of everybody working with Neurodevelopmental Disorders. Moreover, we need to consider that this challenge must be face in all context, especially in the school, considering that in Italy there are no schools for special needs, and the immediate scholastic insertion requires valid and real assistance. Indeed, the literature clearly reports a strong association between PB and academic performance [31, 32], as strict PBs would seem to negatively affect the performance and academic results of children with autism and other neurodevelopmental disorders [32, 33]. So, resolving PBs could also have a significant impact on the academic performance of these children.

1.1 Functional Assessment

In the field of methodologies used in Neurodevelopmental disorders approach for Problem Behaviors, functional behavioral assessment (FBA) is the most useful to identify events that lead to or maintain problematic behavior [34, 35]. FBA includes a range of methodologies used to describe the interaction of children with environment. In accordance with the definition of Miltenberger's [36], we can consider FBA as a systematic method of "generating information on the events preceding and the following behavior in an attempt to determine which antecedents and consequences are reliably associated with the occurrence of the behavior". A common FBA method (Indirect assessment) involves interviews with parents, teachers and other health professionals regarding the events surrounding problem behaviors. Another way (Descriptive assessment) is to observe the child in various settings for several days and record the frequency, intensity and/or duration of behavioral problems as well as the events that precede and follow the behavior. Most commonly descriptive method is called ABC method [37] that involves the description and evaluation of stimuli surrounding the target behavior and helps to confirm initial hypotheses. A third method, called functional analysis (FA), is a more intensive assessment involving the behavior analyst that actively organizes specific conditions to simulate real-life situations and then observe how the individual reacts. For example, to determine if the problem behavior is maintained by the escape from academic demands, the child will be given a job to complete, but the problem behaviors would result in the brief interruption of the requests. This condition is designed to simulate a situation in which a teacher could give a student a short break from work if he or she is getting angry (which could inadvertently reinforce the problem behavior). Similar conditions are created to examine whether the problem behavior is caused and maintained by other events such as gaining access to highly preferred items (such as food, drinks or toys), getting attention from adults or receiving sensory stimulation. Indeed, according to Carr [38], behavioral functions usually fall into the following categories: social attention; access to tangible, escape or avoidance of activities or people, self-stimulation.

Therefore, literature seems to agree on the effectiveness of the functional assessment [39–41]. About risks, is useful to consider the dangerousness of Problem Behaviors for the child who emits and for the context where the child is. Considering that the FBA must be explained and understood by the people who live the child every day such as teachers, there is a need to speed up and make the content of the AF easier for these people. Indeed, teachers are often not able to manage Problem Behaviors, either for the lacks of school system to identify, adapt, and sustain policies that effectively and efficiently meet the needs of all students [41–43], either for lack of knowledge about Problem Behaviors. FBA can help teacher in a natural context (as school) but they have no or few skills in managing the Problem Behaviors[39], for this reason we have to develop a way to help then with a step by step program useful to understand the behavior and its function, and to manipulate the context, shaping it to make to avoid the "host" of Problem Behaviors.

The first step to implement a good treatment routine is doing a Functional Assessment: teachers need special knowledge, therapist help, or both. In the past, literature had already emphasized the importance of the participation of teachers and school staff in the application of the FBA [44] pointing out that using FBA in a structured setting like a clinic is not ecological. Today the view is changed, but there are yet strong lacks.

Various apps have been created to assist the user in functional assessment [45]: however, until now none of them have completely covered all the parts of the process, ranging from data collection to the direct handling of the behavior. Also, no one has really evaluated the psychological component behind a proper assessment: how hard it is, how much mental energy it requires, as lived by the insurrection, by the child and the family.

To meet these needs, our research team has created CareMe, an app whose ultimate goal is to help all the people directly in contact with Problem Behaviors.

2 Method

CareMe is an app that, by integrating the various phases of the aforementioned AF, makes it possible to collect data on problem behaviors issued by the child in order to facilitate the identification of their function and to be able to plan behavioral treatments for their reduction or replacement with more adaptive ones. Using an evidence-based approach, the application is characterized by the possibility of statistically evaluating the improvements thanks to a database that collects the data of all users, highlighting the most adaptive solutions using an ad-hoc algorithm. Once the data has been collected and the behavior function highlighted, a team of experts in the evolutionary field will work to provide the best possible treatment that can be implemented by the teachers themselves.

CareMe can guide the user step by step in gathering useful information to the objective, excluding those that are irrelevant. Based on this assumption, the CareMe application deductively channels all the information collected thanks to closed questions studied and processed based on current literature; all this because a technology can be considered truly "smart" only when it can be easily used by a large sample of individuals with different abilities and skills.

What makes the CareMe truly innovative is not only the strong scientific methodology behind it but also a series of algorithms and flow charts that assist the user in using, collecting and sharing data to identify the best solution to the problem.

2.1 Development And Evaluation

CareMe is a personal mobile application. It requires a username and a password for the user to log in.

An internet connection is not required but is needed to synchronize local data with the server's database instance and share outcomes with the clinical team behind the app.

The application is developed as PWA in HTML5. The server part is managed by a Linux - Python - PostgreSQL stack.

The application guides the user in drawing up the profile of the child, starting from the personal information to move on to personal information (diagnosis, communication skills, scholastic skills, possible pharmacological treatment, etc.).

After entering the preliminary data, the user can insert all the useful information to frame the target behavior, starting from a semi-structured interview that will provide a first indirect analysis of the function. it is possible to enter the topographical description of the target behavior, and the setting in which it occurs.

Once the "indirect" behavior analysis has been completed, the user will have access to the assessment and direct measurement of the behavior. In this part, it will be possible to collect quantitative data on behavior (frequency, duration, Rate, IRT) and to develop a functional ABC composed of a series of closed questions aimed at reconstructing the stimuli triggering the behavior and the consequences.

3 Discussion

The application allows the gradual collection of data that will be displayed graphically step by step: these data will not only be useful to the user and the professional to analyze the behavior function but also to all future interventions. The collection and sharing the data permitted by CareMe will help implement increasingly comprehensive and operational clinical interventions based on past successes. Not only that, the automatic data collection allows the user to save a large part of time and work, helping him focus on the assessment. All the information gathered can be monitored in real time, thanks to an Itech Visual Analysis, both during the assessment and during the treatment.

The user will be able to share his results with other users through an associated app, creating a network of professionals, teachers, parents who are increasingly strong and cohesive.

Finally, the app will allow evaluating through a structured interview about the usefulness of the intervention and the effects on the child's quality of life.

4 Conclusion

Problems behavior still represent one of the most demanding challenges for teachers and for the whole school.

Children with neurodevelopment disorders show dangerous Problem Behaviors for themselves and others; therefore it seems to be a priority for the experts to help those who live the child every day, just as a teacher can to find a quick, effective and ecological solution to the Problem Behaviors in the school context. Today new technologies and smart apps are part of our daily lives, and they are frequently used both by children with disabilities and by operators as a source of continuous help (at home as well as in the clinical context) [17], finding a technological and smart solution not only for diagnosis and therapy but also for functional assessment followed by ad hoc treatment would seem to be the ideal solution for teachers. Moreover, the most important thing to understand, the goal of everybody is not to reduce the behavior in a simplified context,

but to generalize new way to live in the world. Today, thanks to new ecological solutions, it is possible to face even severe Problem Behaviors [39] in a socially, effective and evidence-based way by mixing the knowledge of experts and new tech.

5 References

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