Time Management Application for Executive function disorder users

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1. Introduction

Time management underlies a lot of what people are achieving in short and long term. It is important to schedule and monitor a person's work in the first place of any commitment. Most normal people, without any mental disabilities, depends on the planning and time management in the daily life. When it comes to those who have executive functionality disorders, they are struggling with managing their work and thinking of what is the next step. For example, an executive function disorder person cannot realize how or when to brush his/her teeth, instead he/she relies on somebody else which is another big issue because they might not be helped all the time. There are sometimes where these people have to work alone or in private and some others cannot express what they feel or what they really need. In this project, we are developing an interface that can help them to arrange their basic duties such as doing homework, brushing their teeth, and so on. Other people like teachers or parents can use the application to list the tasks needed to be done and the affected person can show that daily on iPad as an example and then follow the instructions. There are many features, will be sufficiently explained in next sections, that give users the opportunity to make deliverables and milestones and monitor how the affected person really does with reminders and alerts when something goes wrong.

The term "Executive functions" is a set of processes that a normal person has the authority to use in order to connect past experience with current actions. These functions help our brains figure out what is in front of us and list skills we need to accomplish the missions like planning, organizing, communications and so on. It is important that these functions work very sufficient and accurate because any damage or shortage in its order can affect the whole process and then generate unusual results. The executive functions also have a huge impact in the individuals' daily lifecycle activities [1]. Plus, these functions are dependent on brains and on the frontal and parietal neocortex which is a part of the brain involved in higher-order brain functions such as sensory perception, cognition, generation of motor commands, spatial reasoning and language [2].

Our aim of this project is those who have some executive functions disorder that lead to prevent them from being able to decide and plan their activities and when to start the tasks. It also helps them to provide some reminders and checklists so that they become more conscious of their own duties.

2. Related work

A study has been conducted in 2009 aiming to explore the relationship between handwriting performance and organizations abilities among children with and without dysgraphia caused by

executive functions damage in the brain. The study was a survey distributed to 58 male participants, 30 with dysgraphia and 28 with proficient handwriting. What have been found is that there is a big difference between the two examined groups to the degree that learning behavior of those children with dysgraphia issues can be harmfully affected [3]. This kind of study clarifies how hazard and far the problem can go.

Another study has investigated different aspects of executive functions(EF) in children with development dyslexia (DD). These aspects used to assess 60 children with DD and 65 with typical reading abilities were verbal fluency, spoonerism, attention, verbal shifting, short-term and working memory. The study has revealed that children with DD showed deficits mostly in the all EF domains/aspects mentioned above [4]. It is clear that dyslexia problems have a very strong relevance to brain disorders since dyslexia is basically about attention and memory work.

In the E-book published by The National Center for Learning Disabilities, it has been mentioned that in the first place of any task any person should initiate his/her job by recognizing when to get started without procrastinating. In other words, time plays a significant role and those children who have problem deciding when to start have also a planning and organizing problem. In addition, the evil may vary from child to another and some children with weak executive skills will fall further and further behind where the anxiety nightmare exists [5].

A group of specialists have done a study in how goal management training mindfulness mediation can really help children with executive functions disorder improve their working memory which somehow reflects on their performance and achievements. The study basically has a 12 months training treatment where the participants received he same individual and group therapy sessions, perform the same daily activities, follow the same treatment stages and the centers shared the same rules. There were 36 participants with general deficits in executive functions evolved in the study. The outcomes proved that the training had conducted for this group of children really enriched not only the working memory or decision-making but also the stress reduction levels making children a bit less nervous and anxious [6].

It is possible that an executive functions shortage may go beyond that where the problem can lead to cause euthymic bipolar disorder and then end to very complicated situations. People with euthymic bipolar feel unpleasant and some depressive symptoms do appear during euthymia [7].

A structured application was created to find improvements on range of daily financial activities which were compromised by executive dysfunction in individuals. A number of people participated in this study in order to ensure whether the application can provide some helpful findings or not. The outcomes of this experiment showed that with goal management training affected people evidenced huge improvements not only in food shopping but also in open-ended task which required time management and proper reactions [8].

3. Methods

3.1 Requirements Collection

For the requirements collection, we have conducted an interview with Michelle Death, a mentor in Kennedy Krieger institute which provides aid for people being disabled. Before we present the interview content, these are some main requirements which

the app or the interface should definitely have: check list, goals reminders, and guardian monitor. The questions we asked were aiming to understand the specific needs of a person with time management problems and how the app should communicate with the users. In this sections, we are showing the summary of the interview along with any other suggestions mentioned by the interviewee.

3.1.1 Application Purpose

The main purpose of the app is to help those with time management problems manage their tasks duration that will somehow impact on a person's goal while time goes. It is recommended that the app has some profound goals execution techniques/steps. The most important point is to have some clear visual supports and checklists to give the users more energy to deal with that.

3.1.2 Supervision Authority

Beside the user/student who is suffering, the student's teachers and staff should have full access to their students' accounts so that they can ensure what has been done is proper. Additionally, parents will be able to see how their child is doing and discuss with the teacher any further developments. High level students can also get access to other students' pages to provide some guidance.

3.1.3 Application Target

The app can be for academic purposes and for other objectives like day-to-day tasks with visual schedules and checklists. There should be some music interaction when a mission completed to encourage the users to keep on. As an example, Boardmaker Online is a complete system for delivering personalized instruction and therapy while also measuring student progress.

3.1.4 Important Features

Music plays a significant role to promote individuals when completing a step and go to the next step. Plus, positive feedback always gives energy to users to keep working and that makes them feel involved because what they are doing is correct.

3.1.5 Suggestions to Design Reminders and View Checklists

Providing pictures to some tasks is vital because some users are not able to read so they rely on visual supports to help them understand their tasks like brushing their teeth.

3.1.6 Checklists Creation and Data Input

Initially, the staff should enter the checklists along with those capable students whose levels are checked to do so. It is a good idea that students have measurement processes to categorize them based in their understanding levels so that students with high understanding can be able to set up checklists and reminders. However, the reminders mostly are created by the staff since they have better understanding and visions.

3.1.7 Data Sharing with People

It is possible that users can share their achievements which is one of the exciting aspects where user's community can see his/her performance and might get some encouragement.

3.1.8 Users' Activities Monitor

A timer is a visual and auditory queue that provides information for how long a certain task took the user to be done. Also, a progress bar can also be one example of visual queues which gives an idea how the user is doing. It is very important that staff gets alerts when students leave their tasks page to YouTube for instance and put them back on track or send a notification to users to go back.

3.1.9 Application Motivations

- ✓ Changing color
- ✓ Clicking music
- ✓ Congratulating features

- ✓ Customizable feedback ex. Mickey mouse smile

3.1.10 Kennedy Krieger Sections Target

Special Education will be the main section targeted but it is potential that the app can reach some other sections. It depends on what the app really provides later on and what group it serves.

3.2 Tools

We used Axure tool which is a rapid prototyping software aimed at web and desktop application by dragging and dropping placement and resizing options. This tool has been used because it gives us the ability to create costume controls by assigning certain actions to existing widgets. It also gives us full control to change the application behavior or to add several pages later on. Another reason to use Axure is that it is simple to use and easy to be understood by other users.

4. Results

We made the application very simple so that users who are not familiar with technology can also use it without any struggling. Thus, the application has two main screens: one is for regular users like students. The other screen is for Guardian like teachers. This makes the application more organizations to facilitate the way of using. There will be an authentication process when choosing the user identity so that we can avoid any conflicts possibilities. For example, when a student tries to enter as a guardian the system will ask for password to get it.

Figure 1. Main page

Each user has some different tasks. In the students' page, the user will have four options to check. He/she can either look for checklists, activities, awards, or progress to be aware of what have been done and how he/she is doing so far. Also there are some options where the user can go back and forward or even to start over. At the top of the application, a time sign will be provided so that user can be aware of the time and what behavior should go for.

Figure 2. Students tasks lists

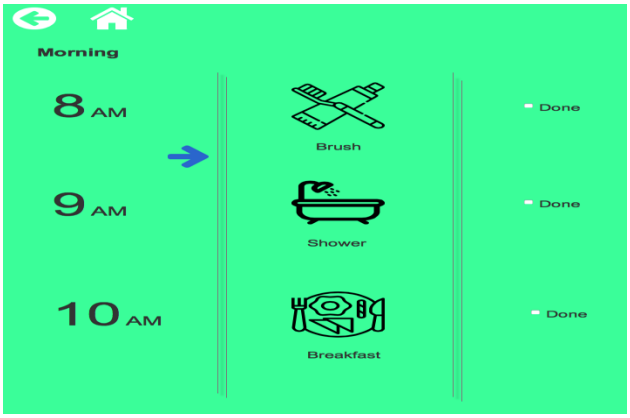

Figure 3. Students tasks in the morning

To do option is the section where students will receive the checklists to follow based on time and appropriate actions will be showing on the screen. For example, if the students open the application at 8:00 in the morning, one of the tasks needed to be

done is brushing their teeth. Plus, there will be checkmark available beside each activity once the user is done with it.

When it comes to the guardian, there will be mostly similar behavior but with different purpose. The main job of the guardians beside monitoring is to create activities to students to pursue. For example, teachers are responsible for creating activities for students and send them a notification that the particular activities have been added and needed to be done in a certain time.

Figure 4. Guardian tasks list

However, the checking progress provides the guardians with information of how a student is doing with a progress bar showing the completion of activities in time scope.

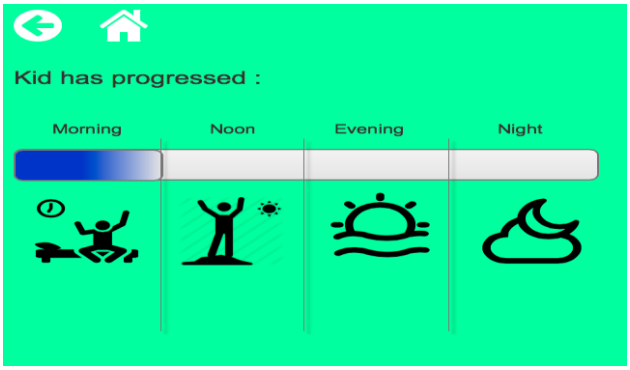

Figure 5. Checking students' progress by the guardians

5. Discussion and limitations

We have created a prototype of the application in planning called 'Let's Do It !' which focuses on specific problem of time managements and execution on routine task a student might have to do. Prototype includes two types of log-in profiles namely 1) Student (patient) 2) Guardian(parent/teacher) both has similar interface but functionalities and option available varies. Interface has been kept minimal, intuitive and welcoming keeping in mind the young-brains (Figure 6: Home Screen). Prototype incorporates 4 major sections which are 1) To-Do: list of routine task categorized in four different parts of the day 2) Activities: lists the routine task alphabetically/customized order 3) Awards: includes accomplishments to encourage the students to use the app and 4) Progress: shows, progress of the targeted activities in a day. Likewise, Guardian's profile has same options where they can push the students a notification and check there progress as well share with other. We have navigation bar on the top which is very simple one step back and forth and direct jump to home. Student received notification based on two events 1) if a task is lined up or 2) if guardian wants to prompt something remotely from their profile. Icons used are flat and easy to understand even if a student can't read. We have addressed majority of the needs mentioned in interview. Prototype is visually appealing, welcoming, and intuitive for younger kids, easy to understand. It has live feedback of every action being performed.

It is vital that users participate in the design process to provide insights on the prototype, we couldn't have participator design considering the time constraints and unavailability of user on site. Design was evaluated based on feedbacks of fellow designer and random users and their feedback helped on improving interaction part as well as aesthetic aspects of the prototype(Figure 8: Student Progress & Figure: 9 Morning To-Do). One of the user strongly recommended the always on notification (figure 7: Student home

(5)) and was incorporated in the basic design to remind students of the upcoming activities or prompts from the guardians to direct the patient/students. Couple of users pointed that icons used might be complex to use and colors might confuse the users adding one more layer to process. Thus considering that suggestion lineal, monochrome icon were chosen which were very easy to understand even by uneducated users (Figure 7: Student Home).

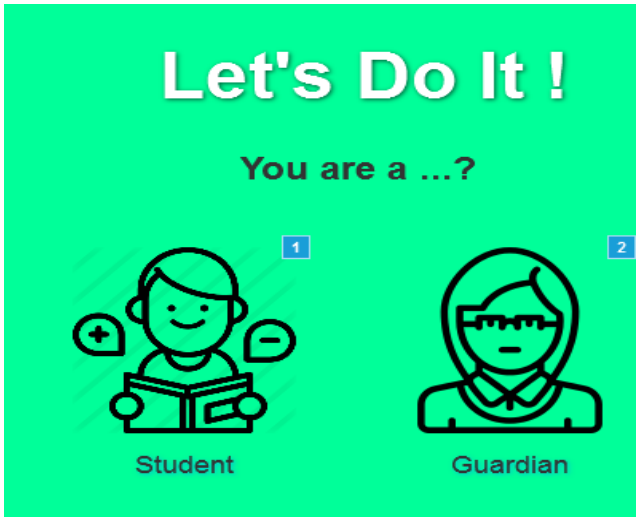

Figure 6. Home Screen

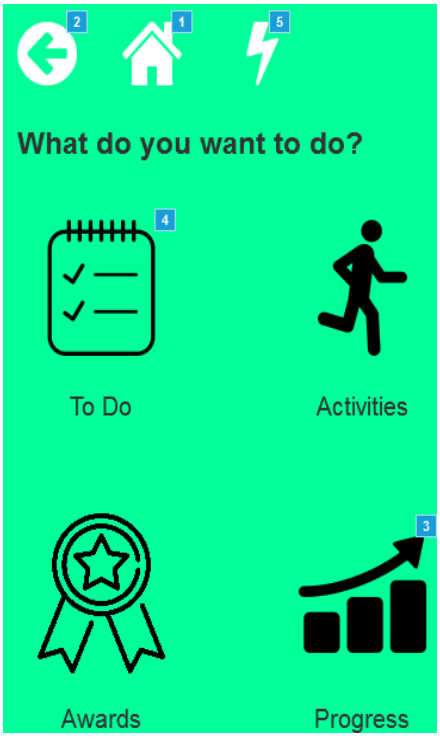

Figure 7: Student Home

There can be obvious need of adding or customizing the activities under To-Do/Activities option as needs of each individual is unique and solution to which is again personal to each individual. Currently, activities and task comes preloaded and guardian or students can not add or edit it which limits students to pre-loaded activities only. Application only comes with English Language thus can only be used by literate English or English speaking population. Considering this as prototype we have listed many options but aren't function main idea was to provide glimpse and possible functionality of the application, thus we only have one each of a kind functionality active in the application.

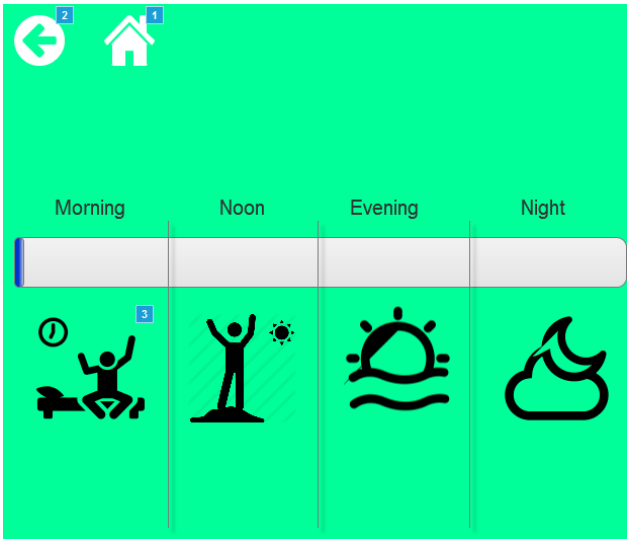

Figure 8: Student Progress

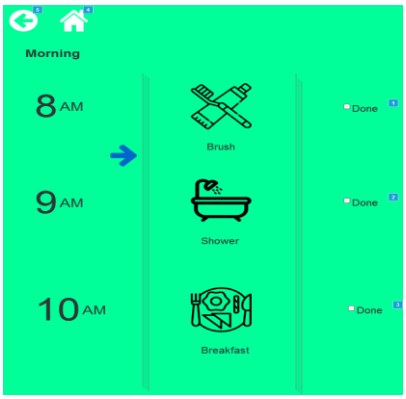

Figure 9: Morning To-Do

6. Conclusion and Future Work

The project aims to develop an application that can help people who have executive function disorder manage their time and achieve some basic goals. Therefore, we used Axure tool to create the application after collecting requirements needed from an interview. The application shows great results which will really help students to list some tasks to do and those people who are monitoring the students' activities and progress to add additional tasks and monitor their progress. Some feedback will be provided to guardians to have better picture of what students are doing. This project can be expanded in the future to cover some advanced activities and goals. We can have editable and updatable To Do/ Activity List to avail custom activities tailor-made for individual. We also plan to have a platform to create and share activities so other can take advantage of activities uploaded on the platform and can also contribute from their side. Sound Feedback was one of the major motivating factor mention in our data collection, thus we also plan to put sound feedback for each action. Participatory Design plays a key role in understanding user needs straight from the end user some of the needs may come up in the process which participant might not even be aware of we plan to iterate our design process have participatory design as major contributor. To avoid confusion and misunderstanding icons and text are keep monochrome, but with better understand and iterations we can include colors to make app more welcoming. Finally, we plan to have a Multi-Platform

App, right now it's website prototype which can run on any browser but we plan to create an app for various platform which would function flawless across platforms and in turn make the app more accessible and robust. These advanced activities need much more effort in collecting data and to develop that to an application.

Acknowledgements

Prototype can be access at https://zr9zn5.axshare.com

For the requirements collection, we have conducted an interview with Michelle Death, a mentor in Kennedy Krieger institute which provides aid for students with Executive Functionality Disorder.

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