Interactive Mobile Application for Identifying OCD, ADHD and anxiety in children under age 10.

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***Abstract*— The lifetime prevalence of childhood OCD, ADHD and anxiety is 2% to 3%. It is a persistent and frequently incapacitating condition. In the past ten years, OCD and ADHD have garnered substantial attention from researchers, changing the way we understand illness in young people. Previously, ADHD was a diagnosis that was often disregarded. The frequency, phenomenology, etiology, and treatment response are consistent throughout the age range. Children who have one or more anxiety disorders, particularly depression, frequently have co-occurring disorders.**

In this regard, due to the lack of knowledge in the country and the ignorance of the children's parents about these diseases, there is no proper guidance for these diseases that can be diagnosed and alleviated. When going to the rural level, this situation is more severe and due to lack of funds and lack of knowledge, such diseases are almost not treated. As a result of this, a group of mentally unbalanced and sick children are born, which affects their education and physical development in many ways. It also cures many other mental problems.

This article contains information about a Smart OCD, ADHD and Anxiety Detecting System which was introduced because of social research conducted to identify this problem. And This paper reports a smart solution for getting the treatments for these diseases in virtual platform. This paper reports on the best solution to identify and seek treatment for OCD, ADHD and Anxiety whenever needed.

Keywords— Childhood OCD, Childhood ADHD, Childhood Anxiety, Child mental health, Co-occurring disorders, Mental health, social research, Smart OCD/ADHD Detecting System, Virtual platform

I. INTRODUCTION

Childhood is the most important phase of a person's life since the foundation of physical, social as well as mental health was built in that era. But is every single child having good mental health? In that point we found there are 3 most common mental disorders among the children between age 5 – 10. They are OCD, ADHD and Anxiety.

Childhood obsessive-compulsive disorder, or OCD, is a complex mental condition that significantly impacts the lives of young people and is often misunderstood. In the complicated landscape of childhood development, the formation of compulsive behaviors and obsessive thinking presents special challenges that need careful examination.

Many children occasionally have troubling thoughts, and even when they act on these impulses, they may feel driven to do so even when their actions are illogical. For example, people might worry about bad luck if they don't wear a favorite piece of clothing. No matter how hard they try, some children just can't seem to get rid of the thoughts or the urges to do things. Unwelcome thoughts may indicate obsessive-compulsive disorder (OCD) in children if they happen frequently, take up a large amount of time (more than an hour per day), cause the child substantial anguish, or interfere with daily duties. The concepts are regarded as obsessions. We call these behaviors compulsions. [10]

Obsessive-compulsive disorder (OCD) in childhood is a persistent and distressing disorder that can seriously affect social, intellectual, and familial functioning. Before the past ten years, childhood OCD was uncommon and not thoroughly studied. The pathogenesis, phenomenology, etiology, and treatment of OCD in children have all been significantly improved in recent years. The public and professional community are much more aware of pediatric OCD now that more advanced assessment techniques have been developed. rates of disease prevalence in this age range. Many young people with OCD are now more likely to have productive, fulfilling, and generally normal lives thanks to ongoing advancements in psychosocial and psychopharmacological treatment techniques.

This research aims to improve the psychological well-being of children by identifying such OCD symptoms in the school classroom during childhood. Accordingly, the MIND Guru mobile app, which is introduced for children between the ages of 5 and 10, identifies those symptoms through quizzes and games and provides treatment through simple activities.

A common neurodevelopmental issue that has a big influence on kids' behavior, focus, and learning capacity is called attention deficit hyperactivity disorder (ADHD). There is a dearth of knowledge, resources, and accessibility about therapeutic options for children with ADHD in Sri Lanka. Effective treatment for ADHD requires early detection, although conventional methods used in Sri Lanka have proven to be ineffective in correctly diagnosing the condition and offering suitable therapies. Our study provides an ADHD-detecting component within a mobile application precisely designed for children aged 5 to 10, the result of a collaborative effort between educators, child psychologists, and technical professionals. The primary goal is to create a seamless and user-friendly platform that allows elementary teachers to easily combine fascinating storytelling with a well-structured questionnaire. The application captivates young minds with fascinating audio-visual narrative, turning the testing procedure into an enjoyable experience for children. Primary teachers play an important role in leading students through the storytelling session and administering a structured multiple-choice quiz. The questionnaire focuses on objective assessment of ADHD-related behaviors, including inattention, hyperactivity, and impulsiveness.

The application's revolutionary features include the ability for primary instructors to track individual students' progress over time, providing critical insights into behavioral patterns and potential ADHD indications. With a user-friendly interface, the program promotes a positive and inclusive research environment for both educators and students. Rigorous security procedures emphasize the processing and protection of sensitive data, protecting the privacy and confidentiality of the information gathered during the study. The ADHD-detecting component of the suggested mobile application, designed specifically for children aged 5 to 10, is the result of a collaboration between educators, child psychologists, and technological specialists. Our goal is to develop a user-friendly platform that allows elementary teachers to effortlessly merge a fascinating storytelling experience with a properly written questionnaire.

The program provides engaging audio-visual storytelling experiences that are intended to catch the interest of young minds, making the testing process entertaining for children. Primary instructors play an important role in directing students through the storytelling session and then administering a structured multiple-choice quiz. The questionnaire is intended to objectively assess ADHD-related behaviors, with an emphasis on detecting areas of inattention, hyperactivity, and impulsiveness. The software enables primary instructors to monitor the growth of individual students over time, providing vital insights into behavioral patterns and potential ADHD indications. The application's user-friendly interface promotes a positive and inclusive research environment for professors and students alike. Robust security mechanisms are in place to handle and keep sensitive data, preserving the privacy and confidentiality of the information gathered during the study.

Temporal phases of threat response, including potential threat (anxiety), acute threat (startle, fear), and post-threat response modulation, have been identified as the underlying markers of anxiety disorders. Objective measures of response during these phases may help identify children at risk for anxiety [1]. Anxiety and depression, collectively known as internalizing disorders, begin as early as the preschool years and impact nearly 1 out of every 5 children. Left undiagnosed and untreated, childhood internalizing disorders predict later health problems including substance abuse, development of comorbid psychopathology, increased risk for suicide, and substantial functional impairment [2].

In the case of the Anxiety-detecting component of the suggested mobile application, designed specifically for children aged 5 to 10, is the result of a collaboration between educators, child psychologists, and technological specialists. Our goal is to develop a user-friendly platform that allows elementary teachers to effortlessly merge a fascinating storytelling experience with a properly written questionnaire.

The program provides a questionnaire for identifying anxiety and dashboard for analyzing progress. The questionnaire provides for guardians.

II. Literature Review

Research emphasizes the development of a comprehensive mobile application utilizing game-based features, machine learning, image processing, motion detection, and speech recognition technology to enhance the early detection and treatment of ADHD in Sri Lankan children [1]. This “Mind Guru” application uses a storytelling activity and a specified questionnaire to identify whether the child has ADHD, and that method is more likely to keep children’s attention constantly. A screening tool for the early identification of ADHD in children using artificial intelligence. Using the Case-Based Reasoning (CBR) and certainty factor method can help identify the type of ADHD, based on the symptoms experienced [2] in proposed system, the data is collected by itself, the application. The convenience and the efficiency of the use with the children should be high. In this work, handwriting patterns are used to detect children who have both ADHD and ASD problems. At the same time, we tried to extract some statistical features and implemented sequential forward floating selection (SFFS) with seven ML-based approaches to select the best combination of effective and efficient features based on classification accuracy [3]. This proposed system lets the child listen to a story and then engages the child with the relevant questionnaire. Expertise using that method increases accuracy. The authors propose a comprehensive index that combines brain imaging behavioral and measures. The results showed that the classification performance of the composite index was better than that of the single behavior or brain image index [4]. The proposed system is introduced to primary students through primary teachers. Basically, the system is introduced to the school system rather than for an individual like a parent or someone else [4,5]. The specialty of this application is the models are trained on

individual child skills and needs. Issues with time management are handled by the scheduler component while the instruction predictor module supports the parent in recognizing the child's understandability level. Furthermore, the children are provided with edutainment activities based on their attention and ability level [5]. The proposed system is trained using the number of incorrect answers for the story-based questionnaire and the answers for the questions that the parent provides.

Obsessive compulsive disorder (OCD) is a mental health condition involving the brain and behavior that often begins during childhood. OCD often causes significant distress in those affected. OCD involves both obsessions and compulsions [6] that take up a lot of time and get in the way of important activities, such as school, family life, extracurricular activities, developing friendships, and self-care. Obsessions are intrusive and unwanted thoughts, images, or urges that occur repeatedly and feel outside the child's control. These obsessions are unpleasant for the child and typically cause a lot of worry, anxiety, and distress.

Scrupulosity, that is, groundless fears of moral, religious, or ethical transgression, date back to religious literature from the sixteenth century, the first description of OCD in childhood was provided in 1903 by Piere Janet, who reported on a 5-year-old boy with characteristic symptoms.55 Kanner, in 1935, and Despert, in 1955, were among the first to note several key characteristics of OCD in children, including the male preponderance, children's. [7]

Compulsions (also referred to as rituals) are behaviors the child feels he or she "must do" with the intention of getting rid of the upsetting feelings and anxiety caused by the obsessions. A child may also believe that engaging in these compulsions will somehow prevent bad things from happening [8] Common compulsions may involve: Excessive checking (e.g., re-checking that the door is locked, that the oven is off),Excessive washing and/or cleaning, Repeating actions until they are "just right" or starting things over again, Ordering or arranging things in a specific way, Mental compulsions (e.g., excessive praying, mental reviewing), Frequent confessing or apologizing, Saying lucky words or numbers, Excessive reassurance seeking (e.g., "Are you sure I'm going to be okay?")

In general, OCD is diagnosed when these obsessions and compulsions become so time-consuming that they negatively interfere with the child's daily life. In most cases, the obsessions and compulsions become gradually more severe over time until they get to this point. In rare cases, symptoms may develop seemingly "overnight" with a rapid change in behavior and mood, and sudden appearance of severe anxiety. Sometimes this happens due to an infection, such as strep throat, that causes the child's immune system to attack the brain instead of the infection. This is called Pediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcus (PANDAS). When OCD onsets suddenly and dramatically without any evidence of an immune infection; this is called Pediatric Acute-Onset Neuropsychiatric Syndrome (PANS) [9].

When it comes to games explicitly about OCD, there are few available games on the market. For example, when searching for "OCD" or "obsessive compulsive disorder" on the gaming platform Steam, none of the found results are explicitly about the disorder, unless it is used as a marketing technique for puzzle games. When using the same search word on the indie game site itch.io though, several games can be found. Five were found when searching for "obsessive compulsive disorder", and twelve when searching for "OCD". Not all games were relevant due to not being empathy games, and some games were not available to play. In the end, two of the games were identified as empathy games about OCD and were played to give a picture of the status on the market. [12] The first game design principle is the importance of the target audience. To make the player feel immersed, and to let them relate to the characters, the game should be designed with this specifically in mind to assure that the purpose of informing OCD is fulfilled. The target audience can be prominent in the design process in several ways. This includes graphics, sound, music, character designs and personalities, and the game's difficulty. This is due to different preferences of different age groups, cultures, socio-economic groups, and so on. To make sure that the player understands the characters and the message, they should be easy to read and understand. This is particularly important when it comes to animations and graphics. The player must be able to identify the character's emotion to feel it themselves. [12]

Emotions can be expressed through facial expressions that cut across cultural divides like a universal language. A lot of efforts are being made to automate face analysis. [13] This is a technology that has many uses in a variety of fields, such as robotics, healthcare, automotive safety, and truth-verification systems.

In the annals of psychological research, Ekman and his colleagues identified seven basic emotions that are generally acknowledged regardless of cultural context: anger, fear, happiness, sorrow, disgust, contempt, and surprise. [14] By delving extensively into studies on facial emotion identification, scientists have examined datasets, defined features, and developed classification techniques, establishing the foundation for future studies into emotional approaches.

Foreseeing future developments, researchers consider the use of emotion-guided image-based reactions using a variety of classification methods, from convolutional neural networks (CNNs) to more conventional support vector machines. Numerous challenges exist, ranging from utilizing closed networks for expression disambiguation to minimizing the effects of heavy makeup and staged positions.

III. Methodology

A. *System Overview*

The developed system comprises several key components and modules that work together to achieve the objectives of OCD, ADHD, and Anxiety detection and treatment. In this case, the client-server model is used as a system architecture, where the mobile application serves as the client interface, and the backend server handles data processing and machine learning

algorithms. The system overview diagram in Figure illustrates the interaction between these components and the flow of information.

B. Data Collection

To train and evaluate the machine learning model, data were collected from a carefully selected group of participants who met the inclusion criteria. Participants were within several age ranges of diagnosed disabilities. Data collection involved the administration of standardized assessments, tools, and questionnaires to gather relevant information. Medical assistance was obtained for data collection and questionnaire preparation

C. Games & activities design and development

The game-based mobile application is designed at dealing with symptoms of OCD, anxiety, and ADHD while also keeping kids engaged. The mobile application was made using programming languages, software frameworks, and game development engines that are respected for their capacity to create engaging and dynamic experiences. UI design put a lot of effort into developing an attractive and kid-friendly interface to enhance engagement. The game design process involved choosing suitable game mechanics and activities which promote concentration, attention, and cognitive skill development. The design and development approach were informed by pre-existing frameworks and game-based interventions.

D. Model Development

The OCD, anxiety, and ADHD detection models were built using a hand-picked dataset especially for this very reason. The dataset included samples drawn from the intended audience, from which characteristics associated with symptoms of the diseases were retrieved. The architecture of the model was developed using neural network designs and well-established algorithms that have a track record of success in classification tasks. The model's performance has been improved through hyper parameter altering and cross-validation approaches. Preprocessing techniques such feature scaling, data augmentation, and normalization have been utilized for the dataset.

E. Implementation and Integration

In keeping with the need mentioned in the introduction to address the mental health difficulties that children encounter, our research endeavors are being implemented with the goal of filling up the gaps that now exist in the identification and effective management of these disorders. Our research presents an innovative strategy to evaluate and treat children's mental health by utilizing virtual techniques, with an emphasis on common problems including OCD, anxiety, and ADHD. By using technology, this project deviates from conventional approaches and provides a more thorough and approachable way to comprehend children's mental health. Using an online program called Mind GURU, customized tasks and evaluations are made to include kids in a virtual setting while gathering important information about their mental states. We aim to address the dearth of individualized mental health support in Sri Lanka's educational system—where high class sizes make it difficult to provide each kid the individualized attention they need—by making use of this cutting-edge platform. This integrated strategy helps improve the emotional and psychological well-being of elementary school students by identifying mental health issues and providing methodical treatments.

F. Evaluation and Testing

Comprehensive testing and evaluation techniques were used to assess how well our virtual method identified and addressed mental health issues in youngsters. To take part in the study, a sample group of elementary school students from various socioeconomic backgrounds was chosen. Participants conducted baseline exams to determine baseline measures of their mental health state before using the Mind GURU web application. Then, participants were subjected to exercises, games, and tests integrated into the online platform and intended to elicit answers that would indicate common mental health issues including OCD, anxiety, and ADHD. To identify patterns and trends in the participants' mental health profiles, the activities were followed by a quantitative and qualitative analysis of their replies. Furthermore, the platform was used to measure user experience and satisfaction by asking educators and participants for comments. Periodic follow-up evaluations were used to track changes in participants' mental health outcomes over time and evaluate the efficacy of the treatments offered through the web app. The effectiveness of the Mind GURU web application in recognizing and addressing children's mental health issues was evaluated through rigorous testing and evaluation procedures, offering important insights into its potential as a workable tool for promoting psychological well-being among primary education students in Sri Lanka and beyond.

G. Ethical Considerations

To protect the privacy and well-being of young users, several ethical issues must be carefully considered when developing an application that diagnoses juvenile diseases in children aged 5 to 10 years. Like Informed Consent and Parental Permission, Privacy and Data Security, Anonymity and Confidentiality, Age-Appropriate Design and Content, Avoidance of Stigmatization, User Empowerment and Autonomy, Inclusion and Diversity, Professional Guidance, Research Transparency, Continuous Monitoring and Updates and Ethical Marketing and Advertising.[11] By addressing these ethical considerations, developers can create these childhood diseases detecting app that is responsible, respectful, and prioritizes the well-being of the children using it.[9]

If we consider Sri Lanka, there are many ethical considerations to be followed to create an App for children's use.

- Cultural Sensitivity: When creating the app, take Sri Lankan cultural conventions and values into consideration. Make sure the language, imagery, and

material are appropriate for the local culture and do not offend anyone. [8]

- Language and Localization: To serve a varied user base, make the app available in Tamil and Sinhala, which are the official languages of Sri Lanka. To make the app more inclusive, take regional variances and accents into account. [8]
- Parental Involvement and Consent: Recognize the significance of family in Sri Lankan society. Before allowing kids to use the app, get their express permission from parents or guardians. You should also involve parents in the app's instructional features. [8]
- Privacy Laws and Data Protection: When handling children's data, abide by international norms and Sri Lankan data protection legislation. Make sure that user privacy is safeguarded and that data gathering procedures are made clear. [8]
- Internet Safety and Security: To safeguard children's personal data, emphasize the need of internet safety and put strict security measures in place. Talk about issues with cybersecurity and internet privacy. [8]
- Ethical Advertising Practices: Follow moral guidelines for advertising and refrain from using dishonest or false advertising techniques. Make sure the app's advertising complies with moral and cultural standards. [8]
- Education and Child Protection: Include instructional components that are in line with the Sri Lankan educational framework. Encourage the implementation of child safety measures and teach kids and parents how to use apps responsibly. [8]
- Local Content and Context: Incorporate regional narratives, illustrations, and situations to enhance the app's relatability for youngsters in Sri Lanka. Consider the app's content's educational curriculum and regional context. [8]
- Compliance with Regulations: Keep yourself updated on any regulations that may apply to Sri Lankan children's apps and abide by them. This comprises government-established regulations and guidelines. [8]

By incorporating these considerations into the development and deployment of the app, you can ensure that it aligns with Sri Lankan ethical standards, respects local culture, and prioritizes the well-being of the children who use it.

*H. **Limitations***

To use the KID-app, the child must have a happy face and it must be confirmed by face-detection. The children who use the app must be between the ages of 5 and 10. The child must use the app through an adult or a teacher. Must be used. To use this, it is mandatory for the teacher to create an account in the app and the teacher must create the account of the student.

IV. Results and Discussion

A. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop-down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1”, “Heading 2”, “Heading 3”, and “Heading 4” are prescribed.

Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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