

Dyslexic Aba: a game to help children with dyslexia

Dyslexic Aba: um jogo para ajudar crianças com dislexia

Aba Dislexico: un juego para ayudar a los niños con dislexia

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Resumo: Este artigo apresenta um jogo para auxiliar profissionais da área de Educação e Psicologia utilizando a metodologia da Análise do Comportamento Aplicada na alfabetização de crianças com dislexia. O jogo é voltado para crianças disléxicas, com o objetivo de melhorar o aprendizado e a aquisição da leitura e da escrita, com o objetivo de desafiar o usuário a formar palavras embaralhadas com letras invertidas, semelhantes ou voltadas para baixo de acordo com uma figura apresentada, como a palavra “carro”, que para o disléxico mostrará “artrph” junto com algum “r” invertido ou girado, o tamanho da palavra aumenta conforme o usuário muda de nível, o jogo usa um estilo “arrastar e soltar”, no qual o usuário arrasta a letra de um quadro embaralhado e o coloca na posição adequada para formar a palavra. A metodologia não adota estímulos negativos “Game Over” e em paralelo trabalha com estímulos positivos utilizando efeitos sonoros e visuais para obtenção de pontos. O aplicativo possui uma estrutura lógica funcional que é fácil de usar, contextualizando os diferentes ambientes de uma casa, com design personalizado, objetos padronizados, animados e coloridos, unindo jogabilidade, educação, ensino e estímulos positivos no processo de alfabetização de pessoas disléxicas.

Palavras-chave: Crianças. Dislexia. Educação. Estímulos positivos. Psicologia.

Abstract: *This article presents a game to help professionals in the field of Education and Psychology using the Applied Behavior Analysis methodology in teaching literacy to children with dyslexia. The game is aimed at dyslexic children, aiming to improve learning and the achievement of reading and writing, aiming to challenge the user to form scrambled words with inverted, similar or facing down letters according to a picture shown, such as the word “car”, which for the dyslexic will show “artrph”. together with some inverted or rotated “r”, the word size increases as the user changes levels, the game uses a “drag and drop” style, in which the user drags the letter from the shuffled frame and places it in the proper position to form the word. The methodology does not adopt negative stimuli*

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“Game Over” and in parallel works with positive stimuli using sound and visual effects and obtaining points. The application has a functional logical structure that is easy to use, contextualizing different environments of a house, with personalized design, standardized, animated and colorful objects, uniting gameplay, education, teaching, and positive stimuli in the literacy process of dyslexic people.

Keywords: Children. Dyslexia. Education. Psychology. Positive stimuli.

Resumen: Este artículo presenta un juego para ayudar a los profesionales del área de la Educación y la Psicología utilizando la metodología de Análisis de Conducta Aplicada en la lectoescritura de niños con dislexia. El juego está dirigido a niños disléxicos, con el objetivo de mejorar el aprendizaje y la adquisición de la lectura y la escritura, con el objetivo de retar al usuario a formar palabras revueltas con letras invertidas, parecidas o boca abajo según un dibujo presentado, como por ejemplo la palabra “car”, que para el disléxico mostrará “artrph” junto con alguna “r” invertida o rotada, el tamaño de la palabra aumenta a medida que el usuario cambia de nivel, el juego utiliza un estilo de “arrastrar y soltar”, en el que el usuario arrastra una letra de un tablero revuelto y la coloca en la posición adecuada para formar la palabra. La metodología no adopta estímulos negativos “Game Over” y en paralelo trabaja con estímulos positivos utilizando efectos sonoros y visuales para la obtención de puntos. La aplicación tiene una estructura lógica funcional y fácil de usar, contextualizando los diferentes ambientes de una casa, con diseño personalizado, objetos estandarizados, animados y coloridos, uniendo jugabilidad, educación, enseñanza y estímulos positivos en el proceso de alfabetización de personas disléxicas.

Palabras-chave: Dislexia. Educación. Estímulos positivos. Niños. Psicología.

INTRODUÇÃO

Learning disorders are described as a specific difficulty in performing academic activities, such as: reading, writing, performing mathematical calculations, among others. Second Oliveira et al. (2013), there is no clinical method for identifying patients who have these disorders. This is due to the fact that the symptoms present themselves in different degrees for each individual, which makes the diagnosis complex.

These difficulties are usually recognized in individuals who present significantly lower than expected results for their level of development, education and intellectual capacity. Among the various learning disorders reported in the literature, dyslexia (specific reading and writing difficulties) stands out as the object of study of this work. Schirmer et al. (2004), says, dyslexia can be divided into two types: central and peripheral. In the first, the linguistic processing of stimuli is compromised, that is, changes in the process of converting from spelling to phonology. In the second, the visual analysis system for reading is compromised, with impairments in the understanding of the material read.

For Capeline (2011, p.38), dyslexia can be defined as a type of disorientation caused by a natural cognitive ability that can replace normal sensory perceptions with conceptualizations; difficulties with reading, writing, speaking and driving, which originate from disorientations triggered by confusion about symbols. Teles (2009) defines dyslexia with difficulty as one characterized by difficulties in word reading accuracy and/or fluency and by poor reading and spelling competence. These difficulties typically result from a deficit in the phonological component of language that is often unanticipated in relation to other cognitive abilities and educational conditions. Secondary to this may arise difficulties in reading comprehension, reduced reading experience that may impede the development of vocabulary and general knowledge. Such difficulties result from a Phonological Deficit, unexpected in relation to the other cognitive abilities and educational conditions, as a consequence difficulty in comprehension and reduced reading may arise, consequently reducing vocabulary development and learning.

According Rotta, Ohlweiler, dos Santos Riesgo (2015) to dyslexia there are some symptoms of more relevant meanings, this

happens at all ages in general in people with dyslexia. In the Diagnostic and Statistical Manual of Mental Disorders - DSM-5 (DSM-5, 2014), dyslexia is included in a broader category called “Neurodevelopmental Disorders”, and is referred to as a “Specific Learning Disorder”. This project describes the development of a game to help children with dyslexia, improving their development, schooling and intellectual capacity. In addition to the DSM-5 (APA, 2014), there is a national study (GERMANO; CAPELLINI, 2011) on the interdisciplinary assessment criteria for students to be considered dyslexic

2 METHODS

From the objective of creation, implementation and technological transfer of a computational tool, together with institutional management processes, the research begins with: 1 – Bibliographic Survey; 2 – Search for research related to the topic; 3 – Definition of the programming language to be used in the project; 4- Development of the protocol to be applied to the data studied; 5 – Analysis and development of the application prototype that simulates the process patterns; 6 – Adequacy of the system and evaluation of the results obtained, with the test of the coherence of the model.

The development of the game was based on the platforms: Unity, Visual Studio e Corel Draw 9. Unity is an IDE that makes it possible to directly create the game through creation and formatting tools in the structure of the application under development. Also, it is responsible for supporting layout management and interpreting code in C# language, so that it can be used as an additional resource in the creation of the same, being responsible for providing the development of applications for mobile devices, making it possible to control build versions for different operating systems.

3 THEORETICAL FOUNDATION

According to Jothiprabha, Bhargavi, Rani (2023) dyslexics have problems understanding the phonemes of languages, therefore,

they show less ability to relate letters to form words and sentences. The portal <https://drauziovarella.uol.com.br/doencas-e-sintomas/dislexia/> states that dyslexia is a disorder caused by a hereditary chromosomal alteration that affects 0.5% to 17% of the population worldwide. The symptoms become more evident during the literacy phase. Dyslexia is a genetic and hereditary language disorder, of neurobiological origin, which is characterized by the difficulty of decoding the written stimulus or the graphic symbol. Dyslexia compromises the ability to learn to read and write correctly and fluently and to understand a text. To varying degrees, people with this congenital defect cannot establish phonemic memory, that is, associate phonemes with letters (ZORZI, 2003).

Júnior et al (2023) state that dyslexia is the cause of reading disorders, because the dyslexic child demonstrates serious difficulties with the identification of symbols and graphics at the beginning of their literacy, which leads to failure in other areas that depend on reading and writing. Selikowitz (2001, p.48) says that dyslexia is, therefore, a form of specific learning difficulty where reading is the particularly affected skill and that the diagnosis of specific reading difficulty is based on the degree of delay in reading and not on specific types of mistakes the child makes.

If there is no clear knowledge at school about the diagnosis of reading and writing difficulties, this could cause distortions in the ways of identifying them and in the intervention strategies, and could collaborate to legitimize school failure, the segregation and exclusion of students with disabilities. such difficulties (JÚNIOR et al, 2023).

Villamarin (2001) describes dyslexia as a syndrome in which the child it has complications in the process of reading and writing, in a severe way. However, Heming (2022) states that having dyslexia does not mean that the child does not have intelligence, nor is it unable to learn.

In this way, Chiamonte and Capellini (2022) state that it is common for students with dyslexia to co-occur with dysorthogra-

phy, since the deficits necessary to carry out the phonographic conversion and linguistic knowledge, which are altered by dyslexia, also bring deficits for learning spelling, since these mechanisms directly influence both diagnoses.

4 THE GAME

When opening the application, the options for settings are made available to the

user, clicking on the start button displays various themes, in which the word size will increase according to the degree of difficulty in levels from 1 to 15. The player can select the correct letter and drag it to its position to form the desired word, when completing the level, it will receive positive stimuli with scores, if it is not successful, it will not receive punishment, remaining at the same level, Figure 01 illustrates the application's initial screen.

Figure 1- Application Home Screen

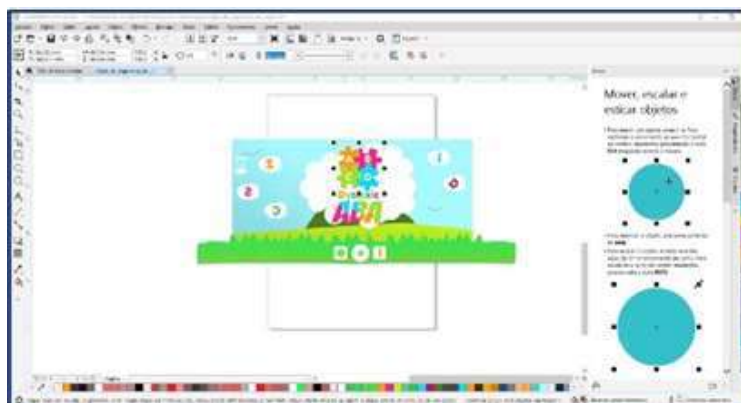


Source: Elaborated by the authors (2023).

Regarding the development of the application, scenarios based on graphics were built, containing objects, shapes and characters previously produced. The layout consists of custom designs of the application interface components such as: moving, scal-

ing and stretching objects, which were developed with the help of Corel Draw software, as it presents the necessary support for the aesthetic alignment of the game, Figure 02 illustrates the custom application interface components.

Figure 2- Custom application interface components



Source: Elaborated by the authors (2023).

Parallel to the previous step, scripts were created with Visual Studio for ordering words which start with two letters, increasing progressively according to the game's levels. With each letter placed in the correct position, you will receive positive stimuli in the form of sound and animations. It is noteworthy that the game, based on the Applied Behavior Analysis (ABA) teaching methodology, can be configured by the professional and/or companion according to the user's needs.

To create the animations, we use the Animation tool present in Unity because it supports the C# language, in addition to the Visual Studio IDE as integrated development environments for editing the scripts. Gameplay levels were optimized using the drag and drop method as a form of "Puzzle" so that the user by positioning the correct word in the displayed image. Figure 03 illustrates the environment containing elements such as: punctuation, sound control, play and close button, in addition to scrambled letters.

Figure 3- Living room scene (empty)



Source: Elaborated by the authors (2023).

Figure 04 illustrates the deployment of the application was carried out on the Google Play

Store. game available for free download on the Google Play Store.

Figure 4 - Game integrated in Google Play Store



Source: Elaborated by the authors (2023).

The game was developed by the multidisciplinary team of the Federal Institute of Education Science and Technology of Maranhão (IFMA), Codó campus, composed of teachers, psychologists, therapists, pedagogues, students, and volunteers, to be applied in the daily lives of people with dyslexia.

5 RESULTS

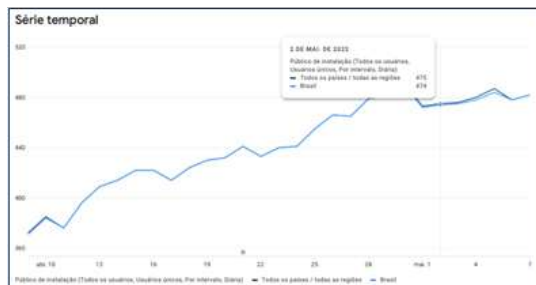
The DyslexicABA game became a relevant application for people with dyslexia, due to the fact that it presents an easy-to-use functional logic, contextualizing different environments of a house, with personalized design, stan-

standardized, animated and colorful objects, using the methodology TAB.

Based on data collected in the Google Play Store time series, as of April 9, 2022, the app has reached a total of 1,980 install and

update events, gaining an average of 442 new users per month, as of the writing of this article. the application reached the peak of 475 new daily users on May 2, 2022, as illustrated in Graph 01.

Graph 1- Play Store Analysis



Source: Elaborated by the authors (2023).

Graph 02 illustrates the 2,090 installation and update events from December 2020

to December 2021. The application supports 18,748 device models.

Graph 2: Installation and update events



Source: Elaborated by the authors (2023).

The DyslexicABA game was developed for devices with Android operating system and is available for free download from the google play store through the link: <https://play.google.com/store/apps/details?id=com.lfmacodo.dyslexicABA>. There was a delicate production, concerned with attracting the child to the game, which was the main difficulty. Animated objects, colors and positioning were key features to achieve this goal.

In addition to the dyslexic attraction to game, the gameplay was of great concern, and the ease of understanding how the game works. Hence, an introduction was incorporated when accessing the APP for the first time and the drag and drop method, avoiding the complexity of using the keyboard. The use of the ABA methodology was of great importance to adapt edu-

cational methods for children with this autistic spectrum, such as avoiding any negative stimulus and highlighting the positive ones.

7 CONCLUSION

Based on the projects and results of basic education, impact throughout the lexical teaching of the target text and complexity of form of complex people as computational tools of complexity, with complexities as cost-effective computational techniques, with a future impact on their audience stimulus. literacy process for dyslexics, optimizing learning, and multidimensional, as it contextualizes and personalizes pre-defined environments, in a temporal understanding in the search for didactic solutions.

In this sense and its multidisciplinary team, the Federal Institute of Education, Science and Technology of Maranhão (IFMA) intends to make available new versions of the application containing additional adjustments and adjustments to an inclusive proposal. Such adjustments must be defined in the Accessibility Accessibility Guide- ISO/IEC2500, in the Mobile Accessibility guidelines, in the Accessibility Model, in the World Wide Web (W3C), Web Content Accessibility Guidelines (WCAG), in the Web Accessibility Initiative (WAI), the Cognitive and Learning Disabilities Task Force (COGA) and Universal Design principles for research eligibility.

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Recebido em 25 de janeiro de 2023

Aceito em 22 de março de 2023