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REVIEW

Technological innovation in the intervention of Autism Spectrum Disorder

Innovación tecnológica en la intervención del Trastorno del Espectro Autista

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ABSTRACT

Introduction: autism Spectrum Disorder (ASD) emerged as one of the most relevant challenges in child and adolescent mental health, due to its implications in communication, social interaction and the presence of repetitive behaviors. From early stages, its symptoms were masked in many cases until social demands overcame compensatory strategies. Faced with this reality, Decree 777/2019 of the Ministry of Health and Social Development proposed an approach based on individualization, structuring of the environment, intensity of interventions and family participation.
Development: the analysis carried out highlighted that the application of these principles was fundamental to guarantee effective treatments.The literature reviewed highlighted that early detection and systematic practices facilitated the acquisition and maintenance of skills. The active role of the family in the therapeutic process was also valued. In parallel, it was observed that Information and Communication Technologies (ICT) offered versatile tools for learning and inclusion. Web applications based on architectures such as MVC and languages such as JavaScript or PHP, together with MySQL databases, favored the design of dynamic and accessible environments. However, the existing market showed limitations, especially in the absence of crisis registers and access restricted by subscriptions. In this context, the agile Kanban approach provided management strategies that optimized the development of technological solutions.
Conclusions: the study evidenced that the combination of sound therapeutic foundations and the use of ICT constituted a promising avenue for creating innovative tools. These applications not only supported learning, but also represented instruments of social inclusion, capable of responding comprehensively to the needs of people with ASD and providing sustainable support to their families.

Keywords: ASD; ICT; Intervention; Inclusion; Kanban.

RESUMEN

Introducción: el Trastorno del Espectro Autista (TEA) se presentó como uno de los retos más relevantes en la salud mental infantil y adolescente, debido a sus implicancias en la comunicación, la interacción social y la presencia de conductas repetitivas. Desde etapas tempranas, sus síntomas quedaron enmascarados en muchos casos hasta que las demandas sociales superaron las estrategias compensatorias. Frente a esta realidad, el Decreto 777/2019 del Ministerio de Salud y Desarrollo Social planteó un abordaje basado en individualización, estructuración del entorno, intensidad de las intervenciones y participación familiar.
Desarrollo: el análisis realizado destacó que la aplicación de estos principios resultó fundamental para garantizar tratamientos eficaces. La literatura revisada subrayó que la detección temprana y las prácticas sistemáticas facilitaron la adquisición y mantenimiento de habilidades. Asimismo, se valoró el rol activo de la familia en el proceso terapéutico. En paralelo, se observó que las Tecnologías de la Información y la Comunicación (TIC) ofrecieron herramientas versátiles para el aprendizaje y la inclusión. Aplicaciones web sustentadas en arquitecturas como MVC y en lenguajes como JavaScript o PHP, junto con bases de datos MySQL, favorecieron el diseño de entornos dinámicos y accesibles. No obstante, el mercado existente mostró

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limitaciones, especialmente en la ausencia de registros de crisis y el acceso restringido por suscripciones. En este contexto, el enfoque ágil Kanban aportó estrategias de gestión que optimizaron el desarrollo de soluciones tecnológicas.
Conclusiones: el estudio evidenció que la combinación de fundamentos terapéuticos sólidos y el uso de TIC constituyó una vía prometedora para crear herramientas innovadoras. Estas aplicaciones no solo apoyaron el aprendizaje, sino que también representaron instrumentos de inclusión social, capaces de responder de manera integral a las necesidades de las personas con TEA y de brindar apoyo sostenible a sus familias.

Palabras clave: TEA; TIC; Intervención; Inclusión; Kanban.

INTRODUCTION

Autism spectrum disorder (ASD) is one of the main challenges in the field of child and adolescent mental health, as it is a neurodevelopmental disorder characterized by difficulties in communication and social interaction, along with restricted and repetitive behavior patterns and interests. These symptoms usually manifest themselves from an early age, although in many cases they remain masked until social demands increase or compensatory strategies become insufficient. This condition, recognized by the DSM-5 and supported by various international organizations, highlights the need for a comprehensive approach that considers not only early detection but also the development of interventions tailored to the unique characteristics of each individual.

In this regard, Decree 777/2019 of the Ministry of Health and Social Development emphasizes the importance of applying principles such as individualization, structuring the environment, intensity, and generalization of interventions, as well as active family participation. These pillars seek to ensure that treatments respond to the specific needs of people with ASD, promoting their comprehensive development and social inclusion.

In recent years, Information and Communication Technologies (ICT) have established themselves as a key resource in this process, enabling the creation of flexible, attractive tools that can be adapted to different levels of maturity and learning. Web applications, programming languages such as JavaScript or PHP, and databases like MySQL form the technological basis for designing platforms that facilitate teaching, progress tracking, and daily interaction. Under architectures such as the MVC model, supported by standards like HTML5, these tools provide dynamic environments that combine accessibility, personalization, and efficiency.

Likewise, agile methodologies such as Kanban provide an organizational framework that enables efficient task management and continuous improvement of technological developments. This approach, focused on workflow visualization, prioritizes process optimization and constant adaptation to the end user's needs.

Analysis of existing applications reveals a growing market. However, it is limited in certain aspects, such as the lack of crisis event logging or the need to resort to paid subscriptions to access all features. Most focus on visual agendas and emotion recognition, but they do not yet fully integrate daily support with systematic reporting. This gap opens up the opportunity to design innovative solutions that combine the best of ICT with a solid therapeutic and pedagogical approach, capable of responding to the real demands of people with ASD and their families.

DEVELOPMENT

Understanding the problem

According to the manual on child and adolescent mental health:

Autism Spectrum Disorder (ASD) refers to a neurodevelopmental disorder defined by a series of behavioral characteristics. According to the DSM-51, the core clinical characteristics of ASD include difficulties in two areas of functioning (social communication and social interaction) and, in some cases, restricted and repetitive patterns of behavior, interests, or activities. These symptoms are present in early development but may not become fully apparent until social demands exceed the child's limited capabilities, or they may be masked by strategies learned in later years.

In this regard, the consensus on the diagnosis and treatment of people with autism spectrum disorder by the Ministry of Health and Social Development of the Nation raises the need to "improve the process of diagnosis and treatment of people with ASD" et al. (Decree 777/2019). To this end, it is essential to refer to the four principles presented in the treatment plan of Decree 777/2019, which states that good practices include:

- Individualization. There is no single treatment that is equally effective for all people with ASD. Variations in the manifestations of this spectrum, as well as the abilities, interests, outlooks on life, and circumstances of those affected, necessitate personalization.
- Structure. That is, adapting the environment to maximize each individual's participation by offering different degrees of predictability and stability, more effective means of communication, setting clear

short- and long-term goals, defining how these goals can be achieved, and monitoring results.

- Intensity and generalization. The interventions used should not be sporadic or short-term, but applied systematically daily, in different contexts, and by everyone who lives and works with the person with ASD. This will ensure that the skills acquired in more structured environments can be maintained in real-life situations. Those responsible for carrying out the interventions should also have access to adequate support and guidance from professionals with experience in ASD.
- Family involvement. Throughout childhood and beyond, parents should be recognized and valued as key elements of any intervention. Information, training, and support should always be provided within the context of family and cultural values, serving as the common denominator of any professional intervention.

As Desirée mentions, the positive impact of ICT on teaching processes enables learning that is adapted to the pace, maturity, and cognitive level of each child. Following the principles mentioned above, we can say that ICTs have the versatility and flexibility to adapt to the needs of each individual. Taking into account their visual characteristics for information processing, ICTs enable the learning process to be structured and adapted, promoting motivation in a pleasant, engaging, and enjoyable way.

ICT

Within the broad world of information and communication technologies, we want to present the following concepts for the development of this project: Web applications: within their architecture, three levels can be distinguished and mentioned: the upper level that interacts with the user or web client, usually the browser; the lower level that provides the data stored in the database; and the intermediate level that processes the data, also known as the web server. For these web applications to work, the client and server must communicate using a standardized protocol known as HTTP, which is part of the TCP/IP family of protocols used on the Internet. These protocols enable the connection of heterogeneous systems, facilitating the exchange of information between different computers.[1]

HTML is a markup language used to format documents for publication on the World Wide Web. Web pages, also known as HTML pages, are files written in this language, which can encompass a wide range of technologies, such as DHTML, CSS, and JavaScript, allowing for more complex developments. Mora et al.[1] HTML5 is a new concept for building websites and applications that combines mobile devices, cloud computing, and networking. It proposes standards for every aspect of the web and also a clear purpose for each of the technologies involved. Starting with this version, HTML provides structural elements, CSS focuses on making that structure usable and visually appealing, and JavaScript has all the power necessary to give dynamism and build fully functional web applications.[2]

Script: a language, also known as a scripting language, similar to a macro language, i.e., a list of commands that can be executed with or without user participation. It is a programming language that is usually used within a context and does not allow the creation of independent executable files. There are many script languages, but one of the most widely used on the internet is JavaScript. They can be used to validate client-side data and check the consistency of values before sending a form. They can also be used to update fields related to forms and perform processing that does not require centralized information. Mora et al.[1] Scripting languages have strong restrictions on access to the machine's resources, preventing the execution of code that could compromise the integrity of the user's system. Mora et al.[1] JavaScript is an interpreted, object-based (not a pure object-oriented language) and multi-platform language invented by Netscape Communications Corporation. One of its main applications is to validate user input through a form. The advantage of this approach is that it reduces the server's load, minimizes delays caused by user errors, and simplifies the programs running on the server by dividing the workload between the client and the server. Mora et al.[1] PHP: This is a high-level language that runs on the server where the pages are hosted, unlike other languages that are executed in the browser itself. The main advantage of running on the server is that pages can be viewed on any computer, regardless of the browser used. Another benefit is that it is a free programming language, allowing anyone to use it at no cost.

Database: "A database is a set of data structured and defined through a specific process, which seeks to avoid redundancy, and which will be stored on some form of mass storage medium, such as a disk".[3]

MySQL: This is the database of choice for most PHP programmers. It supports SQL language and multiple user connections, but is generally used for small to medium-sized applications. Its main advantage is that it is a free database.

MVC: The Model-View-Controller (MVC) pattern or architecture is the most widely used for developing applications that require user interfaces. It is based on the separation of data or models and the view, while the controller is responsible for linking the two.[4]

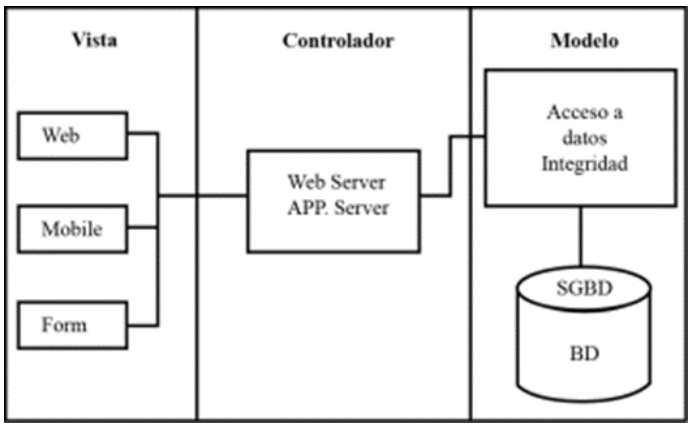

Figure 1. MVC pattern associated with web technology[4]

Kanban:

It is a lean approach to agile software development. In reality, Kanban means many things. Literally, Kanban is a Japanese word meaning "visual card." At Toyota, Kanban refers to the visual and physical signaling system that ties the entire just-in-time production system together. Most agile methods, such as Scrum and XP, are already well-aligned with Lean Thinking principles. In 2004, however, David Anderson pioneered a more direct application of Lean Thinking and the Theory of Constraints to software development. Under the guidance of experts such as Don Reinertsen, this evolved into what David referred to as a "Kanban system for software development," and is now commonly known as "Kanban." While Kanban's application to software development is relatively new, its use in just-in-time production is over half a century old.

Simply put, Kanban divides work into blocks, writes each item on a card, and places it on the board. The board utilizes named columns to indicate the location of each item in the workflow.

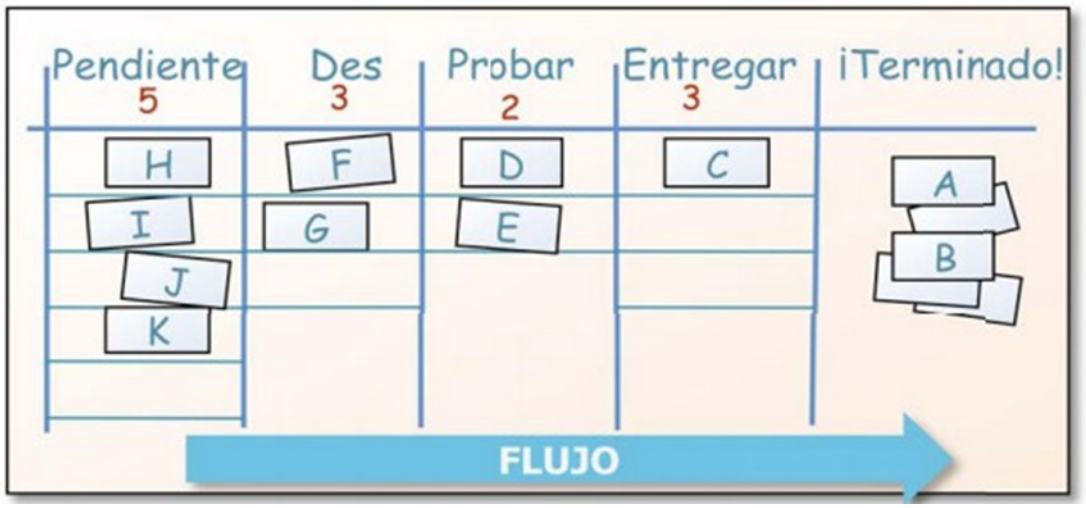

Figure 2. Kanban board

Competencies

Table 1. Competencies

Page	Application	Visual agenda	Identification of emotions	Crisis log	Web app	Paid subscription
https://auticiel.com/	https://play.google.com/store/apps/details?id=com.auticiel.autimo	Yes	Yes	No	No	Yes
https://auticiel.com/	https://play.google.com/store/apps/details?id=com.auticiel.ifeel	Yes	Yes	No	No	Yes
http://www.fundacionorange.es/la-fundacion/	https://play.google.com/store/apps/details?id=com.orange.joseaprende	No	Yes	No	No	Yes

http://www.fundacionorange.es/la-fundacion/	https://play.google.com/store/apps/details?id=com.orange.emoplay	No	Yes	No	No	Yes
http://www.czpsicologos.es/evenbetterga mes/acerca.php	http://www.czpsicologos.es/leoteayuda/	No	Yes	No	Yes	Yes

When analyzing competitors, it is evident that to access these applications, most of which are only available for cell phones, a monthly or annual subscription fee is required to enable all features. Additionally, it is worth noting that none of them allows you to keep a record of crisis events.

Most of these applications focus on two central points: visual scheduling using pictograms and emotion recognition. However, none of them maintains a comprehensive record of both aspects, let alone a record of crisis events. Their dynamics are more focused on presenting a system for learning and identifying emotions, rather than providing emotion reports alongside a structure that allows for daily monitoring.[5,6]

CONCLUSIONS

Autism Spectrum Disorder (ASD) represents a complex and multidimensional challenge that requires a comprehensive approach, both from a clinical perspective and from a technological and social standpoint. Throughout the analysis presented, it has been highlighted that the most effective interventions are those based on individualization, environmental structuring, intensity, and generalization of therapeutic practices, as well as active family participation. These principles, outlined in Decree 777/2019 and supported by scientific evidence, form the basis for providing consistent and sustainable support over time, tailored to the specific needs of each individual with ASD.

In this scenario, Information and Communication Technologies (ICT) are consolidating their position as a strategic resource for promoting learning, autonomy, and inclusion. Tools such as web applications, supported by robust architectures (MVC) and dynamic programming languages such as JavaScript or PHP, offer the possibility of designing accessible, attractive, and personalized virtual environments. Additionally, the use of databases such as MySQL enables the centralization and organization of information, generating valuable records for monitoring progress, detecting behavioral patterns, and implementing more targeted interventions.

However, analysis of the current application market reveals significant limitations. The absence of comprehensive systems that incorporate both visual agendas and crisis records highlights a gap between the real needs of families and the available technological solutions. Likewise, restricted access through paid subscriptions reduces the possibility of democratizing these tools, limiting their social impact. This scenario presents an opportunity for innovation, where interdisciplinary research can contribute to the design of more inclusive platforms with functionalities that respond holistically to the daily challenges faced by people with ASD.

On the other hand, the incorporation of agile methodologies, such as Kanban, into the technological development process represents added value, allowing for more flexible, visual, and efficient project management. This approach not only facilitates the constant adaptation of applications to the end user's requirements but also promotes continuous improvement, a fundamental aspect in a field that demands constantly evolving solutions.

In short, the combination of sound therapeutic principles and the use of ICTs represents a promising path toward developing innovative and practical tools. The challenge lies not only in creating functional applications but also in ensuring that they become accurate instruments of inclusion, capable of promoting the comprehensive development of people with ASD and offering their families concrete, sustainable, and accessible support.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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