

## Analysis of mobile applications for adults with autism spectrum disorder

### Análisis de aplicaciones móviles para personas adultas con trastorno del espectro autista

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#### Abstract

The article aims to present an analysis of mobile applications that currently serve adults with Autism Spectrum Disorder (TEA) in any of the types or levels that are identified, since the literature varies with respect to the terminology they use. Therefore, an investigation of the applications they can access was carried out to identify what kind of support they provide to users, since these can be focused on the adaptation of the environment in which the person works, to organize their days and identify how they should behave at certain events, or in their case they work as support for family members. Derived from the analysis, a minimum percentage of the applications that serve adults with TEA is identified, giving guidelines to the fact that mobile applications can be designed and developed that can serve them with the aim of improving the way they interact with their family, school, social and work environment.

#### Resumen

El artículo tiene como objetivo presentar un análisis de las aplicaciones móviles que actualmente atienden a personas adultas con Trastorno del Espectro Autista (TEA) en cualquiera de los tipos o niveles que se identifiquen, dado que la literatura varía con respecto a la terminología que emplean. Por lo que, se realizó una investigación de las aplicaciones a las que pueden acceder para identificar el tipo de apoyo brindan a los usuarios, dado que estas pueden estar enfocadas a la adaptación del entorno en el que se desempeña la persona, para organizar sus días e identificar como deberían de comportarse en ciertos eventos, o en su caso funcionan como apoyo a los familiares. Derivado del análisis se identifica un porcentaje mínimo de las aplicaciones que atienden a personas adultas con TEA, dando pauta a que se pueden diseñar y desarrollar aplicaciones móviles que puedan atenderlos, con el objetivo de mejorar la forma de interactuar con su entorno familiar, escolar, social y laboral.

**Analysis, Mobile app, Autism, Spectrum, Technology**

**Análisis, App móvil, Autismo, Espectro, Tecnología**

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## Introduction

Currently, the use of mobile and web applications provides a technological tool for people with ASD and the people they interact with on a daily basis. They allow for more fluid interaction between both parties, thus increasing the development of social skills. However, it is important to identify which ones already exist and what benefits they provide or what is the focus of attention for ASD.

Some applications offer the possibility of being able to develop other skills in deficits such as attention, anticipation, executive functions, working memory, sequences of actions, organisation of events, etc. (Gallardo-Montes, 2021).

The analysis is presented with the aim of conducting research to identify the mobile applications that are currently available for adults with some type of ASD in order to have or provide a better quality of life. In addition to knowing what is the area of attention for people who want to use them.

Most of the applications are focused on attending to children, given that this is the ideal age at which it can be detected that an individual has ASD, however sometimes it is not detected in that age range, given that the symptoms are minimal, but as they are not attended to in time, then it is usually difficult to detect them at later ages but as they are not treated the situation is more difficult to recognise that they have symptoms and that they need support to improve the quality of life within their environment.

### *Analysis of mobile applications*

ASD, better known as autism, is a neurodevelopmental disorder that causes challenges in the development of social, communication and behavioural skills in people who have it. It usually manifests in childhood and lasts throughout life.

All people with ASD are different from each other, hence the name spectrum, as the characteristics are highly variable in each case. So each of these variables can affect how they can learn and develop skills for or against their well-being.

Autism is a group of diverse conditions related to brain development. Characteristics can be detected in early childhood, but often autism is not diagnosed until much later. Approximately one in 100 children has autism. The abilities and needs of people with autism vary and may evolve over time. While some people with autism can live independently, there are others with severe disabilities who need constant care and support throughout their lives (WHO, 2023).

Scotto Carolina, 2019, mentions that: "people with autism present a neurobiological condition of a very heterogeneous variety that affects early development, that is, in the first years of life, these individuals present a great variety of symptoms, such as difficulties in communication, in intentional behaviour, in the recognition and expression of emotions from facial expressions, in speech and body language (Enticott et al., 2014). If there are such impairments (observable in the early stages of development), impairments in social performance in general and in reading more sophisticated emotions might be expected.

Families may have access to various applications that are offered for people with ASD for mobile devices. Therefore, they tend to access these applications with confidence in certain applications, but as most of these are specially oriented to a certain type of ASD, they do not always meet the expected purpose for them, but as mentioned in previous paragraphs, it is a spectrum, so not all possible cases to be addressed are identified one hundred percent.

The user interfaces of applications must be analysed and designed correctly, in order to have an optimal usability or interaction with them, to perceive and understand correctly the use of each element (e.g. buttons, text, navigation), to ensure the correct functioning of the applications.

Xiaojie Lian (2023) in his article where he presents a user interface evaluation of an application, refers to two authors who mention the following: Eraslan et al. (2019) conducted an eye-tracking study with high-functioning autistic adults and neurotypical participants to examine whether people with autism have different processing strategies with web pages.

The findings revealed that people with autism tend to look at more elements on a webpage than neurotypical participants and proposed improvements to existing web accessibility guidelines; and Rezae et al. (2020) evaluated the user interface of a mobile navigation software for adults with autism using eye movement analysis, showed that autistic users interact with user interfaces differently than non-autistic users, and made recommendations for improving user interface design.

For the above mentioned reasons it is important to perform a proper analysis of the design of user interfaces for apps.

Researching in Google Play Store, using the keywords autism adults, only 7 applications focused on adults were found, it is worth mentioning that if only autism is placed there are more than 200 applications, but mostly to serve children, the search was conducted on 14/08/2023, but following the objective of this analysis was deepened by identifying which applications meet the needs of adults with ASD. It was observed that some applications are not related to or directly address autism. Given the minimal number of applications and the diversity of approaches to autism, it is important to be careful with the choice of one or another in order to obtain good results.

The purpose of table 1 is to present the applications focused on adults with ASD, including brief information about the applications, such as: name of the application, age range, platform or operating system in which they work and a description of what they do.

No.	Application/ Age range/ Operating System	Description
1	Proloquo2Go/ No hay límite de edad / iOS	Symbol-based augmentative and alternative communication app. Natural-sounding texts can be added in all languages or use local accents (Google Play, 2023).
2	Autism Test (Adult)/ Adulta/ Android	Diagnosis of high-functioning autism, as detection can be delayed until adulthood (Google Play, 2023).

3	NeuroSchemas For Autism/ Adulta/ Android y iOS	Allows you to choose the scheme that best suits a social situation.
4	Learn Autism/ No hay límite de edad/ Android	Choose an event to learn implicit social rules and overcome challenges (Google Play, 2023).
5	MagnusCards - Autism App/ Adulta/ Android y iOS	Learn Autism provides FREE access to evidence-based information on a wide range of topics, from pre-diagnosis to adulthood (Google Play, 2023).
6	Hiki: Autism Friendship Dating/ Adulta/ Android y iOS	MagnusCards provides collectible instructions designed to assist autistic and neuro-diverse individuals with activities of daily living, including money management, self-care, cooking and travel. Each collectible card deck is created in partnership with businesses, venues and non-profit organisations to assist and encourage community engagement and life skills development (Google Play, 2023).
7	Leo - AAC & Autism Speech Aide/ No hay límite de edad/ Android	Free dating and friendship app created BY and FOR autistic people. Our mission is to make it easier to meet and form genuine, unmasked relationships. With features tailored to neurodivergent communication styles, you can spend less time explaining your quirks and more time relating to them (Google Play, 2023).

**Table 1** Applications for adults with ASD

Source: Own elaboration

Of the applications presented in table 1, only one allows the diagnosis of high-functioning autism, in this type they do not show delays with respect to the general population, they are usually agile, like physical activities, which can derive other areas of attention, they also present motor difficulties in adolescence, as a consequence of an abnormal body image and low self-esteem. As well, they show little attachment to their mother from the beginning of their lives, which extends to other significant others during the time of upbringing.

They also lack interest in their peers, lack understanding of other people's emotions and show no interest in developing social interactions. They are also unable to recognise their problems in this regard (The Swan, 2023).

The main functionality of the applications presented in Table 1 is mostly focused on improving the quality of communication, ease of interaction with society and interaction with their environment for people with ASD.

It is difficult for a person in his adult age to accept that he presents symptoms or behaviours of autism, if he still does not know that he suffers from this type of disorder. Therefore, it is necessary that society knows and identifies this type of behaviours, given that it is complicated to coexist with people who have these behaviours, without knowing the reason of their behaviours, and nowadays, when not understanding their ways of acting, there is a tendency to exclude these people.

It is important to identify the different types or degrees of autism that can be identified in adults. Therefore, some of them are mentioned below:

- Asperger's Syndrome: This type of autism is the most difficult and, sometimes, late to be diagnosed, given that the affected persons do not have any type of intellectual disability or physical trait that identifies them. The deficit is in the field of social skills and behaviour, being important enough to seriously compromise their development and social and labour integration. They also present problems of social interaction, lack of empathy, poor psychomotor coordination, not understanding irony or the double meaning of language, and obsession with certain subjects, these are some of the most common characteristics (VIU, 2022).

- Pervasive developmental disorder not otherwise specified: This is a form of diagnostic labelling used in cases where the clinical symptoms are too heterogeneous to be included in any of the other types. But the symptoms they present are: social reciprocity disorders, severe communication problems and the existence of peculiar, restricted and stereotyped habitual interests and activities (VIU, 2022).

It is difficult to detect symptomatology by various professionals, however, sometimes there is an indication that an adult has an ASD and that it was not diagnosed and treated in time, which is why they sometimes express that -they have been a strange subject all their lives, an introverted, quiet, naive person who does not understand jokes or does not realise that someone is teasing them-, to put it colloquially.

Sánchez, 2023, mentions: Massaguer (Berta Massaguer Bardají, Clinical Coordinator of Neurodevelopment at Ita) provides other possible warning signs: "Having an unusual tone of voice; making facial expressions, movements and gestures that do not coincide with what is being said; having an intense and prolonged interest in certain subjects; presenting a lack of responsibility and having difficulties in carrying out household chores or maintaining a stable job; having difficulty following conversations; modulating intermittently or avoiding eye contact; difficulties in understanding another person's point of view...".

However, in recent times, there has been a greater identification of symptomatology presented by adults with ASD, according to María Verde Cagiao, psychologist of the Research area of Autism Spain, since "it is more and more frequent that adults go to clinics and services of psychological and psychiatric assessment looking for a diagnosis". In some cases, these are parents who, "as a result of the diagnosis of their children, discover that they themselves are also within the spectrum" (Sánchez, 2023).

**Results**

The objective of the analysis was achieved due to the fact that the existing applications to date were identified and what each of them performs. In a probabilistic way, considering the data presented in previous sections, it can be estimated that considering as a sample 200 applications with a focus on people with ASD regardless of age as 100%, thus obtaining that only 3.5% of the applications cater to the adult population, and that they only address certain needs and leave out others. Therefore, applications can be developed to address those areas that are not included in the existing ones.

**Conclusions**

Based on the analysis carried out, the need for the development of applications that cater to adults with some level of ASD is detected, due to the fact that many people are not attended to at an early age and are living in environments in which they are not included in an appropriate manner and are sometimes unintentionally discriminated against, given that society is not yet prepared to interact in an appropriate manner, even in the environments in which they have to perform.

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