

Critical Evaluation Of Intervention Modalities In Autism: A Study Of Digital Tools And Conventional Therapies

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Abstract— In this article we critically assess the primary intervention approaches for children with Autism Spectrum Disorder (ASD), comparing the efficacy of digital applications with conventional therapies. The analysis focuses on the impact of both approaches, focusing on the development of self-care and social interaction skills. It also analyzes how conventional therapies are based on human interaction and cannot be substituted due to their socio-emotional nature, as well as their generalization to natural contexts. However, they face challenges related to cost and accessibility. On the other hand, mobile applications offer intensive practice, personalization, and task structures, but are somewhat limited by their abstraction from the real world and their lack of empirical validation. This article argues that the future of intervention is not a substitution of one or the other, but rather a hybrid model that combines both therapies is recommended. Therefore, it is conveyed that technologies enhance face-to-face intervention; therefore, the implications for practice, responsible technological development, and future research are discussed.

Keywords— autism spectrum disorder, conventional therapies, hybrid intervention models, mobile applications.

I. INTRODUCTION

1.1. Autism Spectrum Disorder (ASD): Conceptualization and Current Context.

Autism Spectrum Disorder (ASD) is defined as an early-onset neurodevelopmental condition characterized by persistent deficits in communication and social interaction across contexts, accompanied by restricted and repetitive patterns of behavior, activities, or interests (American Psychiatric Association, 2013).

The nature of the spectrum is essential to understand it since there is the heterogeneity of its manifestations, since ASD affects each individual in a unique way, through a range of challenges, skills and support needs that are significantly varied from person to person and throughout their life (Lord et al., 2018). There are deficits in communication and social interaction that are the basis of the ASD diagnosis, these are manifested through difficulties in socio-emotional reciprocity, which can range from an atypical social approach to failure in reciprocal conversation, it can also be manifested through problems with non-verbal communicative behaviors used in social interaction, such as abnormal eye contact or even difficulties used for social interaction, such as abnormal eye contact or difficulties understanding and using gestures, as well as some challenges in the development and understanding of social relationships (American Psychiatric Association, 2013).

Now it is also important to consider the restricted and repetitive patterns of behavior where there are motor movements, stereotypical speech, insistence on monotony or even adherence to routines, very restricted and fixed interests that are anomalous in their

intensity, as well as hyperreactivity to sensory stimuli from the environment (Leekam et al., 2011). On the other hand, at the epidemiological level, ASD represents a global public health challenge, there are even estimates that it has increased considerably in recent years, for example, the Centers for Disease Control and Prevention of the United States (CDC) reported in 2023 a prevalence of 1 in 36 children aged 8 years, this shows a sustained increase compared to previous estimates (Maenner et al., 2023). That rise may reflect both more awareness by the public and better diagnostic tools. Some other reasons for the increasing trend include prenatal, dietary, environmental, and genetic factors which can justify this behavior (Bragg et al., 2025). The consequences of ASD are not only an individual matter but they also affect the family and even the country. For example, parents of children with ASD are under stress, sleep-deprived, financially burdened, and they face multiple disruptions to their daily routine.

What needs to be recognized is that the negative outcomes in ASD are not solely experienced by the individual but ripple out to families and society more broadly. Parents of children with autistic spectrum disorder (ASD) report higher levels of stress and are more likely to experience financial strain because of having to pay for costly therapies and to make major changes in their daily routine (Zablotsky et al., 2013). At the social dimension at present, it's crucial to guarantee inclusive quality education as well as employment and community life for persons with ASD, the latter is indeed a big challenge at minimalism level.

In this respect it is thought that early identification and intervention are crucial, as scientific literature suggests that persistently providing early support enhances long term outcomes by maximizing the developmental potential and the quality of life of persons living with ASD (Zwaigenbaum et al., 2015).

1.2. Intervention Paradigms in ASD: Conventional Evidence-Based Therapies

There are many different ASD interventions available today, and they have changed over time. Conventional therapies are methods that are grounded in behavioral, developmental, and sensory principles rather than being mediated by digital technology. ABA (Applied Behavior Analysis (ABA)), for instance, has been an evidence-based intervention for a long time.

ABA-based interventions, such as Early Intensive Behavioral Intervention (EIBI) or Discrete Trial Training (DTT), have been shown in multiple studies to be effective in improving language, adaptive skills, and IQ in children with ASD (Reichow, 2012; Virués-Ortega, 2010). These interventions are even more effective if implemented for 20 to 40 hours, showing significant improvements. Therefore, it is important that they be supported by highly trained professionals, as this requires a considerable investment of time and resources. Their intensive application, often recommended between 20 and 40 hours per week, has been associated with substantial improvements, although their implementation requires highly qualified professionals and a considerable investment of time and resources (Flujas-Contreras, Chávez-Askins, & Gómez, 2023).

There are also other models such as the TEACCH approach (Treatment and Education of Autistic and Related Communication-Handicapped Children), which focuses on the physical context and the activities of the world in order to make it more predictable and understandable for people with ASD, through visual supports, systems and work routines, a certain independence can be encouraged, reducing anxiety (Virues-Ortega et al., 2013). Likewise, there are development-based intervention models which integrate ABA principles within the relational and playful framework, focusing on children's initiatives and their emotional reciprocity (Dawson et al., 2010).

There are also sensory integration therapies, which help children more effectively integrate and process sensory information from their context. These are commonly used

to deal with unusual sensitivities among persons with ASD (Case-Smith et al., 2014; Fernández, 2024). These forms of treatment are in great demand because they have been subject to more scepticism about the evidence for their use than behavioral approaches, although there is beginning to be some research on their effectiveness in well-defined areas. Although they have been widely used, their evidence basis had historically been even more controversial than the behavioral interventions; however, recent research is starting to add support for them in some areas (Pfeiffer et al., 2011).

An emerging issue in these classical treatments is the gap of accessibility, since there are few very experienced therapists available back then (as now), especially in the countryside or poor areas. The gap also increases because the costs may be too expensive for most families to afford, and there are waiting lists to receive these types of services. Accordingly, pressing circumstances make necessary the investigation of additional therapy modalities that are convenient and affordable in addition to providing sustained therapeutic support beyond a clinical context.

1.3. Digital Age: A New Horizon for Autism Intervention

The increase in the use of digital technology in all areas has been exponential, and specifically in mobile devices such as smartphones, iPads, and tablets, it has even changed the way information is accessed, how we communicate, and how we learn. This change in the way things are done has not gone unnoticed, especially in special education and therapies. For instance, in the context of ASD, IT could generate various opportunities that align with the distinct needs and learning preferences identified in individuals with ASD (Grynszpan et al., 2014).

The number of mobile apps is also growing, which has made it easier to build a strong learning environment. People who like structure and a little more clarity will like those apps because they are usually easy to understand and follow. They also let you practice skills over and over again without getting bored or losing your way, so a human teacher might be able to help you with them. One more great thing is that it can give you feedback right away and keep giving it to you, which is the best way to learn. Kids with ASD are more interested in and motivated to do tasks that can be very boring when they are interactive and gamified (Gómez-León, 2023).

Lastly, studies have been done on the use of mobile apps and assistive technologies, and the results have been good. Digital tools have been effective in teaching a range of skills, such as recognizing emotions and augmentative and alternative communication (AAC). They also help children with task sequencing by using pictograms to help them overcome challenges, which encourages social interactions in a safe environment with controlled conditions (Fernández, 2024). However, it is important to remember that technology is not just a tool; it can also be a powerful force for change that allows for personalization of the intervention in ways that were not possible before. This technological optimism must be critically moderated; for example, in the area of ASD, there are applications that lack a solid theoretical basis and these have not been subjected to rigorous empirical validation (Capel, 2021).

Under this scenario, several research questions can be generated. Therefore, this article addresses the issue of children with autism spectrum disorder (ASD). The following question arises: How does the implementation of mobile applications (intervention) affect the development of self-care and social interaction skills (outcome) compared to conventional therapies (comparison)? This is undoubtedly a very interesting question worthy of being answered in this article.

1.4. Critical Evaluation Structure

The comparison between the effectiveness of digital interventions and conventional therapies is undoubtedly an area of great importance for research. Currently, there are reviews and evaluations of the technology applied in ASD, however, many of these focus on the usability and viability of digital tools rather than focusing on detailed comparisons with certain established approaches such as digital interventions with conventional controls or virtual reality versus conventional teaching, parent-assisted digital interventions versus conventional interventions, to name a few. Therefore, this derives and arises the need to synthesize the available evidence to guide educators, therapists, and families in making appropriate and informed decisions regarding the type of intervention or combination of interventions, allowing and potentiating them to be more productive and beneficial for the development of autonomy skills, improving the quality of life, such as self-care and social interaction of children with ASD.

This article offers a detailed literature review, examining the evidence base of conventional therapies and exploring the current landscape of digital interventions. This is followed by a direct comparative analysis of both approaches. Once that is understood, the article then takes a step down to look at how each modality affects both self-care as well as social interaction. Based on such analysis, discussion and critique will then be posited in the subsequent section. The conclusion includes a synthesis and some reflections on meaningfulness.

II. LITERATURE REVIEW. FROM CONVENTIONAL THERAPY TO DIGITAL INTERVENTION.

This section describes the evidence for both conventional and digital intervention therapies. It initially reviews some of the conventional methods; these are still commonly relied on to treat ASD as being mainstream, with their essential application to self-care and social interaction skills. It does this through the exploration of digital interventions, and in this, it will examine some of the theory behind them, what kinds of tools exist, and what has been studied to show their effectiveness.

2.1 Conventional Therapies: Fundamentals and Application in Key Skills.

Conventional interventions for the ASD population have been well established and integrated into clinical and research practice. The prevalence of early intervention is due to the effectiveness of behavioral treatments, which, sustained on a solid empirical ground (evidenced by several systematic reviews and meta-analyses putting together their successful outcomes in different developmental areas, Fluja-Contreras, Chávez-Askins & Gómez, 2023; Virués-Ortega, 2010).

2.1.1 Development of Self-Care Skills.

In this paper to bond with the vast literature in the field, and also a proposal of research, conventional treatment for achieving self-care skills will be dealt with partially. Skills of daily self-care which include eating, hygiene, dressing, and bowel/bladder management assistance are necessary to improve the level of potential independence and consequently the quality of life that is most meaningful for children with ASD. Behavioral approaches, derived from Applied Behavior Analysis (ABA), have proven to be very effective in teaching these complex chains of behavior. An important strategy is that which employs Task Analysis, which is based on the decomposition of a complex task into sequences (Cooper et al., 2020). Pictograms could even be used for this decomposition in children with ASD, who are highly visual. For example, task analysis could be done by breaking down the task of "washing hands" this can be broken down into 7 steps: 1) turn on the faucet, 2) wet hands, 3) take soap, 4) rub hands together, 5) rinse hands, 6) turn off the faucet, and 7) dry hands. Once the task is broken down, chaining procedures can be used in order to teach sequence, for example, forward chaining can be taught, which consists

of teaching the first step in this case turning on the faucet, therefore until the child has mastered it, then you can proceed to the second and so on, likewise, backward chaining can be used, this consists of teaching all the steps to the child except the final one so that the child independently obtains the successful result, and then gradually withdrawing assistance in the previous steps gradually (Cooper et al., 2020). It is important to consider that the selection of one method or another will depend on the characteristics of the child and the implicit task.

In addition to the above, these procedures can be combined with a support system known as prompting and fading. Here, prompts are based on stimuli that can provide assurance of the correct response; these can be a verbal cue, a gestural signal, or a physical guide. As the child develops skills, these prompts are gradually removed or diminished to encourage independence (Leaf et al., 2012). Differential reinforcement (Cividini-Motta, Livingston & Efaw, 2024) is a big part of this because it lets you give more valuable rewards for responses that are more independent. The reward system is a big part of keeping kids with ASD motivated while they are learning a lot. When taking care of kids with ASD, these methods can be very helpful. However, they must be used consistently and by trained staff to be effective. This requires a significant investment of time in individualized instruction to achieve a degree of specialization and generalization across diverse contexts.

2.1.2 Promoting Social Interaction.

Challenges in social interaction constitute a primary diagnostic criterion for ASD. Conventional therapies typically address this domain through diverse methodologies. One of these is Social Skills Training Groups (SSTG). In these groups, the therapist can directly teach social skills to a small group of children with ASD who have certain similarities or profiles. For example, they can teach them how to read nonverbal cues, start conversations, or take turns. Sessions include direct instruction, which can be modeled by the therapist demonstrating the skill, roleplaying, and feedback (Gates et al., 2017). SSTG can improve knowledge of social rules, for example; a persistent challenge is the generalization of these skills to natural, unstructured social situations outside the therapeutic setting (Reichow et al., 2012). To address this gap, naturalistic behavioral and developmental intervention (NDVI) approaches have gained considerable popularity and empirical support in recent years. Models such as Pivotal Response Training (PRT) and the Early Start Denver Model (ESDM) do not focus on teaching discrete skills, but rather focus on developing core areas of development that, once consistently improved, have cascading effects on other skills. These core areas include self-initiation, self-management, motivation, and responding to multiple cues (Koegel & Koegel, 2012)

It is important to consider that these interventions are implemented in the child's natural environment, for example, during play, so as not to remove the child from the environment. These interventions follow the child's initiative, focusing on capturing their motivation by interweaving social and communicative learning opportunities into playful and reciprocal interactions (Dawson et al., 2010). This approach facilitates generation, and consequently, skills are learned and practiced in the environments where they will be used.

Finally, there are other types of intervention that are also important, and these are mediated by parents and this can be a key strategy, since the family is the one that interacts most of the time with the child with ASD and even knows him in many aspects that a therapist or a teacher do not know, consequently this can positively maximize the intervention, for example there are programs such as "More Than Words" from the Hanen Centre (The Hanen Centre, sf), in this center parents are trained in order to use communication and social interaction strategies in their daily routines, that is, parents

become agents of intervention and can enhance the child's learning opportunities (Roberts & Kaiser, 2011).

2.2 The Emergence of Digital Intervention: Foundations and Tools.

People with ASD display an affinity toward technology, which has fostered the development of a large ecosystem of digital tools. This affinity can be derived from several factors. First, digital interfaces are consistent and predictable, which can reduce the social anxiety that can arise from the unpredictability of human interaction. Second, they have the visual processing strengths that people with ASD display. Third, they allow for control over the timing and even intensity of stimulation, providing a manageable and safe learning environment (Grynszpan et al., 2014).

The research begins with validating the use of technology as an effective support tool. For example, the critical review identified some technology-based interventions that include tablet applications to improve communication, academic, and socialization outcomes in students with ASD (Knight et al., 2013). The available digital tools can be classified into several categories:

- **Augmentative and Alternative Communication Systems (AAC):** Applications such as Proloquo2Go (The Autism Oasis, 2025) or ARASAAC (ARASAAC, 2023), through a tablet or mobile device, allow non-verbal users or those with limited speech to express themselves through pictograms or symbols that the device vocalizes.
- **Applications for Daily Living Skills (DLS):** In this area, there are applications related to task analysis, such as "José Aprende" (Fundación Orange, n.d.), which uses visual aids (videos, image sequences) to guide the user through personal care routines, promoting independence.
- **Apps for Social Skills Training:** This category is broad and includes apps that enable emotion recognition, such as "TEA: Discover Emotions Kids" (Educ@Madrid, n.d.), which uses games to teach children how to identify facial expressions. There are also other apps that present social scenarios through stories or videos to teach appropriate social responses.
- **Adaptive Learning Platforms:** Tools like Otsimo (Otsimo, 2025) offers several educational games that automatically adapt to the child's skill level, ranging from basic cognitive skills to more complex academic concepts (Otsimo, 2025).

2.3 Current State of Research: Effectiveness and Challenges of Mobile Applications.

At the moment, these technologies are growing very quickly. The research being done shows that they work better than conventional therapies, which is a new area where a lot of work still needs to be done. Existing systematic reviews and critical evaluations typically conclude that the results are promising; however, the methodological quality of many studies is low (Fernández, 2024; Gómez-León, 2023) and somewhat questionable.

Certain challenges have been identified regarding the gap between technological development and pedagogical foundation, as most applications are created without the participation of educators, occupational therapists, speech therapists, or individuals with ASD and their families. Consequently, the tools are technologically functional but pedagogically poor, and they either do not align with evidence-based learning principles or simply do not consider the specific sensory and cognitive needs of users.

Another important and ongoing challenge is that of generalization. For instance, a child may learn to recognize emotions in stylized faces on an app, but this does not ensure that this ability will translate to the intricacies and nuances of facial expressions in real-time human interactions. Consequently, subsequent research should not concentrate exclusively on the skill itself, but rather on its potential for acquisition via an application. Consequently, research ought to concentrate on the learning process, resulting in

substantial and practical enhancements in the child's daily life (Khowaja, Banire, Al-Thani, & Sqalli, 2020). Lastly, one could say that the lack of a standard way to evaluate apps makes it hard for parents and professionals to choose good ones. Most of the time, people choose and evaluate based on user reviews on digital platforms not effectiveness data (Capel, 2021).

Therefore, this calls into question the true pedagogical value and quality of the applications currently on the market. This is why it is so important to minimize the existing gap between application developers, researchers, and families. A genuine collaboration must be established among all those involved in development; in other words, co-creation is essential so that digital interventions are designed, implemented, and tested, ensuring that they are not only visually appealing but also technically and pedagogically effective and ethical.

III. CRITICAL COMPARISON: MOBILE APPLICATIONS AND CONVENTIONAL THERAPIES

Following separate reviews on the rationale and evidence base for the conventional treatments and digital solutions respectively, this section provides direct comparisons that demonstrate the unique strengths, challenges, and potential avenues for integration of each. Review literature on the subject presents several factors that are of relevance for selecting and delivering a successful intervention, including considerations on its accessibility, its scalability, its comorbidity cost, its degree of personalisation and adaptivity, its (intervention) intensity (including dose and adherence level), motivation and engagement, delivery mode, human support, generalisation of social capabilities, empirical backing, standardisation, and caregiver participation.

3.1. Accessibility and scalability vs. cost

One of the most frequently mentioned benefits of digital therapies is the capacity to address access obstacles that impinge on conventional therapies.

- **Conventional Therapies:** Getting access to the right kind of therapist, especially for intensive models like ABA, can be geographically difficult to find and costly. For rural families, or in nations with inadequate health care infrastructures, this constitutes a strong barrier which prevents already conventional therapies from reaching all who need them. In addition, the majority of countries have prohibitively high costs associated with one-on-one sessions, thereby pricing out most people. In addition, health insurance coverage is also a barrier as/unless eligible at least in some places (Zablotsky et al., 2013). Long waiting lists appear common in both public and private sector, which delays intervention in a crucial early developmental period.
- **Mobile apps:** In contrast, mobile apps offer great scalability. Once developed, an app can be distributed globally for free or at a very low cost through digital platforms, even at a marginal cost. Many apps have freemium-based business models or subscription costs far below conventional therapies. This allows for greater accessibility of the intervention, even in the home or school. This provides options for interventions between the school and home, as it provides therapeutic activities and materials. This advantage contrasts with the reality of the existing digital divide regarding access to internet connectivity, which is neither universal nor reliable. It is also important to consider whether the devices are truly adequate and to consider that families with fewer economic resources may be excluded.

3.2. Personalization and Adaptability

One of the most important things that decides if an intervention will work is how well it can meet the needs and learning speed of each child.

- **Conventional Therapies:** Personalization is key to high-quality therapy, like with conventional therapies. Expert therapists do in-depth, one-on-one evaluations to come up with an Individualized Intervention Plan (IIP). This plan is implemented during sessions, where dynamic strategies are adapted in real time, based on direct observation of the child's responses, energy level, and mood. For example, the difficulty of the task could be changed if the child is making rapid progress, or conversely, if progress is slower, the difficulty could be simplified, especially if frustration persists. It is important for the therapist to create a socio-emotional framework that a machine, technology, or application cannot replicate; that is, it must be humanized and contextualized. Therefore, the adaptation must be individualized, intuitive, fluid, and relational (Dawson et al., 2010).
- **Mobile Apps:** Apps can achieve a degree of personalization through algorithms and settings. For example, the Otsimo platform (Otsimo, 2025) uses an adaptive learning system to automatically adjust the difficulty of games based on the user's performance. This can allow the child to be in a zone of proximal development. Many apps allow therapists and parents to select goals, adjust sensory parameters such as colors, sounds, vibration types, and even personalize content by including voices or photos of family members. However, this adaptation is somewhat efficient and preprogrammed, but it lacks the greater emotional and contextual understanding that a human therapist provides.

3.3.Intensity, Dosage and Consistency

Research in ASD, specifically in Early Intensive Behavioral Intervention (EIBI) , demonstrates that a high intensity of intervention between 20-40 hours per week correlates with better outcomes (Virués-Ortega, 2010).

- **Conventional Therapies:** Achieving the ideal recommended intensity through one-on-one sessions is logistically complex, financially demanding, and unattainable for most families, and consistency is lost. Therefore, the consistency of the intervention varies, even among therapists in a care center, clinic, or home setting, so strategies are not implemented uniformly. Another key element to consider in therapy is time, which is typically defined as limited and scheduled. Here, families are typically limited by the therapist's availability and the cost per hour of therapy.
- **Mobile Apps:** Applications allow for high-frequency intervention dosing. This allows, unlike conventional therapies that may be limited by cost or time, that in contrast to mobile applications the child can attempt to perform multiple trials of a specific skill, even in short or long sessions. In addition, these trials can be done at any time and in any place, maximizing the distributed and massive practice that can be one of the greatest strengths that mobile applications offer. Therefore, the implementation of activities can be consistent, based on a program that executes the same way each time, allowing the elimination of instructor variability and can empower the child to perform the activity more effectively. All these characteristics together allow to improve the practice and consolidation of skills that are introduced in therapies.

3.4.Motivation and Commitment (Engagement)

Keeping a child with ASD motivated, actively involved, and engaged in the teaching-learning process is essential.

- **Conventional Therapies:** Motivation is developed through a therapeutic relationship and even a chemistry with the therapist. That is, the therapist identifies the child's interests and, once identified, uses them as natural reinforcement, integrating them into activities (Koegel & Koegel, 2012). Reinforcement can be social, such as praise, congratulations, a smile, a warm hug, or even shared play. This intrinsic and social motivation is the ultimate goal and can sustain interaction in the real world.
- **Mobile Apps:** Motivation is driven through gamification, via badges, points, characters, character upgrades, animations, and virtual rewards, to name a few. These elements can be extremely effective and can capture and maintain a child's attention, even in repetitive tasks (Gómez-León, 2023). However, there is a risk that the child may focus more on the rewards of the game than on learning the underlying skill. It is even possible that this extrinsic motivation may not be transferable to non-gamified situations, again raising the issue of generalization.

3.5. Human Interaction and Generalization of Social Skills

This is one of the dimensions where the distinction between the two approaches can be most marked and critical.

- **Conventional Therapies:** Their essence is human interaction, where the therapist provides a complex and dynamic social model. Therefore, the child can learn to read nonverbal cues, enabling reciprocal conversations, or even repairing communication breakdowns. Natural approach therapies are designed in context, mimicking real life, which inherently facilitates generalization (Roberts & Kaiser, 2011).
- **Mobile Apps:** Here the interaction is with a mobile device through a touch screen, here the apps can teach rules of social interaction, for example, when someone is happy, when someone smiles, when someone is sad, when someone is angry, etc. However, a major limitation is that it cannot successfully replicate daily life experiences in human-human social interaction and much depends on the access context, which can be anywhere, and this could generate decontextualized learning lacking prosodic, pragmatic, and bodily elements of human communication. Without a doubt, one of the greatest challenges of technology is to bridge the gap between mastery of a skill in the app and its fluid and flexible use in the disordered social world (Khowaja, Banire, Al-Thani, & Sqalli, 2020). Apps can certainly be an excellent medium for the initial establishment of social concepts, but these are insufficient for their practice and generalization.

3.6. Empirical Validation and Standardization

Empirical validation and standardization are very important because they ensure that interventions such as therapies are reliable and effective before being implemented. Solid scientific evidence ensures that a treatment will truly work and not simply be an empty promise. Furthermore, standardization offers professional practice the ability to implement therapies with quality and consistency. For example, this can protect patients or users from mobile app therapies that are unproven or ineffective, as they lack scientific backing.

- **Conventional Therapies:** Approaches such as Applied Behavior Analysis (ABA), the Early Start Denver Model (ESDM), or Pivotal Response Training (PRT) have decades of research, including multiple Randomized Controlled Trials (RCTs) and meta-analyses, supporting their effectiveness for a wide range of goals (Reichow, 2012). Additionally, there are certification bodies and professional practice standards that ensure a certain level of quality and fidelity in the implementation of therapies. In conventional therapies, a certified therapist endorsed and validated by recognized institutions and meeting standards in the field, instills greater confidence in parents regarding the quality and care of their children with ASD.
- **Mobile Apps:** The empirical validation and standardization of the vast majority of the thousands of applications available on the market denotes that they have not been subjected to any form of empirical validation (Capel, 2021). This can cause uncertainty or doubt in parents when installing or implementing them with their children. The development of these applications is normally driven by the market through digital platforms and not by science, which can provide solid scientific support. Likewise, the lack of standards for design and evaluation leaves users without the ability to truly validate their reliability to distinguish truly effective tools from those that are merely digital entertainment. This gap shows that the main obstacle to the responsible integration of mobile applications into formal intervention plans is why many parents consider these applications as multimedia entertainment, contrary to what most applications want to convey, which is to support or support formal therapies, allowing them to increase the quality of the child's performance with ASD. The analysis on the two sides of the comparison indicates that mobile apps and conventional therapies are not competing approaches; instead they are tools with specific strengths and weaknesses that can effectively complement one another. For example, mobile apps can be distinguished by their availability, uniformity and the support of an intensive routine, despite motivating specific skills. On the contrary, however, thanks to their humanism, conventional remedies are irreplaceable for what they have in common with relational adjustment capacity and with generalization in natural contexts as well as with the complexity of human interaction. So it's not that one or the other should be used, but instead, they need to be combined in a way that is effective for children with autism.

IV. IMPACT ON SPECIFIC SKILLS: SELF-CARE AND SOCIAL INTERACTION

Now, in this section, the issue of self-care is considered specifically, as well as social interaction. Such skills are necessary for executing critical self-care operations by children with ASD relative to (some) expressions of existential needs, which parents and teachers must support. In this sense, we explore the actionable mechanics of conventional therapies and digital tools in the form of mobile applications to distinguish them, as while connected can also be defined with distinct learning-based issues. It concerns self-maintenance and rests on the development of high-order motor patterns and sequential simplification, as well as interaction with others, which entails flexible use in unpredictable and dynamic contexts.

4.1. Promoting autonomy, developing self-care skills

To be able to perform Activities of Daily Living (ADL), an individual has to have personal autonomy, and this is the first wish in most intervention programs for children with autism. The demand for explicit teaching of these skills derives from the linear and stratified organization of both knowledge.

4.1.1. The Methodical Approach of Conventional Therapies

Applied Behavior Analysis (ABA) is a fundamental standard for teaching ADLs. It uses a method that involves doing things over and over, putting pressure on yourself, and working hard in a planned way. For instance, analyzing tasks involves breaking down the skill and also serves as a way to figure out exactly where the breakdown happens in the chain (Cooper et al., 2020). One of the best things about the intervention is that it is done one-on-one, with a therapist using physical aids. For example, to help a child put on a pair of pants, the therapist may use a hand-over-hand guide to model the motor movement required to put on the pants. This could be replicated digitally in a mobile application. This physical demonstration can be gradually phased out until the child can perform the movement independently (Leaf et al., 2012). In conventional therapy, the therapist can manage the actual time based on the challenges inferred in the task. For example, if the child resists combing their hair due to a hypersensitivity in the scalp, then the therapist must use systematic desensitization strategies, gradually introducing hair brushing, something that an app certainly cannot manage (Case-Smith et al., 2014). This approach can have several weaknesses, among them stimulus generalization. For example, a child can use the bathroom at home but may have certain particular difficulties, but it may also be more difficult for them to apply that skill in the bathroom at school or a restaurant, since these may have different contextual and visual stimuli. Therefore, greater coordination and training with parents and teachers is required here in order to program generalization in different environments.

4.1.2. Consistency of Mobile Applications

Mobile apps address ADL teaching through visual processing strengths common in ASD. Tools such as digital social stories or interactive visual schedules allow task sequences to be presented in a predictable, clear, and visually appealing way. For example, the José Aprende app (Fundación Orange, n.d.) uses pictograms and simple narratives to show the steps of a routine, which reduces the burden on oral language and working memory. Another advantage of mobile apps is that video modeling is possible, allowing for video recording of the child or a family member performing the task correctly. Watching the video is significantly successful, using a self-modeling video technique that allows for motivating and powerful learning (Bellini & Akullian, 2007). The app helps through portable, on-demand visual aids. This means that the child can carry and use their mobile device in their room, in the kitchen, or anywhere else, and follow the sequence step by step, promoting independence and reducing the need for verbal prompts from adults. However, this sequence may be perfect and always presented in the same way, but this may present a limitation to the application, it may show what to do, but it would be physically limited in not being able to help since it would be limited to providing support only in a visual way, for example, if a child stops at a motor step when putting on pants, the application could not offer assistance exactly in that step, since it may be programmed in such a way that the steps are always done well, imitating or ignoring the problems that may emerge, consequently this represents a certain frustration or simply abandoning the task.

4.1.3. Comparative Analysis and Integration Proposal

Regarding self-care skills, both approaches can be complementary. On the one hand, conventional therapy is irreplaceable in the initial acquisition phase, especially for tasks involving fine motor skills and overcoming sensory barriers. Here, the therapist provides explicit instructions and provides scaffolding to establish the skill.

After the child has been taught the basic elements of the skill, mobile apps can allow for a more fluent phase of play. They can be assigned as homework to consolidate skills worked on in session and to serve as a bridge between appointments supporting continuity of care in the therapist in your home. Mobile applications can be used as subtle prompts to motivate users to be more aware of their actual surroundings and foster independence without the need for constant adult supervision. It is clear that the blended model offers the therapist the greatest opportunity to work and generalize in both the physical and virtual environments in a seamless, nurturing ecosystem.

4.2. The Development of Social Interaction

In contrast to ADLs, social routines are less often scripted sequences; within them, we actively adapt to, make sense of, and respond to other people in the moment. This is a challenge for all therapies, whether conventional or digital interventions.

4.2.1. The Live Practice of Conventional Therapies

The fundamental value of conventional therapies when it comes to social skills is there is social interaction. For example, during groups for teaching social skills, children have the chance to interact with their peers in a structured though socially authentic environment. Here, as a kind of social coach, the therapist offers concrete, real-time feedback as the dialogue unfolds. They might also stop the game to introduce an activity or to provide a different way to initiate a conversation (Gates et al., 2017).

Naturalistic behavioral and developmental intervention approaches use children's naturally motivating and naturalistic social exchanges as teaching episodes. For instance, a child may be playing with blocks and take some interest in the tower that the therapist is building. This interest is used to teach joint attention, requesting and using eye contact (Dawson et al., 2010; Koegel & Koegel, 2012). Therefore, learning emerges in an incidental, contextualized, and emotionally significant way. These interactions undoubtedly help lay the foundation for socioemotional reciprocity and create greater human connection. However, generalization remains difficult, particularly in social skills training groups and the need for children to be socially motivated to participate.

4.2.2. The Social Laboratory of Mobile Applications

Mobile applications can address social complexity by fragmenting it into basic components. These act as social laboratories that allow for learning goals without the anxiety or pressure of an adult or therapist. For example, the TEA application: Discover Emotions Kids (EDUC@MADRID, n.d.), which addresses a fundamental skill such as affect recognition through pairing tests, teaching the association between an emotional label and a facial expression. Like this application, there are many more that branch out teaching in the resolution of social problems. For example, a child chooses responses and can see the consequence of their choice, but through animated characters. These effects can allow for declarative social knowledge. However, their weakness lies in social interaction rather than knowledge of rules. Currently, no application can model in milliseconds a verbal and non-verbal interaction, prosody, context, in addition to generating a history of the relationship. This is something very complex to simulate, which will undoubtedly be possible in a short time with the advancement of Artificial Intelligence. Furthermore, the application may generate a perfect score in emotion recognition but be unable to recognize subtle sarcasm in a partner's voice or boredom in their posture (Grynszpan et al., 2014).

4.2.3. Comparative Analysis and Integration Proposal

In the social domain, the idea that apps can replace conventional therapy goes beyond simple problems where evidence is required, where their role is suggested in preparatory and supplementary stages. For example, a flipped classroom, where the child can learn social concepts at home repeatedly and explicitly, being able to identify situations that provoke certain emotions, can set the stage for later in physical therapy, whether individual or group, where the therapist can apply and generalize declarative knowledge and dynamic and procedural interactions. Here the therapist can refer to what was worked on in the apps and in this way provide conceptual foundations, and in therapy, the castle of social competence is already built in a real context. Without a doubt, here we see a combination of both intervention modalities for the benefit of the child.

Without a doubt, the impact of each intervention modality is of great value, but it also depends on the skills to be taught. For instance, in personal care settings, apps can reinforce practice and independence, but for direct human interaction, a therapist-guided intervention is central to development.

V. DISCUSSION AND CRITICAL ANALYSIS

In the previous sections we have shown that both mobile apps and conventional therapies have their advantages as well as limitations in promoting the self-care and communication skills of children with ASD. Therefore, this section offers a simple comparison with the idea of critically analyzing the implications of these findings. It also argues that effective intervention does not lie in a competition between technology and humans, but rather in an informed and synergistic integration. It also discusses the conceptual and practical challenges of a hybrid model, addresses ethical implications, and analyzes future research that could truly realize the potential of the technology.

5.1. Towards a Hybrid Intervention Model

The comparative analysis underlines the strengths of conventional therapy within a relational matrix and contextual sensitivity, thus allowing the possibility of responding to the needs and challenges of ASD in a manner that cannot be mirrored by mobile apps based on technology. This is humanism, a call for a person-centered approach to care that focuses on viewing them as individuals. Yet you cannot ignore the potential of new digital tools enabled by technology. These devices enhance the impact of conventional therapies – reinforcement is powerfully situated within conventional therapy, systems that can be implemented at home, in the moment through tools like these. In fact, there seems a shining track towards imagine hybrid-model driven-system where each modality takes care of its own but above all complementary task.

In this two-fold model, the therapist must be an expert interventionist professional who functions as an integrating point for not only establishing therapeutic goals with families based a priori operative assessments, but also for the reorganization of intricate schemes of intervention. It would seem that the therapist must therefore try to supply in some manner for this. The import of this seems clear. Alternative: In need of remediation through initial acquisition by social and emotional preconditions as well as generalizing praxic skills into authentic social settings. As for in-person therapy, this must be a place that encourages rich practice worthy of the challenges of dynamic human interaction. Mobile apps of this sort are, therefore, in general, precision tools and practice agents as they assist the therapist by allowing them to prescribe certain activities for the child while not in a professional session.

There may even be very specific and measurable objectives. For instance, physical therapy could teach you how to sequence daily living skills like brushing your teeth, and then mobile apps could help you practice recognizing facial expressions. This can help the child get more help because parents can change the pace of learning based on how well

the child is doing. It might even make it easier for parents and therapists to share information, which would help them work together to keep an eye on the child's progress. This could even include viewing plans for the next goals during the physical therapy session. This can result in the creation of feedback loops in the database. Having a hybrid model that allows parents to be more empowered with structured and professionally guided tools can better support children's development at home, even as co-therapists. However, the successful implementation of this model will depend on breaking down significant barriers. For example, therapists must be well-trained to use the tools meaningfully. Therapists must also be competent technology prescribers. The development of platforms that allow for fluid and secure data communication between the application, the family, and the therapists.

5.2. The Imperative of Co-creation and Empirical Validation

In this review, the gap that exists between technological development and scientific validation can be analyzed. It also analyzes how the market for applications for ASD is driven by an offer and not by solid pedagogical evidence and validation, which can be a risk for consumers (Capel, 2021). It is important that to maximize the potential of the applications, they must have a significant change in the paradigm in their development life cycle, in this there must be a co-creation of all interested parties from people with ASD themselves, families, software engineers, educators, speech therapists, occupational therapists, psychologists, all collaborating from early stages to the final testing phases (Courtois Fernández, 2024). This approach allows the resulting tools from this co-creation to be not only technically functional, but also pedagogically sound based on proven learning principles. They can even be clinically relevant, with meaningful and functional objectives, and can be more usable and desirable with designs based on real preferences, sensory needs, and the needs of people with ASD. So if you're a researcher in that group, what we need are protocols to be set up more strictly and stringent with being able to evaluate applications for the end user of these things.

Applications must not only be liked and used, but they must also go through more controlled trials, such as randomized trials in schools, clinics, and the homes of people with ASD. This can even make the tools work better in different situations. In addition to testing how well an application works, it is also important to measure whether the results are really useful and can be used in real life. For instance, to check if these apps really make it easier for kids with ASD to play and hang out with other kids? Did they spend more time with other kids? Does the application encourage them to brush their teeth? If you buy the app, can the child actually brush their teeth on their own? These are the sorts of questions where we do need to know: is this really doing anything positive for us?

5.3. Ethical Considerations in Digital Intervention

There is currently a lot of growth in the area of digital therapeutic applications in many fields, and autism is not an exception. This presents a new series of ethical dilemmas which should, without doubt, be rigorously addressed. For instance, special consideration must be given to the privacy and security of any information the child provides, which may include sensitive information about behavior and development. Hence, privacy policies must be developed that are easily understandable by all users, the data storage should be reliable and secure, and parents should be given full control over who accesses their child's profile and what they can see. Another reality: some stimulation fatigue from screen time, concerns have been raised about screen time for children, particularly those children whose sensory profiles are unique. We recommend pre-registration to use the app, to mitigate its overuse, and to add a series of activities that take place outdoors with physical play and a moment to connect on-screen. Add equal

access and fairness to the other big issues right up there. Such as, high-end applications. E.g., who can have them? And what about those who can't afford them all your premium features? It could create a lot of discrepancy in the community here. Hence, distribution and financing approaches should be formulated in such a way that access to these tools can remain equitable when they are fully functional.

Using mobile apps for ASD is a huge step forward, no question but it can also pose a risk if applied uncritically and unregulated. Technology should make therapy more personal and bring it within easier reach for all. The success of the technology primarily requires an integrated effort and cross-disciplinary cooperation. So new models of delivery and financing must be crafted to enable people to have equitable access to these tools and the full array of them.

Finally, there is the reductiveness of the human condition to consider. It's actually quite scary how much we rely on technology, we are in every life sphere today. We might start to think of ASD as nothing more than a long list of things to fix with an app, and forget about the happiness and well-being of the whole person. Lets just consistently remind ourselves that, technology is a TOOL. Its supposed to be helping us reach our aims, it's not the aim itself. The essence is the cooperation between the therapists, psychologists, pedagogues, families, teachers, designers, and other interested parties. We have an enormous duty to get this right and be ethical. So in the end, it's not about getting a kid to master a new technology but the apps really are getting them to learn about their world, they're getting them to build relationships, they're just helping them navigate life a little bit more easily. That's the only thing that matters.

VI. CONCLUSIONS

The results of the critical review's conclusions only confirm what many people already know, the conventional therapies with direct interaction among humans continues as an essential core for helping children with ASD. These therapies do give human feedback that is emotional, humanistic and social. People are valuable because you never know what they'll do. No matter how advanced it gets, technology just can't do that. For example, in teaching self-care skills, a real person can physically help out, and more importantly, they can instantly adapt to that individual's specific sensory needs. But even with all these positive characteristics, we find a huge problem: accessibility due to high costs of these therapies mean that for many families, they're just not an option, already a significant barrier to access.

Now, from the mobile app perspective, these have emerged as technological tools with great potential, offering intensive practices, motivators, and structures in an accessible and consistent manner. Although some of these require a fee, they are certainly more affordable than the costs generated by conventional therapies. Now, for example, in the case of self-care skills, mobile apps can visually present sequences of images, pictograms, videos, animated images, etc., remotely and anywhere. This can therefore promote mobility, independence, and even provide reminders. Self-modeling can be created based on the child's performance, providing therapies with the support of more appropriate tools based on the child's real needs. Now, in the social realm, the rules and basic concepts of interaction can be taught, as well as knowledge of emotions, but there are still some limitations, such as the ability to transfer learning from the screen to the complex and fluid world of real social interaction, since the app world is simulated and limited by the app's characteristics. Furthermore, many of these methods lack empirical, scientific validation of their content, which can be alarming if they are not thoroughly analyzed before being used and implemented in therapies.

Another point resulting from carrying out this article is that we can answer the research question posed at the beginning of the investigation: How does the implementation of mobile applications (intervention) compared to conventional therapies (comparison) affect the development of self-care and social interaction skills (outcome)? and it is concluded and answered that both mobile applications, as well as conventional therapies, do affect the development of skills in a complementary and synergistic manner, maximizing conventional therapies for the benefit of the patient. This is not a matter of having an exclusive choice, but rather it should be analyzed how applications are extraordinary technological tools that, put into practice and with the appropriate instructions of discrete elements of skills, when implemented asynchronously or synchronously with conventional therapy, maximize the latter by integrating skills in social and functional contexts, even in real time.

Likewise, based on the critical analysis carried out, important implications are derived regarding research, technological development and for practice, regarding practice in the educational and clinical fields, a hybrid model that includes the best of each modality is recommended, for example, therapists or teachers must have an evolution in their role in the aspect of carrying out adequate digital pre-registration, therefore, the use of applications based on clear evidence must be selected and guided that complement the increase in the effectiveness and identity of the face-to-face intervention. In the aspect of technological development, the development model isolated from applications must be abandoned, now the development paradigm must be changed by implementing it, which considers co-creation, involving all stakeholders in the autism community (parents, therapists, educators, psychologists, researchers, etc.), the joint work of all enhances the creation of tools that are truly empirically and scientifically validated, integrating seamlessly into existing intervention plans. In terms of future research, more controlled studies are necessary to evaluate the effect of applications on outcome measures and to critically assess and investigate best-practice models of delivery in combination with conventional treatments. This requires us to measure short-term, medium-term, and long-term effects in functional and real-life outcomes with the aim of making life better for ASD children. Lastly, he noted that the purpose of “new technology” is not to supplant therapies with auto-serve offerings, but rather to make us feel more connected to one another. And Apps can Help us Get Better Therapy and make it easier to Find and Use them. You can make people feel better and save time in therapy. They can also enable better introductions by writing an algorithm to match patients with very similar profiles. So those are the ways they can help kids make and keep friends, be more open with each other, and get them to pay more attention to their social lives in better ways. Therapists should be willing to incorporate technology as an additional resource that can complement other more conventional approaches both in the therapy room and at home. This can enable children with ASD to have a brighter future full of hope and progress in the areas of independence and socialization.

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