Intellectual Disabilities: how technologies can improve comminication skills, a review of litterature.

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Abstract

This article provides an in-depth review of the relationship between Communication Technologies and Intellectual Disability, with specific attention to Augmentative and Alternative Communication (AAC). The review delves into recent research exploring how intellectual disability can compromise various areas of individual development, rendering communicative exchanges vulnerable and contributing to observed social challenges in individuals with communicative needs. Through a theoretical review, the article analyzes the role of communication supportive technologies in promoting social inclusion, considering the often-involved communicative and social challenges. Furthermore, the article discusses the potential contribution of communication supportive technologies in mediating the relationship between intellectual disability and communication, offering insights to guide future research and the development of additional technologies.

Keywords

Intellectual Disabilities, Communication Technologies, Augmentative and Alternative Communication.

1. Intellectual Disabilities

Cognitive disabilities are often associated with various forms of developmental disabilities. In cases of genetic syndromes, such as motor disabilities and autism spectrum disorders, varying degrees of intellectual disabilities are frequently observed, impacting cognitive and communicative processes [1].Intellectual disability is a neurodevelopmental disorder that emerges in childhood [2]. Recently, the criteria for diagnosing intellectual disability have been updated in the fifth edition of the major international diagnostic manual, the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) by the American Psychological Association. In this context, intellectual disability is characterized by a deficit in intellectual functioning (both scholastic and experiential learning, reasoning, problem-solving, planning future actions, abstract thinking, etc.) and a deficit in adaptive functioning in the conceptual, social, and practical domains [2,3]. Currently, DSM-V places particular emphasis on the individual's adaptive functioning, defined as the ability to understand and respond appropriately to environmental situations, closely linked to developmental and sociocultural standards of personal independence and social responsibility [4]. In this regard, compromises in adaptive functioning are crucial for assessing the severity of intellectual disability [2].In educational programs dedicated to students with intellectual disabilities, the acquisition of communication skills plays a crucial role. This competence facilitates adaptation to the surrounding environment and positively influences the cognitive development of the individuals involved [5,6].

Compared to the previous version, DSM-V emphasizes the greater relevance of the Adaptive Quotient (AQ) over the Intelligence Quotient (IQ). This, in the perspective of an evaluation, less rigidly emphasizes IQ and underscores the importance of adaptive functioning as an overall predominant criterion, which can vary based on the presence of barriers/facilitators; these criteria

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are reiterated within the International Classification of Diseases-11th revision (ICD-11) of the World Health Organization (WHO) [7,8]. Adaptive functioning defines the degree of assistance needed to maintain an adequate standard of living; based on this, four severity levels are recognized: mild, moderate, severe, and profound[2]. What has just been stated converges in the perspective of the biopsychosocial anthropological framework ICF (International Classification of Functioning, Disability and Health) by WHO [9, 10]. In this sense, there is a shift from mere identification of the deficit to a multidimensional and taxonomic definition; to an approach where individual factors function in relation to factors of intellectual, social, and practical origin, and the degree of support needed to enable the person to lead an autonomous life [11, 8]. Indeed, an individual's ability to perform an action depends not only on their physical characteristics but also, and especially, on the influence of environmental elements, which can either facilitate or hinder activity and social participation [8]. In intellectual disabilities, communicative deficits are often detectable in the cognitive profile, particularly in forms characterized by higher levels of impairment, making individuals vulnerable in communicative exchanges [12, 13, 14,15, 16,17). Since communication constitutes a fundamental human right, it is essential that each individual acquires autonomy to actively participate in society and develop adaptive behaviors[18, 19]. Indeed, the redefinition by manuals does not represent a simple categorical reconfiguration but rather a scientifically consolidated choice that directs towards the creation of interventions, environments, and services aimed at supporting paths of orientation and life projects based on self-determination for quality of life [8].

2. Augmentative and Alternative Communication (AAC) and Intellectual Disabilities

In the literature, there are studies emphasizing the importance of developing tangible technologies for individuals with communication needs, as they can create new inclusive opportunities to facilitate alternative modes of communication and connection with others [20,21, 22,23]. Augmentative and Alternative Communication (AAC) represents an integrated system of strategies and techniques aimed at mitigating communicative challenges and creating real communication opportunities for individuals who have difficulty communicating effectively [24,15,16]. AAC comprises both unaided modes, such as manual signs and gestures, and aided modes, including the Picture Exchange Communication System (PECS)[25]and Speech-Generating Devices (SGD) [26]. Aided AAC systems include high-tech options, such as apps on Apple devices and GoTalk9+ [27], and low-tech options, such as PECS, boards with eye gaze, symbols on a ring, or in a notebook. In particular, aided AAC refers to systems that require external or additional supports beyond the speaker's body. AAC modes refer to the various types of AAC systems: aided or unaided, low or high-tech, and the various access methods [26]. The synergistic integration of assistive technologies from AAC systems offers possibilities to develop inclusive educational environments for students with diverse disabilities. Currently, it plays an innovative role in the development of inclusive Special Education processes[28,29,30]. From this perspective, AAC systems can also provide effective support to facilitate interactions between students with disabilities and their peers, especially in collaborative and cooperative learning groups [21]. AAC systems are based on the use of stylized symbols, providing individuals with disabilities the ability to communicate requests and express desires or emotions [1]. Awareness of the potential to influence the surrounding context through the sharing of simple stylized symbols leads to significant reductions in inconvenience and disorientation for individuals with disabilities, often caused by difficulties in understanding the demands of the surrounding environment[31,32,1,30]. Crowe et al.'s (2021) review studies have identified some evidence-based practices of Augmentative and Alternative Communication (AAC), including PECS [33], the use of assistive technologies for daily activities [34], the use of high-tech AAC to teach social communication skills[35], computerized instructions [36], tablet-based video modeling[37], aided AAC modeling[38], and inclusive education to improve communication skills [39]. Several studies present a nuanced picture of converging results and variations in AAC use as assistive technology. Overall, there is progress in both expressive and receptive communication abilities through the adoption of AAC [40,41,29, 42]. In particular, interventions involving assisted

AAC input have demonstrated a high degree of effectiveness in enhancing participants' language skills [43]. The frequent use of Speech-Generating Devices (SGD) and the PECS system emerges as a common practice, with both associated with significant improvements in communication for children with Down syndrome [44]. It is worth noting that the effectiveness of AAC can vary depending on usage modes, with particular attention to assisted modeling, which appears to offer benefits. The use of assisted modeling in AAC is supported by strong scientific evidence, indicating an effective approach. Similarly, the use of narrative and modeling-based interventions is supported by robust research, facilitating the learning of graphic symbols and language in AAC [38]. Additionally, AAC interventions with Functional Communication Training (FCT) are effective in reducing problematic behaviors and promoting the use of AAC systems, assisted or unassisted [45]. While some studies indicate significant positive effects of AAC [46,50], others highlight weaker effect sizes on specific communicative outcomes through the use of mobile technology [34].

Emerging evidence suggests that AAC can be effective in teaching various communication functions to children with ASD, in addition to object requests [27]. Assistive technology, including high-tech AAC, shows a significant impact on independence and participation, contributing to the improvement of educational opportunities and quality of life [47,35]. Participation and interest in children significantly improve with the use of AAC in inclusive environments, where children manifest preferences for materials and books adapted to their needs [48]. However, some critical issues emerge, such as the limited social network of children using AAC and challenges related to limited vocabulary on SGDs [49]. In summary, although AAC offers promising benefits, it is crucial to consider the diversity of practices, participant characteristics, and emerging challenges for a comprehensive and effective approach [29]. See Table 1 for a general overview of this study.

Table 1
General overview of the study

Keypoint	Information
Communication Function in Intellectual Disabilities	Crucial role in adaptive skills - Positive impact on cognitive development
Role of Augmentative and Alternative Communication (AAC) in Intellectual Disabilities	AAC as an integrated system to mitigate communicative challenges - Unaided and aided modes - Various AAC technologies and their impact.
Impact of Assistive Technology (High-Tech AAC)	Significant contribution to independence and participation - Improvement in educational opportunities and quality of life

3. Conclusion

The analyzed studies highlight how AAC, through both assisted and unassisted modes, provides inclusive opportunities, particularly in educational contexts. Intellectual disabilities, situated within a multidimensional framework, call for a focus on social adaptation and specific interventions to promote self-determination. The communicative deficit in severe forms underscores the importance of specific support strategies. Further exploration of the role of assistive technologies can contribute to optimizing social inclusion [52]. Interventions based on AAC, supported by scientific evidence, show progress in communication skills, with various practices including PECS, assistive technologies, and modeling. However, challenges such as limited social networks require a careful approach. In conclusion, understanding intellectual disabilities and strategically implementing AAC are essential for improving the quality of life, independence, and social participation. Ongoing research is crucial to refine interventions and tailor them to specific needs, contributing to promoting paths of autonomous and inclusive living.

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