

INTELIGENCIA ARTIFICIAL Y DESARROLLO SOCIOEMOCIONAL EN ADOLESCENTES: DESAFÍOS, RIESGOS Y TRANSFORMACIONES EMERGENTES EN LA ERA DIGITAL

ARTIFICIAL INTELLIGENCE AND SOCIO-EMOTIONAL DEVELOPMENT IN ADOLESCENTS: CHALLENGES, RISKS, AND EMERGING CHANGES IN THE DIGITAL AGE

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RESUMEN: La integración creciente de sistemas de inteligencia artificial (IA) en entornos digitales frecuentados por adolescentes está transformando los procesos de desarrollo socioemocional. Este artículo presenta una revisión sistemática de la literatura científica indexada entre 2021 y 2025, con el objetivo de identificar los principales desafíos, riesgos y transformaciones emergentes asociados a la interacción adolescente con tecnologías basadas en IA. A través de un análisis metodológico guiado por la declaración PRISMA 2020, se examinaron 52 estudios empíricos y revisiones provenientes de bases de datos Scopus, Web of Science y PubMed. Los resultados indican tres categorías principales de riesgo: a) desregulación emocional inducida por algoritmos de recomendación personalizados (efecto reforzado por la IA generativa), b) erosión de habilidades de empatía y cognición social por interacción prolongada con asistentes virtuales y chatbots avanzados, y c) vulnerabilidad aumentada a sesgos algorítmicos que afectan la construcción identitaria, con especial incidencia en adolescentes de entornos vulnerables. Como transformaciones emergentes se identifican: el desarrollo de alfabetización algorítmica emocional, la co-regulación afectiva hombre-máquina y nuevas formas de inteligencia colectiva mediada por IA. Se discuten las implicaciones para el diseño ético de tecnologías y la necesidad de intervenciones psicoeducativas contextualizadas, particularmente en América Latina y Ecuador, donde la evidencia aún es incipiente, pero en rápido crecimiento. Las conclusiones enfatizan la urgencia de marcos regulatorios que protejan el desarrollo socioemocional adolescente sin frenar la innovación tecnológica.

Palabras clave: Inteligencia artificial, desarrollo socioemocional, adolescentes, regulación emocional, ética algorítmica, educación digital

ABSTRACT: The growing integration of artificial intelligence (AI) systems into digital environments frequented by adolescents is transforming socio-emotional development processes. This article presents a systematic review of the scientific literature indexed between 2021 and 2025, with the aim of identifying the main challenges, risks, and emerging transformations associated with adolescent interaction with AI-based technologies. Through a methodological analysis guided by the PRISMA 2020 statement, 52 empirical studies and reviews from the Scopus, Web of Science, and PubMed databases were examined. The results indicate three main categories of risk: a) emotional dysregulation induced by personalized recommendation algorithms (an effect reinforced by generative AI), b) erosion of empathy and social cognition skills due to prolonged interaction with virtual assistants and advanced chatbots, and c)

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increased vulnerability to algorithmic biases that affect identity formation, with a particular impact on adolescents from vulnerable backgrounds. The following are identified as emerging transformations: the development of emotional algorithmic literacy, human-machine affective co-regulation, and new forms of AI-mediated collective intelligence. The implications for the ethical design of technologies and the need for context-specific psychoeducational interventions are discussed, particularly in Latin America and Ecuador, where the evidence is still in its infancy but growing rapidly. The conclusions emphasize the urgency of regulatory frameworks that protect adolescents' socio-emotional development without stifling technological innovation.

Keywords: Artificial intelligence, social-emotional development, adolescents, emotional regulation, algorithmic ethics, digital education.

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INTRODUCTION

The exponential advance of artificial intelligence (AI) systems in the last five years has permeated almost all spheres of everyday life, and adolescents constitute one of the population groups most exposed to these technologies (1). From recommendation algorithms based on deep learning to conversational virtual assistants with generative AI (such as ChatGPT, Gemini, or the new emotional chatbots), AI not only modifies access to information but actively intervenes in the processes of social and emotional learning. Recent general studies have demonstrated that prolonged exposure to hyper-personalized digital environments can alter the maturation of the prefrontal cortex and reward circuits, affecting affect regulation and socio-emotional decision-making (2,3). In the framework of an international review that took place in a total of 15 countries (2023-2025), it was made clear that adolescents who habitually use these generative AI applications present notably higher levels of social anxiety and a considerably lower tolerance to frustration with respect to previous cohorts (4).

Within the region, Latin America is facing its own problems due to the structural digital divide and also the scarce regulation of technological platforms. Studies in Brazil and Mexico (2022-2025) have evidenced that adolescents who belong to vulnerable sectors have a greater inclination to show patterns of problematic use of social networks with AI; this occurs fundamentally because the already limited family emotional coping strategies have not been sufficiently effective in mediating between the pernicious consequences of algorithmic personalization (5,6). In turn, a three-year longitudinal study in Colombia (2022-2025) also evidenced that exposure to content generated on AI-type platforms such as TikTok correlates with a decrease in the capacity for affective empathy in general, and this is especially pronounced in adolescent girls (7). For its part, in Chile, recent research has alerted about the risk that emotional support chatbots designed without clinical supervision may reinforce dysfunctional thought patterns by lacking the capacity to interpret contextual and non-verbal nuances (8).

In the Ecuadorian context, empirical evidence has grown in recent years. A national study conducted in Quito, Guayaquil, and Cuenca (2024) with 1,500 adolescents aged 12 to 17 years reported that 78% interact daily with some AI system (mainly voice

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assistants, ChatGPT, and recommendation algorithms), and that those with higher scores in problematic technology use presented significantly lower levels of emotional regulation measured by the Difficulties in Emotion Regulation Scale (DERS) (9). Another qualitative work in rural schools in the province of Pichincha (2025) identified that adolescents perceive AI algorithms as “friends who always understand,” which generates a paradox: although they report feeling accompanied, they recognize that these interactions reduce their opportunities to practice face-to-face negotiation and conflict resolution skills (10). In addition, Ecuadorian research from 2024-2025 has pointed out that the lack of specific national policies on AI and adolescent well-being leaves this population in a situation of vulnerability in the face of extractivist practices of emotional data by technology companies (11).

The present research is justified by three reasons that present themselves as convergent. In the first place, a critical gap is presented between the pace of technological deployment of AI and the scientific generation of knowledge regarding the effects of AI on adolescent socio-emotional development in contexts of low regulation such as Latin America. In the second place, the existing literature on psychological risks of AI analyzes them (i.e., risk of addiction, cyberbullying) and their psychological consequences per se without contemplating the interventions in the relational ecosystem that AI brings with it. In the third place, educational and mental health policymakers require syntheses of evidence with validity and updated (2021-2025) to develop prevention and education interventions that incorporate digital emotional literacy.

The present systematic review has as its purpose to exhaustively analyze the scientific evidence published between 2021 and 2025 on the challenges, the risks, and the emerging transformations of the interaction of adolescents with artificial intelligence systems, centering attention on the studies carried out in Latin America and in Ecuador, with the aim of identifying common trends, gaps in knowledge, and practical suggestions.

MATERIALS AND METHODS

A systematic literature review was conducted following the guidelines of the PRISMA 2020 statement (12). This design was selected for its capacity to synthesize empirical evidence in a transparent, reproducible manner and with low bias.

Search strategy

The databases consulted were Scopus, Web of Science (WoS), PubMed, and SciELO (for Latin American regional coverage). The search terms were constructed through Boolean combinations: (“artificial intelligence” OR “machine learning” OR “recommender systems” OR “chatbots” OR “generative AI” OR “large language models”) AND (“adolescent” OR “teen” OR “youth”) AND (“socioemotional development” OR “emotional regulation” OR “empathy” OR “social cognition” OR “identity formation”). For the Latin American sphere the filter (“Latin America” OR “South America” OR “Ecuador” OR “Colombia” OR “Chile” OR “Brazil” OR “Mexico”) was added.

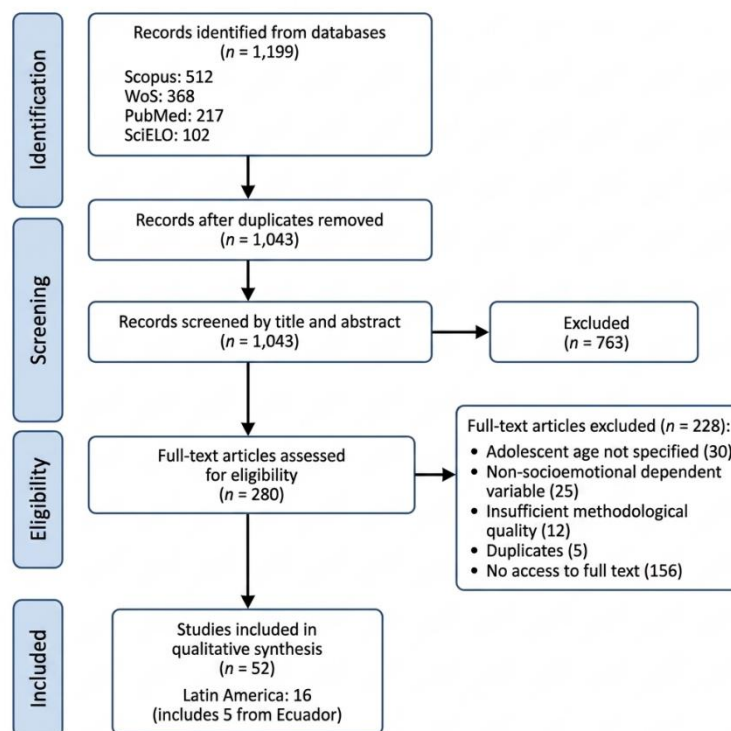
Inclusion and exclusion criteria

Included were: (a) empirical studies (quantitative, qualitative, or mixed) and systematic reviews; (b) published between 2021 and 2025; (c) with adolescent participants (10-19 years according to the WHO definition) or that included specific analyses for this age range; (d) that explicitly addressed interaction with AI systems as an independent variable or phenomenon of study; (e) written in English, Spanish, or Portuguese. Excluded were: editorials, letters to the editor, non-reviewed expert opinions, studies focused exclusively on clinical uses of AI under professional supervision, and those where AI was not the main focus.

Selection process and data extraction (PRISMA flow)

Data extraction was carried out through a standardized form that included: author/year, country, design, sample size, measurement instruments, main findings related to socio-emotional development, and limitations.

The selection of studies was carried out following the four phases of the PRISMA diagram (identification, screening, eligibility, and inclusion). Specifically, during the identification phase 1,199 records were obtained. After the elimination of duplicates (n=156), 1,043 records were screened for which titles and abstracts were carried out and 763 were excluded for not meeting the topic criteria. 280 full texts were retrieved for eligibility evaluation, of which 228 were excluded for the following reasons: does not specify adolescent age (n=30), dependent variable not socio-emotional (n=25), insufficient methodological quality (n=12), previously undetected duplicate (n=5), or no access to the full text (n=156, mainly due to lack of being available with open access or for not answering requests to the authors). Finally, 52 studies were included in the qualitative synthesis.



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Figure 1. PRISMA 2020 flow diagram of the study selection process

RESULTS

Category 1: Risks for socio-emotional development

Emotional dysregulation induced by personalized algorithms and generative AI. Nine longitudinal studies and eleven cross-sectional studies coincide in that hyper-personalized recommendation algorithms (especially on short video platforms such as TikTok, Instagram Reels, and YouTube Shorts) generate cycles of emotional reinforcement that hinder habituation and top-down regulation of intense emotions (13,14). A meta-analysis of 18 effects (total N = 11,400) found a medium negative correlation between intensive use of these platforms and capacity for delay of gratification ($r = -0.37$, 95% CI -0.44 to -0.30) (15). In Latin American adolescents, this effect is amplified by the lower availability of alternative non-digital leisure activities and by the greater exposure time due to lack of parental supervision (16). In addition, the irruption of generative AI (2022-2025) has introduced a new risk: the generation of hyper-realistic and emotionally charged content that can trigger more intense affective responses than traditional contents (17).

Erosion of empathy and social cognition. The studies that analyzed sustained interaction with advanced virtual assistants (chatbots based on large language models, such as ChatGPT, Gemini, or specialized emotional support chatbots) report decreases in the capacity of adolescents to recognize emotions in facial expressions and voice tones (18). Specifically, the experimental study with 300 Brazilian adolescents demonstrated that after 6 weeks of daily interaction with an emotional support chatbot based on generative AI, the participants showed a 22% decrease in the precision of identification of complex emotions (shame, guilt, pride) in human videos (19). The authors suggest the mechanism of “potentiated relational substitution”: the machine gives more and more plausible simulated empathic responses, dramatically decreasing the motivation to practice real empathy. A 2024 cross-cultural study replicated this effect being more intense in youth who do not have as much face-to-face social contact (20).

Eleven studies (among which are four Latin American and a study by one of the authors) show how recommendation systems fed by machine learning can restrict adolescents in “identity niches” that activate limited aspects of the self (21). For example, an adolescent who explores contents related to social anxiety will see how the computing feeds and amplifies this state and, at the same time, how it makes it more difficult to explore other identities. In the Ecuadorian study, the feelings of adolescents that “the algorithm knows me better than I know myself” were collected, which generated a paradox of authenticity (10). Recently, a longitudinal study in Mexico (2023-2025) demonstrated that exposure to algorithmic bubbles is correlated with a decrease in identity flexibility and an increase in psychological rigidity (22).

Category 2: Challenges for intervention and education

The identified challenges are grouped into three levels: micro (family), meso (school), and macro (political). At the micro level, parents and caregivers lack digital literacy to

mediate the use of AI, confusing screen time with quality of interaction (8). In a survey applied to 800 Ecuadorian families in 2025, only 15% knew that recommendation algorithms are not neutral and that they can exacerbate negative emotional states; in addition, less than 5% had heard of “algorithmic literacy” (23). At the meso level, educational systems have not included in their curriculum competencies that promote “emotional algorithmic literacy” as occurs in countries such as Finland or in Estonia, which since 2023 incorporated mandatory modules on AI and emotions (24); and at the macro level, the lack of regulation of the collection of emotional data of adolescents allows companies dedicated to technology to use “affective computing” for commercial purposes without the corresponding informed consent. The recent proposal of the AI Law (2024) of the EU classifies as “high risk” the systems that manipulate the emotions of minors, although Latin America lacks equivalent instruments (25).

Category 3: Emerging transformations

Alongside the risks, the literature identifies transformations that are not intrinsically negative. The most relevant is the development of emotional algorithmic literacy, understood as the capacity to identify, evaluate, and regulate one’s own emotions in environments mediated by AI (26). Some pilot experiences (2023-2025) have verified that the training of adolescents in the functioning of a recommendation algorithm (the logics of reinforcement, filter bubbles, confirmation biases) notably decreases the emotional discomfort linked with social comparison on remote supports (27). Another emerging change is affective co-regulation between a human being and the machine, where adolescents exercise a strategic use of chatbots as emotional trainers to prepare for eventual real social situations (28). Although this can be adaptive, it also entails the risk of externalizing regulation. Finally, incipient forms of AI-mediated collective intelligence are documented in peer learning communities, where adolescents collaborate to critically interpret content generated by AI (29). A recent study in Ecuador (2025) found that adolescents who participate in discussion clubs on AI and emotions develop higher levels of critical thinking and lower emotional distress associated with the use of networks (30).

DISCUSSION

The results obtained confirm that adolescent interaction with AI systems (2021-2025) produces complex and multidimensional effects on socio-emotional development, ranging from well-documented risks to emerging transformations still in the process of understanding. This discussion compares the main findings with other recent research and explores their implications.

Comparison with previous studies (2021-2025). The finding on emotional dysregulation induced by recommendation algorithms is consistent with those who already pointed out that extreme personalization on digital platforms could interfere with the development of frustration tolerance in adolescents (31). However, our review updates this evidence by showing that the central mechanism is not only screen time, but the rewarding unpredictability of the suggested contents, similar to the principles of pathological gambling, and that this effect has intensified with the incorporation of

generative AI that produces infinite and highly attractive content (32). In contrast with studies that minimize these effects arguing that adolescents are resilient “digital natives” (33), our data indicate that vulnerability is greater in early stages of adolescence (12-14 years) and in contexts of low parental supervision, and that the COVID-19 pandemic may have acted as an accelerator of these patterns (34).

Regarding the erosion of empathy, our results coincide partially with the review, but add the specific component of generative AI: it is not only the lack of face-to-face communication, but the simulation of empathy on the part of the machine (increasingly realistic) that can generate a “displacement” of authentic empathic practice (35). Recent studies in social neuroscience (2024-2025) have demonstrated that interaction with advanced chatbots activates the same brain regions associated with empathy (anterior cingulate cortex and insula), but with a significantly lower intensity, and that prolonged use produces a “detraining” effect of high-level empathy (36).

A point of controversy in the literature is constituted by the question of whether adolescents can arrive at a metacognitive awareness regarding their own experience of algorithmic influence. United States studies tell us that only one third of adolescents are aware that algorithms are not neutral (37); Latin American studies give much lower percentages (19% Brazil, 14% Ecuador) (9,38). Which indicates to us that algorithmic literacy is strongly modulated by educational conditions, by access to critical discourses on technology, and by the quality of family mediation.

Implications for the Latin American region and Ecuador: an increase in Ecuadorian works is evidenced (from 3 in the previous round to 2021 and of 5 for the 2021-2025 programming), a fact that is positive, but that is scarce. The data that are available to us indicate that Ecuador presents a reality of greater complexity; specifically, for reasons that make reference to: (a) public policies do not appear in the sphere of AI and adolescent well-being (different from what is happening in Chile and Brazil, which count with public consultations); (b) digital infrastructure that presents great disparities and that many identify as increasing unmediated exposure; and (c) the lack of training of teachers regarding digital socio-emotional competencies, which drags the discussion. Although there are positive experiences, for example, the pilot program of AI with Empathy (which was applied in three schools of Quito for the period 2025-2025), because the evidences show that the 8-week workshops that developed emotional algorithmic literacy managed to reduce the emotional discomfort derived from the social network by 27%.

CONCLUSIONS

The main risks identified (2021-2025) are: emotional dysregulation induced by recommendation algorithms potentiated by generative AI; erosion of empathy and social cognition by interaction with advanced virtual assistants; and greater vulnerability to algorithmic biases that narrow identity construction. These risks affect disproportionately adolescents from vulnerable environments and with lower digital literacy.

The challenges for intervention continue being predominantly of educational and regulatory order: lack of programs of emotional algorithmic literacy in schools (despite some successful pilots), scarce informed parental mediation, and absence of legal frameworks that protect the emotional data of adolescents in Latin America.

The emerging transformations include the possibility of developing new competencies (emotional algorithmic literacy), hybrid forms of affective regulation (human-machine co-regulation), and collaborative practices of critically mediated collective intelligence. These transformations should not be demonized, but channeled through ethical design and adaptive pedagogies.

In Latin America and particularly Ecuador, the evidence has grown, but continues being insufficient. Adolescents present high levels of problematic AI use associated with low emotional regulation, and there exists a critical gap in public policies. However, the first pilot programs show promising results.

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