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Using Artificial Intelligence Methodologies in Examining Parenting Behaviors and Services

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ABSTRACT
Artificial intelligence methodologies have been successfully applied to different areas of behavioral and social sciences, such as increasing effectiveness of diagnosis and prediction of different conditions, increasing understanding of human development and functioning, as well as increasing the effectiveness of data management in different social and human services, many of them focused on parenting. The goal of this article is to provide a systematic examination of artificial intelligence and machine learning methodologies that are currently employed to analyze parenting behaviors and to implement and deliver parenting programs and services. Enabled by transformative technological advances, social and human services on parenting are redesigned to better serve a diverse society through increased digitization and automation and workforce retraining based on new evidence-based approaches. The examination reveals that AI has already become a pervasive trait among vast areas of parenting research and programs. Beyond identifying themes around the use of AI in the context of parenting, ethical issues, such as ensuring equity and fairness of access to services through technology have been addressed.

KEYWORDS
Artificial intelligence; machine learning; parenting behaviors; parenting programs and services.

INTRODUCTION

Artificial Intelligence (AI) methodologies have been applied to many areas of behavioral and social sciences, such as increasing effectiveness of diagnosis and prediction of different illnesses, understanding of human development and functioning, as well as enhancing data management in different social and human services (Robila, & Robila, 2020). Technology use in these areas has continued to grow during the global pandemic (Taylor-Beswick, 2025) and has accelerated with the introduction of Generative AI (Bail, 2024).

AI has influenced all dimensions of family and personal relations. Beyond changing interpersonal communication and engagement, AI driven technologies have been used in education, medical sciences, and public services. Family functioning dimensions, such as communication, affective responsiveness, affective involvement, and parental attitudes impact adolescents' confidence and interest in AI (Ni et al., 2025). The COVID 19 pandemic has sped up the technology use for education and work across the globe. Families have also maintained relationships through video calls and other technologies, often enhancing their experience through automation tools. This crisis had a powerful impact on family dynamics, creating stress, tensions, income loss, mental health problems, drug abuse, domestic violence, and grief (e.g., OECD, 2020). The advantages and strengths of using technology are also reflected throughout the development and assessment of social programs. AI solutions in public services have become available, and, in some instances are even preferred over those provided by humans (Gesk & Leyer, 2022).

Technology has been used to address a variety of issues such as decreases in person engagement and maintaining relationships and the need to adapt social and human services approaches to issues such as violence and illnesses. Morris (2020)'s review on technology use by parents, caregivers, and clinicians indicated that individuals in these roles navigate risks (e.g., privacy violations) with benefits (e.g., improved communication, empathy), maintain relationships, for emotional communication or to cope with social anxiety. Hunt et al. (2020)'s review on prevention of violence against children, suggested that there is substantial potential for AI and mHealth approaches to be utilized to prevent and address violence at a large scale, particularly in low- and middle-income countries. The authors suggested that there is a need for good agent-based models at the level of entire cities (e.g., where and when violence can occur, where local response systems are) and data on individuals help-seeking behavior, and risk factors for child maltreatment, could help to identify the parameters required to understand the causes and responses to violence.

Increased use of AI is occurring around the world. Sethi and Awasthi (2020) work in India on using artificial intelligence-based models for developing better policies for maternal and child health focused on data to find solutions, because despite many government schemes aimed at reducing the rate of sepsis babies' deaths, their number remains high. Jin (2019)'s study in China on influences of artificial intelligence on early childhood family education indicated that the AI has the potential to provide better family education for children, by providing powering assistive

tools (i.e. robots, applications, etc.), and by reshaping the understanding of the skills needed to be acquired by children. As AI will be pervasive in all aspects of human activity, it also needs to be incorporated in learning from an early age. Hong Kong parents reported that it is suitable for kindergarten children to learn about AI tools and concepts while noting that their children encountered some challenges when learning about AI literacy, such as limited comprehension ability, time constraints, the difficulty of the learning content (Su, 2025).

The advancements of AI in society have been addressed on a global level including through United Nations (UN) activities and they are significant parts of the UN 2030 Sustainable Development Goals (SDGs) agenda. Truby (2020) explored the importance of ethics and internationally accepted principles of AI governance to benefit the UN Sustainable Development Goals including, among others, the transparency of the AI's software to monitor its processes and outputs, and accountability. Along with societies, families and parents are active agents in supporting the archiving the UN 2030 SGDs (Robila, 2020).

The goal of this article is to provide a systematic examination of the use of artificial intelligence driven methodologies in parenting programs and services, and specifically of understanding the impact of AI enabled services and programs on parenting and in using AI on program development, implementation, and evaluation. The article also provides an analysis of the use of AI in examining parenting behaviors. Enabled by transformative technological advances, social and human services on parenting are being redesigned to better serve a diverse society through increased digitization and automation and workforce retraining based on new evidence-based approaches. The research questions were: 1) what artificial intelligence methodologies have been used in parenting programs and services development, implementation and evaluation? 2) how has AI changed the research on parenting behaviors?

METHODS

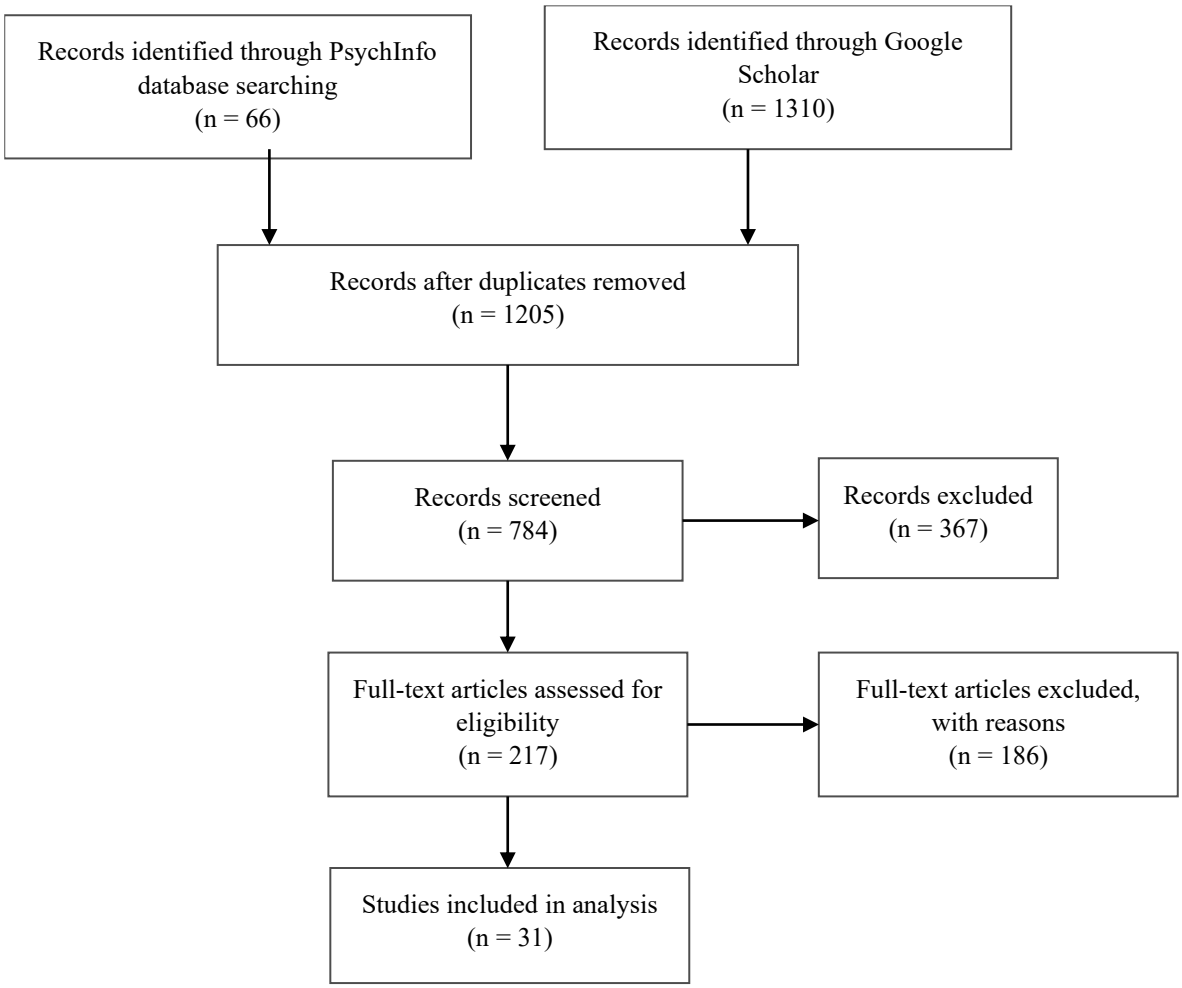
A systematic examination of literature was conducted using scholarly databases PsycInfo and Google Scholar, standard search engines and databases of the academic publications in the field. The searches used the following keywords: artificial intelligence and parenting services and behaviors, and machine learning and parenting services and behaviors. The keywords reflect the focus of the research and are relevant to both parenting studies and artificial intelligence. Articles published in peer-reviewed journals (in English) were selected and included in the analysis.

The search was focused on research published between 2015-2025 to capture the most recent advances. During this timeframe there was significant progress in AI and its use in social and behavioral sciences, allowing for meaningful analysis when focusing on parenting. As exclusion criteria, articles published outside this timeframe and those not published in English were excluded from the analysis. Similarly, articles not focused on parenting and parenting services and AI methodologies were also excluded.

Following up the selection of the references, both authors, one with background in human development and family science and the other in computer science conducted the reviews independently and then discussed and agreed on the selected articles. Both authors conducted the reviews twice to ensure accuracy and that no article was missed. The papers selected met the four criteria: topic relevance, AI relevance, methods validity and reproducibility; and peer reviewed. There were no limitations for geographical location of publication or type of specific AI methodology. The PsycINFO search yielded 66 entries while the Google Scholar search yielded 1310 entries, from which 31 articles were identified as relevant to this study and included in the analysis. A PRISMA Flowchart (Moher et al., 2009) detailing the selection of the articles is presented in Figure 1.

Figure 1.

PRISMA Flowchart for the Study Selection



RESULTS

Using AI in Parenting Programs and Services

Artificial Intelligence techniques have been used in human and social services implementation, monitoring, and evaluation systems (Robila & Robila, 2020). Table 1 (see appendix) includes articles that present the use of artificial intelligence in different parenting services addressing a

variety of issues, from using technology mediated communication, to child maltreatment prevention and intervention, to parenting education services for divorced families.

The impact of AI enabled services and programs on parenting

There has been significant research on the impact of artificial intelligence enabled services (e.g., Beneteau et al., 2020; Brummelen, Tabunshchyk & Heng, 2021) and programs (Ahn et al. 2024; Gaikwad & Jain, 2017) on parenting behaviors. Beneteau et al., (2020) investigated the impact of introducing the smart speaker Alexa to 10 families with children, over four weeks, by using pre- and post- deployment interviews with the whole family and in-home audio capture of parent-child interactions with the smart speaker. Despite the smart speaker causing occasional conflict in the home, the study indicated that parents used the speaker to reach their goals. The results showed that the smart speaker enhanced communication and improved parenting behaviors.

Growing up in an artificial intelligence-filled world, such as with Siri and Alexa could impact children's behaviors and development. Brummelen, Tabunshchyk and Heng (2021) investigated how middle and high school students' perceptions of Alexa change through programming their own conversational agents in AI education workshops. They investigated the workshops' influence on student perceptions of Alexa's intelligence, friendliness, safeness, and feelings of closeness and the results indicated that students felt Alexa was more intelligent and felt closer to Alexa after the workshops, and they recommend designers consider transparency, playfulness and utility when creating them.

Similar efforts have been considered for wearable devices as enablers for parenting actions. As example, a system that helps children reduce the use of bad words in their in-person and online communication was proposed (Gaikwad & Jain, 2017). Being designed as a cloud-based platform, it can be used with wristbands, mobile phone or smart watch. The system is self-learning and analyzes communication and biometric data to assess the stress level of the users. It then employs a gamified approach to engage the users in activities that, through real time feedback, supports the child decreasing negative language and enact positive behavior.

Using AI on parenting program development, implementation, and evaluation

Considerable resources are required to read and code the text data on child abuse. Data science and text mining are efficient and cost-effective strategies for maximizing the value of these data. Perron et al. (2019)'s study tested the feasibility of using text mining for extracting information from unstructured text to examine substance-related problems among families investigated for abuse or neglect. The coded documents were used to develop, train, and validate computer models that could perform the coding on an automated basis. The results indicated that a set of computer models achieved greater than 90% accuracy when judged against expert human reviewers. Fleiss kappa estimates among computer models and expert human reviewers exceeded .80, indicating that expert human reviewer ratings are exchangeable with the computer models. Text mining procedures are cost-effective and efficient solutions for understanding text data.

Machine learning methodologies have been used by different programs providing services for child abuse. Amrit et al. (2017) used text mining analysis to identify and predict cases of child abuse in a public health institution in the Netherlands. A significant part of the medical data that the institutions have on children is unstructured (e.g., text notes). The authors explored whether these data contain meaningful patterns to determine abuse and trained machine learning models on cases of abuse as determined by over 500 child specialists from a municipality. The resulting model achieved a high score in classifying probable cases of abuse. In New Zealand, Gillingham (2016) examined predictive risk modeling to prevent child maltreatment and other adverse outcomes for service users and developed a tool which was also refined in response to perceived biases (Gillingham, 2017). More recently, a predictive risk modeling (PRM) tool for child maltreatment prevention was developed by integrating a machine learning algorithm with a linked dataset of birth records and child protection system (CPS) records (Ahn et al., 2024). The study indicated that within the top 30 % of children with high-risk scores, the PRM tool outperformed the baseline model, accurately identifying about 80 % of all children who would experience maltreatment, surpassing the baseline model's performance of 46 %, having the potential to enhance the risk assessment tool used by child welfare prevention programs.

The growth in Generative AI solutions is also opening new opportunities. Halford and Webster (2024) investigated the efficiency of the use of ChatGPT to assist law enforcement personnel in conducting accurate assessments of threat, harm, and risk by designing a variety of scenarios (including child exploitation, and gender-based violence) and then having the GenAI tool evaluate them. Results indicated that while the system performed well with respect to identification of criminal offense or ethical considerations it was less accurate in identifying risk identification and harm realization, especially when it came to child abuse. The authors also noted that improved contextual information (such as inclusion of professional practice materials in the analysis of the cases) could lead to improved responses. While the above study did not focus on services and programs, it can inform the use in Gen AI for the ones focused on parenting.

When evidence-based prevention programs are delivered at scale in community settings, there have been declines in implementation and outcomes and thus mechanisms to maintain their quality are necessary. Berkel et al. (2019) proposed the development of a practical system to monitor and support the high-quality implementation of evidence-based prevention parenting programs for divorced families called New Beginnings in community setting. The program focused on the application of machine learning algorithms and web-based data collection systems to assess implementation and provide support for high quality delivery and positive outcomes. These measures can be used to develop an unobtrusive system to monitor implementation and provide feedback and support in real time to maintain strong programs.

Araszkiewicz et al., (2015) evaluated the Parenting Plan Support System (PPSS), a partially implemented decision support system designed to help parents draft an agreement concerning

relations with their children after the divorce, against the background of a real-life case. The focus is on knowledge representation issues and the functioning of the inference engine. The main aim of the PPSS system is to promote the wellbeing of children.

There have been investigations on how artificial intelligence can enhance the functioning of online family dispute resolution (OFDR) systems after successful application to other types of disputes. Wilson-Evered and Zeleznikow (2021) reviewed the development of AI in disputes to understand current progress within family law. Several existing negotiation support systems for use in Australian family contexts were described, including Split-Up, Family-Winner, and Asset-Divider (which uses game theory, a mathematical approach to modelling strategic interactions). Negotiation support systems facilitate informed decision-making through performance improvement via machine learning while the integration of game theory assists in the distribution of resources to ensure the best outcome. Since online dispute resolution is becoming more frequent and conducing to institutionalization of services, program regulation and quality need to be ensured (Zeleznikow, 2021).

Pan et al. (2017) evaluated the efficiency of machine learning tools in assessing cases for social services for prenatal case management in Illinois. The study showed that machine learning algorithms performed similarly, outperforming the current paper-based risk assessment by up to 36%; while a refined paper-based assessment outperformed the current assessment by up to 22%. Beyond better accuracy, the use of automated assessment allows for improved scaling, allowing for 100 to 170 additional high-risk pregnant women screened for program eligibility each year to receive services that would have otherwise been unobtainable. Machine learning could support government agencies using data-informed approaches to evaluate risk and provide efficient social services.

Chatbot systems are conversational virtual agents that interact with people through voice or text. An important aspect in the development of conversational agents is whether they are readily accepted by the target user group. Chua et al. (2023) reviewed the literature on parents and parents-to-be in using chatbots to improve their preconception, pregnancy, and postpartum health. Both groups appreciated the informational and socioemotional support provided by chatbots. Success of the chatbots often correlates with the quality of the user experience, and as such, recommendations for improvements include functionality aspects as well as training sessions for health care providers to familiarize them with this new digital technology.

Yu et al. (2023) designed a chatbot system (INFANBOT) that provided real-time education on infants' health to support novice parents. Results showed that INFANBOT can solve most of the problems encountered by users effectively, and that parents improved their knowledge of children's health education.

Chatbots have the potential to teach parenting skills. Parents who were assigned to the chatbot micro intervention as part of a randomized controlled trial to increase positive feedback and praise for children, were engaged and satisfied with the chatbot and reported that they

would recommend it to others (Entenberg et al., 2023a). A randomized control trial with 170 parents who accessed a 15-min intervention that taught them to utilize positive attention and praise to promote positive behaviors in their children indicated that parents learned effective praising skills, but that there were no significant differences by condition in the praising knowledge reported by parents, perceived changes in disruptive behaviors, or parenting self-efficacy, from pre-intervention to 24-hour follow-up and that a longer intervention might be necessary (Entenberg et al., 2023).

Escoredo et al., (2025) developed a conversational agent (CA) for parenting PAT (Parenting Assistant Platform), to investigate how artificial intelligence (AI) can enhance parenting skills. Taking into consideration concerns that AI based solutions may not lead to concrete recommendations, PAT was designed with a hybrid approach where part of the interactions followed engineered scripts and guardrails, while still employing Generative AI capabilities. Although empirical results were pending at the time of the paper's publication, the study demonstrated that effective digital intervention through CAs can eliminate scaling limitations and reach larger groups while still ensuring personalization. PAT is currently available as a service (ParenteAI, 2025).

Lin et al., (2021) examined parental acceptance of children's storytelling robots through a qualitative study with 18 parents using the research technique design fiction. Results showed that parents had positive attitudes toward children's storytelling robots, but that the robots' potential to adapt and to express emotion caused some parents to feel ambivalent about the robots, which might hinder their adoption.

In a non-randomized feasibility study of a voice assistant for parents to support their children's mental health, parents reported that the app contained easy-to-understand information on parenting, and that they could see the potential of voice technology to learn and practice parenting skills (Richmond et al., 2024). Parents also reported challenges such as difficulties with installation and interactions with the app and expressed privacy concerns related to voice technology. Being scalable, the app addresses the barriers faced by parents who attempt to access traditional parenting interventions (Richmond et al., 2024).

Finally, Klapow's et al. (2024) review of the feasibility and acceptability of chatbot technology for delivering parenting interventions, indicated that studies demonstrated a high mean retention rate (72.8%) and reported high acceptability but also significant heterogeneity in interventions, measurement methods, and study quality. While the study recommended further research, standardization of reporting, and scaling up effectiveness testing, the rapid evolution of the technology will continue to present challenges in achieving these objectives.

Intervention based approaches also benefit from AI enabled evaluation. Lebowitz et al. (2021) applied a machine learning approach to identify moderators of treatment response to cognitive-behavioral therapy versus parent-based Supportive Parenting for Anxious Childhood Emotions (SPACE), in a randomized clinical trial with primary anxiety disorders. The study explored relations between moderators (e.g., demographic, parenting, socioemotional) and illustrate

how they interact to predict outcomes. Results showed that parent-reported outcomes were moderated by parent negativity and child oxytocin levels and could be used for optimizing treatment selection and increasing treatment efficacy.

Using AI in Examining Parenting Behaviors

Throughout all fields, data science is revolutionizing how information is collected, interpreted, and used to build actionable results. With support from advances in computer hardware, data communication and new algorithms, AI is transforming data science by processing larger and larger amounts of data, providing new insights, and continuing to achieve improvements in accuracy (Cady, 2024). Examining parenting behaviors using AI is thus a direct progression of the research in the field. Table 2 (see appendix) includes articles that examined the impact of AI on parenting behaviors.

The significant extension of social media use in the last decades led many parents to turn to them for advice and support. Tangherlini et al. (2016) examined “mommy blogs” and the vaccination exemption narrative using a machine-learning approach for story aggregation on parenting social media sites. They found a strong narrative framework related to exemption seeking and a culture of distrust of government and medical institutions. Various posts reinforced part of the narrative in which parents, medical professionals, and religious institutions emerged as key nodes, and exemption seeking emerged as an important edge. In the aggregate story, parents used religion to acquire exemptions to protect their children from vaccines that are required by schools or government institutions, but (allegedly) cause adverse reactions such as autism, pain, compromised immunity, or death. Although parents joined and left the discussion forums over time, discussions about exemptions were persistent. Analyzing parent forums about health care using an automated analytic approach allowed the detection of widespread narratives that inform discussions.

Ammari, Schoenebeck, and Romero (2018) explored parenting roles and identities on Reddit.com communities used by mothers and fathers. A Latent Dirichlet allocation (LDA) model was trained using the Python genism package on the aggregate of all three subreddits in the study: Parenting, Mommit, and Daddit. Results showed similarities in topics across the three boards, such as sleep training, as well as differences, such as fathers talking about custody cases and Halloween. The authors discussed the role of pseudonymity for providing parents with a platform to discuss sensitive parenting topics and the benefic impact on gender inclusivity.

Teague and Shatte (2018)’s study assessed the feasibility of using social media data to map the discussion topics of fathers across the fatherhood transition, using threads from two Web-based parenting communities, r/Daddit and r/PreDaddit from the social media platform Reddit. An unsupervised machine learning algorithm grouped discussion threads into topics within each community and across a combined collection of all discussion threads.

Results showed that men use Web-based communities to share the joys and challenges of the fatherhood experience. Minimal overlap in discussions was found between the two communities, indicating that distinct conversations are held on each forum. Social support was

provided through encouragement, humor, and advice. Data on fathers' experiences can be sourced from social media and analyzed rapidly using automated techniques.

Westrupp et al. (2021) sought to identify the most common parenting situations discussed by parents on parenting-specific forums of the free online discussion forum, Reddit trying to understand perspectives from both mothers and fathers. Latent Dirichlet Allocation (LDA) was used to identify the most common topics discussed in the Reddit posts. Results indicated that topics focused on childcare issues such as eating, sleeping, routines, sickness, toilet training, or responses to child's negative behavior. Most situations were discussed in relation to infant or toddler age children, indicating potential to tailor parenting interventions.

AI driven techniques were also used to analyze data from social media and predicted mental health problems, such as post-partum depression, for both mothers and fathers. Shatte et al. (2020) examined whether passive social media markers are effective for identifying fathers at risk of parental post-partum depression (PPD). A list of 'at-risk' words was developed in collaboration with a perinatal mental health expert. PPD was assessed by evaluating the change in fathers' use of words indicating postpartum depression. Predictive models were developed as a series of support vector machine classifiers using behavior, emotion, linguistic style, and discussion topics as features. The performance of these classifiers indicated that fathers at risk of PPD can be predicted from their prepartum data. Development of support and intervention tools could be conducted for fathers during the prepartum period.

Zhang et al. (2021) proposed a machine learning framework for predicting postpartum depression (PPD) risk prediction using data extracted from electronic health records (EHRs). A framework of data extraction, processing, and machine learning was implemented to select a minimal list of features from the EHR datasets to ensure model performance and to enable future point-of-care risk prediction. Results indicated the best-performing model uses clinical features related to mental health history, medical comorbidity, obstetric complications, and demographics. The model performances were consistent when tested using data ending at multiple time periods during pregnancy and at childbirth. EHRs and machine learning could be used to identify women at risk for PPD early in their pregnancy and to provide prevention and intervention mechanisms.

ML techniques have also been used for detecting different disorders, such as language disorders, developmental delays, and autism in children. Justice, Ahn, and Logan (2019) identified child- and family-level characteristics most strongly associated with language disorder for preschool children. Machine learning was used to identify variables that classified children receiving therapy for language disorders. Using a dichotomous outcome based on receipt of language therapy, the authors applied the least absolute shrinkage and selection operator (LASSO) classification approach to a range of background data available on children. This suggests that use of machine-learning approaches to classify children receiving language services in school settings may support identifying the factors that differentiate children with language disorders.

Tariq et al. (2019) worked on detecting developmental delay and autism spectrum disorders (ASD) through machine learning models using home videos of Bangladeshi children**.** The authors enhanced the utility and performance of their model by building two classification layers: the first layer distinguishes between typical and atypical behavior, and the second layer distinguishes between ASD and non-ASD. The results showed that it might be useful to use a mobile video-based and machine learning–directed approach for early and remote detection of autism in Bangladeshi children and in other developing countries with few clinical resources for diagnosis.

Parents are likely to seek Web-based communities to verify their suspicions of autism spectrum disorder signs in their child. Automated tools support human decisions in many domains and could therefore potentially support concerned parents. Ben-Sasson, Robins, & Yom-Tov, (2018) tested the feasibility of assessing autism spectrum disorder risk in parental concerns from Web-based sources, using automated text analysis tools and minimal standard questioning parents with concerns regarding their child. An algorithm predicted autism spectrum disorder risk using a combination of the parent's text and a single screening question, selected by the algorithm to enhance prediction accuracy. The prediction of a child's risk on the ASQ or M-CHAT-R was significantly more accurate when predicted from text combined with an M-CHAT-R question selected (automatically) than from the text alone. The frequently automatically selected M-CHAT-R questions that predicted risk were following a point, make-believe play, and concern about deafness. The internet can be used to prescreen for autism spectrum disorder using parental concerns by administering a few standardized screening questions to augment this process.

An AI tool using ML techniques was designed to identify autism red flags in children aged 6- 18 months, to analyze data from parent/caregiver questionnaires and short audiovisual recordings to identify behavioral deviations indicative of ASD, and had higher than 80% accuracy, having potential to enhance early interventions strategies and reduce health care costs (Vitanidi & Nanos, 2025).

McFayden's et al. (2024) study on evaluating ChatGPT-4, an artificial intelligence question and answer-style communication program, as a potential tool for parents seeking information about autism suggested that ChatGPT was largely correct, concise, and clear, but did not provide concrete advice, which was further limited by inaccurate references and hyperlinks. The authors concluded that ChatGPT-4 is a viable tool for parents seeking accurate information about autism, with opportunities for improvement in actionability and reference accuracy.

Machine learning provides a method of identifying factors that discriminate between substance users and non-users improving the ability to match need with available prevention services. Vázquez et al. (2020) utilized machine learning to identify high impact factors that discriminate between substance users and non-users among a national sample of Mexican children. Four dissimilar classification algorithms were fitted to the training set to create

prediction models for each substance use indicator: Elastic net, k-nearest neighbors, neural networks, and random forest. Findings suggest that father and best friend illicit substance use (drugs) and respondent gender (boys) were consistent and important discriminators between children who tried substances and those that did not. Friend cigarette use was a strong predictor of lifetime use of alcohol, tobacco, and marijuana. Perceived danger of alcohol and inhalant use predicted lifetime alcohol and inhalant use. These data help practitioners identify youth at highest risk and provide preventive services.

Crutzen et al. (2015) investigated whether parents' reports of parenting dimensions and alcohol-specific parenting practices, adolescents' perceptions of these dimensions and practices, or a combination are most informative to identify binge drinkers, and which of these are identifying binge drinkers. A binary classification task, using an alternating decision tree, was conducted and measures regarding the performance of the classifiers were reported after a 10-fold cross-validation. Adolescents' perceptions were best at identifying binge drinkers whereas parents' perceptions were best at identifying non-binge drinkers. For parenting practices, rules were important in understanding drinking behavior.

Based on the environmental, dietary, and feeding practices data, and using a machine learning technique, C4.5 decision tree, to determine which variables might be important to gain insights about childhood obesity in Hispanic preschoolers, Wiechmann et al., (2017) suggested that machine learning techniques are particularly amenable to this study because they can reveal the relationship between variables as well as how each variable is related to child obesity.

Sun, Ram and McHale's (2020) study on adolescent family experiences predicting adult educational attainment with machine learning, indicated that the models proposed had accuracy of 73.43% of family experiences for college enrollment, and 79.10% for college graduations, and identified the predictors of college enrollment and graduation including family characteristics and parental educational expectations.

Druga, Christoph and Ko (2022l) conducted a 5-week online in home study with 18 children (5 to 11 years old) and 16 parents and identified parents' roles in supporting their children and consider the benefits of parent-child partnerships when learning AI literacies by designing learning activities such as image classification, object recognition, interaction with voice assistants, and unplugged AI co-design. The study indicated that parents play roles as mentor, collaborator and tinkerer, and that engaging families in joint AI literacy practices can stimulate them to find new ways to learn about these technologies.

Liu and Wei's (2023) systematic review of data mining studies in parenting research indicated that there is an increase in the use of data mining methods in predicting and analyzing children's academic performance, psychological well-being, cognition, parenting concerns, and behavior based on family factors.

McStay and Rosner (2021) examined the social acceptability and governance of emotional artificial intelligence (emotional AI) in children's toys and other child-oriented devices

and parents shared concerns about generational unfairness guarded interest and the need for good governance.

While AI technologies provide benefits for maintaining close personal relationships, they also present limitations in terms of commitment and care that characterize human interactions, particularly in the context of loneliness (Symons & Sanwoolu, 2025). The phenomenon of cyberbullying children and adolescents is another challenging consequence of online technological access (Caceres-Reche et al., 2019).

CONCLUSIONS

This article examined the use of artificial intelligence and machine learning methodologies in parenting programs and services, focusing on understanding the impact of AI enabled services and programs on parenting and in using AI on program development, implementation, and evaluation. The proliferation of AI enabled devices used by families and parents provide opportunities to understand their impact on relationships and behaviors.

The limitations of this study relate to the timeframe used and accessibility to technology.

Although ten years (2015-2025) is a large timeframe, the rapid changes in technology will determine quick modifications in the patterns of the impact that AI has on parenting services and behaviors. As social media use has been correlated with important benefits, low adoption rates can mean a portion of the population is not receiving these benefits. Redmiles (2018) examined equity of social media benefits among users, including learning of privacy-preserving behaviors and parental engagement in children's social media use and the equity of their distribution among social media users. Results indicated no difference in adoption of social media based on education and found that lower-income users are more likely to use social media, and an inequality in benefits with older and less educated social media users reporting lower degrees of benefits. Parents who use social media help their children set up privacy settings and teach them safe posting behaviors.

The extended use of Artificial Intelligence methodologies raised issues such as data protection and child rights policy. Some parents share significant information about their children, while others share very little. As children grow up, they might not feel comfortable with this information being shared about them by their parents, and thus, AI and data protection and child rights policy are important aspects. Ethical issues, such as ensuring equity and fairness of access to parenting services through technology, are also significant.

Fiske, Henningsen and Buyx's (2019) article on ethical implications of embodied artificial intelligence in psychiatry, psychology, and psychotherapy assessed the ethical and social implications of translating embodied AI applications into mental health care and developed recommendations on how to address ethical and social challenges in current and future applications. Embodied AI is a promising approach across the field of mental health; however, further research is needed to address the broader ethical and societal concerns of these technologies to negotiate best research and medical practices in innovative mental health care.

Given the projections that AI technologies will continue to impact individuals and families along the life span, future studies are recommended to examine the impact of technological advances on families' interactions in later life, on intergenerational relations and exchanges (e.g., grandparent - grandchildren), in countries around the world.

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APPENDIX

Table 1.

Use of AI in Parenting Programs and Services

Reference	AI tools used	How was AI used	Results
Ahn et al. (2024)	gradient-boosting decision tree for classification using datasets of birth records and child protection system (CPS) records	classifier was trained and tested on 132,216 birth and CPS records from 2011 to 2016 from a hospital network accounting for 53.9% of all births in Orange Co, CA.	within the top 30 % of children with high-risk scores, the predictive risk modeling (PRM) tool accurately identified 75.3%–84.1% of all children who would experience maltreatment substantiation (compared to baseline model's performance of 46.2 %). PRM has the potential to enhance the risk assessment tool used by prevention programs.
Araszkiewicz et al. (2015)	rule-based reasoning / case-based reasoning using PROLOG	designed and evaluated a model for a decision support system (Parenting Plan Support System -PPSS) to help parents draft an agreement on relations with their children after the divorce	PPSS is promoted as focused on the children's wellbeing and minimizing biases on the side of either parent. Real-life examples introduced to support further implementation.

Beneteau et al. (2020)	Amazon's Alexa platform	investigated the impact of introducing Alexa to 10 families. Four-week experiment, with pre- and post- deployment interviews and in-home audio capture of parent-child interactions with the smart speaker	parents leveraged Alexa to further parenting goals. Influence the smart speaker on family dynamics grouped on three themes: 1) fostering communication, 2) disrupting access, and 3) augmenting parenting.
Berkel et al. (2019)	broad set of tools that include text and audio processing.	designed framework for data collection systems to assess implementation and provide support for delivery of the "New Beginnings" program. Automated ratings of written or spoken language	validated automated methods to assess indicators of quality and fidelity reduce the cost of assessment, improve the reliability, and enable a rapid feedback, increased scalability. Demonstrated value of integration of multiple AI technologies.
Brummelen et al. (2021)	Amazon's Alexa platform	Alexa was used to evaluate how middle and high school students' perceptions of chatbots change while learning to develop their own conversational agents	students felt Alexa was more intelligent and felt closer to Alexa after the workshops. Authors recommend that designing learning activities should account for personification, transparency, playfulness to improve acceptance
Entenberg et al. (2023)	AI based chatbot developed through Facebook Messenger. Knowledge engine refined through interaction with experts.	Chatbot used to deliver 15 minutes micro-intervention on positive reinforcement of children's behavior. Study assessed impact through pre and post intervention to 170 parents with at least one child (2–11 years old).	Parental self-efficacy improved and disruptive behavior decreased but not in a statistically significant manner. Further studies were proposed including a longer follow-up period.
Entenberg et al. (2023a)	AI based chatbot developed through Facebook Messenger. Knowledge engine refined through	Part of the same experiment described above (Entenberg et al., 2023). Study focused on the user experience in using chatbots.	Users completed the intervention at a high rate, engaged with the chatbot, and were satisfied. Users also would recommend it to others and reported a high

	interaction with experts.		level of acceptability. Study also noted differences may exist between Spanish speaking and English-speaking users pointing to the need for further customization.
Escoredo et al. (2025)	rule-based reasoning, few shot learning, generative AI, web based chatbot	conversational agent (CA) for parenting PAT (Parenting Assistant Platform)	CA was used to demonstrate how artificial intelligence (AI) can enhance parenting skills. System currently live. CAs have the potential to reach a broad population of parents and deliver personalized interventions and timely support for family wellbeing; could be used as alternatives to waitlists.
Gaikwad and Jain (2017)	Feelbot, cloud based self-learning system deployed through wearable devices.	Feelbot is a listening component that gives real time alerts when bad words are being used and suggests better words.	Only a high-level prototype is discussed. Privacy and accessibility in the context of wearable devices are also considered.
Gillingham (2016)	supervised learning, logistic regression	ML used to develop a supervised Predictive Risk Model for Child Services	Predictive risk modeling - useful tool to prevent child maltreatment in New Zealand. Tool also refined in response to perceived biases.
Lebowitz et al. (2021)	linear regression, random forest. Clinical trial data of 124 children with anxiety disorders. Multiple modality data (surveys, behavioral observations, biological samples).	ML employed to explore relations between moderators (e.g., demographic, parenting) and on how they interact to predict outcomes.	Children assigned to their optimal treatment condition exposed significantly greater reduction in anxiety symptoms, compared with children assigned to their nonoptimal treatment. Model selected important moderators provide paths to optimized treatment.
Lin et al. (2021)	robotic platforms (Luka, and Trobo) used as story tellers	evaluated the parental acceptance of children's storytelling robots. Qualitative study with 18 parents. Robots were chosen for	while storytelling experience was seen as valuable, the use of robots was received with ambivalence mostly due to concerns on their potential to adapt and to express

		diversity of form, voice rendering, interaction ability and data communication mechanism.	emotion. Such limitations are being rapidly overcome by new platforms.
Pan et al. (2017)	random forest, linear discriminant analysis, penalized logistic regression, naive Bayes (scikit-learn Python)	comparative analysis of four ML methods as classifiers. Use best model to design a paper-based tool.	ML algorithms outperformed the traditional paper-based risk assessment by 36%. Improvements allow 100 to 170 additional high-risk pregnant women screened for program eligibility each year to receive services
Richmond et al. (2024)	Amazon's Alexa platform, proprietary and open-source natural language processing (NLP) modules.	study how voice assistants can help parents to support their children's mental health. Sample of 55 parents completed interactive training / coaching sessions. Of these, four also tested a second app version.	parents reported that the app contained easy-to-understand information on parenting, and that they could see the potential of voice technology to learn and practice parenting skills. Concerns related to privacy or access to technology were also noted.
Vázquez et. al. (2020)	Elastic net, k-nearest neighbors, neural networks, and random-forest based classification applied to data from The National Survey of Drug Use Among Students (ENCODE) in Mexico.	the classification algorithms were used to create prediction models for each substance use indicator.	Various indicators identified (father and best friend illicit substance use, and respondent gender (boys) - consistent and important discriminators between children who tried substances and those that did not). ML successful in highlighting indicators will reduce data collection and processing efforts.
Amrit et al. (2017)	NLP processing (NLTK) k-means clustering naive Bayes, random forests, support vector machines (scikit-learn Python)	comparative analysis for three ML methods used for classification to detect patterns of child abuse. Application Programmer Interface (API) designed to use models as tool in the field	the approach was found successful and implemented as a field tool at a municipality in the Netherlands

Perron et al. (2019)	text mining using inverse document frequency matrix, classification using rule-based, logistic regression, random forest. Data: unstructured text (case studies with manual annotations). investigations of child abuse and neglect	design and implement a prototype for extracting information from case data provided by a state child welfare agency to better understand substance-related problems among families investigated for abuse or neglect. Expert human reviewers coded 2,956 investigation summaries	the prototype achieved greater than 90% accuracy. Fleiss kappa estimates among computer models and expert human reviewers exceeded .80, indicating that expert human reviewer ratings were exchangeable with the computer models. Text mining procedures were shown to be cost-effective and efficient solutions for extracting meaningful insights from unstructured text data
Yu et al. (2023)	chatbot system-based data created by experts	chatbot named INFANBOT used to provide real-time customized education for novice parents on infants' health	while the user count is small (58 from which 30 participated in usability studies), INFABOT was shown to be effective in assisting novice parents. Research also identified major themes for parents' concerns.

Table 2.

Use of AI in Examining Parenting Behaviors

Reference	AI tools used	How was AI used	Results
Ammari et al. (2018)	trained an LDA model using the Python genism package on the aggregate of all three subreddits in the study	explored parenting roles and identities on Reddit used by parents. Data from three major parenting subreddits used to investigate what topics parents discuss and how they vary across the subreddits	similarities in topics across the three boards: sleep training, as well as differences: fathers talking about custody cases and Halloween. This encourages the use computational techniques to understand parenting practices online at large scale.
Crutzen et al. (2015)	data mining used to allow for data driven exploration of	AI used to study parenting norms' impact	results indicated that depending on the parenting dimension or practice,

	nonlinear relationships. Classification/ decision trees.	on binge drinking in children. Survey 499 adolescent - parent dyads.	parents' reports correctly identified the drinking behavior of 55.8 % (using psychological control) and up to 70.2 % (using rules) of adolescents.
Justice et al. (2019)	Least absolute shrinkage and selection operator (LASSO) classification applied to a range of background data available on children, including teacher and caregiver ratings of social and communication skills.	ML identified variables that best classified children receiving language disorder therapy. Sample of 483 children (3- to 5-year-old). Identified child and family level features associated with language disorder for preschool-aged children.	model had good classification accuracy based on area under the curve (AUC) of .87 and .85 on the training and test sets, respectively. Variables contributing to accurate classification: cognitive impairment, age, gender, and teacher- and parent-reported communication, social, and literacy skills. Machine-learning approaches to classify children receiving language services in school settings - valuable approach for identifying those factors that best differentiate children with and without language disorders.
Teague and Shatte (2018)	natural language processing, k-means clustering (scikit-learn Python)	ML used to identify themes in online postings	explored discussion topics of Web-based communities as men transition to fatherhood, by mapping them on two forums for expectant and current fathers from the social media site Reddit
McFayden et al. (2024)	ChatGPT-4	evaluated AI tool's potential for parents seeking information about autism.	ChatGPT-4 provided correct, concise, and clear answers, but did not include actionable advice; provided inaccurate references and hyperlinks ChatGPT-4 - a viable tool for parents with opportunities for improvement in actionability and reference accuracy
Shatte et al. (2020)	predictive models developed as a series of support vector machine classifiers using behavior,	post partum parental depression (PPD) assessed by evaluating	examined whether passive social media markers are effective for identifying fathers at risk of PPD, fathers at risk of PPD can be predicted

	emotion, linguistic style, and discussion topics as features.	the change in fathers' use of words indicating depressive symptomatology after childbirth. 67,796 Reddit posts from 365 fathers, in a 6-month period around the birth of their child.	from their prepartum data alone. The best performing model used discussion topic features only with a recall score of 0.82. Support tools could be developed for fathers during the prepartum period.
Tariq et al. (2019)	ML models based analysis of questionnaire responses of observers of home videos of Bangladeshi children used to detect developmental delay and ASD	enhanced the utility and performance of the model by building two classification layers: (typical and atypical behavior), and the second layer (ASD and non-ASD)	An accuracy (area under the curve [AUC]) of 76% (SD 3%) and sensitivity of 76% (SD 4%) for identifying atypical children from among developmentally delayed children, and an accuracy (AUC) of 85% (SD 5%) and sensitivity of 76% (SD 6%) for identifying children with ASD from those predicted to have other developmental delays.
Sun et al. (2020)	regularized logistic regression, random forests (Scikit-learn library) applied to Add Health data variables selected on preliminary literature review	identify which variables best predict adult educational attainment	prediction accuracies of 73.43% and 72.33% of family experiences for college enrollment, and 79.10% and 79.07% for college graduation. Best predictors of college enrollment and graduation: family socioeconomic characteristics and parent educational expectations
Wiechmann et al. (2017)	C4.5 decision tree, to determine which variables could predict childhood obesity in Hispanic preschoolers	analysis of structured qualitative interviews.	ML techniques are particularly amenable to this study because they can reveal the relationship between variables as well as how each variable is related to child obesity.
Westrupp et al. (2021)	Latent Dirichlet Allocation (LDA) applied to forum posts	identify common discussion topics in parenting -	based on- 340 (r/Daddit) and 578 (r/Mommit) original posts; 45 unique but broadly defined parenting situations:

		specific forums. Data from two parenting-specific 'subreddits' (r/Daddit; r/Mommit).	basic childcare situations - eating, sleeping, routines, sickness, and toilet training; or related to how to respond to child negative emotions or difficult behavior. High level of consistency in the themes in both subreddits.
Zhang et al. (2021)	ML framework that includes logistic regression, random forest, decision tree, extreme gradient boosting (XGboost), and multilayer perceptron (MLP) applied to electronic health records (EHRs) to predict postpartum depression (PPD) risk.	framework uses two EHR datasets: 15,197 women (2015–18) at a single site, and 53,972 women (2004 – 17) at multiple sites as development and validation sets to construct the PPD risk prediction model.	diagnosis of PPD within 1 year following childbirth. Best-performing model - mental health history, medical comorbidity, obstetric complications, medication prescription orders, and patient demographic characteristics. model performances consistent This may facilitate scalable and timely prevention and intervention, reducing negative outcomes and the associated burden.
Ben-Sasson et al. (2018)	automated text analysis tools and minimal standard screeners. ML based classifiers.	tested the feasibility of assessing autism spectrum disorder (ASD) risk in parental concerns from Web-based sources. Parents (n=115) with concerns regarding their child's (16 to 30 months old) social-communication development. and who had a family history of autism spectrum disorder (57.4% or 66/115).	parents reported concerns online and completed an ASD screener (M-CHAT-R/F), and a broad developmental screener (ASQ). The algorithm predicted ASD risk using a combination of the parent's text and a single screening question, selected by the algorithm to enhance prediction accuracy. Screening - identified 58% (67/115) to 88% (101/115) of children at risk for autism spectrum disorder. Parents - likely to seek Web-based communities to verify their suspicions of autism spectrum disorder. Automated tools support human decisions in many domains and could therefore potentially support concerned parents.

Vitanidi and Nanos (2025)	ML based analysis of text and media files used to identify autism characteristics.	developed tool for ASD diagnostic. Data from parent / caregiver questionnaires and short audiovisual recordings.	the tool has accuracy above 80%, and could reduce diagnostic delays, facilitate timely intervention, and encourage early help- seeking while maintaining anonymity.