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RESEARCH ARTICLE
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The Role of AI Anxiety and Attitudes Shaping Healthcare Perceptions among Jordanian Children

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Abstract:

Background: As Artificial Intelligence (AI) technologies become increasingly integrated into healthcare settings, healthcare professionals need to understand children's psychological responses to AI to ensure its appropriate and informed implementation.

Objective: This study aims to examine how subcomponents of AI anxiety —“AI learning anxiety, AI configuration anxiety, job replacement anxiety, and sociotechnical blindness” — influence children's general attitudes toward AI.

Methods: A “cross-sectional” study was conducted with a sample of 400 children in Jordan. The study commenced in February 2025 and concluded in May of the same year. Data were collected through an anonymous web-based survey designed for Jordanian children. Responses were obtained using two self-report questionnaires, along with a demographic information form. Descriptive statistics, including means, frequencies, standard deviations, and percentages, were used to summarize the demographic data. Inferential statistical analyses, including “Spearman’s and Pearson’s correlation coefficients” as well as “hierarchical multiple linear regression”, were conducted using SPSS version 26.

Results: Correlational and regression analyses revealed that AI learning anxiety ($\beta = 0.437$, $p < 0.001$) and AI configuration anxiety ($\beta = 0.266$, $p < 0.001$) were significant positive predictors of positive attitudes toward AI, suggesting that certain levels of anxiety may reflect engagement rather than resistance. Conversely, job replacement anxiety ($\beta = -0.615$, $p < 0.001$) and sociotechnical blindness ($\beta = -0.232$, $p < 0.001$) emerged as strong negative predictors of positive attitudes.

Conclusions: The findings underscore the importance of interprofessional approaches that integrate pediatric healthcare providers and mental health practitioners to foster digital literacy and emotional preparedness among children. As AI becomes increasingly integrated into child-centered healthcare modalities, establishing a balanced understanding and cultivating emotional readiness are crucial. Early, proactive, and supportive interventions may facilitate healthy engagement with AI and equip children with the competencies and confidence needed to navigate an increasingly dynamic technological landscape.

Keywords: AI anxiety, Artificial intelligence, Attitudes, Healthcare, Jordanian children.

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1. INTRODUCTION

The term “Artificial Intelligence (AI)” is defined broadly, much like intelligence itself. To illustrate, an early definition, stemming from the 1955 Dartmouth Research Project, remains accurate: “Making a machine behave in ways that would be called intelligent if a human were so behaving” [1]. AI can also be defined as “a system's capacity to interpret external data, learn from it, and use that learning to achieve some goal with flexibility and responsiveness” [2]. AI excels at uncovering complex patterns and subtle relationships in large, high-dimensional datasets, providing insights that elude traditional analytical approaches [3]. In the past two years, AI has been a topic of public discussion across various fields, including politics, economics, scientific research, and among the general public. Although there is broad interest in AI, the public's understanding of the technology is still comparatively low, with attitudes toward it being ambivalent rather than universally positive [4]. Although AI is widely viewed as a potentially useful tool for enhancing various aspects of human life, disagreements persist regarding ethical concerns, the potential loss of human control, and the unforeseen effects that may result from its uncritical use [5].

Consequently, AI is widely used in the healthcare sector for medical image analysis, not only in radiology but also in specialties such as pathology, ophthalmology, and dermatology [6]. In clinical settings, AI supports risk prediction, diagnosis, and treatment by processing sizable and complex datasets. For instance, it can enhance cancer prognosis predictions by combining genomic, proteomic, and radiomic data [7]. By rapidly processing enormous volumes of data, AI expands the limits of human cognitive capacity and helps reduce the workload of healthcare professionals [8]. While there is considerable potential for utilizing AI in the medical field, it also raises significant concerns regarding data privacy and confidentiality. Patients often express apprehension about losing control over treatment decisions, dealing with growing medical expenses, and complications related to insurance coverage stemming from AI integration [9].

The use of AI in healthcare practice has garnered considerable scholarly attention lately. According to surveys conducted in countries such as Germany, France, and the UK, healthcare professionals generally have a positive opinion of AI and believe it will enhance their routine clinical activities. Nonetheless, professionals are still well aware of the difficulties and dangers involved in integrating AI [10-12]. In addition to technological viability, patient and family acceptance are essential for the successful integration of AI into the healthcare system. The contemporary healthcare system places a greater emphasis on patient involvement and shared decision-making, which is frequently summarized by the phrase “patient empowerment” [13]. However, patients' compliance may suffer if therapy interventions are not deemed acceptable, which lowers the possibility of the best possible clinical results [14].

Jordan's healthcare system is one of the most advanced in the Middle East, characterized by widespread insurance coverage and targeted investment in health infrastructure. This reputation has earned the nation acknowledgment from the international community, including the World Health Organization, which continues to emphasize its efforts toward system-wide modernization. In recent years, national authorities have backed a wide-reaching e-health project in response to population growth and the increasing need for more efficient healthcare systems. This project ensures that health information is available throughout the entire sector, improves medical record management, and brings together public and private health organizations [15]. However, the integration of AI into Jordan's healthcare system presents enormous prospects while also posing unique challenges. Although AI has the potential to enhance patient care, optimize diagnostic and therapeutic procedures, and increase the effectiveness of healthcare delivery, its implementation in Jordan has progressed at a slower pace compared to that of technologically advanced countries [16]. One of the primary barriers to the application of AI in the healthcare field is general skepticism among both healthcare professionals and patients regarding its dependability and safety; these concerns often stem from issues related to data security, patient privacy, and job displacement [17]. As AI continues to advance, more attention is being paid to the emotional and psychological aspects of human-AI interactions, especially with children. Early exposure to technology can have a profound impact on children's attitudes and receptiveness to future advancements in AI in healthcare [18].

The increased incorporation of AI in global health systems has sparked considerable interest in people's attitudes toward these technologies. Public attitudes toward

AI are influenced by various factors, including cultural contexts, personal experiences, and media representations of AI [19]. They are commonly understood to comprise cognitive, affective, and behavioral facets that collectively reflect people's evaluations of AI's value and possible risks. These attitudes are influenced by the level of trust in AI technologies, previous experience, and perceived performance of the applications, according to a study by Schepman and Rodway [20]. A different study also found that people who regularly use AI systems have more favorable opinions of the technology and associate it with improved decision-making and efficiency [21]. However, negative sentiments are exacerbated by worries about job loss, privacy invasion, and ethical issues [22, 23]. Furthermore, people's perceptions of AI are significantly influenced by culture, resulting in varying levels of fear and confidence in AI systems among populations in different regions [24]. In this regard, the concept of AI anxiety has drawn more focused attention. AI anxiety, defined as "the fear or unease associated with the use or potential misuse of AI technologies, and general attitudes toward AI play crucial roles in shaping how children view and accept AI applications" [25]. Children, with their high exposure to technology, encounter more AI within healthcare contexts. The possible impact of this exposure to these technology systems on their emotional and psychological health, especially emerging concerns such as anxiety related to AI, still receives little attention [26].

The pervasive application of AI across health systems worldwide has created fervent concern regarding public attitudes toward the innovations [27]. Although considerable studies have focused on the attitudes of adults and their consequences for the adoption and use of AI, a significant gap remains in understanding the perceptions of younger age groups, and research within the context of children remains limited [28, 29]. Today's children are growing up surrounded by AI technologies, which significantly influence their learning experiences, entertainment, and social interactions. The understanding of AI in children is influenced by their developmental phases and the level of their exposure to these technologies [21]. Children differ from adults in that they lack the higher-order reasoning abilities necessary to judge AI in an unbiased manner. As it is, they are more prone to form prejudices or misconceptions [22].

Although research on AI in healthcare is expanding, studies specifically focusing on children's attitudes towards AI in healthcare have been relatively under-examined. This is particularly concerning given that children are not only frequent users of AI-driven technologies but also future beneficiaries of their integration into healthcare systems. While a small number of studies have begun to explore this topic, their findings vary widely depending on the population studied and the specific AI application in question. Furthermore, while anxiety toward AI is gaining recognition as a relevant emotional construct, its connection to broader attitudes toward AI remains underexplored in the current literature. Small or homogeneous samples often constrain existing studies and have predominantly focused on Western contexts, neglecting to account for views among children from less economically developed areas, such as those in the Middle East. As such, there is a pressing need to investigate how children in these settings perceive AI and whether AI-related anxiety plays a role in shaping their attitudes. This study aims to address these gaps by examining the moderating role of AI anxiety on children's attitudes toward AI in healthcare, using data collected from a Jordanian sample.

2. MATERIALS AND METHODS

2.1. Aim

This study aimed to predict the levels of AI anxiety among Jordanian children in healthcare contexts and to evaluate their general attitudes toward AI. It further examined the relationship between AI anxiety, general attitudes toward AI in healthcare contexts, and identified the characteristics of patients that may impact AI anxiety and attitudes.

2.2. Study Design

A "cross-sectional" design was selected. Questionnaires were employed for data collection using an anonymous online questionnaire.

2.3. Sampling and Setting

The study participants were selected from Jordanian children attending various schools in Jordan, and a stratified random sampling approach was used to ensure diverse representation based on urban and rural residence, socioeconomic backgrounds, and levels of technology exposure. Stratification was achieved by first obtaining a list of eligible schools, and then schools were randomly selected within each stratum. A total of 400 children were included in the study. Participants were selected based on the following inclusion criteria: Jordanian nationality, age between 13 and 16 years, and the ability to read, write, and comprehend the Arabic language. The study commenced in February 2025 and concluded in May of the same year. G*Power was used to calculate sample size, which pointed out a minimum necessary sample size of 370 participants, based on "α=0.05, power=0.80, and a Cohen's d (medium effect size of 0.30) [30]. However, to account for possible dropouts during the data collection process, a larger number of participants was recruited.

2.4. Instruments

There were three components to the study variables and instruments:

2.4.1. Demographic Data

The researcher developed a demographic information form to gauge the participants' demographic characteristics, encompassing age, gender, health state, and parents' educational levels.

2.4.2. AI Anxiety Scale

Wang and Wang (2022) developed a 21-item scale to assess anxiety related to AI, structured around four factors: "AI learning anxiety, job replacement anxiety, sociotechnical blindness, and AI configuration anxiety". Items are rated on a "seven-point Likert scale (1 = never to 7 = completely)". The reliability coefficient of the scale was α= 0.97, and the subscales: " AI learning anxiety, job replacement anxiety, sociotechnical blindness, and AI configuration anxiety" had a reliability coefficient of 0.92 [25]. Additionally, the Arabic scale exhibited good convergent and divergent validity with a related scale, and Cronbach's alpha (α) was reported as 0.93 [31, 32].

2.4.3. General Attitudes toward Artificial Intelligence Scale (GAAIS)

Schepman and Rodway developed this scale to measure people's general attitudes toward AI [20]. This scale encompasses 20 items with two dimensions: "positive attitude toward AI (12 items) and negative attitude toward AI (8 items)". Sample items included "Artificial Intelligence is exciting" and "I think Artificial Intelligence is dangerous". The items are scored with a "five-point Likert scale (1= strongly disagree through 5= strongly agree)" rating scale. The scale exhibits good internal consistency reliability, as evidenced by Cronbach's alpha values of 0.88 for the positive dimension and 0.83 for the negative dimension. The Arabic version's validity and reliability were verified by a reported "Cronbach's alpha coefficient" of 0.92 and composite reliability reported as 0.93 [33].

2.5. Data Collection

An anonymous online survey was used to gather data from a convenience sample of 13–16-year-old Jordanian children. Participation was random and voluntary. Google Forms was used to build survey questionnaires, and every item was marked as mandatory. Twenty minutes were allotted for completing the questionnaire. After completion, the data was safely sent to the principal investigator's email. Contact information was also provided to participants, enabling them to reach out to the researschers with any questions regarding survey completion.

2.6. Data Analysis

All the collected data was verified twice for accuracy and completeness. The data was then input into IBM SPSS 26 for analysis. The data was analyzed using both descriptive and inferential statistics, including "standard deviation, mean, and frequencies". Additionally, "Spearman's correlation" and "Pearson's correlation" were used to explore the potency of the link between AI anxiety, general attitudes toward AI, and sociodemographic variables. Furthermore, "hierarchical multiple linear regression analysis" was conducted to examine the predictive role of various variables on both positive and negative attitudes toward AI.

3. RESULTS

3.1. Characteristics of Study Participants

The study sample comprised 400 participants, with a mean age of 14.32 years (SD = 0.97), indicating a relatively homogeneous adolescent group in terms of age. Gender distribution was relatively balanced, though slightly female-skewed, with 223 females (55.8%) and 177 males (44.3%). A significant majority of participants' parents held a bachelor's degree (80.0%), while the remaining participants had lower or higher educational attainment: 4.0% held a high school diploma or less, 8.0% held a diploma, and 4.0% each held a master's or PhD degree. Only 12.0% of the participants reported having a health condition, while the remaining 88.0% reported no health issues. AI learning anxiety had a mean of 32.41 (SD = 7.57), AI configuration anxiety averaged 12.15 (SD = 2.90), job replacement anxiety showed a mean of 24.43 (SD = 6.44), and sociotechnical blindness had a mean of 15.65 (SD = 3.92). The composite AI anxiety score was 84.64 (SD = 10.91). In addition, positive GAAIS scores were relatively high (mean = 37.88, SD = 10.33), suggesting generally favorable attitudes toward AI, whereas negative GAAIS scores (mean = 24.71, SD = 5.27) were comparatively lower (Table 1).

Table 1. Sociodemographic characteristics of the participants (N=400).

Variables		Mean	SD	Frequency	N %
Age	-	14.32	0.97	-	
Gender	Male	-	-	177	44.3%
	Female	-		223	55.8%
Parents' educational level	High school and less	-		16	4.0%
	Diploma degree	-		32	8.0%
	Bachelor's degree	-		320	80.0%
	Master's degree	-		16	4.0%
	PhD degree	-		16	4.0%
Health status	Yes	-		48	12.0%
	No	-		352	88.0%
AI Anxiety	AI learning anxiety	32.41	7.57	-	-
	AI configuration anxiety	12.15	2.90		
	Job replacement anxiety	24.43	6.44		
	Sociotechnical blindness	15.65	3.92		
	AI anxiety	84.64	10.91		
GAAIS	Positive GAAIS	37.88	10.33	-	-
	Negative GAAIS	24.71	5.27		

3.2. Descriptive Correlations among Study Variables

Table 2 presents Spearman's correlation and Pearson's correlation coefficients between GAAIS—both positive and negative dimensions—and various demographic, health, and AI anxiety variables. For positive GAAIS scores, a significant positive correlation was found with AI learning anxiety (r = 0.406, $p < 0.01$) and AI configuration anxiety (r = 0.230, $p < 0.01$). Notably, positive GAAIS scores were negatively correlated with job replacement anxiety (r = -0.565, $p < 0.01$) and sociotechnical blindness (r = -0.182, $p < 0.01$). In terms of demographic and health variables, positive GAAIS did not show significant correlations with age (r = -0.026, $p = 0.605$), gender (r = 0.028, $p = 0.576$), parents' educational level (r = 0.070, $p = 0.160$), or health status (r = -0.012, $p = 0.818$) and the AI anxiety (r = -0.057, $p = 0.256$).

Table 2. Descriptive statistics and correlations between variables.

Variables	1	2	3	4	5	6	7	8	9	10	11
Age	1.0##	-									
Gender	-0.280**#	1.0#	-								
Parents' Educational Level	0.285**#	0.087#	1.0#	-							
Health Status	0.110*#	0.167**#	-0.024#	1.0#	-						
AI learning anxiety	0.014##	0.003#	0.043#	0.035#	1.0##	-					
AI configuration anxiety	0.027##	-0.045#	-0.128*#	0.040#	-0.039##	1.0##	-				
Job replacement anxiety	-0.009##	-0.007#	0.001#	0.028#	0.042##	0.021##	1.0##	-			
Sociotechnical blindness	0.012##	-0.066#	-0.083#	0.008#	-0.009##	-0.032##	-0.111*##	1.0##	-		
AI anxiety	0.016##	-0.032#	-0.031#	0.067#	0.705**##	0.240**##	0.586**##	0.279**##	1.0##	-	
Positive GAAIS	-0.026##	0.028#	0.070#	-0.012#	0.406**##	0.230**##	-0.565**##	-0.182**##	-0.057##	1.0##	-
Negative GAAIS	-0.042##	-0.003#	0.000#	0.061#	0.000##	0.014##	-0.003##	0.078##	0.030##	0.263**##	1.0##

Note: *$p < 0.05$, **$p < 0.01$.
Spearman correlation (categorical variables), ## Pearson correlation (continuous variables).

Table 3. Hierarchical multiple linear regression analysis results on the predictive role of various variables on positive and negative attitudes toward AI.

Variables	Positive				Negative			
	B	SE	ß	*p*-value	B	SE	ß	*p*-value
Constant	47.858	5.928	-	< 0.001	25.014	4.990	-	< 0.001
Age	-0.697	0.363	-0.066	0.056	-0.326	0.306	-0.060	0.287
Gender	-0.190	0.690	-0.009	0.783	-0.150	0.581	-0.014	0.797
Parents' Educational Level	1.327	0.508	0.085	0.009	0.135	0.427	0.017	0.753
Health Status	-0.429	1.004	-0.014	0.670	1.125	0.845	0.069	0.184
AI learning anxiety	0.596	0.042	0.437	< 0.001	-0.001	0.035	-0.002	0.972
AI configuration anxiety	0.944	0.110	0.266	< 0.001	0.030	0.092	0.017	0.741
Job replacement anxiety	-0.985	0.049	-0.615	< 0.001	0.003	0.041	0.003	0.946
Sociotechnical blindness	-0.611	0.081	-0.232	< 0.001	0.107	0.068	0.080	0.117
AI anxiety *	-0.054	0.047	-0.057	0.256	0.014	0.024	0.030	0.552

Note: Model positive fit: $R^2 = 0.637$, Adjusted $R^2 = 0.629$, $p < 0.001$
Model negative fit: $R^2 = 0.013$, Adjusted $R^2 = -0.007$, $p = 0.749$
* AI Anxiety was excluded by SPSS in the final model due to multicollinearity with its subcomponents (AI learning anxiety, AI configuration anxiety, job replacement anxiety, sociotechnical blindness). It was analyzed separately with positive and negative attitudes as outcomes but was not a significant predictor in either model.

On the other hand, negative GAAIS scores showed a significant positive correlation with positive GAAIS scores ($r = 0.263$, $p < 0.01$). However, negative GAAIS scores did not significantly correlate with any of the AI-specific anxieties; learning ($r = 0.000$, $p = 0.993$), con-figuration ($r = 0.014$, $p = 0.783$), job replacement ($r = -0.003$, $p = 0.958$), sociotechnical blindness ($r = 0.078$, $p = 0.119$), or AI anxiety ($r = 0.030$, $p = 0.552$). Similarly, negative GAAIS scores showed no significant correlations with age ($r = -0.042$, $p = 0.408$), gender ($r = -0.003$, $p = 0.952$), parents' educational level ($r = 0.000$, $p = 0.997$), or health status ($r = 0.061$, $p = 0.224$).

3.3. Hierarchical Multiple Regressions

A "hierarchical multiple linear regression" analysis was conducted to investigate the predictive role of various variables on positive and negative attitudes toward AI. The results revealed significant differences in the strength and significance of predictors across the two models—positive GAAIS and negative GAAIS.

The model predicting positive attitudes toward AI yielded strong explanatory power with an R^2 of 0.637 and an adjusted R^2 of 0.629 ($p < 0.001$), indicating that approximately 63% of the variance in positive attitudes can be explained by the included predictors. Several variables emerged as statistically significant contributors. Most notably, AI learning anxiety ($B = 0.596$, $SE = 0.042$, $\beta = 0.437$, $p < 0.001$) and AI configuration anxiety ($B = 0.944$, $SE = 0.110$, $\beta = 0.266$, $p < 0.001$) were positively associated with positive attitudes. Interestingly, job replacement anxiety was negatively associated with positive attitudes ($B = -0.985$, $SE = 0.049$, $\beta = -0.615$, $p < 0.001$), suggesting that concern over AI replacing human jobs may significantly dampen favorable perceptions. Sociotechnical blindness was also a negative predictor (B = -0.611, SE =

0.081, β = -0.232, $p < 0.001$). Additionally, parents' educational level showed a modest but significant positive association (B = 1.327, SE = 0.508, β = 0.085, $p = 0.009$). Age and gender did not reach statistical significance, although age approached the threshold ($p = 0.056$).

In contrast, the model predicting negative attitudes toward AI showed poor explanatory power, with an R^2 of 0.013 and an adjusted R^2 of -0.007 ($p = 0.749$), indicating a lack of significant overall model fit. None of the predictor variables reached statistical significance in this model. The highest β coefficient was for sociotechnical blindness (β = 0.080), but this was not statistically significant ($p = 0.117$). Other variables, including AI learning anxiety, AI configuration anxiety, and job replacement anxiety, which were significant in the positive model, did not contribute meaningfully to the negative model (Table **3**).

4. DISCUSSION

This study explored how specific subcomponents of AI-related anxiety, "AI learning anxiety, AI configuration anxiety, job replacement anxiety, and sociotechnical blindness," influence children's attitudes toward AI. Given the rapid integration of AI technologies into educational and healthcare systems, understanding how children conceptualize and emotionally respond to AI is critical for shaping effective, developmentally appropriate interventions. The findings highlight several nuanced associations between anxiety subtypes and both positive and negative perceptions of AI, while also considering their demographic and health-related backgrounds. Our findings indicated that neither age nor education level significantly predicted attitudes toward AI. This aligns with some previous studies, such as Chocarro [34], which found that age did not influence teachers' intention to adopt chatbots. However, other research suggests that younger individuals tend to hold more favorable views of the AI [35], highlighting inconsistent results. One possible explanation is that age may interact with other factors, such as educational exposure or technological familiarity, warranting further exploration. Regarding parental education, past studies [36, 37] have linked higher education with more positive views of AI, which agrees with our result, suggesting that parental influence and socio-educational background may play a meaningful role in shaping children's openness to AI technologies.

The regression analysis revealed that AI learning anxiety significantly predicted more favorable attitudes toward AI (r = 0.406, $p < 0.01$; B = 0.596, SE = 0.042, β = 0.437, $p < 0.001$). At first glance, this may appear paradoxical; however, the association likely reflects a motivational form of anxiety, wherein children perceive AI as challenging yet engaging. Developmentally, mild-to-moderate anxiety can catalyze deeper interest and learning, particularly when children are exposed to novel and complex tools. This finding aligns with Solyst [38], who observed that while children often begin with overtrust in generative AI like ChatGPT, they develop uncertainty and self-doubt when faced with the limitations of the system, leading to nuanced and occasionally anxious engagement. Such anxiety may be interpreted as a form of anticipatory stress, where interest in AI coexists with concerns about one's ability to keep pace with technological demands.

The present research strongly confirms that concern about AI configuration is a significant positive predictor of children's positive attitudes toward AI (r = 0.230, $p < 0.01$; B = 0.944, SE = 0.110, β = 0.266, $p < 0.001$). These results support the suggestion that children may view challenges related to setting up AI systems as opportunities for mastery and control, leading to the dewlopment of positive attitudes toward these systems. Such an interpretation aligns with the argument that children exposed to advanced technologies can develop a sense of agency and mastery. Consistent with this view, research by Solyst [38] demonstrated that children's experiences with generative AI models, such as ChatGPT, led to increased interest and positive attitudes toward these technologies, suggesting that uncertainty could be replaced by high interest and positive attitudes toward AI. Thus, based on such evidence, hands-on experience with AI technologies is likely to translate early configuration apprehension into learning opportunities, consequently reducing anxiety and fostering positive attitudes.

In contrast, job replacement anxiety had a strong negative association with positive AI attitudes (r = -0.565, $p < 0.01$; B = -0.985, SE = 0.049, β = -0.615, $p < 0.001$). The concerns voiced by both children and adults regarding the potential displacement of human work by AI in various sectors align with existing academic literature. Concerns over future labor prospects and job security appear to be affecting children, based on their exposure to societal narratives about automation and work. At the same time, among experts within the clinical context, concerns about being replaced by AI in professional responsibilities have resulted in increased resistance and reduced acceptance of AI technologies in healthcare settings [39]. This trend suggests an increasing awareness of the socio-economic implications and anticipated changes in children's understanding of AI's role in future professional and healthcare settings. Training might be required to implement and encourage open conversations about career areas to address these issues. On the other hand, according to research by Mertala and Fagerlund [40], AI is frequently seen by Finnish children as a useful tool and an adjunct to human work rather than a complete replacement for it. At this stage, optimism might be an emerging awareness of the bounds of AI capacity or a result of training paradigms that emphasize complementary rather than disruptive aspects of AI. This disparity may be attributed to socio-economic and cultural narratives. In Jordan, where economic vulnerability and youth unemployment remain pressing concerns, children may suffer from deeper societal anxieties. Media portrayals and parents' concerns about job security may amplify these anxieties.

Sociotechnical blindness also negatively predicted positive AI attitudes (r = -0.182, $p < 0.01$: B = -0.611, SE = 0.081, β = -0.232, $p < 0.001$). Children who were less aware of the far-reaching societal and ethical implications involved with AI reported a lower tendency to hold a positive attitude toward it. This finding underscores the need for an integrated framework of learning about AI that extends beyond technical proficiency to encompass societal and ethical contexts. Mertala and Fagerlund (2023) noted that Finnish 5th- and 6th-graders often misused and anthropomorphized AI, developing a poor conceptual understanding that could significantly affect their attitudes towards using AI [40]. Additionally, research by Andries and Robertson [23] has shown that young children often anthropomorphize AI systems, lacking a deeper conceptual understanding. Bridging these gaps may help children develop more realistic and balanced views of AI as a tool with both potential and limitations. However, it is possible that older children, like those in our sample, may begin to develop more sophisticated socio-technical awareness as their cognitive capacities mature.

Interestingly, the model evaluating negative attitudes toward AI was not statistically significant (R^2 = 0.013, adjusted R^2 = -0.007, p = 0.749). None of the anxiety subcomponents meaningfully predicted negative views of AI. This suggests that children's negative perceptions may stem from factors not directly related to personal experiences with AI or functional concerns, but rather from external influences such as parental anxiety, media portrayals, or emotional discomfort with technological change. The research by Andries and Robertson [23] clarifies children’s attitudes toward AI, demonstrating that these attitudes are largely influenced by unclear affectual reactions and pervasive societal narratives and stories, rather than by direct concerns. This aligns with recent studies suggesting that attitudes towards AI are generally formed early in life and are more strongly influenced by contextual experiences than by demographic factors [40]. The pervasiveness of AI in children's daily lives, whether through educational activities, media consumption, or virtual worlds, may explain why various demographic groups exhibit largely similar attitudinal tendencies. The aggregate item measuring AI anxiety was further removed from the final analytical model due to multicollinearity issues with its constituent parts. Furthermore, when examined individually as predictors for favourable (p = 0.256) and negative (p = 0.552) attitudes, AI anxiety did not result in significant prediction. This adds to the theoretical significance of assessing AI anxiety through its constituent parts, as they have different amounts and types of influence on children’s developing perspectives.

These findings point to the complexity of children's psychological responses to AI. While positive attitudes appear to capture a combination of interest, engagement, and awareness, they are, in turn, related to spontaneous anxieties about learning and using AI effectively. Negative attitudes may reflect affective and ideological concern rather than particular concerns. For child health practitioners, efforts to improve understanding and engagement with AI need to combine technical training with building emotional resilience and computational confidence. Encouraging an informed, inclusive, and emotionally secure approach to AI in childhood is essential to prepare the next generation to interact critically and creatively with intelligent machines, as well as to support children in successfully understanding and using AI in health, learning, and everyday contexts. Both for healthcare and for developmental reasons, these findings have considerable implications. They suggest that therapeutic approaches to increasing children’s understanding about AI need to be designed according to specific kinds of AI-related worries they encounter. Encouraging exploration and trust in learning about and configuring AI can foster creative engagement, while actively confronting concerns about job loss and sociotechnical consequences might help ease nascent anxieties. These concerns are especially timely as AI technologies increasingly pervade healthcare contexts, as children grow up to become both young consumers and future developers, patients, and professionals in AI-rich environments.

4.1. Study Limitations

While offering considerable insights into the relationship between AI anxieties and children's attitudes toward AI, this study has certain limitations. First, although significant correlations were identified, it is still unclear whether attitudes are influenced by the dimensions of anxiety or vice versa over time. Longitudinal studies are needed to clarify the direction and nature of the association's developmental trajectory and how it changes as exposure to and comfort with technology evolve over age. Second, the current study did not control for prior exposure to AI technologies as a possible moderating factor that might play a significant role in influencing the results. Children who repeatedly use and interact positively with AI, such as through educational apps or intelligent assistants, may differ in their attitudes and level of anxiety compared to children with few interactive experiences with such technologies. Future study efforts should also measure familiarity and literacy regarding AI to facilitate a greater understanding of children's reactions. Third, although the sample size was adequate for statistical analysis, it may not be representative of all sociodemographic backgrounds. The generalizability of results may be limited by factors such as geographical location, technological resource availability, and educational familiarity with subject matter related to AI. For example, children from under-resourced schools or rural areas may have limited direct interaction with AI systems. Hence, their level of anxiety and development of attitudes might be affected. Furthermore, because children's perceptions may be significantly influenced by their media environments and respective cultures, future research efforts should consider context to enhance pediatric health education and policy development. This investigation narrowly focused on a particular cluster of subconstructs related to anxiety about AI. It did not consider other potentially important factors, such as concerns about privacy, autonomy, and moral reasoning. As children increasingly use and interact with AI in healthcare settings and other contexts, efforts must be broadened to address all aspects of the implications for psychology, ethics, and development. Recognizing these limitations lays a foundation for future studies and more effective intervention strategies to promote healthy and balanced engagement with AI technologies during childhood.

CONCLUSION

This study offers valuable insights into children's perceptions of AI and the range of anxieties related to AI that impact their understanding and attitudes toward it. The results suggest that certain types of anxiety—such as worries about learning to engage with and use AI—can co-occur and even promote positive attitudes toward AI. In contrast, anxieties about job loss and sociotechnical blindness are associated with reduced positivity. Notably, negative attitudes toward AI were not largely explained by any single anxiety subfactor, which may indicate that wider emotional or cultural factors underpin children's attitudes toward AI. These results highlight the need for early and developmentally appropriate education about AI that strengthens both technical proficiency and children's emotional reactions, as well as their conceptual understanding of ethical considerations and conceptual foundations. For child health professionals and those working in clinical settings, children must be prepared with the skills and confidence to use AI effectively, especially as these technologies become increasingly ubiquitous in healthcare, schools, and everyday life.

AUTHORS' CONTRIBUTIONS

The authors confirm their contributions to the paper as follows: F.A.S., A.A., and J.D.A.S.: Data collection; S.A.S: Writing the paper. All of the authors have reviewed the results and approved the final version of the manuscript.

ABBREVIATION

AI = Artificial Intelligence

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study strictly abided by ethical principles and was approved by Al-Balqa Applied University (IRB #: 78/7/2024/2025) in February 2025.

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or research committee and the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

The participants and their parents received an electronic consent form outlining the study's purpose and procedures, which they reviewed and digitally signed before completing the online survey voluntarily. Additionally, confidentiality was ensured through strict privacy measures, including safeguarding participant identities and excluding personal information, as well as data encryption for enhanced security.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author [SAS] on request.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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