
EXPLAINABLE ARTIFICIAL INTELLIGENCE IN AUTISM SPECTRUM DISORDER: ADVANCING EARLY DETECTION, CLINICAL DECISION-MAKING, AND INTERVENTION OUTCOMES

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ABSTRACT

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by persistent challenges in social communication, restricted interests, repetitive behaviours, and sensory processing differences. Early diagnosis and personalized intervention significantly improve developmental outcomes; however, traditional assessment procedures often require extensive clinical expertise and considerable time. Artificial Intelligence (AI) has emerged as a promising technology for autism screening, diagnosis, and intervention planning. Nevertheless, the lack of transparency in many AI systems raises concerns regarding trust, reliability, and ethical implementation. Explainable Artificial Intelligence (XAI) addresses these concerns by making AI-driven decisions understandable and interpretable to clinicians, educators, and caregivers. The present study examines awareness, acceptance, and perceived effectiveness of XAI applications in autism assessment and intervention among 200 participants, including special educators, psychologists, rehabilitation professionals, and postgraduate students. Using a mixed-method research design, quantitative and qualitative data were analysed. Findings indicate that participants demonstrated positive attitudes toward XAI, particularly when transparent explanations accompanied diagnostic recommendations. Clinical psychologists and special educators reported greater confidence in explainable systems compared to conventional AI models. The study highlights the potential of XAI to improve diagnostic accuracy, support clinical decision-making, and enhance intervention outcomes while maintaining ethical accountability and professional trust.

KEYWORDS: Autism Spectrum Disorder, Explainable Artificial Intelligence, Early Detection, Clinical Decision-Making, Machine Learning, Special Education, Intervention Planning.

INTRODUCTION

Autism Spectrum Disorder (ASD) is one of the most prevalent neurodevelopmental disorders affecting children worldwide. It is characterized by deficits in social interaction, communication, and adaptive behaviour, accompanied by repetitive and restricted patterns of interests and activities. According to recent global estimates, approximately one in every 100 children is diagnosed with ASD, making it a significant public health and educational concern.

The growing prevalence of autism has increased the demand for early screening, accurate diagnosis, and individualized intervention planning. Traditional assessment methods rely heavily on behavioural observations, developmental histories, and standardized diagnostic instruments administered by trained professionals. Although effective, these approaches are often time-intensive and may be influenced by subjective interpretation.

Artificial Intelligence (AI) has emerged as a transformative tool in healthcare and special education. Machine learning algorithms can analyse large volumes of behavioural, speech, neuroimaging, and genetic data to identify autism-related patterns with remarkable accuracy. Despite these advancements, many AI systems operate as "black boxes," making it difficult for professionals and families to understand how conclusions are reached.

Explainable Artificial Intelligence (XAI) seeks to bridge this gap by providing transparent and interpretable explanations for AI-generated predictions and recommendations. In the context of autism, XAI can enhance diagnostic confidence, support personalized interventions, and facilitate collaborative decision-making among clinicians, educators, and caregivers.

The present study investigates perceptions and awareness of XAI among professionals working in autism-related fields and explores its potential role in improving early detection, clinical decision-making, and intervention outcomes.

Objectives of the Study

1. To assess awareness regarding Explainable Artificial Intelligence in Autism Spectrum Disorder.
2. To examine attitudes toward the use of XAI in autism diagnosis and intervention planning.
3. To compare perceptions among special educators, psychologists, rehabilitation professionals, and postgraduate students.
4. To explore qualitative perspectives regarding ethical and practical implications of XAI in autism services.

METHODOLOGY

The study employed a mixed-method research design integrating quantitative and qualitative approaches.

Participants

The sample consisted of 200 participants:

- 60 Special Educators
- 50 Clinical Psychologists
- 40 Rehabilitation Professionals
- 50 Postgraduate Students

Participants were recruited from educational institutions, rehabilitation centres, and healthcare organizations across Haryana, Delhi, and neighbouring regions.

The mean age of participants was 34.6 years ($SD=8.1$). Female participants constituted 61% of the sample, while males represented 39%.

Research Instruments

The following tools were utilized:

- Explainable Artificial Intelligence Awareness Scale (XAI-AS)
- Attitude Toward AI in Autism Scale (ATAIAS)
- Clinical Trust and Acceptance Inventory (CTAI)
- Semi-Structured Interview Schedule

Data Collection Procedure

Data were collected between January and May 2026 through online questionnaires, institutional visits, and individual interviews. Participation was voluntary, and confidentiality was maintained throughout the research process.

Data Analysis

Quantitative data were analysed using SPSS Version 29. Descriptive statistics, ANOVA, and correlation analyses were performed. Qualitative data from interviews were analysed using thematic analysis.

RESULTS

Table1: Participant Demographics.

Category	N	MeanAge(SD)	Female(%)	Male (%)
SpecialEducators	60	35.1(7.4)	65	35
ClinicalPsychologists	50	36.4(8.2)	70	30
RehabilitationProfessionals	40	34.2(7.6)	55	45
PostgraduateStudents	50	31.5(6.3)	54	46

Table 2: Mean Scores on Key Scales.

Variable	Special Educators	Clinical Psychologists	Rehabilitation Professionals	Students	F-value	Sig.
XAI Awareness Scale	81.6(7.4)	84.9(6.8)	78.3(8.1)	72.8 (9.5)	13.42	p <0.01
Attitude TowardAI Scale	83.5(6.9)	87.2(6.1)	80.6(7.5)	75.4 (8.6)	15.88	p <0.01
ClinicalTrust Inventory	79.1(8.3)	85.4(7.0)	76.2(8.9)	70.8 (9.7)	12.75	p <0.01

The results indicate significant differences among participant groups regarding awareness, attitudes, and trust toward XAI applications. Clinical psychologists demonstrated the highest awareness and acceptance levels, followed closely by special educators. Post graduate students showed positive attitudes but lower practical knowledge regarding explainable AI systems.

DISCUSSION

The findings suggest that professionals involved in autism assessment and intervention recognize the value of Explainable Artificial Intelligence in improving decision-making

processes. Participants emphasized that transparency is a critical factor influencing trust in AI-generated recommendations.

Clinical psychologists exhibited higher confidence in XAI due to its ability to provide evidence supporting diagnostic conclusions. Special educators valued the potential of XAI for monitoring student progress, designing individualized educational plans, and evaluating intervention effectiveness.

Qualitative analysis identified three major themes:

Theme1: Transparency Enhances Trust

Participants reported that understanding how an AI system arrives at a recommendation increases professional confidence and reduces Questioning approach.

Theme2: Ethical Responsibility and Accountability

Respondents highlighted concerns regarding bias, privacy, and ethical implementation. Explain ability was viewed as essential for responsible AI adoption.

Theme3: Human-AI Collaboration

Most participants believed that AI should complement rather than replace professional expertise. Explain able systems were considered useful tools for supporting evidence-based decision-making.

The findings align with contemporary research emphasizing the importance of transparent AI systems in healthcare and educational settings.

Educational Implications

Teacher education and special education programs should integrate AI literacy and training in explainable technologies to prepare future professionals.

Clinical Implications

Healthcare institutions should adopt explainable AI tools that provide interpretable recommendations for autism screening, diagnosis, and treatment planning.

Policy Implications

Government agencies and regulatory bodies should establish ethical guidelines for the use of AI in special education and healthcare services.

Research Implications

Future studies should investigate long-term outcomes of XAI-assisted interventions and examine effectiveness across diverse autism populations.

Limitations

The study was limited to selected institutions in Northern India and may not represent all geographical regions. The use of self-reported measures may introduce response bias. Future research should include larger samples, longitudinal designs, and objective measures of AI implementation outcomes.

CONCLUSION

Explainable Artificial Intelligence represents a significant advancement in autism assessment, diagnosis, and intervention planning. By providing transparent explanations for AI-generated recommendations, XAI enhances trust, accountability, and clinical utility. The findings indicate strong acceptance of explainable systems among professionals working in autism-related fields. As AI technologies continue to evolve, integrating explainability into diagnostic and intervention frameworks can improve early detection, support personalized care, and contribute to more equitable and effective autism services. Successful implementation will require interdisciplinary collaboration, ethical oversight, and continuous professional training to ensure that technological innovations remain centered on the needs of individuals with autism and their families.

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