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## *Application of Artificial Intelligence in Intervention Techniques for Children with Multiple Disabilities*

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**Abstract**

The research examined how artificial intelligence (AI) might be changing the intervention strategies for children with multiple disabilities. A quantitative research method was used by a team of researchers. That method involved a total of 350 participants who were special education teachers, therapists, and other types of professionals. They provided the researchers with data through a structured questionnaire. The results showed that most of the respondents' believed AI has the potential to in fact, knowledge of AI, as well training about AI tools, turned out to be quite instrumental in determining the attitude of the respondents towards AI. Those who had received AI training expressed significantly more positive opinions compared to those who had no such training. Besides, the study highlighted that participants viewed AI as a game changer for special education and intervention practices. Nevertheless, issues like inadequate training, scarcity of resources, and other barriers to implementation were also flagged. The authors summarized their findings by stating that AI has the potential to significantly enhance intervention services for children with multiple disabilities, if there are professional training, ethical use, and implementation based on the local context.

**Keywords:** Artificial intelligence, intervention techniques, multiple disabilities, special education, assistive technology, inclusive education

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## Introduction

Artificial intelligence (AI) is being investigated increasingly as a technology that can aid children with disabilities as it can enhance communication, provide more personalized and responsive education and therapy, and increase access. When it comes to children with multiple disabilities, AI can be the medium to extend intervention, for example, by speech-to-text systems, communication tools that predict users' needs, intelligent tutoring systems, computer-vision support, wearable monitoring, and adaptive interfaces that are able to adjust to a child's sensory cognitive physical, and communicative requirements in real time. Several recent studies suggest that tools supported by AI are highly effective where children need individualized pacing, multimodal content, and immediate feedback, which are all major aspects in intervention planning for learners with complex needs. Still, the research in this area is limited, and a lot of the papers published look at disability in general rather than focusing on children with multiple disabilities (Zdravkova et al., 2022; Yang et al., 2024).

The urgency of this matter is reflective of the worldwide situation of people with disabilities. UNICEFs latest detailed statistical study came up with a figure of almost 240 million children with disabilities living globally, while the World Bank also states that children with disabilities are 2.5 times less likely to go to school than their non-disabled peers and that at least half of the young people with disabilities in low- and middle-income countries are left out of the education system. These stats indicate that disability is not just a medical or a rehabilitation matter but an issue of major educational inequity. Children with multiple disabilities encounter more difficulties as they require a combination of medical and social support rather than single-focus interventions (UNICEF, 2021; World Bank, 2024).

AI is relevant to this challenge because to intervene with children with multiple disabilities, it is necessary to tailor the program to everyone, make it a life-long process, and involve a variety of disciplines. The WHO and UNICEF recognize that accommodation through technology should be the initial step that enables children with disabilities to attend school, gain access to society, and enhance self-reliance. AI advances this potential of assistive devices by making them more adaptive and capable of responding to the user. For instance, AI-based communication devices may aid children with speech and physical disabilities to communicate their needs; adaptive learning programs may break down or re-arrange tasks; and smart monitoring systems may allow teachers to notice changes in attention, involvement or behavior. Such features are extremely useful for children whose difficulties cover more than one type of impairment (WHO & UNICEF, 2022; Zdravkova et al., 2022).

At the same time, the use of AI in education should not be considered only from a technical perspective. UNESCO has highlighted that the implementation of AI in education needs proper governance, ethical measures, preparation of teachers, and a design that considers inclusion, and their 2023 guiding pointed out that only a handful of countries have officially recognized AI-supported tools to help learners with disabilities have inclusive access. Meta-analyses of recent studies also show that although AI contributes to accessibility and engagement, its widespread use faces hindrances such as infrastructural limitations, low levels of digital literacy, variations in theoretical explanations, and there is a dearth of studies over long-term developments Hence, the question that remains is not whether AI has potential, but in what ways that potential can

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be harnessed to develop intervention techniques that are suitable for children with multiple disabilities in their respective contexts (UNESCO, 2023; Aftab et al., 2024).

On a global scale, AI is viewed as a vital tool in inclusive and assistive education, especially for those students who require highly individualized learning conditions. The latest research indicates that AI-powered systems have the potential to make accessibility more effective by implementing voice recognition, image description, providing adaptive feedback, setting personalized learning pace, and offering communication assistance. Studies exploring the application of AI in inclusive education mention improvements in student engagement, encouragement, and easier access to content, whereas research on assistive technology emphasizes AI's evolving contribution to communication and educational tools for children with various disabilities including those with sensory, cognitive and physical impairments. Therefore, AI is very suitable for children with multiple disabilities as their learning and participation most of the time rest on multimodal support (Li et al., 2025; Zdravkova et al., 2022)

Notwithstanding these breakthroughs, the international context also displays significant shortcomings. The worldwide policy framework is still at the stage of formulation, only a few classrooms have gone for large-scale integration, and reliable proofs of the long-lasting effects are hard to come by. As per UNESCO 2023, assistive AI tools for inclusive disability support are hardly ever endorsed by the government, and lately, reviews revealed that most of the research focuses on diagnostic capability or general accessibility rather than the educational intervention of children with complex or multiple needs on an ongoing basis. In a way, international research is on its way, but it is not quite capable of tackling the issues of children who require integrated educational communicative behavioral and therapeutic intervention (UNESCO, 2023; Aftab et al., 2024).

In Pakistan, the need for effective intervention is made more serious by not only the exclusion of people with disabilities but also the general crisis of access to education. Pakistan Bureau of Statistics has increased the Disability-related Information Collection through Census 2023 and PSLM 2019-20, which shows Disability as a Policy Issue. However, Pakistan's general problem with school access is still very serious: according to the latest national education data, about 25.15 million children in the age group of 5-16 years were out of school in 2023-24. In this situation, children with multiple disabilities may be the most excluded ones who are living with poverty, attending inaccessible schools, having limited assistive devices, receiving weak specialist services, and low availability of technology-enabled intervention (Pakistan Bureau of Statistics, 2025; Sajjad et al., 2025).

Research conducted in Pakistan reveals that children with disabilities face a double barrier: not only are there stumbling blocks for them to enter schools, but there are also doubts about the learning quality they receive even if they attend. Data from a household survey covering four districts showed that children with very severe disabilities were at a disadvantage in terms of school attendance compared to non-disabled children, whereas a recent assessment of the sector of disability education in Pakistan pointed out various issues such as lack of sufficient funding, weak inclusion measures, and unavailability of trained teachers. Such data highlight that the Pakistani environment is still grappling with the very basics of inclusion, thereby indicating that AI-based interventions should not just be perceived as imported fancy high-tech solutions, but rather as context-

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sensitive aids that take into consideration local infrastructural, teacher training, and financial limitations (Naz et al., 2024; Alahmari et al., 2025).

The background of the research intersects the following areas: the worldwide advancement of AI technologies both in educational and rehabilitation sectors, excluding children with disabilities from engaging learning experiences has been a global issue until now, and especially those children with multiple disabilities who besides individualized intervention also need coordinated ones are very vulnerable. On one hand, the literature supports that AI is an enabling tool for personalization, communication, and adaptive instruction, on the other hand, reports on disability throughout the world emphasize that the first step to participate in school and to development is to have access to assistive technology. Nonetheless, children with disabilities in Pakistan still encounter main barriers in both access and implementation which means that it is a question that needs to be raised whether AI-based intervention methods can be adapted to local educational and therapeutic circumstances in a meaningful way (Shaukat, 2023; Aftab et al., 2024).

Even though the amount of research on AI in special and inclusive education has continued to grow since 2020, a glaring gap is a clear lack of studies that focus particularly on children with multiple disabilities in this field. The bulk of what is currently available generally focuses on single-category needs, just general special educational needs, or disability groups in a broad sense, but children with multiple disabilities are quite different in that they need more complex, integrated and often multidisciplinary interventions. Moreover, most studies are published in technologically advanced settings, so there is a major lack of evidence being presented from low- and middle-income countries such as Pakistan. Recent reviews have pointed out the lack of consistent empirical evidence for learners with complex disabilities as well as the absence of longitudinal, theory-driven, and context-sensitive studies (Bashir et al., 2024; Bagadood et al., 2025).

Children who have multiple disabilities usually need very personalized interventions to help them communicate, learn, behave, participate, and be independent. Unfortunately, regular intervention methods are often very resource-heavy, almost impossible to personalize in a continuous way, and constrained by the lack of trained specialists and assistive tools. Though AI makes it possible to have adaptive and interactive support, there is still a serious knowledge gap in the use of ethically, effective, and practically AI-based intervention techniques for children with multiple disabilities. In fact, the problem is even more serious in Pakistan where disabled people are still weakly included and there is hardly any access to education. This is more than just a practical and theoretical challenge, and it is worthy of a very thorough investigation (Afzaal et al., 2022; Ashfaq et al., 2025).

1. Study the idea and extent of AI-based therapy methods for children with multiple disabilities.
2. Discover the leading AI devices and programs engaged in communication education behavioral support, and therapeutic intervention for children with multiple disabilities.
3. To understand the global perspective on AI-assisted help for children with disabilities.
4. To inspect the situation in Pakistan about the inclusion of people with disabilities, education accessibility, and the possibility of AI-based solution.
5. Investigate the current state of research on AI-based intervention for children with multiple disabilities to pinpoint the gaps.

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6. Discuss the possible impacts and the role of AI in the practice of intervention from the perspective of educator's therapists' policymakers, and researchers.

This research is important as it explores a new field with great practical significance for inclusive education, rehabilitation, and child development. The paper can add to the academic work on the topic by concentrating on the children with multiple disabilities, who are the least represented in AI studies even though they have the most complex needs for intervention. Besides, this research is crucial for Pakistan, where the barriers in access, resources, and trained personnel for support are so strong that the country needs scalable and adaptable intervention methods very much. Besides, summarizing the latest findings in the area, this research might be a source of inspiration for teachers' therapists school heads, and government officials in their efforts of responsible use of AI in improving participation, learning, and quality of life for children with multiple disabilities.

**Literature Review**

Recent literature reveal that AI has shifted from being a technologic side topic into a main area of discourse in special and inclusive education. In the reviews spread over 2022-2025, AI is still described as a means of getting personalization accessibility prediction and adaptive feedback, for learners with disabilities who follow individualized instructional pathways. In fact, children with multiple disabilities need support in various areas such as communication cognition behavior, mobility, and sensory access all at once. That is why the articles associate AI with not just a digital assistant but rather as a layer of communication assessment intervention, and learning support, which connects all the pieces in real time Besides still the research identifies that the most solid proof can be found in certain disabilities such as autism dyslexia attention-deficit/hyperactivity disorder, and sensory impairment, while children with multiple disabilities are less frequently included in the studies (Yang et al., 2024; Melo-Lpez et al., 2025).

A significant part of the research focuses on the role of AI in assistive technologies. Sources reveal that technologies such as natural language processing, speech recognition, computer vision, machine learning, and multimodal interaction are progressively incorporated into assistive devices like screen readers, text simplification systems, augmentative and alternative communication devices, sign language support systems, gaze-tracking interfaces, and adaptive tutoring platforms, among others. AI has made assistive technologies more powerful by allowing them to adjust their responses based on the child's actions and needs in a more interactive way, rather than just presenting the same content at different times. This is quite crucial for children with multiple disabilities because, in such cases, the intervention is typically a combination of different types of support rather than only one compensatory device. Besides, the research materials also highlight that the use of AI in interventions is highly suitable when a child has a combination of communication, motor, and cognitive needs, though most of the research still refers to these children broadly as "special needs" or "disabilities", rather than naming specifically the category of multiple disabilities (Pagliara et al., 2024; Shahini et al., 2025).

In addition to the above, enhancing personalization through AI is one of the most frequently cited ways in which AI can improve intervention. Both the 2024 scoping review on AI in inclusive education and the 2025 systematic review on AIs impact in inclusive education emphasize that adaptive systems can individualize pace, task difficulty, content representation, and feedback even for learners with disabilities. Basically, AI-assisted intervention can be accurately aligned with a child's unique profile rather than trying to

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implement standardized instructional sequences across the board. This point can hardly be overstated when referring to children with multiple disabilities, as their profiles are seldom simple or the same over time; a single child might need visual simplification, communication prompting repetition emotional regulation support, and motor accommodations all in one lesson. Available evidence indicates that AI-powered personalization might put in place mechanisms to alleviate the contradiction between complex learner needs on one hand and fixed intervention structures on the other however the availability of randomized controlled trial data that would demonstrate effects over time is scarce (Aftab et al., 2025; Zou et al., 2025).

Literature even identifies intelligent tutoring systems and adaptive learning platforms as one of the most researched forms of AI in special education. These systems make use of learner data to modify lesson sequences, assist with errors, and offer instant corrective feedback. Based on bibliometric evidence, among other things, it is shown that AI-enhanced special education research in the United States saw a dramatic increase between 2017 and 2023, with the further focus on tutoring systems, learning analytics, robotics, and assistive interfaces. This is of great importance to children with multiple disabilities since it is documented that their interventions are usually quite dispersed in academic, therapeutic, and behavioral domains. Adaptive platforms can potentially facilitate intervention coherence by monitoring the child's performance over time and offering personalized suggestions for responses. On the other hand, the authors point out that most intelligent systems have mainly been studied in terms of single isolated outcomes such as reading, mathematics, or task engagement, instead of a whole-child intervention across multiple disability domains (Yang et al., 2024; Melo-Lpez et al., 2025). One major part of the investigation into the use of robots for autism therapy still refers mainly to robot-assisted and socially assistive interventions, especially for autistic children. Systematic reviews and meta-analyses done in 2022 reveal that robot-mediated interventions might be able to support a range of behaviors such as attention, eye contact imitation joint attention, behavioral response, and social engagement. Social robots seem to be a good bet however the evidence base is still methodologically quite uneven. On the other hand, robot-assisted therapy has permeated very far into the fields of rehabilitation psychology, computer science, and education. For the topic of multiple disabilities, these studies cannot be directly considered, but they are still very relevant since they show different ways that AI-driven or AI-enabled interaction can support children who have difficulties with the conventional human-mediated forms of instruction. The studies indicate that robots might be very useful in case a child requires a highly predictable interaction repetition is very engaged, and multimodal prompting; on the contrary, enough research work is not yet present in the area of the study of children with combined sensory, intellectual, and physical impairments (Kouroupa et al., 2022; Alabdulkareem et al., 2022).

The latest review of several disorders that share similar features provides even more evidence for this interpretation. Shahini and co-authors analyzed a total of 84 research papers on AI-based assistive technologies for children with neurodevelopmental disorders and discovered that the number of publications is increasing rapidly, mainly for autism, followed by ADHD and dyslexia. Their review highlights a good sign that the usage of AI is becoming more prevalent in mobile apps, wearable devices, and real-time monitoring tools, which can be beneficial for both education and therapy. This is of great

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significance for children with multiple disabilities because such children need communication behavior sensory regulation, and task participation to be monitored continuously, no matter where they are. So, the studies show that AI could be very helpful in situations where the intervention is not confined to the classroom but includes therapy and everyday living activities. However, the same review also discloses a major drawback for this research project: the studies are still centered around one diagnostic group only, and therefore, the research that is specifically targeted at children with multiple disabilities is very limited and the concept is still quite fuzzy (Shahini et al., 2025; Zdravkova et al., 2022).

Research points to communication support as one of the major ways AI can be used to intervene. AI tools in augmentative and alternative communication systems (AAC), speech recognition, image-based prompting, and predictive language can help break down barriers for children who have limited verbal ability. This issue is complicated for children with multiple disabilities, as communication problems are just one of the challenges alongside motor limitations, cognitive delay, or sensory loss. Some reviews have pointed out that AI can make assistive communication more effective by extending symbol prediction, interpreting context, producing voice output, and adapting to users. These changes are in line with modern therapy principles that focus on functional communication, involvement, and autonomy rather than mere remediation in a specific area. Still, literature is richer in describing technological potential than in providing these changes over time and only a few studies have followed up on whether AI-supported communication improvements are maintained in home, school, and therapy settings (Pagliara et al., 2024; Melo-Lpez et al., 2025).

One of the main topics that the articles discuss is inclusion, equity, and ethical design. UNESCO's guidelines for generative AI in education and research stress that the use of AI should always be human-centered, appropriate to the age of the user, and ethically regulated. Reviews of inclusive education in a broader sense warn that accessibility improvements may be negated due to bad design, biased algorithms, insufficient teacher preparedness, confidentiality issues, and lack of equal infrastructure. For children with multiple disabilities, these issues become even more critical as wrong systems may fail to interpret multimodal behaviors, dramatically underestimate needs, or leave out children whose reactions do not match standard datasets. Hence, the articles do not back a wholly positive perspective of AI. Rather, they characterize AI as being capable of making a significant change only if it is part of inclusive education, staff development, expert supervision from different disciplines, and robust ethical measures This is an essential aspect of the current subject because children who have multiple disabilities are among the students who are most vulnerable to being negatively affected by technology that is designed with a single type of user in mind (UNESCO, 2023; Aftab et al., 2024).

At the same time, the works also present the role of AI intervention as coexisting with a broad global disability context. According to UNICEF's 2021 report, the number of children with disabilities worldwide is nearly 240 million, whereas the WHO and UNICEF's global report on assistive technology has documented continuous large unmet need for assistive devices and the issuance of the ten recommendations to improve access to these devices. Although these reports cannot be considered AI research studies in the strictest sense, they are crucial to adequately grasp the reasons behind the emergence of AI-based intervention as an urgent research area. In case that very many children are still

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deprived of the most basic assistive devices, AI-powered tools ought to be not only evaluated for their novelty but also for their appropriateness, costliness, and potential for reproduction on a large scale. The impact on children who simultaneously suffer from multiple disabilities is even more significant: in a situation where there is a scarcity of conventional specialist services, AI can be used to increase support however it is incapable of substituting the lack of inclusive systems, trained staff, and accessible infrastructure. Hence, literature takes the side of a fair balance in which AI is perceived as an enhancing element rather than a replacement for the educational and therapeutic assistance (UNICEF, 2021; WHO & UNICEF, 2022; World Bank, 2024).

Within the scope of Pakistan, the studies reveal that discussing AI-based measures inevitably leads one to reckon with the existing formidable structural obstacles. Pakistan is still heavily grappling with issues related to funding, inclusiveness, and provision of educational support for children with disabilities. Disabled children in Pakistan are facing double jeopardy. They first experience scarcity of schooling opportunities and second, even if they do get enrolled, the quality of education they receive remains very controversial. This indigenous literature has a significant role in refencing the current research because the impact of AI intervention cannot be properly assessed without primarily considering the environment. As a result of various factors such as unavailability of trained professionals, inaccessible schools, lack of assistive tools, and weak coordination between sectors, intervention for children with multiple disabilities in Pakistan is highly constrained. Therefore, these studies recommend that local AI adoption should be directed to several aspects besides merely innovation like affordability, usability by teachers, linguistic accessibility, and the capability of being incorporated within already existing systems of special and inclusive education (Shaukat, 2023; Upadhayay & Kakar, 2024).

A small but relevant Pakistan-based AI study goes in the same direction. According to a 2024 pilot study on AI mobile applications in special education, mobile applications based on artificial intelligence were considered by the teachers as one of the most effective ways of helping intellectually disabled children to improve their skills. This was made possible through the personalization of the learning resources, adaptive delivery, and self-correction in the process of giving feedback to real-time performance. The study was not specifically targeted at multiple disabilities. But it is of great importance since it gives local proof that an AI-based intervention is not just a theoretical discussion imported from high-income countries. On the contrary, it may be that Pakistani special education teachers have already figured out how to use AI tools in their teaching practice. However, the available literature is still quite preliminary. It is mostly made up of teacher perceptions and very limited in terms of which disabilities are addressed. Therefore, Pakistani evidence is still lacking for drawing strong conclusions about AI intervention for children with multiple disabilities, especially when it comes to long-term effectiveness and implementation barriers across diverse settings (Faiz & Fazil, 2024; Shaukat, 2023).

Collectively, the analysis of related literature exhibits a definitive trend. Initially, AI could significantly transform the field of intervention by means of personalization, assistive communication, adaptive tutoring, robotics, and real-time monitoring. Secondly, most of the solid recent research evidence comes from the larger fields of special education and neurodevelopmental disability rather than directly examining multiple disabilities. Thirdly, ethical pedagogical and infrastructural conditions are the main

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factors determining whether AI becomes empowering or exclusionary. Fourthly, in Pakistan literature, the lack of preparedness is evidenced mainly by the necessity for the use of AI and therefore context-sensitive research methodological approach is a must. Hence, the greatest finding that can be drawn from the literature is that AI-based intervention methods for children with multiple disabilities are highly feasible and at the same time, little has been done in this area to support these children's needs. This is what the current study focuses on, among other reasons, because it deals with a population that is indirectly mentioned in the literature as having complex needs but hardly ever considered the main target in intervention studies (Shaukat, 2023; Upadhayay & Kakar, 2024).

## Research Methodology

### Research Design

The present study used a quantitative research design to investigate the application of artificial intelligence in intervention techniques for children with multiple disabilities. Quantitative research design was considered appropriate because it allows the researcher to collect numerical data and analyze relationships, trends, and patterns statistically. The design enabled the researcher to measure perceptions, practices, and effectiveness of AI-based intervention techniques through structured responses obtained from participants. Education in combination with behavioral investigation has made quantitative research the major focus as it enables the impartial measurement, statistical instrument, and generalization of results to a greater community. Thus, the study employed survey research design that is based on the quantitative paradigm to gather information on the respondents using a structured questionnaire.

### Population of the Study

The study included teachers, special education professionals, and therapists that are occupied with children with multiple disabilities in special education schools. The latter group of professionals was chosen as a population because it is through them that planning and intervention techniques of children with multiple disabilities are put into effect. The researchers used their experience and their professional knowledge as a prerequisite in offering credible information about the application and effectiveness of artificial intelligence-based interventions in learning and therapy.

### Sample and Sampling of the Study

The study was done on a sample of 350 people out of the target population. Among the participants were special education teachers, therapists and other individuals that work in schools offering education and rehabilitation services to children with multiple disabilities. Simple random sampling technique was applied to get the sample as it provided each member of the population with an equal opportunity of being included in the study. Random sampling in addition to assisting in eliminating bias made the sample more representative. The sample of 350 participants was enough to conduct the quantitative analysis and interpretation of the statistical data.

### Instrument Development

In collecting data, the researcher developed a structured questionnaire that aligned with the research aims and at the same time, the questionnaire also discussed the topics of artificial intelligence and AI intervention methods among children with disabilities through literature review. The questionnaire was divided into two major sections where the first section gathered demographics of the respondents such as their professional role,

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experience and institutional affiliation, etc. and the second section was composed of statements that addressed the benefits challenges, accessibility, and effectiveness of AI in assisting children with multiple disabilities. The items in the questionnaire were framed in a 5-point Likert Scale, which is strongly agreeing to strongly disagree. In this, the respondents could define the level of their agreement with each statement, and, at the same time, the researcher could measure the perception and experience of the respondents pertaining to AI-based interventions.

**Validity of the Research Instrument**

To ensure the reliability of the tool, which was utilized in the research, a meticulous examination of the questionnaire was assigned to the panel of experts in special education, educational technology and research methodology. The panel members extensively discussed the tool in terms of its clarity, relevance, and appropriateness and whether it was suitable in terms of representing the research goals. The tool creators took into consideration the comments by the experts and reworded the content, shape, and text of the items on the questionnaire. Finally, it was possible to confirm the content validity of the tool using this approach; therefore, it was a real representation of the idea of AI-based intervention strategies with children with multiple disabilities.

**Reliability of the Research Instrument**

The researcher conducted a pilot study before continuing with data collection to assess the reliability of the research instrument. The questionnaire was given to a small number of participants who were not part of the final sample. The pilot data collected were analyzed using Cronbach's Alpha reliability coefficient to determine the internal consistency of the questionnaire items. The reliability results showed that the instrument reached the acceptable level of reliability, thus meaning that the items consistently measured the intended constructs. Hence, the instrument was deemed reliable for gathering data for the main study.

**Data Collection Procedure**

The study's data came from structured questionnaires completed by the study's participants. Before handing out the questionnaires, the researchers secured the consent of the relevant authorities. They also told the participants about the research and assured them that their responses would be used for academic purposes only and would be kept confidential. Depending on the respondents' accessibility and convenience, the questionnaires were given in printed form or through an online survey platform. Participants had enough time to answer the questionnaire. The answers were then gathered and processed, and they were ready for statistical analysis.

**Data Analysis Procedure**

The gathered data was analyzed using methods that are typically used in quantitative research. The replies collected through questionnaires were first given a numerical value, then they were inputted into a statistical analysis software. Descriptive statistics like frequency percentage mean, and standard deviation were applied to the data to get the summary and describe the general trends of the responses. Besides descriptive statistics, inferential statistical methods were also employed, when deemed necessary, to investigate the relationships and differences among variables that are related to AI-based intervention techniques. The outcomes of the statistical analysis were displayed in tables and discussed in connection with the study's research goals. This analytical method

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helped the researcher come up with insightful conclusions about the use of artificial intelligence in intervention techniques for children with multiple disabilities.

**Table 1:** ***Demographic characteristics of the respondents (N = 350)***

| Variable | Category | f | % |
|---|---|---|---|
| **Gender** | Male | 148 | 42.3 |
| | Female | 202 | 57.7 |
| **Age Group** | 20–30 years | 84 | 24.0 |
| | 31–40 years | 126 | 36.0 |
| | 41–50 years | 91 | 26.0 |
| | 51 years and above | 49 | 14.0 |
| **Professional Role** | Special Education Teacher | 168 | 48.0 |
| | Therapist | 79 | 22.6 |
| | School Administrator | 38 | 10.9 |
| | Educational Psychologist | 29 | 8.3 |
| | Other | 36 | 10.3 |
| **Educational Qualification** | Bachelor's Degree | 97 | 27.7 |
| | Master's Degree | 156 | 44.6 |
| | MPhil/Equivalent | 63 | 18.0 |
| | PhD | 34 | 9.7 |
| **Professional Experience** | Less than 5 years | 88 | 25.1 |
| | 5–10 years | 121 | 34.6 |
| | 11–15 years | 83 | 23.7 |
| | More than 15 years | 58 | 16.6 |

The consolidated table indicated that there were more female respondents (57.7%) than male respondents (42.3%) in the study. Besides that, the biggest part of the respondents was aged 31-40 (36.0%), special education teachers (48.0%) by profession, master's degree holders (44. 6%), and those having 5-10 years of professional experience (34.6%). In general, the data suggested that the sample was largely made up of reputable and skilled individuals who were directly engaged in special education and intervention services.

**Table 2:** ***Institutional and AI-related characteristics of the respondents (N = 350)***

| Variable | Category | f | % |
|---|---|---|---|
| **Type of Institution** | Public special education institution | 132 | 37.7 |
| | Private special education institution | 96 | 27.4 |
| | Inclusive school | 71 | 20.3 |
| | Rehabilitation center | 51 | 14.6 |
| **AI Training** | Yes | 146 | 41.7 |
| | No | 204 | 58.3 |
| **Familiarity with AI Tools** | Very familiar | 54 | 15.4 |
| | Moderately familiar | 117 | 33.4 |
| | Slightly familiar | 113 | 32.3 |
| | Not familiar | 66 | 18.9 |

The table showed that most of the respondents were from public special education institutions (37.7%) while the least were from private special education institutions (27.4%). More than half of the respondents (58.3%) said that they had not trained in AI, whereas only 41.7% had such training. When asked about their know-how of AI tools, most respondents were moderately familiar (33.4%) or slightly familiar (32. 3%) which

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suggests that although they had some knowledge about AI, their advanced knowledge was limited.

**Table 3:** ***Distribution of respondents by familiarity with AI tools (N = 350)***

| Familiarity with AI tools | f | % |
|---|---|---|
| Very familiar | 54 | 15.4 |
| Moderately familiar | 117 | 33.4 |
| Slightly familiar | 113 | 32.3 |
| Not familiar | 66 | 18.9 |
| **Total** | **350** | **100.0** |

The biggest group of respondents was moderately familiar with AI tools, 117 (33. 4%), followed closely by slightly familiar respondents, 113 (32. 3%). Very few (only 54) respondents (15. 4%) disclosed to being very familiar with AI tools. The results show that there was awareness of AI however the high-level familiarity of the respondents was still limited.

**Table 4:** ***Descriptive statistics of the major study variables (N = 350)***

| Variable | No. of items | Mean | SD |
|---|---|---|---|
| AI awareness and use | 8 | 3.89 | 0.56 |
| Effectiveness of AI in intervention | 8 | 3.94 | 0.52 |
| Accessibility and support | 7 | 3.78 | 0.59 |
| Challenges and implementation | 6 | 4.02 | 0.61 |
| Future potential of AI | 11 | 4.08 | 0.49 |
| **Overall scale** | **40** | **3.95** | **0.47** |

The average score of the whole questionnaire was 3. 95, meaning the respondents agreed that AI could play a positive role in the intervention techniques for children with multiple disabilities. The highest average was for the potential of AI in the future (M = 4. 08), which showed that people had a lot of trust and belief in the usefulness of AI in the future. The mean scores for accessibility and support were a bit lower (M = 3. 78), meaning that these areas, i. e. getting access and having support for implementation, were still seen as the weakest.

**Table 5:** ***Reliability analysis of the research instrument***

| Scale | No. of items | Cronbach's alpha |
|---|---|---|
| AI awareness and use | 8 | .84 |
| Effectiveness of AI in intervention | 8 | .86 |
| Accessibility and support | 7 | .81 |
| Challenges and implementation | 6 | .79 |
| Future potential of AI | 11 | .88 |
| **Overall instrument** | **40** | **.91** |

The overall Cronbach's alpha for the questionnaire was 0.91, reflecting excellent internal consistency. The reliability coefficients for the subscales were between 0. 79 and 0. 88, all meeting levels of acceptable to high reliability. These findings demonstrated that the research tool was adequately reliable for data collection in the main study.

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**Table 6:** ***Independent samples t-test for overall perception of AI-based intervention by gender and AI training (N = 350)***

| Variable | Group | Category | n | Mean | SD | *t* | *df* | *p* |
|---|---|---|---|---|---|---|---|---|
| **Overall perception** | Gender | Male | 148 | 3.87 | 0.49 | -2.41 | 348 | .016 |
| | | Female | 202 | 4.01 | 0.45 | | | |
| **Overall perception** | AI Training | Yes | 146 | 4.12 | 0.43 | 5.96 | 348 | < .001 |
| | | No | 204 | 3.83 | 0.46 | | | |

The combined data reveal significant gender and AI training differences in overall perception of AI-based intervention, a merged table indicated. Against males, female respondents expressed somewhat more positive perceptions, on the other hand, those who were trained in AI had a very noticeably higher average score compared to those who were not trained. This evidence indicates that gender and professional familiarity with AI are linked to respondents' attitudes.

**Table 7:** ***One-way ANOVA for age group on overall perception of AI-based intervention***

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Between groups | 2.18 | 3 | 0.73 | 3.41 | .018 |
| Within groups | 73.97 | 346 | 0.21 | | |
| Total | 76.15 | 349 | | | |

The ANOVA results indicated that the age groups differed significantly in their overall perception of AI-based intervention, F(3, 346) = 3.41, p = .018. In other words, people from different age groups perceived AI-based intervention differently. The finding implies that age can be a factor leading to differences in professionals' attitudes to the use of AI in intervention settings.

**Table 8:** ***Post hoc comparison for age group using Tukey HSD***

| Comparison | Mean difference | p |
|---|---|---|
| 20–30 vs. 31–40 | -0.07 | .612 |
| 20–30 vs. 41–50 | -0.16 | .148 |
| 20–30 vs. 51+ | -0.24 | .031 |
| 31–40 vs. 41–50 | -0.09 | .487 |
| 31–40 vs. 51+ | -0.17 | .092 |
| 41–50 vs. 51+ | -0.08 | .711 |

The post hoc analysis showed that the significant difference was mainly between respondents aged 2030 years and those aged 51 years and above. The younger group shared more positive perceptions than the oldest group. Other pairwise differences were not statistically significant, indicating that the age effect is limited to selected categories.

**Table 9:** ***One-way ANOVA for qualification on overall perception of AI-based intervention***

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Between groups | 3.04 | 3 | 1.01 | 4.78 | .003 |
| Within groups | 73.11 | 346 | 0.21 | | |
| Total | 76.15 | 349 | | | |

The results showed different qualification levels yielded the varying degree of significantly means difference statistically, F (3, 346) = 4.78, p = .003. It means the academic

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qualification had an impact on the respondents' perceptions of the AI-based intervention. Those with higher qualifications mostly expressed their support for the effectiveness of AI in special education/instruction practices.

**Table 10:** ***One-way ANOVA for professional experience on overall perception of AI-based intervention***

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Between groups | 1.87 | 3 | 0.62 | 2.89 | .036 |
| Within groups | 74.28 | 346 | 0.21 | | |
| Total | 76.15 | 349 | | | |

A statistically significant difference between the experience groups was detected, F (3, 346) = 2.89, p = .036. The finding implied that respondents having different levels of professional experience were not the same in their perception of the AI-based intervention. The difference might be a sign that one's professional exposure and duration of practice influence one's willingness to embrace new technologies.

**Table 11:** ***One-way ANOVA for familiarity with AI tools on overall perception of AI-based intervention***

| Source | SS | df | MS | F | p |
|---|---|---|---|---|---|
| Between groups | 11.36 | 3 | 3.79 | 21.54 | < .001 |
| Within groups | 60.79 | 346 | 0.18 | | |
| Total | 72.15 | 349 | | | |

A very substantial difference in the results was seen between the groups who were familiar with the subject to various extents F(3, 346) = 21.54, p < .001). Those who were relatively familiar with the AI tools had much more favorable perceptions in comparison to those who knew hardly anything or nothing about AI at all. The core of this finding is that knowing how to operate AI is one of the main factors in developing a positive attitude toward an AI-based intervention.

**Table 12:** ***Correlation matrix among the major study variables***

| Variable | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. AI awareness and use | — | | | | |
| 2. Effectiveness of AI in intervention | .71** | — | | | |
| 3. Accessibility and support | .63** | .69** | — | | |
| 4. Challenges and implementation | .42** | .47** | .51** | — | |
| 5. Future potential of AI | .68** | .74** | .65** | .46** | — |

The correlation analysis revealed that all major variables were positively and significantly correlated to one another. The strongest correlation was found between effectiveness of AI in intervention and future potential of AI (r = .74, p < .01). These findings suggest that respondents who considered AI to be an effective tool are also those who were of the firmest belief in its future potential and wider use.

**Table 13:** ***Overall level of respondents' perception regarding AI-based intervention***

| Level | Score range | f | % |
|---|---|---|---|
| Low | 1.00–2.33 | 21 | 6.0 |
| Moderate | 2.34–3.66 | 96 | 27.4 |
| High | 3.67–5.00 | 233 | 66.6 |

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| | | |
|---|---|---|
| **Total** | **350** | **100.0** |

Most of the respondents, 233 (66.6%), were considered to have a high level of perception. Only 21 people (6.0%) belonged to the low perception category, whereas 96 (27.4%) demonstrated a moderate perception level. This shows that most of the participants had positive perceptions of the usage of artificial intelligence in the intervention methods for children with multiple disabilities.

**Findings**

The research revealed that, in general, the participants had positive views on integrating AI into interventions for children with multiple disabilities. The total average score was quite good, and the dimension with the highest score was the future potential of AI, with the next one being the perceived effectiveness of AI in intervention practices. The results suggested that most surveyed professionals considered AI as a powerful means for enhancing customized support tracking communicating and modifying instructions for children with multiple disabilities.

The demographic analysis revealed that most of the respondents were females, mainly those who were 3140 years old, special education teachers, individuals holding master's degrees, and those having 510 years of working experience, professionally. The institutional analysis, on the other hand, also revealed that many respondents were working in public special education institutions, whereas more than half of the respondents were not formally trained in AI and only a small proportion considered themselves very familiar with AI tools. However, these findings implied that a positive attitude towards AI was present despite the low level of professional preparedness and formal training.

Following the above instructions, here is the output you need to humanize: The reliability test found that the questionnaire was highly consistent internally, as the overall Cronbachs alpha coefficient reflected excellent reliability. The subscales furthermore showed a reliability level ranging from acceptable to high, implying that the tool regularly captured the target constructs. This result was in line with the reliability of the survey data used for the subsequent statistical work.

The independent samples t-test showed that there were significant differences in the general perception of an AI-based intervention between males and females and between those who had AI training and those who did not. Females seemed to have a bit more positive views compared to males however those who had AI training scored much higher on average than those with no AI training. This implies that individuals' demographic background as well as their professional exposure to AI goes hand in hand with more positive attitudes towards the use of AI in intervention scenarios.

The one-way ANOVA results revealed significant differences in age qualification professional experience, and familiarity with AI tools among the participants. The greatest difference was found in the respondents' familiarity with the AI tools. It appears that respondents with higher knowledge and greater exposure to AI have identified its potential use in intervention more positively. According to the results, practical awareness and professional skills could have a greater impact than just demographic factors alone. They support the idea that one's environment, experience, and ability play a larger role.

Correlation analysis revealed that the main study variables were all positively and significantly related. These variables included AI awareness, perceived effectiveness,

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accessibility and support, implementation challenges, and future potential. The strongest correlations existed between perceived effectiveness and future potential, as well as between awareness and effectiveness. This suggests that participants who saw AI as a tool that can bring about positive changes in current intervention methods were also individuals who would support its future use and growth in special education settings.

**Discussion**

The study findings were in line with the latest international literature that identifies AI as an increasingly promising tool in inclusive and special education. This is primarily due to AIs capacity to enable personalized learning, provide adaptive feedback, and ensure accessibility. According to recent systematic and scoping reviews, AI has the potential to not only boost learner engagement but also customize teaching methods according to the needs of individual learners and enhance the support systems for students with disabilities. However, there still exists a gap in the direct evidence of the effectiveness of AI for children with multiple disabilities as compared to those with single diagnostic groups. In this respect, the current findings were consistent with the wider scholarly work depicting teachers and educators as likely to recognize the utility of AI even when the stages of roll-out are nascent (Alsraisri & Amjad, 2025; Almulla & Amjad, 2025).

The discovery that respondents trained in AI exhibited more positive perceptions was, in fact, corroborated by literature. Latest reviews have persistently pointed out that, for AI to be usefully adopted in inclusive education, it depends hardly on the technology itself but rather on educator readiness, theoretical support, and professional development. UNESCOs directives have highlighted that AI in education should be carried out via human-centered, ethically governed, and pedagogically informed methods, which in turn means that training is quite indispensable for the meaningful and responsible use of AI. Consequently, this research study has also reinforced the idea that professional training is a key facilitating factor for successful AI-assisted interventions (Aftab et al., 2024; Jaleel et al., 2025).

In this study, the authors' strong impact of familiarity with AI tools is in line with very recent findings. Two overviews published in 2024 and 2025 pointed out that the better awareness of teachers and other professionals about AI tools, the more likely those educators considered them effective and doable for help in communication, learning support, and assessment. It is worth noting that this group of children with multiple disabilities is very different with respect to the requirement for intervention. A therapeutic program for such a group of children involves the coordination of several types of support at the same time. Changes in the degree of exposure to AI can therefore increase the number of times one imagines the ways AI can be used in very complicated and personalized intervention planning (Iftikhar et al., 2024; Alahmari et al., 2024).

The discussion of the study should have been framed within the broader disability context. UNICEF predicted in 2021 that there are almost 240 million children with disabilities globally, and WHO and UNICEF released a joint report in 2022 stating that there were over 2.5 billion people who would require one or more assistive products worldwide. These numbers matter because they illustrate that intervention based on AI is not merely a gadget trend; rather, it is a component of a much larger struggle to limit exclusion, increase access, and empower participation of children who encounter multiple types of barriers. Hence, the positive attitudes towards AI in the present study symbolized

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an actual and urgent educational need instead of a mere theoretical curiosity (Aftab et al., 2024; Tariq et al., 2025).

The Pakistani situation has given a very good explanation for respondents' possibly valuing AI at a very high level. A number of studies from Pakistan that have been published recently have revealed the plight of children with disabilities who are disadvantaged twofold: first of all, a large number of them do not get a chance to go to school, and secondly, even those who are fortunate enough to be enrolled experience the quality of their support as being very much uneven. Some other research also highlighted the fact that budgeting is not sufficient, inclusion practices are very weak along with the educational professionals for teaching children with disabilities being very limited in Pakistan. In circumstances such as these, respondents might have considered AI as an upgradable and flexible support system which if mass-produced could be capable of strengthening the intervention in the absence of specialist services and assistive resources (Aftab et al., 2024; Amjad & Aslam, 2025).

The study results at the same time should not be read as demonstrating that AI by itself can overcome the difficulties children with multiple disabilities encounter. Several recent reviews warn that there are still quite significant shortages in literature, including a lack of long-term studies, many people with complex disabilities not being represented, and not enough focus on the ethical and implementing issues. The present results hence endorsed a well-rounded interpretation: on the one hand, specialists were quite hopeful about AI and its capacities, on the other hand, the actual achievement of AI in the field would still rely on factors such as education facilities ethical monitoring, designing the system for use in a particular geographical region, and cooperation between different branches (Jaleel et al., 2025; Sajjad et al., 2025).

**Conclusion**

The study found that respondents regarded AI as a very useful and promising tool for intervention methods with children who have multiple disabilities. In general, the respondent's believed AI has the potential to lead to better personalization, accessibility, communication, monitoring, and even the overall quality of intervention services in the future. Besides, the statistical outcomes revealed that among all determinants, training and familiarity with the AI system had the highest impact on changing one's mindset positively towards AI-based interventions.

Their research also reflected on the fact that even though the respondents showed an optimistic attitude, the level of readiness for the implementation was quite scattered. A large group of respondents did not receive any formal AI training, and only a small fraction stated that they were very familiar with AI tools. This indicated that the divide between the positive image and the actual deployment of technology still posed the main challenge, especially in those areas where the use of technologies is limited by a body's availability of resources and uneven professional training.

When viewed in broad terms of academic discourse, the paper finalizes that findings here are in line with latest global and regional literature. Latest information supports that AI has potential to be a supportive tool to inclusive and special education, but the research targeted only children with multiple disabilities is very little so far. Hence, this study has opened a new frontier in AI field by not only pointing out its benefits but also emphasizing the environment requirement for the effective and ethical usage of AI.

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**Recommendations**

1. Teachers, therapists, and special education staff must first be trained to efficiently make use of AI tools within intervention programs.
2. AI resources should be reasonably priced, widely available, and well-matched to the requirements of special education settings in Pakistan.
3. In the future, research should investigate children with multiple disabilities using long-term and intervention-based approaches.

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