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IMPACT OF SCHOOL READINESS INTERVENTION ON SCHOOL SKILLS OF CHILDREN WITH AUTISM SPECTRUM DISORDER

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Abstract
This research aimed to evaluate the efficacy of school readiness intervention designed to prepare children with autism spectrum disorder (ASD) for school readiness. Using a pre-post research design, a purposive sampling technique was used to select 31 children aged 6 to 9 years diagnosed with ASD. Assessments were carried out using the childhood autism rating scale and school skills assessment protocol taken from the assessment of functional living skills at baseline and post intervention level. The findings at baseline and post intervention levels were compared and pre-post mean differences using paired sample t test were analyzed. The results of the current study showed that school readiness intervention significantly improved specific school skills of children with autism spectrum disorder. It is concluded that specific school readiness interventions targeting specific school skills are useful for the children with ASD to improve their school readiness.

Keywords: Autism spectrum disorder, School readiness intervention, CARS, School skills

Introduction
Autism spectrum disorder (ASD) is regarded as a persistent neurological disorder that produces difficulties in various domains of life such as impairments in verbal and non-verbal communication, social interaction, and restricted range of activities. Like other neurodevelopmental disorders, several executive functions deficits are associated with ASD (Fatima, 2019a; 2019b). It is considered a life-long disorder that results in repetitive behaviors in children (Christensen et al., 2020). Transitioning into formal school becomes difficult for children with ASD due to their social and communication difficulties. Environmental influences have a significant role in the development and progression of the disorder. Children suffering from autism spectrum disorder go through various problems in their educational lives. Every child may experience different types of issues, but some difficulties are common to almost all of the children with ASD. These difficulties include complications in social interaction hence resulting in social anxiety, majorly in adolescence years. School readiness interventions along with sensory and motor interventions are effective for treating children with autism spectrum disorder. The challenges in sensory and motor processing contribute to the problems in social interaction, and adaptive and repetitive behaviors. The interventions target overall functioning by reducing the challenges and improving the quality of life (Cascio et al., 2008).

In response to the increasing rate of ASD across the globe, educators, therapists, and instructors are exploring different ways to treat children with autism spectrum disorder. One such method is introducing children with autism spectrum disorder to school readiness interventions. These interventions aim to reduce the challenges faced by children and improve their quality of life. Moreover, interventions such as school readiness enable the child to transition into formal school and it prepares the child to understand social cues, take part in activities along with their peers, and follow routines. Neurocognitive skill deficits are commonly observed in children with ASD (e.g., Fatima, 2019a). Evidence from studies conducted in Western countries suggests that cognitive abilities, social skills, and communication can be improved after the application of such interventions on children with

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ASD. Developmental gaps can be reduced, and long-term success rates of improved self-confidence and independence can be observed (Hume et al., 2017).

Prior Research

Importance of School Readiness Intervention

School readiness interventions are crucial for children with autism spectrum disorder. These interventions provide children with important skills that enable them to thrive in educational settings. School readiness interventions mainly impact areas such as responsive behavior, emotional regulation, communication, and social interactions. Children with autism spectrum disorder generally lack in these areas. Children often require the necessary support to succeed in these areas and to participate in different activities with their peers. Previous research has reported that the use of necessary school readiness interventions on children with autism spectrum disorder enhanced the probability of significantly positive outcomes because such interventions focus specifically on challenging domains in children with ASD (Hume et al., 2017). These interventions assist children with ASD to perform better and to adjust to challenging school routines, participate in peer group activities, and nurture individuality and self-assurance. Functional and effective school readiness programs help educators to create inclusive environments for children with ASD that help them thrive in different environments. Moreover, such interventions aid in minimizing the social and routine challenges associated with developmental disorders such as autism spectrum disorder (e.g., Zwaigenbaum et al., 2015).

Importantly, early school readiness interventions have a strong impact on children with ASD when initiated in preschool years. The brain development in a child usually occurs in preschool years hence these years are considered crucial years for learning life skills among children. Immense improvements are observed in children with ASD when school readiness interventions are initiated in preschool years. The improvements are observed in various domains such as social, emotional, and cognitive domains. Likewise, previous research has revealed that children who undergo early interventions generally exhibit better communication and interactions. As well as they also show less maladaptive behaviors and enhanced adaptive behaviors which enables them to effectively transition into proper schooling (Zwaigenbaum et al., 2015). Moreover, the application of early school readiness interventions helps organize children with autism spectrum disorder to adapt to organized routines and to perform better in the classroom environment. Parental involvement plays an important role in early interventions. Long-term effects are obtained after the application of early school readiness interventions (Hume et al., 2017).

Children with autism spectrum disorder often have a critical period during which major development in the brain takes place. Researchers have been significantly studying the critical period and the outcomes of these studies suggest that increased chances of neuroplasticity in the early years of children with autism spectrum disorder enhance the efficacy of early interventions. The critical period refers to duration of development when the brain is captive of adaptability. Hence, giving children with autism spectrum disorder necessary interventions in this period enables them to bring significant positive developmental changes. Entwisle and Alexander put forward theories on the importance of the critical period in general children population. They highlight the positive impact of providing structured educational environments in the critical period enabling children to perform better and to progress more. These theories and research have provided a baseline for theorists working on autism spectrum disorder to focus mainly on the critical period of childhood. Adaptive functioning, social communication, and behavioral regulation are mainly targeted, and these areas can be leveraged in the critical period (Entwisle & Alexander, 1989). Dawson and colleagues in 2010 put forward that significant improvements are

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observed when early interventions like the early start Denver model are applied. Progress has been seen in areas such as communication, adaptive behaviors, and IQ (Dawson et al., 2010).

Early interventions play an important role in reducing developmental difficulties in children with autism spectrum disorder. The difficulties are generally seen in areas such as social interactions and communications. Early interventions like school readiness interventions enable children with autism to work independently and have a better quality of life. Many theorists and researchers have worked on children with ASD providing them with school readiness interventions. Such as Godishala and colleagues et al. (2021) provided children with school readiness interventions, behavior therapy, socialization training, language and speech therapy, sensory integration, group therapy, and home-based management. The results were assessed in pre-assessment as well as in post-assessment. The results indicated progress in attention, and concentration, reduced sensory issues, reduced hyperactivity, and improved eye contact. The study findings revealed that early interventions improved synchronized functions of various sensory inputs in children with ASD to help them in adaptive, behavioral, educational, socialization, and activities of daily living.

Other studies have also found that children receiving early intervention treatment as young preschoolers always have better improvements than children receiving intervention treatment as school-aged children (Harris & Handleman, 2000). Few other studies on children with ASD show that early intervention programs improve the developmental functioning and decrease the maladaptive behaviors and severity of symptoms of autism (Vismara & Rogers, 2008).

A systematic review study was carried out consisting of 20 studies based on behavioral cognitive and social aspects to evaluate factors that influence school readiness in children with ASD. All studies were based on participants from preschool to elementary school. The review findings revealed that behavioral interventions improved daily life and cognitive skills in such children (Marsh et al., 2017). Barton and Smith (2019) conducted research on the role of early intervention in children with ASD. The study aimed at improving school readiness in children with ASD. The researchers induced teacher-mediated interventions on the children that were used to integrate evidence-based practices among the children. It was implemented to reduce the academic and skills gaps focusing on the importance of classroom rules and the importance of providing visual and verbal cues to the children. The study findings revealed that such interventions have a positive impact on the children and can have long-term impacts as well if incorporated for a longer period of time.

Based on the literature review, this research was aimed at investigating the impact of the school readiness intervention on school skills of children with ASD. The specific research objective was to assess the effectiveness of the intervention. More specifically, it was hypothesized that school readiness intervention would be effective in improving the school skills of children with ASD.

Method

Research Design

In this study, the researchers used a pre-post intervention research design to investigate the effectiveness of a school readiness intervention on specific school skills of children with ASD.

Sample

The current study started in June 2024 whereas it ended in December 2024. Initially, the total number of participants selected for the conduction of this study was 33. The interventions were implemented on these 33 participants. The interventions were applied in four autism centers. Amongst these 33 participants, one skipped the research due to settling in abroad. Another participant dropped at the 11th week of the research due to personal family issues.

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Hence, the remaining 31 participants received the interventions over 6 months. The participants were children aged 6 to 9 years diagnosed with ASD, recruited from autism centers and clinics through a purposive sampling technique. The pre and post assessments of these participants were made, and the results were concluded. Informed consents were obtained from parents or legal guardians, and permission was taken from administration of autism centers and clinics before the study conduction. Sample demographics have been presented in Table 1.

Table 1

Descriptive Statistics of Demographic Variables of Study Participants (N=31)

Variables	M(SD)	f (%)
Gender		
Boys		23(74.2%)
Girls		8(25.8%)
Age (6-9 years)	6.99(0.96)	
No of siblings		
1		3(9.7%)
2		12(387%)
3		13(41.9%)
4		3(9.7%)
Birth order		
First		15(48.4%)
Middle		13(41.9%)
Last		3(9.7%)
Siblings diagnosed with ASD		
Yes		10(32.3%)
No		21(67.7%)
Father age	42.19(4.17)	
Mother age	39.45(4.18)	
Child live with		
Mother only		10(32.3%)
Both parents		21(67.7%)
Family system		
Joint		19(61.3%)
Nuclear		12(38.7%)

Assessment Measures

The assessment was done by using a demographic sheet, the childhood autism rating scale, and school skills assessment protocol taken from the assessment of functional living skills protocol. After approval from Departmental Advisory Committee of the university, the proper intervention plan for the participants was designed for the 6 month time period. The school readiness intervention was applied for 6 months. Before the intervention, baseline measures were applied to assess the initial school skills of participants. After 6 months of school readiness intervention, assessment on all assessment protocols was conducted again at post intervention level.

Childhood Autism Rating Scale

Assessment modules were used to assess children at pre-assessment level and as well as at post-assessment level. One of the assessment modules was the childhood autism rating scale. The Childhood Autism Rating Scale (Schopler et al., 1988) is designed as a clinical rating

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scale to rate items indicative of ASD after direct observation of the child (Schopler et al., 1988). This scale has been extensively used by many therapists to identify the severity of autism in children across cultures. The total number of items on this scale is fifteen, therefore the children with autism are assessed on 15 criteria. These criteria included sensory responses, body movements, emotional understanding, and communication etc.. The items on the scale are scored from 1 to 4, 1 being normal behavior and 4 being severely abnormal behavior. The total score obtained is classified as mild, moderate, or severe (Schopler et al., 1988). The childhood autism rating scale is widely used because of its simplicity to assess children having the age of 2 years or older. This tool enables therapists, clinicians, and educators to assess children with ASD at different developmental levels and the improvements of treatment interventions. Therefore, in this study, Childhood Autism Rating Scale was administered to evaluate the specific symptoms and severity levels of autism in the participants.

School Skills Assessment-Functional Living Skills

School skills assessment protocol taken from functional living skills was also used to assess participants' maturity levels of school skills at the pre and post assessment levels. The assessment measure provides caregivers and professionals with criterion-referenced information regarding a learner's ability to be an active participant in a variety of skills, routines, and social situations in learning settings. These skills are essential in striving for independent and successful functioning in different types of classrooms, in all spheres of the school related activities, and for interaction with peers, teachers, and school staff. The school skills assessment protocol taken from functional living skills assesses skills that allow a learner to participate in various academic and common social situations all over their education. It also incorporates skills that are essential in a wide range of classroom environments and considers the individual's level of development (e.g. language, behavior, and cognitive abilities). The learner's knowledge of specific skills and the ability to apply them are evaluated in this assessment. Also, the learner's ability to learn skills and participate during individual or group instructions and awareness of the school's social culture are also assessed from this protocol. There are eight skill areas covered in this module. They include classroom mechanics, routines and expectations, meals at school, social skills, technology, common knowledge, core academics, and applied academics.

Procedure

After approval from the Departmental Advisory Committee, the proper intervention plan for the participants was designed for a 6-month time period. Before the intervention, baseline measures were collected to assess the initial school skills of participants as assessed from school skills assessment protocol. The school readiness intervention was applied for 6 months with a total of 10 hours of weekly interventions in 5 sessions per week. These intervention sessions were provided in group sessions with a therapist-to-child ratio of 1:4. In addition, 2 individualized one-hour therapy sessions per week were given to the children who were not performing well in group sessions. The aim of these individualized sessions was to provide therapy to the children who were not performing well in group sessions. It mainly focused on the areas that were hard for the children in group activities. After 6 months of school readiness intervention, post assessment on assessment protocols was conducted again.

Results

At the baseline level before the application of the school readiness interventions, the severity levels of autism and school skills of children were assessed using childhood autism rating scale and school skills assessment. The descriptive statistics at the baseline level of assessment on childhood autism rating scale have been presented in Table 2 and for school skill assessment has been presented in Table 3.

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Table 2
Pre Assessment of the Sample on Childhood Autism Rating Scale (N=31)

Variables	M	SD	Observed range	Potential range
Relating to people	2.37	0.37	2.00-3.00	1-4
Imitation	2.13	0.22	2.00-2.50	1-4
Emotional response	2.34	0.47	1.50-3.00	1-4
Body use	2.48	0.42	2.00-3.00	1-4
Object use	2.14	0.23	2.00-2.50	1-4
Adaptation to change	2.27	0.28	2.00-3.00	1-4
Visual response	2.27	0.36	2.00-3.00	1-4
Listening response	2.39	0.36	2.00-3.00	1-4
Taste, smell, and touch response and use	2.14	0.29	2.00-3.00	1-4
Fear of nervousness	2.21	0.25	2.00-2.50	1-4
Verbal communication	2.26	0.36	2.00-3.00	1-4
Nonverbal communication	2.26	0.34	2.00-3.00	1-4
Activity level	2.27	0.28	2.00-3.00	1-4
Level of consistency of intellectual response	2.14	0.23	2.00-2.50	1-4
General impression	2.61	0.21	2.50-3.00	1-4

A higher score on each assessed domain indicated a higher difficulty level whereas a lower score indicated a lesser difficulty level as assessed from the Childhood Rating Scale. The domain of General Impression had the highest score indicating the highest difficulty level faced by children in this domain. Domains like relating to people, emotional response, and body use had moderate scores indicating moderate problems observed. Whereas, in imitation, lesser scores were observed indicating fewer problems or difficulties faced by children in this domain.

Table 3
Pre Assessment of the Sample on School Skills Assessment Protocol (N=31)

Variables	M	SD	Observed range	Potential range
Classroom mechanics	2.80	0.69	2.00-4.00	0-18
Meals at school	3.29	0.82	2.00-6.75	0-34
Routines & expectations	2.92	0.50	2.50-4.50	0-54
Social skills	3.49	0.68	2.75-5.50	0-35
Technology	2.78	0.63	2.00-4.00	0-39
Common knowledge	4.17	0.68	3.00-5.50	0-51
Core academics	3.89	0.78	2.75-6.25	0-51
Applied academics	0.46	0.86	0.00-3.75	0-55

Similarly, the scores at pre assessment level were also assessed using school skills assessment protocol (see Table 3). The scores of all the children revealed that children had difficulties in all learning and school skills before the school readiness interventions were given to them. The baseline assessment is crucial for evaluating the impact of school readiness intervention on their basic learning and academic skills after the intervention. Deficits were observed in all facets of the school skills assessment protocol. Particularly, deficits were observed in applied academics. The participants showed relatively fewer

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deficits on domains like classroom mechanics, routines, and expectation, technology as compared to applied academics. Similarly, participants presented the lowest levels of difficulties on domains including common knowledge, social skills, and meals at schools among all school skills assessed.

Table 4

Pre Post Difference on Childhood Autism Rating Scale at Post Intervention Level (N=31)

Variables	Pre assessment	Post assessment	Mean difference	t df=30	Cohen's d
	M(SD)	M(SD)	M(SD)		
Relating to people	2.37(0.37)	2.10(0.27)	0.27(0.36)	4.22***	0.83
Imitation	2.13(0.22)	1.98(0.27)	0.14(0.35)	2.33*	0.61
Emotional response	2.34(0.47)	2.18(0.30)	0.16(0.27)	3.32**	0.40
Body use	2.48(0.42)	2.10(0.33)	0.39(0.46)	4.68***	1.00
Object use	2.14(0.23)	2.08(0.19)	0.06(0.21)	1.68	0.28
Adaptation to change	2.27(0.28)	2.14(0.23)	0.13(0.22)	3.23**	0.51
Visual response	2.27(0.36)	2.10(0.24)	0.18(0.27)	3.59**	0.55
Listening response	2.39(0.36)	2.24(0.28)	0.14(0.26)	3.06**	0.46
Taste, smell, and touch response and use	2.14(0.29)	2.08(0.19)	0.06(0.21)	1.68	0.24
Fear of nervousness	2.21(0.25)	2.19(0.25)	0.02(0.16)	0.57	0.08
Verbal communication	2.26(0.36)	2.13(0.31)	0.13(0.29)	2.50*	0.39
Nonverbal communication	2.26(0.34)	2.18(0.27)	0.08(0.23)	1.98	0.26
Activity level	2.27(0.28)	2.22(0.28)	0.05(0.15)	1.80	0.18
Level of consistency of intellectual response	2.14(0.23)	2.10(0.20)	0.05(0.15)	1.80	0.18
General impression	2.61(0.21)	2.14(0.23)	0.46(0.26)	10.17***	2.13

Note: **p<.05, **p<.01, ***p<.001*

After the intervention, the participants were reassessed on childhood autism rating scale and school skill scale at the post intervention level. The results from paired sample t-test computed at post intervention level reported improvements in school skills of children with autism spectrum disorder. Pre-post differences were computed for childhood autism rating scale and results have been presented in Table 4. As the higher scores on the scale presented more difficulties in assessed domains. It was observed that difficulties decreased significantly in most domains at the post assessment level. Most significant improvements were observed in three domains including relating to people, body use, and general impression where mean scores significantly decreased indicative of significant decrease in difficulty levels on these domains. Other domains including imitation, emotional response, adaptation to change, visual response, listening response, verbal communication showed moderate decrease in difficulty levels indicating improved visuo-motor coordination. However, improvement on the rest of domains including object use, fear of nervousness, nonverbal communication, activity level and level of consistency of intellectual response could not reach significant levels.

Table 5

Pre Post differences on School Skills Assessment Protocol at the Post Intervention Level (N=31)

Variables	Pre	Post	Mean	T

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	assessment	assessment	difference	df=30
	M(SD)	M(SD)	M(SD)	
Classroom mechanics	2.80(0.69)	9.99(1.14)	-7.19(0.99)	-40.59***
Meals at school	3.29(0.82)	13.51(0.32)	-10.22(1.45)	-39.19***
Routines & expectations	2.92(0.50)	12.03(0.34)	-9.11(1.78)	-28.48***
Social skills	3.49(0.68)	13.10(0.30)	-9.60(1.51)	-35.43***
Technology	2.78(0.63)	10.11(0.21)	-7.33(1.08)	-37.63***
Common knowledge	4.17(0.68)	23.63(0.54)	-19.46(2.77)	-39.09***
Core academics	3.89(0.78)	13.30(0.30)	-9.41(1.53)	-34.26***
Applied academics	0.46(0.86)	6.27(0.17)	-5.81(1.03)	-31.44***

Note: **p<.05, **p<.01, ***p<.001*

Similarly, pre and post differences on school skills assessment protocol were assessed at post assessment level (see Table 5). The results from the paired sample t-test assessing the significance of mean differences between pre and post assessments suggest improvement in the progress of several school skills. Significant improvement was observed in all school skills at the post intervention level. Significant improvement in domains including classroom mechanics, meals at school, routine and expectations, social skills, technology use, common knowledge, core academics, and applied academics indicated that participants were improved in managing their daily activities required for school readiness.

Discussion

The overall findings of the current study concluded that there was a positive impact of school readiness intervention on the school skills of children with autism spectrum disorder. Pre-assessment of children was carried out to measure the severity level at the initial phase. Children were then provided with school-based intervention. Moreover, post-assessment was carried out to study the impacts of intervention on children with ASD. Pre and post-assessments were carried out using the childhood autism rating scale and school skills assessment protocol taken from the assessment of functional living skills. The results from paired sample t-test assessing mean differences at pre and post intervention levels on domains assessed from childhood autism rating scale and school skills assessment protocols showed that the school readiness intervention was impactful in improving school skills of children with ASD. The analyses revealed that school readiness interventions were useful for the children as they yielded positive outcomes.

Though, the findings of the current study consistent with previous research that has explored the impact of school readiness intervention on the school skills of children with autism spectrum disorder yet provided a priori evidence from an underrepresented population of Pakistan on a sample of children with ASD. The present finding has significant contributions for society and research to represent this underrepresented region of the world in the existing body of knowledge as there are no prominent studies present on the effectiveness of such school readiness interventions on children with ASD from this region. This study will provide a training guide to parents and educators in understanding the role of school readiness intervention and in applying strategies from this intervention with their children with ASD for their improvement.

Moreover, the efficacy of the intervention was assessed after the application of intervention at a six month interval yet considering the neurodevelopmental and persistent nature of the disorder, future studies are recommended to establish its longer-term efficacy for improvement in school skills. Though significant, the findings must be interpreted in light of few limitations. Primarily, the study consisted of a sample size of 31 participants. It is

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likely that the 31 individuals do not provide adequate representation of the entire population of children with ASD. For that reason, the results of the study might be extrapolated to other population subsets. Therefore, future researchers are recommended to test the efficacy of similar interventions on larger samples with broader generalizations.

In addition, future studies may also use control groups to rule out if the improvements are specifically owed to the intervention and simply not the effect of maturation. In the absence of a control group, it becomes difficult to analyze whether the improvements were due to school readiness intervention or because of other factors such as environmental influences, support from caretakers or educators, or maturational changes. This limitation can be addressed by using a randomized control trial. The random assignment of participants in two groups either intervention group or control group is expected to increase the authenticity of the findings. This will help in validating and strengthening the study findings.

The interventions were only provided to the students in limited structured settings such as classrooms or therapy centers. This study has limited generalizability. There is a need to apply these interventions in other settings such as homes, playing areas, social and vocational settings. Therefore, applying intervention in other settings increases the generalizability of the study. Moreover, the participants were from the same cultural background due to which there was a lack of diversity. All the participants belonged to the same cultural, socioeconomic, and ethnic backgrounds. It may have caused a lack of external validity. As the study findings may not be generalized to other populations. To overcome this limitation, participants from diverse cultural, ethnic, and socioeconomic backgrounds should be included in future studies. Considering that the research on neurodevelopmental disorders is lacking from Asian regions in general and from Pakistan in particular (e.g., Fatima & Sharif, 2019), more research is recommended from Pakistan in this field.

Policy Implications

The current research has several policy implications and potential gains for researchers, practitioners, and psychotherapists engaging in evaluation and research on children with ASD. The current research findings are useful and relevant to theoretical and applied psychologists and other related practitioners working with such samples. The findings of the present study can be used by educators to design plans that would meet the learning and school related needs of children with ASD. These individualized teaching plans include visual tasks, consistent routines, and task segmentation. Hence, the current study findings would enable other therapists and educators to make more effective programs for children with ASD. Moreover, it could help policymakers to allocate resources for early intervention programs for such children.

The study findings revealed that school readiness intervention has a positive impact on children with autism spectrum disorder. Considering the importance of parenting in children outcomes (Fatima and sheikh, 2009; 2016; Fatima & Sharif, 2017), parents at home can be encouraged by the positive outcomes and can be trained to actively take part in understanding their role by implementing necessary interventions at an early age on children with autism spectrum disorder. Moreover, the study findings could provide a basis for future studies suggesting that additional comprehensive studies are needed to confirm and extend the knowledge of the current study's findings. This study can help drive educators' and parents' as well as the society's attention toward the awareness of the need for early school readiness strategies for children with ASD. Early diagnosis and implementation of intervention are likely expected to lead to better and positive outcomes. Lastly, communication and coordination between child's educators, therapists, and psychologists can be improved to develop comprehensive programs that provide coverage of different areas of development at diverse contexts including school, home and clinical setting.

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Conclusion

It is concluded that school readiness intervention designed to target specific school and learning skills of children with ASD is an effective intervention to improve school skills of these children and enhance their school readiness at least at the short-term level. Loger-term efficacy of the school readiness intervention can be established in longitudinal studies. School readiness intervention has broader implications for educators, psychologists and parents of children with ASD.

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