



Knowledge and reported use of evidence-based practices by early intervention professionals working with autistic children in Saudi Arabia

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ABSTRACT

Background: This study examined early intervention professionals' attitudes towards, knowledge and reported use of evidence-based practices for autistic children in Saudi Arabia.

Method: An online survey was completed by 173 early intervention professionals working directly with autistic children (under the age of six years) in early intervention programs at public and private nursery schools/ day-care centres in all provinces of Saudi Arabia.

Results: Participants reported greater use of evidence-based practices than emerging and unsupported practices. However, some evidence-based practices (EBPs) were reported to be used infrequently - less than once per week on average. Unsupported practices were also reported to be used more frequently than emerging practices. Participants were more likely to report using EBPs when they had more knowledge of EBPs, they said that they would have a higher level of willingness to use EBPs if it was required by authorities, and the location of their school/centre was a major city. Participants were also more likely to report using emerging practices when they had less knowledge of EBPs and more knowledge of emerging practices. A similar pattern was also found for unsupported practices. The most reported used sources of information on early intervention practices were other teachers, professional development inside the workplace, and general web searches. Research literature was one of the reported least commonly accessed sources of information.

Conclusions: These results add to the scant Saudi literature investigating autism early intervention practices, highlighting the knowledge and reported use by professionals of these practices. The implications of these findings for the facilitation of knowledge transfer into practice are discussed.

1. Introduction

Autistic children can make significant gains in development when intervention is provided in the early years, partly due to greater brain plasticity during early development in comparison to later in life (Dawson, 2008; Dawson et al., 2012). Evidence-based interventions are essential for maximizing these potential gains (Boyd et al., 2014). Using Evidence-Based Practices (EBPs), which are

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practices supported by sufficient research evidence, is a primary pathway to achieving positive outcomes for autistic children in social, communicative and academic functioning domains and others (Boyd et al., 2014; Steinbrenner et al., 2020; Wong et al., 2015).

A recently updated review using rigorous reviews of the literature identified 28 practices as EBPs (Steinbrenner et al., 2020). Other autism early intervention approaches were identified as practices that have at least some evidence but have not met the criteria for EBPs (Steinbrenner et al., 2020). Although such reports on EBPs can be used as a tool to help direct the selection of specific interventions when working with autistic children, the use of non-EBPs and use of unsupported practices continues in practice (Accardo & Finnegan, 2019; Carter et al., 2011; Hess et al., 2008; Paynter et al., 2018; Sulek et al., 2018). The use of unsupported early intervention practices can result in lost instruction time and create false hope for teachers and parents (Chan & Nankervis, 2015; Lilienfeld et al., 2015; Travers, 2017).

The use of non-EBPs is also reflected in a ‘research to practice’ gap in providing early interventions for autistic children (Cook et al., 2013; Parsons et al., 2013). It is, therefore, important to understand what influences early intervention service providers in their intervention selections. Implementation science emphasizes the need for research evidence to be translated into meaningful and practical information that is accessible to early intervention service providers, which they can use (for example) in their work with autistic children (Dingfelder & Mandell, 2011; Fixsen et al., 2013). Eccles and Mittman (2006) defined implementation science as the “study of methods to promote the adoption and integration of EBPs, interventions, and policies into routine care” (p.1). To achieve this, it is important to understand the factors that may affect the use of EBPs, such as knowledge, attitudes, and sources of information that practitioners access.

Autism early intervention providers have been found to be more knowledgeable about EBP practices than about emerging practices and unsupported practices (Paynter et al., 2017). The most commonly reported used practices identified in research in Australia were EBPs, such as the Picture Exchange Communication System (PECS) and visual supports (Paynter & Keen, 2015; Paynter et al., 2017). However, knowing which practices are effective and supported by research is not enough to eliminate the use of unsupported practices. For example, Paynter & Keen (2015) and Paynter et al. (2017) found that autism early intervention practitioners reported having sound knowledge of the EBPs which they predominantly used, but some practices classified as emerging and unsupported were also in regular use. In addition, early intervention professionals in the USA reported using a mixture of both EBPs and unsupported practices, with a small number of practices having some evidence base (Hess et al., 2008; Stahmer et al., 2005). The knowledge of EBPs may influence decisions about implementing and using early interventions. For example, autism research suggests that knowledge of EBPs is a key factor associated with the use of EBPs (e.g., Barry et al., 2021; Paynter et al., 2017; Sulek et al., 2018).

Attitudes also are a factor that may affect the decision about whether to try and later implement a new EBP (Aarons et al., 2012; Burgess et al., 2017; Frambach & Schillewaert, 2002; Glasman & Albarracín, 2006). Research suggests that autism early intervention professionals (predominantly teachers) in the USA showed positive attitudes towards EBPs. Their willingness to adopt EBPs if it was a requirement (e.g., from a supervisor or agency or state) has also been shown to influence the adoption of EBP practices (Stahmer & Aarons, 2009). Previous studies in Australia have shown a significant association between openness to using EBPs and knowledge and use of EBPs among autism early intervention providers (e.g., Paynter & Keen, 2015; Paynter et al., 2017). Australian early intervention teachers were also more likely to report being willing to adopt EBPs if required by their organization (Paynter et al., 2022). Additionally, most professionals, including special education teachers who provide early intervention services for autistic children in Bangladesh, showed positive attitudes towards EBPs, were open to manualized EBPs, and found them appealing (Pervin & Hagemayer, 2022).

The sources of information about EBPs may play a vital role in early intervention service providers’ decision-making process. General education teachers reported seeking information on autism from other teachers and drawing from their own experience (Sulek et al., 2018). Research in the special education field also indicates that teachers consider their colleagues a reliable source of information (see Cook & Cook, 2013). In early intervention environments, autism intervention providers frequently used research literature, which was the most trusted source of information about autism interventions (Paynter et al., 2018). Additionally, internal organizational professional development, other therapists, and external workshops or professional development were other commonly accessed sources for making autism intervention decisions, and these were also rated as highly trusted sources (Paynter et al., 2017). Dissemination of information via trusted mechanisms might help ensure the translation of evidence-based early interventions into early intervention settings (Paynter et al., 2017). For example, Barry et al. (2021) found that participants who had access to support professionals more than seven times per year had the highest levels of knowledge and reported using EBPs most frequently.

1.1. Saudi Arabia context

The prevalence of autism in Saudi Arabia is the highest in the Gulf region, with 59 per 10,000 children (Qoronflesh et al., 2019). In Saudi Arabia, the Ministry of Education and The Ministry of Human Resources and Social Development are responsible for providing special education and related services (e.g., provision of early intervention services) for autistic individuals while the Ministry of Health provide diagnostic and related services (Alnemary, 2017). Saudi teachers play an essential and direct role in designing and implementing early intervention services for autistic children, as they are specialists in special education. Other professionals (e.g., psychologists, occupational therapists, and speech and language disorders specialists) also play vital roles in supporting the development of autistic children, including in the provision of intervention (Ministry of Education, 2019, 2020). For the purposes of this study, early intervention refers to intervention (including, but not limited to, specialist education, or input from psychologists, occupational therapists, and speech and language disorders specialists) provided in the years prior to entry to formal education for autistic children.

Autism early intervention services are provided in nursery schools and day-care centres, whether public or private (Ministry of

Education, 2014, 2015a). Day-care centres usually focus on providing intervention for autistic children aged three years or under. Nursery schools focus on autistic children between three and six years of age (Ministry of Education, 2014, 2015a). For autistic children, early intervention services are provided in as inclusive an environment as possible in four different models: 1. General education classrooms, which are in nursery schools; 2. Special education classrooms that have an inclusive style and resource room that the autistic children attend to receive individual sessions according to their needs; 3. Day-care centres that care for and provide intervention services for disabled children, including autistic children; and 4. Hospitals for individuals with severe intellectual disabilities (Ministry of Education, 2019, 2020).

In public day-care centres in Saudi Arabia, each early intervention teacher is responsible for three autistic children in the classroom, and in private day-care centres five children (Ministry of Education, 2014, 2015b; Ministry of Human Resources and Social Development, 2018). For nursery schools, the number of typically developing children should not be more than 25 children in the classroom; disabled children, including autistic children, should not exceed 25% of the total number of neurotypical children, i.e., around 5–6 children (Ministry of Education, 2019, 2020). The provision of early intervention services is regulated through an initial assessment by the multidisciplinary team to determine eligibility. This team then refers the child to nursery schools or day-care centres where services are provided (Ministry of Education, 2019, 2020).

In Arab countries, early intervention providers might face a challenge accessing the information related to autism services and interventions due to a lack of autism research in Arab contexts (Alallawi et al., 2020; Hussein et al., 2011; Hussein & Taha, 2013). To the best of the authors' knowledge, in Saudi literature specifically, there has been only one study on special education teachers' knowledge and the use of EBPs for autistic children. Alhossein (2021) surveyed 240 special education teachers on their knowledge and

Table 1
Demographics of Participants.

Variable	n (173)	%
<i>School/Centre location</i>		
Riyadh	53	30.6
Makkah al Mukarramah	42	24.3
Al Medina Al Munawara	6	3.5
Al Qassim	6	3.5
Eastern province	17	9.8
Al Bahah province	6	3.5
Aseer province	13	7.5
Tabuk province	3	1.7
Hail province	9	5.2
Northern Borders province	2	1.2
Jazan province	5	2.9
Najran province	3	1.7
Al Jowf province	8	4.6
<i>Type of school/centre</i>		
Public school/centre	88	50.9
Private school/centre	85	49.1
<i>Type of classroom</i>		
Mainstream schools (general education classroom)	12	6.9
Mainstream schools (special education classroom)	47	27.2
Mainstream schools (Resource room)	8	4.6
Day-care centres (special education classroom)	106	61.3
<i>Highest academic qualification</i>		
High school	1	0.6
Bachelor's degree	125	72.3
Diploma in special education	9	5.2
Master's degree	35	20.2
Doctoral degree	3	1.7
<i>Type of academic certificate</i>		
Behavioural disorders and autism	82	48.2
Intellectual disability	24	14.1
Learning disabilities	7	4.1
Hearing disability	5	2.9
Early intervention	10	5.9
Special education	13	7.6
Speech and language disorders	11	6.5
Psychology	15	8.8
Occupational therapy	3	1.8
Missing	3	1.8
<i>Years of experience with autism</i>		
Less than 1 year of experience	15	8.7
1–5 years	89	51.4
6–10 years	45	26.0
11–15 years	10	5.8
16–20 years	8	4.6
21 + years	6	3.5

use of EBPs for autistic students. Saudi teachers reported moderate levels of knowledge and use of EBPs for autistic students. The most commonly used practices identified in Alhossein's study (2021) were reinforcement, prompting, extinction, and modelling; while scripting, social narratives, self-management, time delay, and video modelling were the least used practices. The least known practices were Pivotal Response Training (PRT), time delay, scripting, functional communication training, and self-management (Alhossein, 2021).

Alhossein's study did not provide an inclusive description of participating teachers regarding the age of the autistic children they taught or whether early intervention teachers were included in the study. Additionally, Alhossein's sample covered only Riyadh, the capital city of Saudi Arabia, and therefore not representative of all early intervention professionals in Saudi. The current study aimed to build upon the research to date by examining early intervention professionals' knowledge of EBPs and their reported use of these practices with autistic children in all provinces of Saudi Arabia. The purpose of the current study was to: (i) determine the knowledge and reported use of EBPs by autism early intervention professionals in Saudi Arabia, to (ii) investigate early intervention professionals' attitudes towards using EBPs for autistic children, to (iii) explore the factors associated with the process of selecting early intervention practices for autistic children, and to (iv) explore sources of information that autism early intervention professionals access in making intervention decisions.

2. Method

2.1. Participants

Participants were 173 early intervention professionals working directly with autistic children (under the age of six years) in intervention programs at public nursery schools/day-care centres ($n = 88$) and private nursery school/day-care centres ($n = 85$) in 13 provinces of Saudi Arabia. The majority of participants were from Riyadh (30.6%) (the capital city in Saudi Arabia), then Makkah al Mukarramah (24.3%), and the Eastern province (9.8%). Autism intervention providers in this study worked in day-care centres (61.3%), in special education classrooms in mainstream schools (27.2%), and in general education classrooms in mainstream schools (6.9%). A majority of participants held a bachelor's degree as their highest qualification (72.3%). This included certification in behavioural disorders and autism (42.9%), intellectual disability (14.1%), and psychology (8.8%). A minority of participants (5.9%) had a degree in early intervention. About half (51.4%) of the participants had work experience with autistic children between one and five years in duration, and a further quarter (26.0%) had six to 10 years of experience. In Saudi Arabia, teaching children in the early childhood stage is only undertaken by female teachers. Therefore, no data on participant gender were gathered. Demographic information for the 173 included participants is shown in Table 1.

2.2. Measures

An online survey was developed consisting of 82 questions across four subject areas as described below, which took approximately 15–20 min to complete.

2.2.1. Demographics

Questions included nursery school/centre geographic location (administrative provinces within Saudi Arabia), type of school, type of classroom, highest academic qualification, type of qualification, and number of years of teaching experience with autistic children.

2.2.2. Knowledge and use of practices

This measure forms part of the Early Intervention Practices Scale (Paynter & Keen, 2015). It included a list of 41 practices, involving EBPs ($n = 27$, e.g., computer-aided instruction, extinction, and naturalistic intervention), emerging practices ($n = 7$, e.g., exercise, auditory integration training, and sign language instruction), and unsupported practices ($n = 7$, e.g., academic intervention, facilitated communication, and holding therapy) drawn from the literature on EBPs (Green et al., 2006; National Autism Centre, 2009; Odum et al., 2010). We recategorized all practices based on Steinbrenner et al.'s recently updated review (2020). The re-categorisation included sensory integration and music intervention now being EBPs and sensory diet and auditory integration training as practices with some evidence (emerging practices). Participants were asked to rate their knowledge of each practice using a five-point scale (0 = *Very little* (know nothing about this practice); 1 = *To a slight extent* (heard of this practice); 2 = *To a moderate extent* (know a little about this practice); 3 = *To a great extent* (have a good amount of knowledge of this practice); 4 = *To a very great extent* (know a great deal and could instruct others on this)). Participants were also asked to rate their use of each practice on a five-point scale ranging (0 = *Never* (I do not use this practice); 1 = *On rare occasions* (less than once per week); 2 = *Sometimes* (one or more times a week but not every day); 3 = *Often* (about once per day); 4 = *Frequently* (more than once per day)). Ratings of use of practices were summed across items in each category to create an EBPs use ($\alpha = 0.92$), emerging practices use ($\alpha = 0.77$), and unsupported practices use ($\alpha = 0.66$) score, each with acceptable to high levels of internal consistency. Knowledge scores in each category likewise had good to high levels of reliability: in EBPs knowledge ($\alpha = 0.95$), emerging practices knowledge ($\alpha = 0.81$), and unsupported practices knowledge ($\alpha = 0.76$).

2.2.3. Attitudes to EBPs

The EBPs Attitudes Scale (EBPAS; Aarons, 2004) evaluates participants' attitudes toward EBPs. The measure has 15 items, and four subscales: requirements (e.g., it was required by your workplace), appeal (e.g., you felt you had enough training to use it correctly), openness (e.g., I like to use new types of interventions/practices to help my students), and divergence (e.g., I know better than

academic researchers how to care for my students). Participants rated statements on a five-point scale (0 = *Not at all*; 1 = *To a slight extent*; 2 = *To a moderate extent*; 3 = *To a great extent*; 4 = *To a very great extent*). All subscales showed a good reliability in the present sample: requirements (three items, $\alpha = 0.90$), appeal (four items, $\alpha = 0.78$), openness (four items, $\alpha = 0.88$), and divergence (four items, $\alpha = 0.73$).

2.2.4. Sources of Information

The Sources of Information Scale is a scale developed for parents (Carlon et al., 2015); that was adapted for use with early intervention teachers and other professionals (Paynter et al., 2017, 2018). This scale measures and identifies possible sources of information about early intervention practices that are used with autistic children. It includes 20 items (e.g., parents of autistic children, teachers, and Friends/relatives) rated using a dichotomous *yes/no* response.

2.3. Translation process

The survey and other study documents (e.g., participant information sheet and consent form) were translated into Arabic. The following translation procedures was used to ensure that the Arabic version of each study measure was accurate:

2.3.1. Step 1: Forward translation

The original survey was translated from English to Arabic by the first author.

2.3.2. Step 2: Back translation

The Arabic version was independently translated back into English by three bilingual individuals. A table was created collating the three back-translations for each item. Instances where the back-translated phrase in English was not quite the same as the original were identified, along with suggestions of where the Arabic translation could be changed to more closely capture the meaning of the item in English. Then further back-translation was undertaken, along with review by the research team. In particular, the translation of the behavioural practices items were discussed at length, (e.g., differential reinforcement, prompting, and extinction), because these practices have specific technical meaning/function not necessarily reflected in the simple label/term used. Unclear items were also sent to an autism behavioural specialist in Saudi Arabia to improve the description and translation of these items.

2.3.3. Step 3: Comparison and revision

The Arabic translation of the study survey was independently reviewed to confirm translation equivalence by an assistant professor in the Special Education department at a Saudi University; this individual had experience working with children with disabilities.

2.3.4. Step 4: Pilot testing

The final Arabic survey was pilot tested with two early intervention providers in autism programs and two teachers in adult autism programs. All the points and issues raised in the pilot study were discussed and edits/adjustments made to the items where needed.

2.4. Procedure

Ethics approval was obtained from the [detail removed for blind peer review]. Participants were invited to complete the online survey hosted on the university's Qualtrics survey platform (available November 2020–March 2021). Recruitment was carried out via multiple pathways to ensure that the survey reached the target sample. First, a list and contact details of private nursery schools and day-care centres ($n = 132$) that included autistic children in Saudi Arabia was obtained from the Ministry of Human Resources and Social Development. Administrators of private nursery schools and day-care centres were contacted via email and encouraged to distribute an information flyer about the study to their staff via email and their social media accounts (e.g., teachers' groups on WhatsApp and Twitter). Second, the Education Policy Research Centre at the Ministry of Education was contacted to distribute information about the survey to public nursery schools. An official letter from the centre mentioned above was sent to all education departments in Saudi Arabia ($n = 48$) to encourage distribution of information about the survey to public nursery schools that include autism early intervention professionals. Third, special education supervisors ($n = 71$) in all provinces of Saudi Arabia were contacted by email and by telephone, asking them to distribute the information about the survey to early intervention autism professionals who were under their supervision in the public day-care centres.

Some of the private and public day-care centres and nursery schools that were contacted did not provide early intervention services ($n = 12$) or services for autistic children ($n = 7$), and others had closed because of the COVID-19 pandemic ($n = 1$). In addition, some declined to distribute information about the survey ($n = 3$). Participants first read the information sheet about the study, then they were directed to a website, where they provided consent online. Informed consent was obtained via the online survey before participants could start the survey. A telephone number and email address were provided in the participant information leaflet so that participants could contact the research team if they had any questions regarding the study and consent. All responses to the survey were anonymous. Due to the multiple recruitment pathways, it was not possible to determine an overall response rate.

2.5. Approach to data analysis

Data were screened for missing data and assumptions underpinning regression analysis were tested. Only 4% of values were

missing from the data. A total of 173 participants started the survey, reduced to 166 for some questions due to missing data. Demographic variables were re-coded into meaningful sub-groups for ease of analysis and interpretation where necessary: location (main cities [Riyadh, Makkah al Mukarramah, Al Medina Al Munawara, and Eastern province] vs. other cities (General Authority for Statistic Kingdom of Saudi Arabia, 2017); type of school/centre (public school/centre vs. private school/centre); academic qualification (undergraduate degree vs. postgraduate degree); type of academic certification (specialist [Behavioural disorders and autism, and intellectual disability] vs. non-specialist); and years of experience working with autism (5 years and under vs. 6 years or more). The type of classroom was excluded from the analysis (general education classroom vs. special education classroom) due to a very small number in the general education subgroup (12 vs.161). Most autistic children in Saudi Arabia are privately educated (Al-Zahrani, 2013).

Regression assumptions were verified using SPSS Statistics, and all indicators suggested that regression assumptions were adequately met. First, multicollinearity was examined using correlation coefficients and Tolerance and Variance Inflation Factor (*VIF*) statistics. Correlations between predictors were all less than 0.9, tolerance values all exceeded 0.2, and *VIF* values for included variables were below 10. Thus, there was no evidence of problems with multicollinearity. Second, histograms and normal P-P Plots were used to verify the normality of residuals assumption, and this assumption was met for all regression models. In the regression models, the dependent variables were the use of each category of practices (EBPs, emerging practices, unsupported practices). Predictor variables included knowledge of practices, attitudes towards the use of EBPs, and demographic variables.

Table 2
Mean (SD) Scores of Knowledge and Use of Intervention Practices.

Practice	Category	Use M (SD)	Knowledge M (SD)
Reinforcement	EBP	4.46 (1.00)	4.49 (0.98)
Prompting	EBP	4.34 (1.04)	4.42 (0.95)
Visual supports and schedules	EBP	4.10 (1.21)	4.34 (1.03)
Extinction	EBP	3.99 (1.12)	4.34 (1.03)
Task analysis and chaining	EBP	3.96 (1.21)	4.20 (1.09)
Response interruption/redirection	EBP	3.90 (1.18)	4.07 (1.15)
Differential reinforcement	EBP	3.89 (1.16)	4.21 (0.96)
Discrete trial training	EBP	3.86 (1.26)	4.13 (1.13)
PECS	EBP	3.75 (1.35)	4.40 (1.03)
Computer-aided instruction	EBP	3.73 (1.25)	4.17 (1.13)
Naturalistic interventions	EBP	3.66 (1.24)	4.00 (1.16)
Exercise	E	3.64 (1.27)	4.02 (1.12)
Functional communication training	EBP	3.54 (1.30)	3.90 (1.20)
Stimulus control/environmental modification	EBP	3.54 (1.22)	3.98 (1.13)
Facilitated communication	U	3.53 (1.42)	3.88 (1.21)
Peer-mediated instruction/intervention	EBP	3.48 (1.26)	4.07 (1.10)
Massage/touch/deep pressure	E	3.47 (1.33)	3.91 (1.25)
Video modelling	EBP	3.46 (1.29)	4.01 (1.20)
Functional behaviour assessment	EBP	3.34 (1.26)	3.79 (1.21)
Sensory integration	EBP	3.33 (1.31)	3.98 (1.12)
Academic Interventions	U	3.31 (1.36)	3.86 (1.20)
Holding therapy	U	3.31 (1.45)	3.76 (1.37)
Music intervention	EBP	3.29 (1.41)	3.81 (1.31)
Structured work systems	EBP	3.27 (1.36)	3.64 (1.32)
Joint attention interventions	EBP	3.21 (1.34)	3.65 (1.28)
Multisensory environments/ Snoezelen	U	3.20 (1.42)	3.83 (1.25)
Social skills training groups	EBP	3.13 (1.45)	3.66 (1.35)
Social narratives/social stories	EBP	3.07 (1.36)	3.95 (1.26)
Parent-implemented interventions	EBP	3.05 (1.38)	3.68 (1.27)
Developmentally-based	E	3.03 (1.42)	3.24 (1.45)
Self-management	EBP	2.98 (1.49)	3.54 (1.41)
Time delay	EBP	2.98 (1.36)	3.45 (1.36)
Pivotal Response Training (PRT)	EBP	2.63 (1.42)	3.25 (1.39)
PROMPT	U	2.55 (1.46)	3.05 (1.48)
Auditory integration training	E	2.43 (1.37)	3.28 (1.38)
Weighted vests/clothing	U	2.41 (1.46)	3.44 (1.48)
Sensory diet	E	2.40 (1.37)	3.11 (1.40)
Brushing/Wilbarger Protocol	U	2.33 (1.47)	2.89 (1.59)
Theory of mind training	E	2.30 (1.32)	2.84 (1.52)
Speech Generating Devices and other Alternative and Augmentative Communication (AAC)	EBP	2.21 (1.29)	2.95 (1.51)
Sign language instruction	E	2.10 (1.36)	3.18 (1.57)

Note: EBP evidence-based practice, E emerging practice, U unsupported practice.

3. Results

3.1. Knowledge and reported use of practices

3.1.1. Individual practices

Ratings of knowledge and reported use of each intervention practice are shown in Table 2. The mean score for reported use of practices, regardless of whether these practices were supported, emerging, or unsupported, indicated that all were reported used by at least some participants. The most frequently reported used practices (in order from most to least) were: reinforcement, prompting, visual supports and schedules, extinction, task analysis and chaining, response interruption/redirection, differential reinforcement, discrete trial training, PECS, and computer-aided instruction. These were also all EBPs. The least reported used practices (less than once per week) in order from least to most frequently reported used were: sign language instruction, Speech Generating Devices and other Alternative and Augmentative Communication (AAC), theory of mind training, brushing/Wilbarger protocol, sensory diet, weighted vests/clothing, auditory integration training, Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT), PRT, and time delay. Four of these were from the emerging practices category, and three of them (brushing/Wilbarger protocol, weighted vests/clothing, and PROMPT) were in the unsupported category. AAC, PRT, and time delay were in the EBPs category.

3.1.2. Comparisons across levels of evidence for reported use

A one-way repeated measures ANOVA was conducted to determine whether statistically significant differences existed in the participants' reported use of EBPs, emerging practices, and unsupported practices. Participants differed in their reported use of these three categories of practice ($F(1.91, 328.50) = 110.381, p < .001, \eta_p^2 = 0.39$, using a Huynh-Feldt correction due to non-sphericity (Mauchly's test, $\chi^2(2) = 10.30, p = .006$). Post hoc analysis with a Bonferroni adjustment revealed that participants reported used EBPs ($M=3.49, SD=0.72$) more frequently than both emerging ($M=2.78, SD=0.88$) and unsupported ($M=2.95, SD=0.83$) practices (all $p < .001$). Unsupported practices were also reported used more frequently than emerging practices ($p < .001$).

3.1.3. Comparisons across levels of evidence for reported knowledge

For the repeated measures ANOVA of overall knowledge about practices, the assumption of sphericity was not violated, as determined by Mauchly's test of sphericity ($p = .209$). Participants differed significantly in their knowledge of each category, ($F(2, 344) = 65.248, p < .001$). A post hoc pairwise comparison using a Bonferroni adjustment showed higher levels of EBP knowledge ($M=3.92, SD=0.79$) than for emerging ($M=3.37, SD=0.94$) and unsupported practices ($M=3.52, SD=0.88$), as well as higher levels of knowledge about unsupported than emerging practices.

3.2. Attitudes towards EBPs

The mean ratings (and SD) of the EBPAS subscales can be found in Table 3. Overall, autism early intervention professionals had a mean score of 3.28 on the total score, which indicates overall favourable attitudes towards EBPs. Most participants were generally open to trying new interventions and willing to try or use more structured or manualised interventions (openness subscale). The divergence subscale (which assesses the extent to which the professional perceives EBPs as not clinically useful and less important than clinical experience) had the lowest overall score.

3.3. Correlations between knowledge and reported use of EBPs, and attitudes

The correlation coefficients (Pearson r) between use in each category of practices, attitude to EBPs, and demographic factors are presented in Table 4. There was a significant correlation between knowledge and reported use of EBPs, with higher reported knowledge linked to the higher reported use of EBPs ($r = 0.690$). Reported use of EBPs was also significantly correlated with both knowledge categories: emerging ($r = 0.518$), and unsupported practices ($r = 0.508$). Only the location and type of school/centre were significantly correlated with the reported use of EBPs, ($p < .01$) ($p < .05$) respectively. In terms of attitudes, the reported use of EBPs was positively associated with all three other attitudes dimensions (requirements, openness, and appeal). Only the divergence subscale was not significantly linked to more reported use of EBPs ($r = 0.12, p = .10$). Similar patterns of associations were observed for emerging and unsupported practices (see Table 4).

Table 3
Mean (SD) Scores of the EBPAS.

Scale	M	SD
Requirements subscale	3.28	1.06
Appeal subscale	3.65	0.90
Openness subscale	4.03	0.92
Divergence subscale	2.16	0.84
EBPAS total	3.28	0.93

Table 4
Use of Each Category, Knowledge, Demographic Factors, and Attitudes.

Correlations		Use		
		EBPs	Emerging practices	unsupported practices
Use	Use of EBPs			
	Use of emerging practices	0.634 **		
	Use of unsupported practices	0.615 **	0.779 **	
Knowledge	Knowledge of EBPs	0.690 **	0.295 **	0.334 **
	Knowledge of emerging practices	0.518 **	0.655 **	0.545 **
	Knowledge of unsupported practices	0.508 **	0.458 **	0.621 **
Demographic Factors	Location [0 = Main cities vs. 1 = Other cities]	-0.211 * *	0.05	0.05
	Type of school/centre [0 = Public school/centre vs. 1 = Private school/centre]	0.183 *	0.204 **	0.175 *
	Highest academic qualification [0 = Undergraduate degree vs. 1 = Postgraduate degree]	0.02	-0.06	-0.13
	Type of academic certificates [0 = Specialist vs. 1 = Non-specialist]	0.10	0.370 **	0.199 **
	Years of experience working with autism [0 = 5 Years and under vs. 1 = 6 Years or more]	-0.08	-0.04	-0.03
	Requirements	0.233 **	0.158 *	0.161 *
	Appeal	0.344 **	0.07	0.10
Attitude	Openness	0.410 **	0.06	0.09
	Divergence	0.12	0.329 **	0.289 **

Note: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

3.4. Regression analysis of reported use of practices

Three multiple linear regression models were conducted, examining potential predictors of early intervention professionals' reported use of EBPs, emerging practices, and unsupported practices. The results of these regression models are summarized in Table 5. For the reported use of EBPs, the predictors explained a significant proportion of the variance $F(7, 158) = 27.270, p < .001, R^2 = .527$. Participants were more likely to report using EBPs when they had more knowledge of EBPs ($p < .001$), they had a higher level of willingness to use EBPs if it was a requirement ($p = .013$), and the location of their school/centre was a major city ($p = .024$).

For the reported use of emerging practices, a significant proportion of variance was also explained, $F(7, 155) = 28.392, p < .001, R^2 = .542$. Participants were more likely to report using emerging practices when they had less knowledge of EBPs ($p = .015$) and more knowledge of emerging practices ($p < .001$), they perceived a higher level of divergence between their reported use of current and new practices ($p = .002$), and they had non-specialist academic certificates ($p = .001$).

In the regression model for the reported use of unsupported practices, a significant proportion of variance overall was explained, $F(7, 155) = 20.587, p < .001, R^2 = .458$. Participants were more likely to report using unsupported practices when they had less knowledge of EBPs ($p = .033$) and more knowledge of unsupported practices ($p < .001$). Participants were also more likely to report using unsupported practices when they perceived a higher level of divergence between their reported use of current and new practices ($p = .034$).

3.5. Sources of information

The results for 166 early intervention professionals who completed the sources of information measure are shown in Table 6. Most participants reported receiving information about practices from other teachers (83.7%). The following most common sources of

Table 5
Multiple Regression Models of Use of EBPs, Emerging and Unsupported Practices.

Predictor	EBPs		Emerging practices		Unsupported practices	
	Beta	p	Beta	p	Beta	p
Knowledge of EBPs	0.631	< 0.001	-0.22	0.015	-0.201	0.033
Knowledge of emerging practices	0.098	0.304	0.742	< 0.001	0.145	0.175
Knowledge of unsupported practices	-0.059	0.537	-0.016	0.864	0.629	< 0.001
<i>Attitudes</i>						
Requirements	0.136	0.013	-	-	-	-
Appeal	-	-	0.073	0.204	-	-
Divergence	0.061	0.283	0.178	0.002	0.132	0.034
<i>Demographic variables</i>						
Location of school/centre [0 = Main cities vs. 1 = Other cities]	-0.128	0.024	-	-	-	-
Type of school/centre [0 = Public school/centre vs. 1 = Private school/centre]	0.051	0.370	0.027	0.630	0.029	0.632
Highest academic qualification [0 = Undergraduate degree vs. 1 = Postgraduate degree]	-	-	-	-	-0.08	0.175
Type of academic certificate [0 = Specialist vs. 1 = Non-specialist]	-	-	0.192	0.001	0.08	0.201

Table 6
Sources of Information

Source	Proportion of sample (%)
Teachers	83.7
Professional development within a workplace	71.7
General web-searches	70.5
Other professionals	68.1
Professional development outside a workplace	64.5
Parents of autistic children	62.7
Social media	60.8
Research and professional websites	49.4
Autism associations or organizations	42.2
Intervention reviews	41.0
Friends/relatives	37.3
Medical doctors	35.5
Professional associations	33.7
Research literature	32.5
Traditional media	27.7
Religious or cultural sources	27.1
Ministry of Education and Ministry of Human Resources and Social Development websites	22.9
Books	19.9
Complementary or alternative medicine practitioners	19.3

information were: professional development within a workplace (71.7%), general web-searches (70.5%), other professionals such as psychologists, speech therapists, and occupational therapists (68.1%), professional development outside a workplace (64.5%), and parents (62.7%). The least commonly accessed sources of information were (from least to most): complementary or alternative medicine practitioners (19.3%), books (19.9%), Ministry of Education and Ministry of Human Resources and Social Development websites (22.9%), religious or cultural sources such as reading Al-Quran (27.1%), social media such as WhatsApp/ Twitter (27.7%), and research literature (32.5%).

4. Discussion

The present study aimed to investigate early intervention professionals' attitudes toward and knowledge and reported use of EBPs for autistic children in early intervention settings in Saudi Arabia. Overall, the most commonly reported used practices were from the EBPs category, such as reinforcement, prompting, and visual supports and schedules. The least frequently reported used practices were generally from emerging categories (e.g., sign language instruction, theory of mind training, and sensory diet). However, some EBP practices (e.g., AAC, PRT, and time delay) were reportedly used infrequently - less than once per week on average. Participants generally reported greater knowledge and reported use of EBPs than emerging and unsupported practices.

The findings are generally positive regarding the practices reported to be in use for autistic children in Saudi Arabia. However, it is not clear whether these data on the reported frequency of use of EBPs, in general, would relate to the supports for individual children. In addition, the quality/fidelity of the use of these practices is unknown. For example, early intervention professionals may have good knowledge and report using EBPs more than they actually do in practice, their knowledge may be reported inaccurately, or they may use practices with a low fidelity of delivery. On the other hand, Saudi providers may not be selecting certain EBPs because the evidence on which these practices are based is drawn from Western research and may not be perceived as relevant to their students or experience. A recent systematic review confirmed very little high-quality research on interventions and autism services in Arabic countries, including Saudi Arabia (Alallawi et al., 2020).

The practices with the lowest reported use may be associated with practical implementation barriers. Some of these practices (e.g., PRT) might require specialist training (Suhrehrich, 2011; Suhrehrich et al., 2007). Lack of access to training in some practices may preclude their use in Saudi settings. Lack of access to specialist equipment might also be a potential barrier to the use of some EBPs (e.g., IT equipment for using AAC in practice).

The findings on the reported use of EBPs in Saudi Arabia are consistent with previous research on early intervention practitioners in other countries (e.g., Paynter et al., 2017, 2018; Paynter & Keen, 2015; Stahmer et al., 2005), that participants reported using more EBPs than other practices. The findings from this study also confirmed those of Paynter & Keen (2015) and Paynter et al. (2017), where greater knowledge of EBPs was found than emerging and unsupported practices.

In contrast to previous studies (Paynter et al., 2017, 2018; Paynter & Keen, 2015), Saudi early intervention professionals reported greater knowledge of and use of unsupported practices than emerging practices. A possible explanation for this result might be that participants know and use common practices. Unfamiliar practices are rarely used regardless of the evidence supporting their use, as suggested by Cook et al. (2008). Although participants in the present study reported using EBPs alongside unsupported practices, the use of unsupported practices is still likely to influence autistic children's outcomes. It is also important that autism early intervention professionals know the limitations and hazards of using unsupported intervention practices. Therefore, further research should be undertaken to investigate the reasons behind using unsupported practices alongside EBPs.

The regression analyses showed that participants reported using EBPs when they had more knowledge of them; this result is in line with those in the literature (Cook et al., 2008; Hsiao & Sorensen Petersen, 2019; Paynter et al., 2017; Paynter & Keen, 2015).

Participants also had a higher level of willingness to use EBPs if it was perceived as a requirement and when their school or centre location was in a major city. Nursery schools or day-care centres that provide early intervention services are still limited in major cities in Saudi Arabia (Alnemary et al., 2017; Al-Zaalah et al., 2015). There remains a serious lack of these services in other cities. Consequently, resources that support the utilization of EBPs in early intervention, such as knowledge of EBPs, access to information related to EBPs, and quality training, may be limited and centralized in major cities.

These findings are consistent with existing research from Western countries showing that participants outside of metropolitan areas reported significantly lower knowledge and use of EBPs than those from within the metropolitan areas in Australia (Paynter & Keen, 2015). There is also a lack of EBP use in rural areas in the USA (Stahmer et al., 2005). These results show some challenges in providing effective autism intervention, such as limited in-service professional development opportunities, a general lack of resources, and a shortage of staff with appropriate training, as Olsen et al. (2012) also suggested.

Participants also reported using emerging practices when they had less knowledge of EBPs and more knowledge of emerging practices. Using emerging practices was also associated with a perceived higher level of divergence between their reported use of current and new practices, and having non-specialist academic certificates. In the current study, the non-specialists were those with academic certificates other than in behavioural disorders and autism, and intellectual disability, such as hearing impairment, psychology, and occupational therapy. It is possible that non-specialists in the present study may be using the practices with which they were most familiar, as the reported use of emerging practices was strongly related to knowledge of emerging practices.

A similar pattern was also found for unsupported practices, in that participants reported using them more when they had less knowledge of EBPs and more knowledge of unsupported practices. This reinforces the importance of training and experience to increase knowledge at least of EBPs.

The most reported used sources of information on early intervention practices were other teachers, professional development inside the workplace, general web searches, other professionals, professional development outside the workplace, and parents. Conversely, participants reported that the least commonly accessed sources of information were complementary or alternative medicine practitioners, books, the Ministry of Education, the Ministry of Human Resources and Social Development websites, religious or cultural sources, traditional media, and research literature.

These findings are consistent with those of Sulek et al. (2018), who found that general education teachers also reported seeking information on autism interventions from other teachers. Internal/external professional development was also one of the most widely used sources of information in the current study, consistent with previous research (e.g., Deyro et al., 2016; Nail-Chiwetalu & Ratner, 2007; Paynter et al., 2017, 2018). General internet searches (e.g., using Google) were one of the most used sources of information, and research literature was one of the least used sources. This outcome is contrary to that of Paynter et al. (2018), who found research literature was the most accessed source of information and the most trusted. A possible explanation for this may be that most of the research literature on early intervention practices and EBPs is in a language different from the language of the participants in this study (Arabic). For example, early intervention providers refer to Western literature as their main source of information to comprehend autism practice interventions in Saudi Arabia (Alotaibi & Almalki, 2016). Another possible explanation is what was confirmed by Alallawi et al. (2020): there is a lack of autism research in Arab contexts, which confronts early intervention professionals with the challenge of accessing the information on autism interventions. There is also often a lack of access to published research literature - journals charge high fees to access published papers.

Overall, it is important to know the quality of available information through the sources of information identified by autism early intervention professionals as it may influence their selection and implementation of practices. For example, if autism early intervention professionals use general web searches they may find potential misinformation, such as inaccurate information on using EBPs or endorsing unsupported practices. Participants in the current study also reported that research literature was one of the least used sources; thus, the updated information on autism practices in the published systematic reviews might not reach early intervention professionals. The published reviews could also help inform decisions on using EBPs and may act as a check on false information or endorsements of unsupported practices that are spread through other media.

5. Limitations

There were some limitations to this study. First, the results presented in the current study are based on early intervention professionals' self-reports, which may not accurately reflect the actuality of using practices identified or the level of fidelity in implementing such practices. A list of practices was also included; thus, responses were limited to those on the list. Second, the current study did not include all the EBPs covered in the recent review (Steinbrenner et al., 2020), such as direct instruction, modelling, cognitive behavioural/instructional strategies, exercise and movement, and behavioural momentum interventions. Thus, such surveys in future could be extended to cover these practices and other practices that develop over time. Third, although this study was conducted in all provinces of Saudi Arabia, where educators represent diverse backgrounds and cultures and some educators are from rural areas, the study sample may not be fully representative of all Saudi early intervention professionals working with autistic children, as there were smaller numbers of participants from some provinces. Fourth, this study included a relatively small sample. Nevertheless, in relation to the two preceding points, the latest report available on the number of autism early intervention teachers in Saudi Arabia from the (Ministry of Education, 2016, 2017) estimated that there were approximately 271 such teachers, suggesting that the survey may have reached more than 50% of eligible teachers. However, future research with a range of autism early intervention professionals is needed to investigate how practices are actually used, whether they are implemented with fidelity, and whether they align with early intervention professionals' self-reports. Further insights could be gained from direct interviews with autism early intervention professionals to explore their views on the barriers and facilitators to implementing EBPs in their schools/centres in Saudi Arabia.

6. Implications

The findings from the current study have implications for autism practice and policy in Saudi Arabia. For example, it is essential to explore and overcome barriers to implementing EBPs in non-main cities in Saudi Arabia to achieve optimal outcomes for autistic children. Greater efforts are needed to effectively implement EBPs by examining and understanding of autism specialists' and non-specialists' experiences and attitudes toward EBPs. At a societal and political level, comprehensive plans to transform knowledge-to-action by ensuring appropriate systems, services and support for use of EBPs should be a priority for policymakers in Saudi Arabia. Moreover, more ongoing monitoring and evaluation should be made available to ensure that there are no gaps between policy and practice. Provision of informational support and professional training about research-based practices may enhance use of EBPs and reduce use of unsupported practices for autistic children.

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CRedit authorship contribution statement

Nouf Alatifi: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing – original draft, Visualization, Project administration. **Richard Hastings:** Conceptualization, Methodology, Writing – review & editing, Supervision, Project administration. **Kylie Gray:** Conceptualization, Methodology, Writing – review & editing, Supervision, Project administration.

Declaration of Competing Interest

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Data Availability

The data that has been used is confidential.

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