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Training status in evidence-based practices among in-service special education teachers and its association with teaching in autism educational settings

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ABSTRACT

The present study investigates the adequacy of training, perceived knowledge, and the frequency of use of evidence-based practices (EBPs) among in-service special education teachers and its association with their teaching practices in autism educational settings in Jordan. Additionally, it analyzes the influence of key variables, including gender, age, level of educational qualification, number of years teaching in special education, number of years teaching students with autism, number of students with autism in the classroom, and number of in-service professional development programs attended. Using an analytical descriptive approach utilizing survey-based research, a convenience sample of 121 teachers from seven specialized autism centers reported on their training adequacy, knowledge, and frequency of use of a set of 23 EBPs. The results showed that the adequacy of in-service training was higher than that of pre-service training. Moreover, there was a positive correlation between in-service training, teachers' knowledge, and the use of EBPs. The number of in-service professional development training programs emerged as the only variable that significantly influenced the teachers' responses regarding the adequacy of their in-service training. The multiple regression analysis revealed that in-service training programs and years of teaching students with autism were the only predictors of teachers' knowledge and use of EBPs. The most reported EBPs were reinforcement, task analysis, and modeling, whereas the least reported were video modeling, social narratives, and functional communication. Further enhancements in teacher training in EBPs are needed to improve teacher training programs in Jordan.

Contribution/Originality: This study offers original insights by investigating the factors influencing in-service special education teachers' training, knowledge, and use of evidence-based practices (EBPs) in autism educational settings. It highlights that the number of students in the classroom and in-service professional development training programs significantly predict teachers' knowledge and use of EBPs.

1. INTRODUCTION

Autism is a neurodevelopmental disorder characterized by difficulties with social communication and interaction, as well as restricted and repetitive patterns of behavior (Diagnostic and Statistical Manual of Mental Disorders-DSM-5: American Psychiatric Association (2013)). Estimates suggest that autism affects 1–2% of people worldwide (Pervin, Ahmed, & Hagmayer, 2022). However, prevalence rates differ across regions. For instance,

reviews show rates of 0.6% globally, 0.4% in Asia, 1% in America, 0.5% in Europe, 1% in Africa, and 1.7% in Australia (Salari et al., 2022). Autism is also seen in the Arab world (Alallawi, Hastings, & Gray, 2020).

The increasing prevalence of autism and its multifaceted manifestations emphasizes the need for effective practices to support students with autism in various educational settings (Pervin & Hagmayer, 2022). Consequently, professionals and educators are determinedly seeking to identify and implement evidence-based practices (EBPs) tailored to the needs of students with autism (Hume et al., 2021; Locke et al., 2022). To ensure that students with autism have positive educational outcomes, EBPs have been recommended. These EBPs are teaching practices supported by empirical research. Multiple reviews have identified these practices, with one review recently designating 28 of them (Hume et al., 2021; Steinbrenner et al., 2020).

While EBPs are effective in helping students with autism learn, teachers often face challenges in selecting and using them effectively (Barry, Holloway, Gallagher, & McMahon, 2022). Studies have pointed out issues such as inconsistent use of EBPs, reliance on unsupported teaching methods, and the constant need for additional training (Garrad, Rayner, Pedersen, & Cuskelly, 2021; Locke et al., 2022; Wang & Fleury, 2021). Implementing EBPs successfully in autism education involves the consideration of various interconnected factors. These include individual factors, such as teachers' knowledge and skills, and organizational factors, such as leadership, school climate, and resources (Lauderdale-Littin & Brennan, 2018; Williams & Beidas, 2019).

Many special education teachers begin their careers without receiving specific training in autism (Scheeler, Budin, & Markelz, 2016), which can lead to gaps in their knowledge and confidence (Devi, Palmer, Ganguly, & Barua, 2024; Gee & Gonsier-Gerdin, 2018; Lukins, Able, & Hume, 2023). This lack of training makes it difficult for them to meet the unique needs of students with autism. Therefore, it's essential to ensure that both pre-service and in-service teachers are well-prepared to use EBPs in their teaching routines to better support the academic and social development of students with autism.

Accordingly, this study focuses on exploring the training adequacy (pre-and-in-service), knowledge, and frequency of use of EBPs in autism education among Jordanian in-service special education teachers, with a focus on individual-level factors. By examining these factors, the current study aims to gain a deeper insight into the challenges related to implementing EBPs and provide suggestions to enhance training and support for teachers to achieve positive outcomes for students with autism in Jordan.

2. LITERATURE REVIEW

Research shows that using EBPs significantly improves the learning outcomes of students with autism. Lukins et al. (2023) researched 137 novice special education teachers in the US using a mixed methods design to study their employment of EBPs. The study established that their use was highly dependent on the individual preparedness of the teachers involved. Educators displayed knowledge of EBPs; however, they used these techniques less frequently than anticipated. It also indicated that prompting, modeling, and reinforcement were among the most used EBPs, while the Picture Exchange Communication System (PECS) and peer-based instruction (PBI) were the least implemented techniques. In another instance, Paisley, Eldred, Cawley, and Tomeny (2023) used a qualitative online survey to assess feedback from 303 educators who were asked about their knowledge and utilization of autism-specific EBPs. Their findings showed that a quarter had correctly identified one specific EBP which they had incorporated into teaching, while approximately 80% mistakenly linked at least one EBP with autism.

Furthermore, Larraceleta, Castejón, Iglesias-García, and Núñez (2022) examined how much training on 12 social communication strategies for students with autism is available to special education teachers in Spain. They wanted to know if these strategies were being taught in teacher education and in-service training programs. They gathered data from 108 special education teachers who rated the inclusion of these strategies in their training programs using a scale from 1 to 4. More than 70% of the teachers reported that these 12 strategies were never addressed in either their teacher education or in-service training programs. The study compared these results to

results from a study by Hsiao and Petersen (2019) in America. The results showed that the Spanish special education teachers had a lower percentage of these strategies included in their training compared to their American counterparts.

Atas, Ozsandikci, Olcay, and Saral (2023) carried out a study to determine what special education teachers in Turkey think about EBPs for students with autism. They interviewed 11 teachers and looked at their knowledge, experience, and how they use EBPs. The results showed that while the teachers understood that EBPs are important for autism education, they didn't have a complete understanding of these practices and didn't use them much in their teaching. The teachers who took part in the study stressed the need for better training for both new and experienced educators. They also suggested that there should be more training and coaching sessions to help teachers use EBPs and that these practices should be made more widely available for students with autism in Turkey.

Layden, Maydosz, Crowson, Horn, and Working (2022) conducted a study to assess the viewpoints of 263 education professionals (e.g., administrators, teachers, and related services personnel) regarding their levels of training, confidence in implementation, and frequency of use of 27 EBPs for students with autism in the USA. Through a survey instrument that included 89 items, the educators who participated in the research indicated low levels of training, low confidence in their ability, and a low frequency of the use of EBPs. A substantial number of educational staff also reported that they were not at all confident that they could use the 27 EBPs. The authors recommended that educators and administrators in particular be trained in EBPs for students with autism.

In another study, Alhossein (2021) surveyed 240 special education teachers in Saudi Arabia to understand how they used EBPs. The results showed that teachers had a reasonable understanding of how to apply EBPs for children with autism. Interestingly, female teachers scored higher than male teachers in their proficiency with EBPs. Additionally, teachers who participated in more than five professional development programs used EBPs for autism more often in their classrooms. Commonly used practices included reinforcement, prompting, extinction, and modeling, while scripting, social narratives, self-management, time delay, and video modeling were less common.

Garrad et al. (2021) investigated factors that influence teachers' adoption and discontinuation of EBPs in Australia. The results of the study emphasized that fulfilling student needs was the leading criterion influencing teachers' adoption of EBPs. Additionally, teachers ranked their perception of training as the second-lowest factor influencing their decision regarding the adoption of EBPs. The results also emphasized a need for the promotion and dissemination of information regarding EBPs in the training provided for teachers in Australia.

Additionally, Hamrick, Cerda, O'Toole, and Hagen-Collins (2021) surveyed 255 teachers in public special education settings in the US to investigate their instructional practices, level of preparedness, and access to training. The survey included 93 questions and was completed online. The results showed that the teachers frequently used practices not identified as EBPs when working with students with autism. Additionally, over 30% of the teachers felt they needed more training in best practices. The most frequently used best practices included differential reinforcement, discrete trial training, exercise, functional communication training, modeling, PECS, prompting, and reinforcement.

Dynia, Walton, Brock, and Tiede (2020) conducted a survey with 45 preschool teachers in the USA, focusing on their teaching methods, confidence levels, and interest in professional development. All teachers reported using at least one EBP, with visual supports, behavioral strategies and social narratives being the most commonly employed. In a separate study, Knight, Huber, Kuntz, Carter, and Juarez (2019) surveyed 535 special education teachers regarding their use of 26 EBPs. The results indicated that direct instruction, modeling, and physical arrangement were frequently utilized, whereas audio integration training, video modeling, and facilitated communication were rarely employed. Furthermore, the study revealed that teachers' access to training and resources related to EBPs was limited, suggesting a need for improved access to resources for teachers to gain more understanding related to EBP implementation.

Hsiao and Petersen (2019) gathered information from 63 special education teachers in the USA regarding the inclusion of 25 EBPs in their teacher education and in-service training programs. Around 60% of the teachers reported that the 25 practices identified were either directly taught or discussed in their teacher education and professional development sessions. Additionally, there was a 20% overlap in the practices addressed (i.e., discussed or directly taught) or neglected (i.e., not mentioned or incidentally mentioned) across both training programs. In total, these programs were able to successfully address only 40% of the 25 identified practices. The results of the study highlighted the importance of providing more coverage of these practices in both of the training pathways.

Finally, McNeill (2019) conducted a study entitled "Social validity and teachers' use of evidence-based practices for autism." The study used a survey to assess the social validity of EBPs and measure the correlation between social validity and knowledge level and frequency of use with 130 special education teachers in the US. The results revealed a strong interconnection among knowledge, use, and social validity. Teachers perceived modeling, reinforcement, prompting, and visual support practices as the most socially valid. The regression analysis revealed that enhanced knowledge, greater perceived social validity, and the number of students with autism in the classroom were predictors of more frequent use of EBPs among teachers. The findings highlighted the critical role of social validity in teachers' implementation of EBPs in autism education.

2.1. Problem Statement

In Jordan, specific data regarding the prevalence of autism is currently unavailable. However, there are approximately 10,000 children with autism in Jordan, an estimated rate of 1/50 (Alqhazo, Hatamleh, & Bashtawi, 2020). Jordan is progressively moving toward fostering an inclusive culture for all students with disabilities via the 10-Year Strategy for Inclusive Education (MoE, 2020). This strategy has a key emphasis on applying global best practices in processes and procedures for inclusive education, tailored to the local context (MoE, 2020). Despite Jordan's inclusive commitment, services for students with disabilities remain fragmented, involving multiple venues and vendor interactions (Benson, 2020).

Furthermore, as Jordan advances toward inclusivity, the necessity for well-trained teachers becomes paramount. Teachers must be adequately prepared to utilize best practices, and this readiness is closely linked to their training. Pre-service preparation of special education teachers in Jordan is offered through public and private universities and community colleges, incorporating coursework and practicum experiences. The coursework covers diverse areas such as pedagogy, psychology, special education categories, behavioral management, curriculum development, and instructional methods. However, variations exist among these programs in credit hours, practicum requirements, and the emphasis on knowledge acquisition and theoretical aspects.

Unfortunately, research focusing on special education teachers who work with students with autism have documented that these teachers possess moderate skills and competencies for teaching such students (e.g., (Al-Hiary & Migdady, 2019; Sakarneh, Katanani, & Alrahamneh, 2021)). In this context, Hsiao and Petersen (2019) concluded that understanding the training status in EBPs helps teacher training programs identify teachers' training needs in EBPs. Indeed, understanding the relationship between teachers' training in EBPs and the use of these practices is justified and critical in Jordan to support the inclusive movement.

The present study initiates of series of research endeavors aiming to synthesize, analyze, and promote the dissemination of EBPs among special education teachers in autism education in Jordan. The significance of the current study lies in exploring how teacher (pre-and-in-service) preparation programs in Jordan equip special education teachers with the training and knowledge required to implement EBPs in their teaching in autism education. Additionally, it sheds light on factors that could influence teachers' knowledge and use of these practices and explores the practices currently used in their daily teaching routines. To achieve this, the study addresses the following questions:

(1) How do in-service special education teachers perceive the adequacy of the training they received on evidence-based practices?

(2) How do in-service special education teachers perceive their knowledge of selected evidence-based practices as relevant to autism education?

(3) How frequently do in-service special education teachers use evidence-based practices in supporting students with autism in their daily teaching practices?

(4) How do the statuses of teachers' training, self-perceived knowledge, demographics, and frequency of use of evidence-based practices interrelate with each other?

3. METHOD

3.1. Research Design

This study used an analytical descriptive approach with a survey-based methodology to explore the training, knowledge, and use of evidence-based practices (EBPs) among in-service special education teachers of children with autism in Amman, Jordan. This approach was chosen to gain a comprehensive understanding of the perspectives of these teachers in their specific educational context.

3.2. Research Population

The research population consists of 155 in-service special education teachers who work with students with autism in the city of Amman, Jordan, employed across seven special education institutions. These institutions provide services in self-contained educational settings specifically tailored for students with autism.

3.3. Research Sample

A convenience sample of 121 in-service special education teachers, who work with students with autism, participated in this study (age range 23–44; $M = 28$; $SD = 5.36$). Table 1 presents an overview of the participants' characteristics. Most of the teachers were female ($n = 75$; 62%). Approximately 43.8% ($n = 53$) fell within the age range of 26–35, 81% ($n = 98$) held an undergraduate degree in special education, with the majority graduating from The University of Jordan ($n = 105$; 86%), while the rest graduated from Hashemite University ($n = 10$; 8.2%) and Al-Balqa' Applied University ($n = 6$; 4.9%).

Regarding teaching experience, 57% ($n = 69$) had less than three years of experience in the profession, and 78.5% ($n = 95$) had been teaching students with autism for less than three years. Furthermore, 65.3% ($n = 79$) of the teachers reported teaching 1–5 students with autism. Lastly, 52.1% ($n = 63$) reported attending 1–2 in-service professional development training programs.

Table 1. Participant demographics.

Characteristics	Number (%)
Gender	
Female	75 (62)
Male	46 (38)
Age	
25 and below	43 (35.5)
26–35	53 (43.8)
36 and above	25 (20.7)
Level of educational qualification	
College diploma	16 (13.2)
Undergraduate degree	98 (81)
Graduate degree	7 (5.8)
Years teaching in special education	
3 and below	69 (57)
4 and above	52 (34)

Characteristics	Number (%)
Years teaching students with autism	
3 and below	95 (78.5)
4 and above	26 (21.5)
Number of students in the classroom	
1–5	79 (65.3)
6–10	42 (34.7)
In-service professional development programs	
1–2	63 (52.1)
3–4	43 (35.5)
5 and above	15 (12.4)
Total	121

3.4. Instrument

Data for this study were collected through a self-reported survey (see Appendix A), which was developed based on a literature review of related studies (e.g., (Devi et al., 2024; Hsiao & Petersen, 2019; Hugh et al., 2023; Larraceleta et al., 2022; Lukins et al., 2023)). Part 1 of the survey collected information concerning teachers' characteristics (gender, age, highest degree earned, teaching experience in the field, teaching experience of students with autism, and number of attended professional development training programs). Part 2 encompassed all designated EBPs and their definitions (for clarity purposes) as outlined by the National Clearinghouse on Autism Evidence and Practice (NCAEP) (Hume et al., 2021; Steinbrenner et al., 2020). In this section, teachers were asked to review the definition of each practice and evaluate the adequacy of training received on each practice (both pre- and in-service), their level of knowledge, and the frequency of use on a 4-point Likert scale (1 = very inadequate/no knowledge at all/never used to 4 = very adequate/high level of knowledge/used frequently).

3.4.1. Validity of the Instrument

To validate the survey, a panel of seven special education experts reviewed it to ensure clarity. They confirmed its appropriateness and suitability for the research questions but recommended pairing the Augmentative and Alternative Communication (AAC) practice with the Picture Exchange Communication System (PECS) for teachers. They additionally advised removing the practices of Behavioral Momentum Intervention (BMI), Cognitive Behavioral/Instructional Strategies (CBIS), Music-Mediated Intervention (MMI), Response Interruption/Redirection (RIR), and Self-Management (SM) practices as they were unfamiliar to teachers in Jordan. Consequently, the total number of included EBPs after panel feedback was 23. Further, 20 teachers were asked about their familiarity with the five practices that had been removed (BMI, CBIS, MMI, RIR, and SM) and whether they should be included. Their responses confirmed the decision to remove these five practices due to unfamiliarity and supported the addition of the PECS next to the AAC practice. Additionally, to address clarity concerns raised by some teachers, the term "Social Stories" was included next to "Social Narratives." In addition, the results of the correlation coefficient between each domain and the total score from the piloted sample ($n = 20$) were 0.905 (for pre-service training), 0.940 (for in-service training), 0.892 (for knowledge), and 0.630 (for the use of each practice), all significant at the 0.01 level.

3.4.2. Reliability of the Instrument

Cronbach's alpha was used to evaluate the reliability of the survey, which was piloted with a sample of 20 special education teachers drawn from the study population but excluded from the study sample. The Cronbach's alpha coefficients for Part 2 were 0.958 for pre-service training, 0.937 for in-service training, 0.929 for knowledge, 0.953 for the use of each practice, and 0.967 for the entire survey. These results supported the suitability of the survey for use in the study.

3.5. Data Analysis

All data were entered into IBM SPSS version 25 for analysis. Several statistical tests including descriptive statistics (numbers, percentages, means, and standard deviations) and an independent sample *t* test were employed to determine the significance of the differences between two independent groups, an analysis of variance (ANOVA) test was employed to assess the significance of the differences among more than two independent groups, Pearson's correlation was used to assess the correlations among teachers' training, knowledge and use of EBPs, and a standard multiple regression analysis was employed to determine what individual-level factors predict teachers' knowledge and use of EBPs.

4. FINDINGS

4.1. Adequacy of Pre-Service and In-Service Training

Table 2 presents the means, standard deviations, numbers, and percentages of the teachers' responses to the adequacy of training received for each EBP in their pre-service training. The means ranged from 3.02 (*SD* = 0.889) to 2.06 (*SD* = 1.17), with an overall mean of 2.42 (*SD* = 0.836), suggesting a moderate level of training adequacy. In terms of percentages, nearly 29% of the teachers reported their training in EBPs as "very inadequate," 18.8% as "inadequate," 30% as "adequate," and 21% as "very adequate." Looking at the individual practices, teachers agreed that the highest reported practices with adequate training received in teacher education were "Reinforcement" (*M* = 3.02, *SD* = 0.889), "Task Analysis" (*M* = 2.87, *SD* = 0.939), "Modeling" (*M* = 2.81, *SD* = 0.879), "Prompting" (*M* = 2.73, *SD* = 0.940), and "Differential Reinforcement" (*M* = 2.63, *SD* = 0.941). On the other hand, the practices with the lowest reported training adequacy were "Video Modeling" (*M* = 2.06, *SD* = 1.17), "Social Narratives/Stories" (*M* = 2.09, *SD* = 1.13), "Functional Communication Training" (*M* = 2.12, *SD* = 1.13), "Sensory Integration" (*M* = 2.17, *SD* = 1.10), and "Augmentative and Alternative Communication/PECS" (*M* = 2.17, *SD* = 1.15).

Table 2. Means, standard deviations, numbers, and percentages of teachers' responses on training in EBP received in their teacher education programs ranked from highest to lowest based on mean.

EBP	M	SD	Teachers' responses n (%)			
			Very inadequate	Inadequate	Adequate	Very adequate
1. Reinforcement	3.02	0.889	11 (9.1)	13 (10.7)	59 (48.8)	38 (31.4)
2. Task analysis	2.87	0.939	15 (12.4)	17 (14)	58 (47.9)	31 (25.6)
3. Modeling	2.81	0.879	13 (10.7)	21 (17.4)	63 (52.1)	24 (19.8)
4. Prompting	2.73	0.940	18 (14.9)	20 (16.5)	60 (49.6)	23 (19)
5. Differential reinforcement	2.63	0.941	19 (15.7)	27 (22.3)	55 (45.5)	20 (16.5)
6. Direct instruction	2.58	0.973	23 (19)	24 (19.8)	55 (45.5)	19 (15.7)
7. Extinction	2.55	1.26	43 (35.5)	7 (5.8)	33 (27.3)	38 (31.4)
8. Time delay	2.45	1.15	36 (29.8)	23 (19)	33 (27.3)	29 (24)
9. Technology-aided instruction	2.44	1.23	42 (34.7)	18 (14.9)	27 (22.3)	34 (28.1)
10. FBA	2.43	1.18	38 (31.4)	25 (20.7)	26 (21.5)	32 (26.4)
11. Visual supports	2.40	1.17	39 (32.2)	23 (19)	30 (24.8)	29 (24)
12. Naturalistic intervention	2.37	1.18	42 (34.7)	20 (16.5)	31 (25.6)	28 (23.1)
13. Parent-implemented intervention	2.35	1.15	41 (33.9)	22 (18.2)	33 (27.3)	25 (20.7)
14. Antecedent-based intervention	2.32	0.977	26 (21.5)	48 (39.7)	29 (24)	18 (14.9)
15. Social skills training	2.29	1.20	48 (39.7)	17 (14)	29 (24)	27 (22.3)
16. Discrete trial training (DTT)	2.27	1.08	40 (33.1)	26 (21.5)	37 (30.6)	18 (14.9)
17. Peer-based instruction	2.23	1.13	44 (36.4)	28 (23.1)	26 (21.5)	23 (19)
18. Exercise and movement	2.18	1.12	46 (38)	28 (23.1)	26 (21.5)	21 (17.4)
19. AAC/PECS	2.17	1.15	49 (30.5)	24 (19.8)	26 (21.5)	22 (18.2)
20. Sensory integration	2.17	1.10	47 (38.8)	24 (19.8)	32 (26.4)	18 (14.9)
21. Functional communication	2.12	1.13	50 (41.3)	26 (21.5)	25 (20.7)	20 (16.5)
22. Social stories	2.09	1.13	52 (43)	26 (21.5)	23 (19)	20 (16.5)
23. Video modeling	2.06	1.17	59 (48.8)	17 (14)	24 (19.8)	21 (17.4)
Total	2.42	.836	841 (29.7)	524 (18.8)	840 (30.1)	578 (21.4)

Table 3 presents the means, standard deviations, numbers, and percentages of the teachers' responses to the adequacy of training received for each EBP in their in-service training. The means ranged from 3.36 (SD = 0.902) to 2.16 (SD = 1.01), with an overall mean of 2.61 (SD = 0.680), suggesting a moderate level of training adequacy. In terms of percentages, nearly 18.4% of the teachers reported their training in EBPs as "very inadequate," 22.4% as "inadequate," 38% as "adequate," and 21% as "very adequate." Looking at the individual practices, teachers agreed that the highest reported practices with adequate training received in in-service training were "Reinforcement" (M = 3.36, SD = 0.902), "Differential Reinforcement" (M = 3.15, SD = 0.813), "FBA" (M = 3.02, SD = 0.806), "Direct Instruction" (M = 2.93, SD = 0.838), and "Discrete Trial Training" (M = 2.86, SD = 0.830). On the other hand, the practices with the lowest reported training adequacy were "Video Modeling" (M = 2.16, SD = 1.01), "Exercise and Movement" (M = 2.17, SD = 0.969), "Functional Communication Training" (M = 2.29, SD = 1.06), "Parent Implemented Intervention" (M = 2.33, SD = 1.01), and "Peer Based Instruction" (M = 2.36, SD = 1.15).

Table 3. Means, standard deviations, numbers, and percentages of teachers' responses on training in EBP received in in-service professional development training ranked from highest to lowest based on means.

EBP	M	SD	Teachers' responses n (%)			
			Very inadequate	Inadequate	Adequate	Very adequate
1. Reinforcement	3.36	0.902	7 (5.8)	14 (11.6)	29 (24)	71 (58.7)
2. Differential reinforcement	3.15	0.813	8 (6.6)	8 (6.6)	63 (52.1)	42 (34.7)
3. FBA	3.02	0.806	6 (5)	20 (16.5)	61 (50.4)	34 (28.1)
4. Direct instruction	2.93	0.838	11 (9.1)	14 (11.6)	69 (57)	27 (22.3)
5. Discrete trial training (DTT)	2.86	0.830	10 (8.3)	21 (17.4)	66 (54.5)	24 (19.8)
6. Visual supports	2.71	0.889	14 (11.6)	28 (23.1)	58 (47.9)	21 (17.4)
7. Prompting	2.69	0.947	14 (11.6)	36 (29.8)	44 (36.4)	27 (22.3)
8. Task analysis	2.66	0.909	19 (15.7)	20 (16.5)	65 (53.7)	17 (14)
9. AAC/PECS	2.66	0.881	12 (9.9)	38 (31.4)	50 (41.3)	21 (17.4)
10. Modeling	2.65	0.964	20 (16.5)	24 (19.8)	55 (45.5)	22 (18.2)
11. Extinction	2.61	1.24	38 (31.4)	11 (9.1)	32 (26.4)	40 (33.1)
12. Naturalistic intervention	2.60	1.05	27 (22.3)	20 (16.5)	49 (40.5)	25 (20.7)
13. Sensory integration	2.56	0.956	20 (16.5)	33 (27.3)	48 (39.7)	20 (16.5)
14. Social stories	2.51	0.877	19 (15.7)	33 (27.3)	57 (47.1)	12 (9.9)
15. Technology-aided instruction	2.49	0.877	19 (15.7)	36 (29.8)	54 (44.6)	12 (9.9)
16. Social skills training	2.47	0.923	21 (17.4)	37 (30.6)	48 (39.7)	15 (12.4)
17. Time delay	2.45	0.931	21 (17.4)	40 (33.1)	44 (36.4)	16 (13.2)
18. Antecedent-based intervention	2.40	1.28	48 (39.7)	13 (10.7)	24 (19.8)	36 (29.8)
19. Peer-based instruction	2.36	1.15	40 (33.1)	23 (19)	32 (26.4)	26 (21.5)
20. Parent-implemented intervention	2.33	1.01	28 (23.1)	45 (37.2)	28 (23.1)	20 (16.5)
21. Functional communication	2.29	1.06	35 (28.9)	36 (29.8)	30 (24.8)	20 (16.5)
22. Exercise	2.17	0.969	34 (28.1)	47 (38.8)	26 (21.5)	14 (11.6)
23. Video modeling	2.16	1.01	43 (35.5)	27 (22.3)	40 (33.1)	11 (9.1)
Total	2.61	0.680	514 (18.4)	624 (22.4)	1027 (38)	573 (20.8)

4.2. Teachers' Knowledge of EBPs

Table 4 presents the means, standard deviations, numbers, and percentages of the teachers' perceived knowledge of each practice. The means ranged from 3.51 (SD = 0.807) to 2.16 (SD = 0.957), with an overall mean

of 2.67 (*SD* = 0.649), suggesting a moderate level of knowledge, but these means were slightly higher than those related to training adequacy. Regarding knowledge of EBPs, around 16% of the teachers reported having "no knowledge at all," 22.4% as having a "mild level of knowledge," 38.6% as having a "moderate level of knowledge," and 22.4% as having a "high level of knowledge." Looking at the individual practices, teachers agreed that the practices with the highest levels of knowledge were "Reinforcement" (*M* = 3.51, *SD* = 0.807), "Prompting" (*M* = 3.23, *SD* = 0.783), "Modeling" (*M* = 3.12, *SD* = 0.868), "Extinction" (*M* = 3.02, *SD* = 0.806), and "Differential Reinforcement" (*M* = 3.00, *SD* = 0.866). On the other hand, the lowest reported practices were "Peer-based Instruction" (*M* = 2.36, *SD* = 1.15), "Sensory Integration" (*M* = 2.33, *SD* = 1.01), "Functional Communication Training" (*M* = 2.29, *SD* = 1.06), "Video Modeling" (*M* = 2.16, *SD* = 1.01), and "Exercise and Movement" (*M* = 2.16, *SD* = 0.957).

Table 4. Means, standard deviations, numbers, and percentages of teachers' knowledge of each EBP ranked from highest to lowest based on means.

EBP	M	SD	Teachers' responses n (%)			
			Not at all	Mild level	Moderate	High level
1. Reinforcement	3.51	0.807	7 (4.1)	9 (7.4)	26 (21.5)	81 (66.9)
2. Prompting	3.23	0.783	5 (4.1)	11 (9.1)	56 (46.3)	49 (40.5)
3. Modeling	3.12	0.868	6 (5)	21 (17.4)	47 (38.8)	47 (38.8)
4. Extinction	3.02	0.806	6 (5)	20 (16.5)	61 (50.4)	34 (28.1)
5. Differential reinforcement	3.00	0.866	5 (4.1)	30 (24.8)	46 (38)	40 (33.1)
6. Task analysis	2.97	0.909	9 (7.4)	19 (15.7)	60 (49.6)	33 (27.3)
7. Direct instruction	2.93	0.838	11 (9.1)	14 (11.6)	69 (57)	27 (22.3)
8. Discrete trial training (DTT)	2.86	0.830	10 (8.3)	21 (17.4)	66 (54.5)	24 (19.8)
9. Visual supports	2.71	0.889	14 (11.6)	28 (23.1)	58 (47.9)	21 (17.4)
10. FBA	2.66	0.881	12 (9.9)	38 (31.4)	50 (41.3)	21 (17.4)
11. AAC/PECS	2.65	0.964	20 (16.5)	24 (19.8)	55 (45.5)	22 (18.2)
12. Naturalistic intervention	2.60	1.05	27 (22.3)	20 (16.5)	49 (40.5)	25 (20.7)
13. Antecedent-based intervention	2.56	0.956	20 (16.5)	33 (27.3)	48 (39.7)	20 (16.5)
14. Technology-aided instruction	2.51	0.877	19 (15.7)	33 (27.3)	57 (47.1)	12 (9.9)
15. Social narratives/Stories	2.49	0.877	19 (15.7)	36 (29.8)	54 (44.6)	12 (9.9)
16. Social skills	2.47	0.923	21 (17.4)	37 (30.6)	48 (39.7)	15 (12.4)
17. Time delay	2.45	0.931	21 (17.4)	40 (33.1)	44 (36.4)	16 (13.2)
18. Parent-implemented intervention	2.40	1.28	48 (39.7)	13 (10.7)	24 (19.8)	36 (29.8)
19. Peer-based instruction	2.36	1.15	40 (33.1)	23 (19)	32 (26.4)	26 (21.5)
20. Sensory integration	2.33	1.01	28 (23.1)	45 (37.2)	28 (23.1)	20 (16.5)
21. Functional communication	2.29	1.06	35 (28.9)	36 (29.8)	30 (24.8)	20 (16.5)
22. Video modeling	2.16	1.01	43 (35.5)	27 (22.3)	40 (33.1)	11 (9.1)
23. Exercise	2.16	0.957	34 (28.1)	47 (38.8)	27 (22.3)	13 (10.7)
Total	2.67	0.645	460 (16.4)	625 (22.4)	1075 (38.6)	625 (22.4)

4.3. Teachers' Use of EBPs

Table 5 displays the means, standard deviations, numbers, and percentages of teachers' responses on the frequency of use of each of the EBPs in their daily teaching. The means ranged from 3.40 (*SD* = 0.780) to 1.74 (*SD* = 0.909), with an overall mean of 2.44 (*SD* = 0.790) suggesting a moderate level of use. In terms of percentages, nearly 30% of the teachers reported that they have "never used" any of the EBPs in their teaching, 20.8% have "mildly used," 28.5% have "moderately used," and 17.8% have "frequently used" the practices in their teaching. Based on the percentages, the teachers agreed that the most used practices were "Reinforcement" (*M* = 3.40, *SD* = 0.780), "Prompting" (*M* = 3.19, *SD* = 0.734), "Modeling" (*M* = 2.81, *SD* = 0.879), "Task Analysis" (*M* = 2.73, *SD* = 0.940), and "Extinction" (M = 2.63, *SD* = 0.941). However, the lowest used practices were "Sensory Integration" (*M* = 2.17, *SD* = 1.10), "Parent-Implemented Intervention" (*M* = 2.10, *SD* = 1.12), "Exercise and Movement" (*M* = 1.39, *SD* = 1.07), "Video Modeling" (*M* = 1.89, *SD* = 1.02), and "Functional Communication Training" (*M* = 1.74, *SD* = 0.909).

Table 5. Means, standard deviations, numbers, and percentages of teachers' frequency use of each EBP ranked from highest to lowest based on means.

EBP	M	SD	Teachers' responses n (%)			
			Never	Mildly	Moderately	Highly
1. Reinforcement	3.40	0.780	4 (3.3)	10 (8.3)	41 (33.9)	66 (54.5)
2. Prompting	3.19	0.734	2 (1.7)	17 (14)	58 (47.9)	44 (36.4)
3. Modeling	2.81	0.879	13 (10.7)	21 (17.4)	63 (52.1)	24 (19.8)
4. Task analysis	2.73	0.940	18 (14.9)	20 (16.5)	60 (49.6)	23 (19)
5. Extinction	2.63	0.941	19 (15.7)	27 (22.3)	55 (45.5)	20 (16.5)
6. Differential reinforcement	2.58	0.973	23 (19)	24 (19.8)	55 (45.5)	19 (15.7)
7. Discrete trial training (DTT)	2.55	1.26	43 (35.5)	7 (5.8)	33 (27.3)	38 (31.4)
8. Visual supports	2.45	1.15	36 (29.8)	23 (19)	33 (27.3)	29 (24)
9. FBA	2.44	1.23	42 (34.7)	18 (14.9)	27 (22.3)	34 (28.1)
10. AAC/PECS	2.43	1.18	38 (31.4)	25 (20.7)	26 (21.5)	32 (26.4)
11. Technology-aided instruction	2.40	1.17	39 (32.2)	23 (19)	30 (24.8)	29 (24)
12. Direct instruction	2.37	1.18	42 (34.7)	20 (16.5)	31 (25.6)	28 (23.1)
13. Naturalistic intervention	2.35	1.53	41 (33.9)	22 (18.2)	33 (27.3)	25 (20.7)
14. Time delay	2.32	0.977	26 (21.5)	48 (39.7)	29 (24)	18 (14.9)
15. Social skills training	2.29	1.20	48 (39.7)	17 (14)	29 (24)	27 (22.3)
16. Antecedent-based intervention	2.27	1.08	40 (33.1)	26 (21.5)	37 (30.6)	18 (14.9)
17. Social narratives/Stories	2.23	1.13	44 (36.4)	28 (23.1)	26 (21.5)	23 (19)
18. Peer-based instruction	2.18	1.12	46 (38)	28 (23.1)	26 (21.5)	21 (17.4)
19. Sensory integration	2.17	1.10	47 (38.8)	24 (38.8)	32 (26.4)	18 (14.9)
20. Parent-implemented intervention	2.10	1.12	49 (40.5)	32 (26.4)	19 (15.7)	21 (17.4)
21. Exercise	1.93	1.07	58 (47.9)	30 (24.8)	17 (14)	16 (13.2)
22. Video modeling	1.89	1.02	57 (47.1)	33 (27.3)	18 (14.9)	13 (10.7)
23. Functional communication	1.74	0.909	62 (51.2)	35 (28.9)	17 (14)	7 (5.8)
Total	2.44	0.790	837 (30)	558 (20.8)	795 (28.5)	554 (17.8)

4.4. Factors Significantly Influencing Teachers' Responses

To examine how the characteristics of the study sample (see Table 1) influenced the teachers' responses, we conducted an independent sample t test on gender, years in special education, years teaching students with autism, and number of students with autism in the classroom. The analysis revealed no significant differences in the responses for training, knowledge, and use of EBPs.

However, the one-way ANOVA revealed that the number of in-service professional development training programs significantly influenced the responses concerning in-service training adequacy, $F(2, 118) = 9.63$, p = 0.000; knowledge, $F(2, 118) = 9.54$, p = 0.000; and use of EBPs, $F(2, 118) = 9.54$, p = 0.000. Post-hoc comparisons using Tukey's Honestly Significant Difference (HSD) test indicated that teachers who attended five or more programs and those who attended 3–4 programs had higher means compared to teachers who attended 1–2 training programs for all comparisons related to training, knowledge, and use of EBPs. In additions, the comparison between the five or more group and the 3-4 group revealed no significant difference in the teachers' responses related to training, knowledge, and use of EBPs.

4.5. Interrelations Among Teachers' Training, Knowledge, and Use of EBPs

Regarding the relationships between teachers' training, knowledge, and use of EBPs, Pearson's correlation results revealed a large positive correlation between teachers' use of EBPs and their in-service professional development training, $r(121) = 0.972$, $p < 0.000$ (two-tailed), and teachers' knowledge of EBPs, $r(121) = 0.817$, $p < 0.000$ (two-tailed), but not with their pre-service training $r(121) = 0.042$, $p < 0.645$ (two-tailed). The results also revealed a large positive correlation between teachers' knowledge of EBPs and their in-service professional development training, $r(121) = 0.830$, $p < 0.000$ (two-tailed).

A standard multiple regression analysis was conducted to evaluate factors related to teachers' knowledge of EBPs and their use of EBPs. The predictors were (a) number of years teaching in special education, (b) number of

years teaching students with autism, (c) number of children with autism in the classroom, and (d) number of in-service training programs. The results showed that these predictors significantly explained a proportion of the variance in teachers' knowledge ($R^2 = 0.138$, $F(4,116) = 4.639$, $p < 0.002$). Specifically, it was found that only the number of years teaching students with autism ($\beta = 0.253$, $t = 2.396$, $p < 0.018$) and the number of in-service professional development training programs ($\beta = -0.399$, $t = -3.667$, $p < 0.000$) significantly predicted teachers' knowledge of EBPs. Additionally, the results showed that the predictors significantly explained a proportion of the variance in teachers' use of EBPs ($R^2 = 0.228$, $F(4,116) = 8.57$, $p < 0.000$). Specifically, it was found that only the number of years teaching students with autism ($\beta = -0,462$, $t = -4.616$, $p < 0.000$) and the number of in-service professional development training programs ($\beta = 0.527$, $t = 5.119$, $p < 0.000$) significantly predicted teachers' use of EBPs.

5. DISCUSSION

This study explored both the perceived pre-service and in-service training adequacy, knowledge levels, and the frequency of implementing evidence-based practices (EBPs) for students with autism among in-service special education teachers in Jordan. The investigation also examined the interrelationships among teacher-related factors (as presented in Table 1), adequacy of training, level of knowledge, and the frequency of EBP use.

In terms of training adequacy, knowledge, and use of EBPs, the participating teachers reported a satisfactory level of training, knowledge, and utilization of EBPs for students with autism. This suggests that teachers receive acceptable training on EBPs, enabling them to integrate this knowledge into their daily teaching practices. These findings align with prior research studies (e.g., (Devi et al., 2024; Hsiao & Petersen, 2019; Larraceleta et al., 2022; Lauderdale-Littin & Brennan, 2018)). An in-depth examination of teachers' training revealed a moderate level of adequacy, with slightly higher ratings reported for in-service professional development ($M = 2.61$, $SD = 0.680$) compared to pre-service training ($M = 2.42$, $SD = 0.836$). Notably, 58.8% of the teachers perceived their in-service training as "adequate," whereas 51.5% reported the same for pre-service training. These findings are consistent with those of other studies (e.g., (Alhossein, 2021; Devi et al., 2024)).

One plausible explanation could be tied to the structure of pre-service training in Jordan, which, despite offering a reasonable level of adequacy, focuses more on general knowledge and skills in special education and lacks specialized training in autism (Al-Hiary & Migdady, 2019). This aligns with Alexander, Ayres, and Smith (2015), who observed that many personnel training programs in autism fall short in preparing teachers to the required specification level. Another potential explanation could be attributed to the significance of receiving in-service training. In fact, the results of this study revealed a significant positive correlation between EBP knowledge, use, and in-service training aligning with results obtained by Paynter et al. (2017). The results further revealed that the number of professional development training courses attended was a predictor of the teachers' knowledge and use of EBPs. These results are consistent with other studies (e.g., (Knight et al., 2019; Lukins et al., 2023)). Attending more professional development programs among teachers in this study resulted in them reporting a greater level of knowledge and utilization of EBPs. This aligns with the findings of Alhossein (2021) who found that those who attended more professional development programs reported greater knowledge and use of EBPs.

It might be assumed that when training is provided, knowledge of and the willingness to use EBPs would increase. Teachers in our study who participated in these training courses might have had the opportunity to discuss more, obtain more information, and share practical experiences. Additionally, experience in teaching students with autism emerged as a predictive factor for knowledge and use of EBPs in this study. This aligns with previous research conducted by Knight et al. (2019) which suggests that experience enhances teachers' knowledge and implementation of these practices.

Moreover, as we investigated the use of EBPs, the prevalent practices reported by teachers in this study were consistent across their reports related to training, knowledge, and use. Noteworthy practices included

"Reinforcement," "Task Analysis," "Modeling," "Prompting," "Extinction," "FBA," and "Differential Reinforcement." Conversely, the less reported practices were "Functional Communication," "Social Narratives/Stories," "Video Modeling," "Parent-implemented intervention," "Peer-based instruction," and "Exercise and movement" (see Tables 2, 3, 4, and 5). These results also align with other studies (e.g., (Hamrick et al., 2021; Locke et al., 2022; Morin, Sam, Tomaszewski, Waters, & Odom, 2021)).

It is unsurprising that the reported practices are consistent for several reasons. First, the correlations obtained in this study indicate that teachers tend to use the EBPs that they are trained on and knowledgeable about, hence selecting what they felt more confident with. Second, teacher training in Jordan follows a non-categorical approach, focusing on theoretical and knowledge-based topics in special education, curriculum and instruction, and behavior management. This likely explains the focus on the most reported practices, as these programs provide in-depth discussions during class meetings. According to Hsiao and Petersen (2019) this is unsurprising as these practices are taught because they are related to classroom management courses and are useful for students with disabilities. Third, training challenges for the less reported practices are due to access limitations in training and resource allocation, which hindered the improvement of teachers' knowledge and use of these practices (Coates, Lamb, Bartlett, & Datta, 2017; Silveira-Zaldivar & Curtis, 2019) raising the demand for more accessibility to resources related to EBPs for teachers in Jordan. Overall, the results of this study highlight the need to address the challenges faced by in-service special education teachers in using EBPs and the ongoing need for providing adequate support to special education teachers working in autism educational settings in Jordan.

6. CONCLUSION

The current study provides results related to training, knowledge, and frequency of use of evidence-based practices (EBPs) among in-service special education teachers in autism educational settings in Jordan. The findings indicate a reasonable level of training adequacy, knowledge depth, and EBP implementation among the participants. A significant positive correlation was found between the knowledge and use of EBPs and in-service training. Notably, the number of professional development training courses attended and experience in teaching students with autism emerged as significant predictive factors, underscoring the importance of practical knowledge gained through hands-on experience. Consistency in reported practices across training, knowledge, and use of EBPs suggests teachers' tendencies to use practices they trained on and feel confident implementing. However, challenges associated with less used practices highlights the necessity for accessible resources and support mechanisms to enhance teachers' familiarity with a broader range of EBPs. The findings of this study suggest that while special education teachers in Jordan have a solid foundation in evidence-based practices, there is room for growth and improvement in certain areas. Moving forward, educational institutions and policymakers should prioritize the provision of comprehensive training programs and resources that address the full spectrum of evidence-based practices.

7. IMPLICATIONS

The findings of this study accentuate the importance of professional development training programs in enhancing the use of EBPs among in-service special education teachers in Jordan. An increase in the number of professional development training programs attended correlates positively with the effective implementation of EBPs. Therefore, service providers need to arrange broad professional development training programs that meet the specific needs of teachers working with students with autism in Jordan. These training programs should particularly focus on the essentials of EBPs by providing teachers with practical and applicable training to ensure the successful implementation of EBPs.

Moreover, the findings highlight the crucial role of gaining practical experience in teaching students with autism as a pivotal predictor of EBP implementation, confirming that teacher training in Jordan needs to provide

opportunities for student teachers before graduation to gain hands-on experience through structured classroom placements and practical training sessions. Therefore, the methodologies of pre-service preparation programs in Jordan must be reassessed to emphasize specific training rather than generalized preparation. These programs need to equip teachers with a robust knowledge base and a persistent commitment to implementing EBPs effectively, particularly in the context of autism education. By doing so, improvements in students' achievement will certainly be noticeable. This will, in turn, contribute to the accomplishment of the inclusive movement in Jordan.

8. LIMITATIONS AND FUTURE DIRECTIONS

Although the findings of this study provide important insights into teacher training and the knowledge and use of EBPs in Jordan, its limitations should be considered. First, this study focused on in-service special education teachers in self-contained settings. Future studies should examine other staff (e.g., general education teachers) and other educational settings (e.g., inclusive settings) given the current movement toward inclusive education in Jordan. Second, while this study initiates research on EBPs in Jordan, future endeavors should explore barriers, facilitators, selection criteria, implementation fidelity, and dissemination strategies related to EBPs for students with autism. Third, this study relied on teachers' self-reports of their perceived use of EBPs. It is recommended that future studies incorporate other techniques to capture the actual use of these practices, such as observational research methods. Fourth, this study focused on teachers' training and their knowledge and use of EBPs. Literature suggests that other factors such as teacher attitudes, motivation, and emotional status (e.g., stressors and burnout), as well as contextual factors (e.g., resources, administrative support, and school climate) influence the use of EBPs. Thus, future research may target these factors for further exploration. Lastly, it is recommended that in-service training in Jordan be improved by integrating multiple approaches and emphasizing practices that have a strong evidence base for effectiveness for students with autism (Morrier, Hess, & Heflin, 2011). Such a model may include multiple training methods such as individual instruction, video examples, written materials, workshops, and lectures. Future research can augment the current educational landscape in Jordan with studies focusing on these areas.

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Appendix A. Research instrument.

Part 1: Demographics:

Gender: ☐ Male   Female ☐

Age:

☐ 25 and below   ☐ 26–35   ☐ 36 and above

Level of Educational Qualification:

☐ College diploma   ☐ Undergraduate degree   ☐ Graduate degree

Years Teaching in Special Education:

☐ 3 and below   ☐ 4 and above

Years Teaching Students with Autism:

☐ 3 and below   ☐ 4 and above

Number of Students in the Classroom:

☐ 1–5   ☐ 6–10

Number of In-service Professional Development Programs:

☐ 1–2   ☐ 3–4   ☐ 5 and above

Part 2: Training Adequacy, Level of Knowledge, and Use of EBPs

A. Instructions:
Please refer to the definition of each of the following 23 EBPs placed in the end of this survey, and evaluate the adequacy of the training you have received in your Pre-service training as well as In-service training:
- The evaluation is based on a Likert scale encompassing the following values:
  1. Very inadequate
  2. Inadequate
  3. Adequate
  4. Very adequate

The practice	Adequacy of in-service training				Adequacy of pre-service training			
	1	2	3	4	1	2	3	4
Antecedent-based interventions (ABI)								
Augmentative and alternative communication (AAC)/PECS								
Differential reinforcement of alternative, incompatible, or other behavior (DR)								
Direct instruction (DI)								
Discrete trial training (DTT)								
Exercise and movement (EXM)								
Extinction (EXT)								
Functional behavioral assessment (FBA)								
Functional communication training (FCT)								
Modelling (MD)								
Naturalistic intervention (NI)								
Parent-implemented intervention (PII)								
Peer-based instruction and intervention (PBII)								
Prompting (PP)								
Reinforcement (R)								
Sensory integration (SI)								
Social narratives/Stories (SN/SS)								
Social skills training (SST)								
Task analysis (TA)								
Technology-aided instruction and intervention (TAII)								
Time delay (TD)								
Video modeling (VM)								
Visual supports (VS)								

B. Instructions:

Please refer to the definition of each of the following 23 EBPs listed at the end of this survey and evaluate the adequacy of your knowledge and use of each practice.

- The rating of knowledge is based on a Likert scale with the following values:
  1. No knowledge at all
  2. Mild level of knowledge
  3. Moderate level of knowledge
  4. High level of knowledge

- The rating of use is based on a Likert scale with the following values:
  1. I have never used it
  2. I am using it to a mild degree (once per month)
  3. I am using it to a moderate degree (once per week)
  4. I am using it to a high degree (daily)

Practice	Knowledge of the practice				Frequency of use			
	1	2	3	4	1	2	3	4
Antecedent-based interventions (ABI)								
Augmentative and alternative communication (AAC)/PECS								
Differential reinforcement of alternative, incompatible, or other behavior (DR)								
Direct instruction (DI)								
Discrete trial training (DTT)								
Exercise and movement (EXM)								
Extinction (EXT)								
Functional behavioral assessment (FBA)								
Functional communication training (FCT)								
Modelling (MD)								
Naturalistic intervention (NI)								
Parent-implemented intervention (PII)								
Peer-based instruction and intervention (PBII)								
Prompting (PP)								
Reinforcement (R)								
Sensory integration (SI)								
Social narratives/stories (SN/SS)								
Social skills training (SST)								
Task analysis (TA)								
Technology-aided instruction and intervention (TAII)								
Time delay (TD)								
Video modeling (VM)								
Visual supports (VS)								

Additional notes:

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