

Investigating Knowledge of Applied Behavior Analysis Strategies among Teachers and Teacher Assistants of Students with Autism Spectrum Disorder in Private Special Education Schools in Kuwait

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Applied behavior analysis (ABA) is a critical evidence-based framework for developing effective interventions for students with autism spectrum disorder (ASD). In Kuwait, where the majority of students with ASD are enrolled in private special education schools, the ABA competency of the instructional workforce remains largely unexamined. This cross-sectional quantitative study investigated the knowledge of ABA strategies among 328 teachers and teacher assistants at private special education schools in Kuwait. The sample of the study totaled 328 special education teachers and teacher assistants selected from 32 special education schools providing ABA services to students with ASD. Using an adapted and translated Arabic version of the Behavior Management Survey (Randozzo, 2011), participants were evaluated across five key domains: Basic Principles, Measurement, Skill Acquisition, Antecedent Interventions, and Behavior Reduction. The data were analyzed using descriptive statistics, the Mann–Whitney U test, the Kruskal–Wallis H test, and the chi-square test. The results indicated significant disparities in knowledge across domains ($p < .001$), with participants demonstrating relative strengths in Basic Principles ($M = 62.3\%$) and Skill Acquisition ($M = 56.3\%$) but exhibiting critical deficiencies in Measurement ($M = 46.0\%$), Antecedent Interventions ($M = 43.3\%$), and Behavior Reduction ($M = 49.8\%$). Notably, participants who held formal ABA certifications (RBT, BCaBA, or BCBA) scored significantly higher across all the domains ($p < .001$), with median scores up to three times higher than those of noncertified staff. These findings reveal a substantial gap in procedural ABA knowledge within Kuwait's private special education sector and underscore an urgent need for systematic

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professional development and policies that support formal certification to ensure high-quality educational outcomes for students with ASD.

Keywords: basic principles of aba, measurement, skill acquisition, antecedent interventions, behavior reduction.

INTRODUCTION

Applied behavior analysis (ABA) is a science that has significantly influenced the educational environment of people with autism spectrum disorder (ASD) in a positive manner. ABA has become a strictly scientific field focused on the use of behavioral principles to enhance socially significant behaviors, as its philosophical underpinnings were laid by B.F. Skinner (1953) in his work on operant conditioning (Baer, Wolf, and Risley, 1968; Cooper, Heron, and Heward, 2020). ABA has defined its methodologies by being highly precise, objective, and focused on the demonstration of outcomes (ABA is one of the most extensively studied and validated techniques for teaching individuals with ASD) (National Autism Center, 2015; Wong et al., 2015). A body of research has continued to indicate that the use of early and intensive behavioral intervention, which is based on ABA, can result in significant gains in cognitive, language, and adaptive skills (Lovaas, 1987; Eldevik et al., 2009; Makrygianni, Gena, Katoudi, and Galanis, 2018).

The prevalence of ASD across the entire globe has significantly increased during recent decades (Baio et al., 2018) and has become apparent in Gulf Cooperation Council (GCC) countries, such as the State of Kuwait (Alshaban et al., 2019). This increased prevalence has increased the call to have effective and specialized educational services. The school-based provision for students with ASD in Kuwait operates through two main streams: government-managed schools and private special education schools. A distinctive characteristic of the Kuwaiti system is that many students with ASD enroll in private schools, with many being bilingual (Arabic-English) and receiving substantial government subsidies. This model provides parents with an option that combines special education support with English language instruction.

Kuwaiti national law provides free education to individuals with disabilities, which distinguishes Kuwait from some contexts where funding poses a primary barrier to service access (Peters-Scheffer et al., 2011). However, it is important to clarify that publicly funded education for students with disabilities is also mandated in many other countries, including the United States under the Individuals with Disabilities Education Act (IDEA). The key distinction in the Kuwaiti context is not the presence of public funding per se, but rather the heavy reliance on the private sector to deliver publicly funded services, which places unique demands on human resource capacity. This implies that public educational authorities in Kuwait make efforts to design training programs able to meet the needs of ASD students in both public and private schools. This policy context shifts emphasis from financial accessibility—which is legally guaranteed—to the knowledge, skills, and training of educational personnel who implement interventions. Thus, understanding educator competency becomes particularly critical in this service delivery model.

The teaching staff at private schools in Kuwait are mostly expatriates, who have formed a distinctively heterogeneous but homogenous workforce with a variety of qualifications and training backgrounds worldwide (Al-Hendawi, 2013). Although this diversity can be quite beneficial, it results in high variability in exposure to and training with respect to ABA. The difficulty of providing all high standards of practice is complicated by the complexity of ASD, which requires customized systematic and expert interventions (Lord et al., 2020). In these schools, teachers and teacher assistants (TAs) have a collective responsibility for providing instruction. Although teachers usually possess greater qualifications and wider planning roles, TAs are often direct, one-on-one or small-group support providers, and their knowledge and skills are also of similar importance to those of students (Giangreco & Broer, 2005). Despite their central position, all studies on ABA knowledge have historically marginalized teacher assistants, with the exception of the almost exclusive focus on lead teachers (Brock et al., 2013).

Research across multiple national contexts has documented persistent gaps in educators' ABA knowledge and application. In the United States, Brock et al. (2013) reported that while special education teachers demonstrated familiarity with basic behavioral principles, they reported limited knowledge of systematic data collection methods and function-based interventions. Similarly, Randozzo (2011) reported that elementary teachers could identify reinforcement concepts but struggled with more complex procedures such as differential reinforcement schedules and extinction bursts.

Studies in the Middle East have revealed comparable patterns. Al-Otaibi (2015) reported that Saudi Arabian teachers of students with ASD demonstrated adequate knowledge of basic behavioral strategies but lacked proficiency in data-based decision-making and antecedent interventions. Alhossein (2016) reported that teachers in Saudi Arabia felt unprepared to implement structured ABA teaching formats, including discrete trial training and naturalistic environment teaching, despite recognizing their importance for students with ASD. Khaleel (2019) identified data collection as a significant challenge for teachers in the United Arab Emirates, with educators reporting difficulty in selecting appropriate measurement procedures for classroom use.

Current literature on different settings has focused on the knowledge and application of ABA among educators. It has been documented in the United States (Brock et al., 2013; Randozzo, 2011) and the Middle East (Al-Otaibi, 2015; Alhossein, 2016) that although teachers, in general, are conversant with the principles of basic behavior, they lack expertise in regard to more intricate processes associated with data gathering, antecedent-based interventions, and the subtle use of behavior reduction methods. This gap between research and practice is a known hindrance to the best performance by students (Cook & Odom, 2013). In contrast to most other nations, where one of the main barriers is funding (Peters-Scheffer, Didden, Korzilius, and Sturmey, 2011), Kuwait National Law provides free education to people with disabilities. This policy essentially transfers the primary issue from financial accessibility to human resource capacity, placing emphasis directly on the knowledge, skills, and training of the specialists themselves. The growing number of professionals

assuming international certifications (e.g., by the Behavior Analyst Certification Board [BACB]) may offer a potential way to standardize expertise. However, this does not guarantee that the certifications equate to greater knowledge in the context of Kuwaiti schools' specific cultural and operational realities. Thus, this research is intended to be at the nexus of a number of significant gaps in the literature, specifically concerning the lack of reliable measures or baseline data on the knowledge of ABA in Kuwait; other studies did not include teacher assistants, and the impact for an alternative experience of some professionals would be the efficacy of this type of professional certification in the Kuwaiti context.

Research Questions and Hypotheses

To address these gaps, the current study sought to answer the following research questions:

1. What are the differences in knowledge of ABA among participants across the major domains (basic principles, measurement, skill acquisition, antecedent interventions, and behavior reduction)?
2. What is the hierarchy of knowledge among participants within the subdomains of each major ABA domain?
3. What effects do ABA certification, job title, and type of school have on the level of knowledge among participants across the major ABA domain?

On the basis of the literature, the following hypotheses were developed:

H1: Knowledge will be significantly greater in the basic principles domain than in the more applied domains of measurement, antecedent interventions, and behavior reduction. This prediction is grounded in research indicating that foundational behavioral concepts (e.g., reinforcement, extinction) are typically emphasized in introductory teacher preparation and professional development, whereas procedural applications receive less attention (Brock et al., 2013; Randozzo, 2011).

H2: Within each domain, knowledge of basic strategies exceeds knowledge of advanced or complex procedures. For example, within the measurement domain, participants were expected to report greater knowledge of continuous measurement (e.g., duration and latency) than discontinuous methods (e.g., interval recording), which is consistent with findings that practitioners receive limited training in pragmatic data collection tools suitable for classroom settings (Fiske & Delmolino, 2012; LeBlanc et al., 2016).

H3: Compared with noncertified staff, staff holding ABA certification (RBT, BCaBA, or BCBA) will demonstrate significantly higher knowledge scores across all domains. This hypothesis is based on evidence that standardized, competency-based certification programs provide comprehensive training across all areas of ABA practice, in contrast to the variable and often superficial coverage typical of general teacher preparation programs (Shook & Favell, 2008). Given the mixed findings in previous research regarding job title and school type effects (Brock et al., 2013), no directional hypotheses were proposed for these variables.

METHOD

Research Design and Participants

This study utilized a quantitative, cross-sectional survey design, which is the best design for examining the characteristics of a sample population at a specific time (Creswell & Creswell, 2018). The reference population was defined as every special education teacher and teacher assistant who provided direct instruction to students with ASD in private special education schools throughout Kuwait. A thorough examination of official records from Kuwait's Ministry of Education and other relevant ministries revealed 32 private special education schools. The distribution of the schools, as shown in Table 1, comprised an identical split between Arabic-language schools and bilingual (Arabic-English) international schools, which offered a multicultural opportunity to sample from the private sector.

Table 1
Number of Special Education Schools in Arabic and Bilingual Schools in Kuwait

Type of School	Number
Arabic	16
Bilingual	16
Total (N)	32

Power Analysis

A priori power analysis was conducted using G*Power software (Faul et al., 2009) to determine the required sample size. For the primary analyses comparing groups (Mann–Whitney U tests), with a medium effect size ($d = 0.5$), $\alpha = .05$, and power = .80, the analysis indicated a minimum of 128 participants per group. For the Kruskal–Wallis H test, which compared five domains, with a medium effect size ($f = 0.25$), $\alpha = .05$, and power = .80, the required sample size was 200 participants. The obtained sample of 328 participants exceeded these requirements, providing adequate power to detect meaningful effects.

The final data set consisted of 328 participants who completed the survey. The demographic and professional characteristics of the analysis sample are provided in Table 2. The sample consisted of 193 special education teachers (58.84%) and 135 teacher assistants (41.16%), which is representative of the workforce distribution in these educational settings. The sample was also considered to be experienced. In total, 75.3% ($n=247$) of the participants reported more than five years of experience in their profession. The most common level of education reported was a bachelor's degree (89.02%) in special education (30.49%), general education (28.05%), or another area (30.49%). A smaller number of respondents (10.98%) reported having a master's degree. Additional data revealed that the majority of participants (69.51%, $n = 228$) had no formal ABA certification, whereas 30.49% ($n = 100$) reported holding at least one recognized ABA credential. Among the certified participants, 62 held the Registered Behavior Technician (RBT) credential, 28 held the Board Certified Assistant Behavior Analyst (BCaBA) credential, and 10 held the Board Certified Behavior Analyst (BCBA) credential, all from the Behavior Analyst Certification Board (BACB). No other certification bodies or local credentialing systems were represented in the sample.

Owing to the smaller numbers within each certification level, the certified participants were combined into a single group for primary analyses; however, the distribution across credential levels is noted to contextualize the findings.

Table 2

Demographic and Professional Characteristics of the Participants (N = 328)

Characteristic	Category	N	%
Job Title	Special Education Teacher	193	58.84%
	Teacher Assistant	135	41.16%
Experience	> 5 years	247	75.30%
	< 5 years	81	24.70%
Highest Degree	Bachelor's (Special Ed.)	100	30.49%
	Bachelor's (Education)	92	28.05%
	Bachelor's (Other)	100	30.49%
	Master's Degree	36	10.98%
School Type	Bilingual/International	181	55.18%
	Arabic School	147	44.82%
ABA Certification	Certified	100	30.49%
	Not Certified	228	69.51%

Inclusion and Exclusion Criteria and Ethical Considerations

The study utilized specific inclusion criteria: the applicants must currently be working as either a teacher or a teacher assistant at one of the 32 private special education schools identified, and they must currently have or have had a direct and ongoing instructional relationship with at least one student diagnosed with autism spectrum disorder (ASD). Similar exclusionary criteria included administrative staff, therapists who did not have a teaching capacity, and staff from a general education school who did not have a special education or related service role.

Before data collection commenced, ethical approval was obtained from the Institutional Review Board (IRB) of University Sains, Malaysia. The study complied with the principles set forth in the Declaration of Helsinki. All prospective participants received a comprehensive information sheet outlining the study's purpose, procedures, risks, and benefits, as well as ensuring anonymity and confidentiality. Informed consent was obtained electronically from all participants prior to accessing the survey questionnaire.

Research Instrument

The primary data collection tool was an adapted survey designed to assess knowledge of ABA principles and procedures, which was based on the behavior management survey developed by Randozzo (2011). Several modifications were implemented to enhance validity, reliability, and contextual relevance.

Instrument Adaptation and Content Validity

First, the survey was refined for a special education audience by eliminating items applicable only to general education teachers. Second, a comprehensive review of the ABA literature (Cooper et al., 2020; Leaf et al., 2016; Wong et al., 2015) revealed the inclusion of critical strategies not present in the original survey, particularly in skill acquisition (e.g., naturalistic environment teaching and discrete trial training) and behavior reduction (e.g., differential reinforcement procedures). Some of the items were reworded to be more suitable to ASD individuals.

Conceptual Framework for Item Selection

Item selection was guided by the BACB Task Lists (for RBT and BCBA levels) to ensure coverage of foundational competencies in ABA practice. The Basic Principles domain included positive reinforcement, negative reinforcement, extinction, and schedules of reinforcement. Although punishment is a basic behavioral principle, it was not included as a separate sub domain because the focus was on positive behavioral interventions commonly emphasized in educational settings; however, this represents a limitation acknowledged in the discussion. In the measurement domain, frequency recording was encompassed within the “rate” sub domain, as the rate is frequency standardized by time, which is the preferred metric in ABA (Cooper et al., 2020).

In the final format of the survey, it consisted of (35) items distributing on (5) domains reflecting core ABA domains:

1. Basic Principles: 6 sub domains
2. Measuring Behavior: 7 sub domains
3. Skill Acquisition: 10 sub domains
4. Antecedent Interventions: 4 sub domains
5. Behavior Reduction: 8 sub domains

Translation and Cross-Cultural Validity

The survey was translated into Arabic using an intensive forward-backward translation process (Brislin, 1970). Two bilingual specialists independently translated the English version into Arabic; these versions were synthesized into a single draft. A third bilingual translator, naive to the original instrument, back-translated the draft into English. The back-translated version was compared with the original version to identify and resolve discrepancies, ensuring linguistic and conceptual equivalence.

Response Format and Scoring

For each sub domain, participants rated their knowledge on a 5-point Likert scale: 0 (No Knowledge), 1 (Slightly Knowledgeable), 2 (Somewhat Knowledgeable), 3 (Knowledgeable), and 4 (Very Knowledgeable). Domain scores were computed by summing sub domain scores and converting them to percentages (where 100% indicates “Very Knowledgeable” across all sub domains).

Reliability and Validity Assessment

A pilot study with 30 participants (excluded from the final sample) assessed internal consistency. The Cronbach's alpha for the knowledge scale was .92, indicating strong reliability (Tavakol & Dennick, 2011). The item-total correlations ranged from .45 to .78, suggesting acceptable item discrimination.

Limitations of Self-Report Measurement

The use of self-reported knowledge ratings represents a methodological limitation. Self-reports may not correspond directly to actual skill or implementation fidelity, and responses may be influenced by social desirability bias, particularly given the professional nature of the survey content (Paulhus & Vazire, 2007). Participants may overestimate their knowledge because of familiarity with terminology without deep conceptual understanding or may underestimate it because of modesty. Thus, the findings should be interpreted as perceived knowledge rather than demonstrated competency. Future research should incorporate direct observation or competency-based assessments to validate self-reported findings.

Data Analysis

All the data analyses were completed using R software (version 4.3.1; R Core Team, 2023). Descriptive statistics (means, standard deviations, medians, ranges, frequencies, and percentages) were calculated to characterize the sample's demographics and to summarize the knowledge scores for each of the domains and sub domains in turn.

The distribution of the percentage knowledge scores was formally assessed for normality using the Shapiro–Wilk test and visually analyzed using quantile–quantile (Q–Q) plots. Given that the normality assumption was not met by the data for the parametric analyses, all the inferential analyses employed nonparametric counterparts (Field, 2018).

To answer Research Question 1, differences in knowledge percentages across all five main domains were analyzed through the Kruskal–Wallis H test, a nonparametric equivalent of one-way ANOVA. When significant effects were found, post hoc, pair wise comparisons were performed using the Mann–Whitney U test with a Bonferroni correction for family wise errors.

To investigate Research Question 2, which examined the hierarchy of knowledge among sub domains, the knowledge levels for the sub domains were condensed from five categories to three, which were more conducive to a categorical analysis and included “No Knowledge” (original score of 0), “Some Knowledge” (original scores of 1 and 2), and “High Knowledge” (original scores of 3 and 4). The differences in the distribution of the three knowledge levels were tested among the three sub domains (i.e., technical, scientific, and emergent) for each main domain using chi-square tests. When the chi-square test assumption of expected cell counts of at least 5 was not satisfied, Fisher's exact test was used.

The analysis of Research Question 3, which tested the effect of the independent variables, including certification, job title, and school type, was investigated for the two-level independent variables via the Mann–Whitney U test. The examination of the relationship between knowledge and application (an ancillary analysis noted previously in this manuscript) utilized the Kendall tau correlation and was modeled via robust linear regression; the results are reported as pseudo-R² to indicate the amount of variance explained. For all the inferential tests, .05 was set as the alpha level for statistical significance. The handling of missing data was addressed through list wise deletion; however, owing to the forced-response design of the online survey, the amount of missing data was negligible (<0.5%) and considered non-influential.

RESULTS AND DISCUSSION

The presentation of the results is integrated with a discussion of their implications to provide a coherent and interpretative narrative structured by the research questions.

Macro-Level Differences in Knowledge Across ABA Domains (RQ1)

The first and most general analysis revealed substantial differences in overall knowledge among the five basic domains of ABA (Kruskal–Wallis $H = 215.4$, $p < .001$). Descriptive statistics for knowledge percentages in each domain are reported in Table 3 and are shown graphically through a bar chart with error bars and significance letters in Figure 1.

Table 3

Description of the Percentage of Knowledge in Each Domain

Domains	Mean $\pm$ SD	Median [Min–Max]	p Value
Antecedent Intervention	43.3 $\pm$ 26.4	37.5 [0 - 100]	<0.001
Measuring Behavior	46.0 $\pm$ 23.1	39.3 [10.7 - 96.4]	
Behavior Reduction	49.8 $\pm$ 21.7	43.8 [15.6 - 100]	
Skill Acquisition	56.3 $\pm$ 20.0	52.5 [17.5 - 100]	
Basic Principles	62.3 $\pm$ 17.4	58.3 [25 - 100]	

Sensitivity Analysis: Impact of Certified Participants on Overall Findings

Given concerns that including certified participants ($n = 100$) alongside noncertified participants ($n = 228$) in the overall sample might skew domain-level knowledge estimates, a sensitivity analysis was conducted. Table 4 presents knowledge percentages for the full sample alongside estimates for noncertified participants only.

Table 4

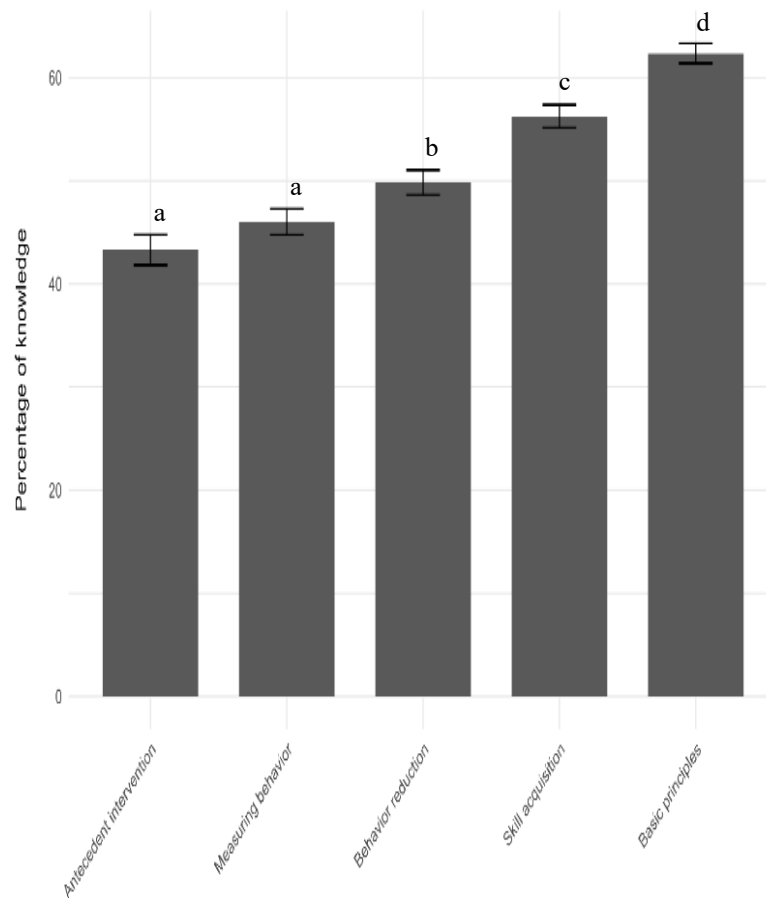
Comparison of Knowledge Percentages: Full Sample vs. Noncertified Only

Domain	Full Sample (N = 328)	Non-Certified Only (n = 228)	Difference
Basic Principles	62.3%	55.6%	6.7%
Skill Acquisition	56.3%	49.7%	6.6%
Behavior Reduction	49.8%	42.9%	6.9%
Measurement	46.0%	36.8%	9.2%
Antecedent Interventions	43.3%	34.0%	9.3%

As shown in Table 4, the inclusion of certified participants elevated mean knowledge scores across all the domains, with the greatest differences in measurement and antecedent interventions (approximately 9 percentage points). However, the pattern of relative strengths and weaknesses remained consistent: Basic Principles ranked highest and

Antecedent Interventions lowest in both samples. This suggests that while the absolute knowledge estimates are somewhat inflated by including certified staff, the overall conclusions about domain-level knowledge hierarchies are robust.

Figure 1: Percentage of Knowledge among Domains



Revised post hoc analyses supported a good ranking of hierarchies. The basic principles domain had the highest level of knowledge ($M=62.3\%$) and was significantly different from all the other domains. The next highest was skill acquisition ($M=56.3\%$), which was significantly different from behavior reduction ($M=49.8\%$), measuring behavior ($M=46.0\%$) and antecedent interventions ($M=43.3\%$), which were not significantly different from each other.

This pattern provides strong support for Hypothesis 1 and provides a good depiction of the term of professional knowledge. The researchers think that most educators are most comfortable with the baseline,

conceptual pillars of ABA—principles such as reinforcement and extinction—which are often the first things introduced in teacher training and the most commonly discussed topics in educational discourse in general. However, it can be argued that there is a steep decline in levels of educator knowledge as the capacity shifts from principles to executing procedures. From the researchers' point of view, and based on their field experiences as educators working in the Kuwaiti special education system for years, this can be attributed to that teachers participating in this study lack the procedural knowledge related to the implementation of ABA in Kuwaiti private schools providing such services for students with autism, especially in measurement of behaviors that can be described as part of ASD. It can be argued in this respect that they do not have the knowledge to use the measurement instruments provided to them, and this implies the need for more training in this area. The low levels of knowledge scores found for Measuring Behavior are very concerning. As Fiske and Delmolino (2012, p. 77) point out, “measurement is the foundation of behavioral intervention.” Without these skills to collect data—particularly discontinuous methodologies that are practical for today’s classroom educators are “flying blind” and therefore incapable of objectively discerning if an intervention is effective, resulting in the inability to make data-based decisions. These findings resonate with those of Khaleel (2019), who identified data collection as a major hurdle for teachers in the UAE. Similarly, the poor performance in antecedent interventions suggests a reactive rather than proactive approach to behavior management, overlooking strategies that can prevent problem behavior before it occurs, which is a cornerstone of positive behavior support (Carr et al., 2002).

Micro-Level Hierarchy of Knowledge Within Domains (RQ2)

Exploring each area in greater depth reveals an internal hierarchy that is consistent across all the domains, supporting Hypothesis 2 and revealing exact areas of knowledge deficit.

Basic principles. As demonstrated below in Table 7 and Figure 2 (a horizontal bar chart), although knowledge of stand-alone principles, such as positive reinforcement (89% high knowledge) and negative reinforcement (83.2% high knowledge), was quite strong, knowledge decreased significantly when these principles were embedded in more complex schedules. This can be attributed to the fact that the teachers and co- teachers working in Kuwaiti private schools suffer from works overload and this was evident in the results of the study. Indeed, only 31.7% of participants reported high knowledge of Intermittent Schedules of Reinforcement. This is a significant gap in knowledge. Continuous reinforcement is crucial for the acquisition of skills, whereas intermittent schedules of reinforcement are far more crucial for the maintenance of behavior and resistance to extinction (Cooper et al., 2020). A teacher who does not understand how to thin reinforcement may quickly see skills begin to deteriorate and start successful, leading to frustration and genuine feelings of “failure” of the intervention.

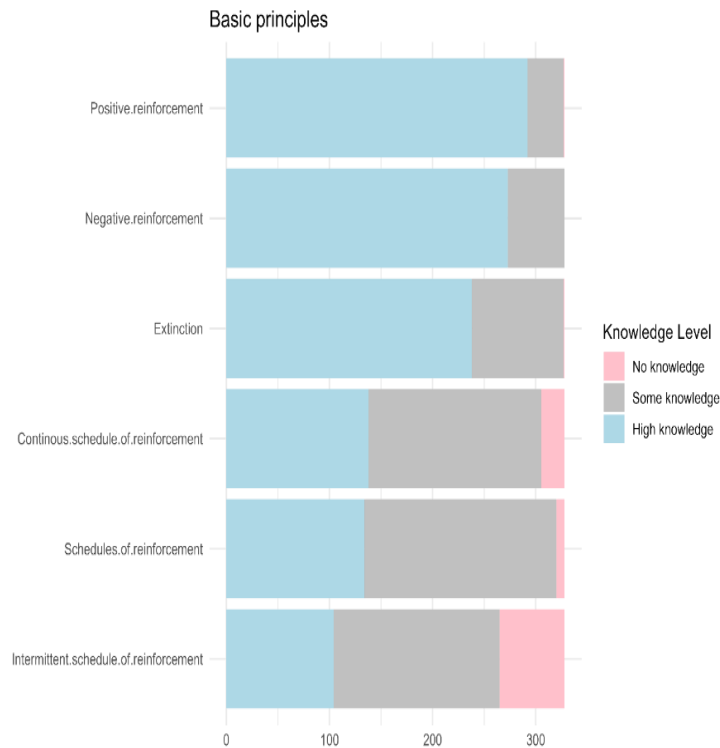
Table 7*Comparison of Knowledge Levels Among Basic Principles Subdomains*

Sub-Domain	No knowledge n(%)	Some knowledge n(%)	High knowledge n(%)
Positive Reinforcement	1 (0.3%)	35 (10.7%)	292 (89.0%)
Negative Reinforcement	0 (0.0%)	55 (16.8%)	273 (83.2%)
Extinction	1 (0.3%)	89 (27.1%)	238 (72.6%)
Schedules of Reinforcement	8 (2.4%)	186 (56.7%)	134 (40.9%)
Continuous Schedule of Reinf.	23 (7.0%)	167 (50.9%)	138 (42.1%)
Intermittent Schedule of Reinf.	63 (19.2%)	161 (49.1%)	104 (31.7%)
p Value	<0.001 (Fisher's Exact Test)		

Educational Significance of Measurement Knowledge Gaps

The distinction between continuous and discontinuous measurement procedures has important implications for classroom practice. Continuous measurement methods (duration, latency, rate) provide precise data but are often impractical for teachers managing multiple students simultaneously (LeBlanc et al., 2016). Discontinuous methods (interval recording) offer feasible alternatives that balance accuracy with classroom demands. The finding that only 31.1% of participants reported high knowledge of whole-interval recording and 23.8% reported high knowledge of partial-interval recording suggests that most educators lack access to pragmatic data collection tools. The researchers assume that this gap likely results in either (a) no data collection occurring, resulting in teachers being unable to make data-based decisions, or (b) the collection of continuous data that may be inconsistent or inaccurate because of competing classroom demands. Both scenarios compromise the evidence-based practice model, as Fiske and Delmolino (2012) emphasize that “measurement is the foundation of behavioral intervention” (p. 77). Without accessible measurement strategies, educators are effectively “flying blindly” and are unable to objectively determine intervention effectiveness.

Figure 2:
Distribution of Knowledge Levels Among Basic Principles Subdomains



Behavior Measurement. This area is clearly divided, as will be demonstrated in Table 8 and Figure 3. There is a significant amount of knowledge pertaining to continuous measurement procedures—e.g., duration (47.6% high knowledge) and latency (36.3% high knowledge)—and poor knowledge of discontinuous measurement methods, such as whole-interval recording (31.1% high knowledge), partial interval recording (23.8% high knowledge), and permanent products (30.5% high knowledge). Approximately one-quarter of the respondents indicated that they had no knowledge of these methods whatsoever. This creates a significant research-to-practice gap. Continuous measurement procedures are ideal for precise data collection; however, it may be impossible to use continuous measurement data procedures if a classroom teacher is responsible for the behavior of more than one student or for the measurement of high school students with EBDs (i.e., emotionally and behaviorally vulnerable students). Discontinuous measurement procedures may be used instead as a feasible method of data collection in practice (LeBlanc, Raetz, Sellers, & Carr, 2016). It is quite concerning that, in one approach or another, the school personnel and paraprofessionals are not training in this instrumentation of pragmatic tools, which leads to an

ancillary product of behavior data related to student progress and challenging behavior, which becomes compromised altogether—the initial purpose of help for children with EBDs becomes lost. The intent of evidence-based practice is to monitor student progress related to behavioral challenges and acquire supporting empirical research to assist educators with data collection. In short, a lack of training in the very tools that minimize data collection practices means that data about behavior are not even being collected, thus defying the whole architectural structure of evidence-based practices.

Table 8

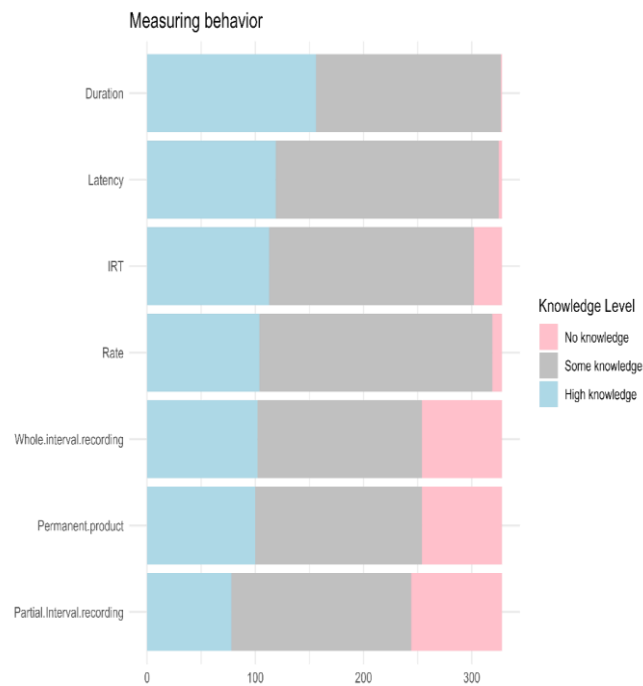
Comparison of Knowledge Levels Among the Subdomains of Measuring Behavior

Sub-Domain	No knowledge n(%)	Some knowledge n(%)	High knowledge n(%)
Latency	3 (0.9%)	206 (62.8%)	119 (36.3%)
Rate	9 (2.7%)	215 (65.5%)	104 (31.7%)
Duration	1 (0.3%)	171 (52.1%)	156 (47.6%)
IRT	26 (7.9%)	189 (57.6%)	113 (34.5%)
Whole Interval Recording	74 (22.6%)	152 (46.3%)	102 (31.1%)
Partial Interval Recording	84 (25.6%)	166 (50.6%)	78 (23.8%)
Permanent Product	74 (22.6%)	154 (47.0%)	100 (30.5%)
p Value	<0.001 (Fisher's Exact Test)		

Educational Significance of Skill Acquisition Knowledge Gaps

The low knowledge rates for Discrete Trial Training (41.5% high knowledge) and Naturalistic Environment Teaching (45.7% high knowledge) are particularly concerning, as these are not merely instructional options but foundational, evidence-based practices for teaching individuals with ASD (Leaf et al., 2016; Wong et al., 2015). DTT provides the structured, intensive instruction necessary for skill acquisition in early learners, whereas NET promotes the generalization and naturalistic use of skills. When educators lack knowledge of these methodologies, students are systematically denied access to the most effective instructional formats available. These findings align with those of Alhossein (2016), who reported that Saudi Arabian teachers felt unprepared to implement structured ABA teaching formats despite recognizing their importance.

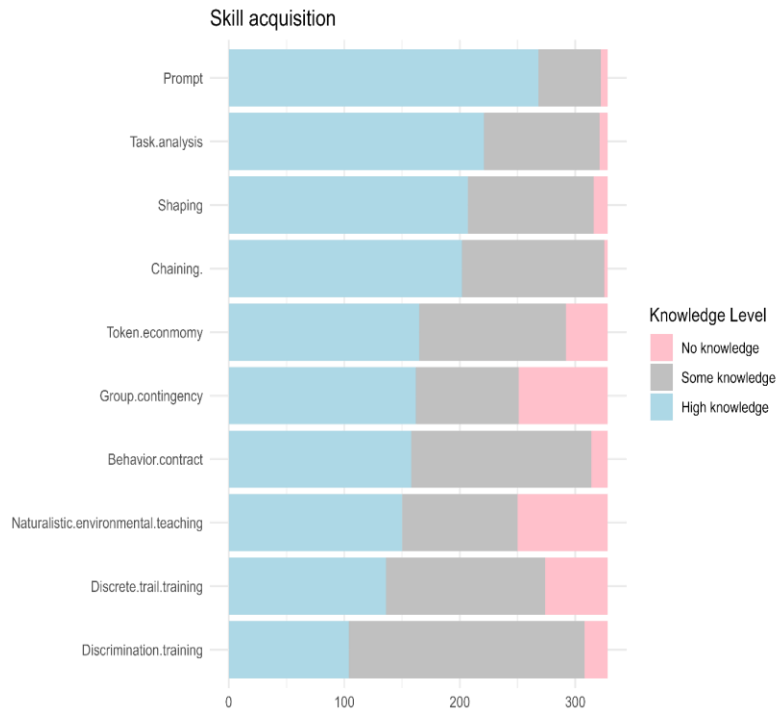
Figure 3:
Distribution of Knowledge Levels Among Measuring Behavior Subdomains



Skill acquisition. Table 9 and Figure 4 show a division between common and simpler procedures versus more difficult evidence-based teaching packages. Strategies such as prompting (81.7% high knowledge), task analysis (67.4%), and shaping (63.1%) are somewhat well learned. However, the high knowledge rate decreases significantly for pivotal and extensive instructional methods, such as discrete trial training (DTT; 41.5% high knowledge) and natural environment teaching (NET; 45.7% high knowledge). This is concerning because these practices are not just isolated methods; rather, they are important, evidence-based practices for instructing individuals with ASD (Leaf et al., 2016; Wong et al., 2015). When teachers do not have the knowledge to implement these methods in the classroom, students are systematically denied access to the best possible, effective, organized forms of instruction or teaching possible. Access and potential teaching and learning slows for students with ASD because teachers are under qualified to implement these individualized teaching technologies. This study corroborates the findings of Alhossein (2016), who reported that teachers felt unprepared to implement these styles of ABA-based practices in their classrooms in Saudi Arabia.

Table 9*Comparison of the Levels of Knowledge Among the Skill Acquisition Subdomains*

Sub-Domain	No knowledge n(%)	Some knowledge n(%)	High knowledge n(%)
Prompt	6 (1.8%)	54 (16.5%)	268 (81.7%)
Task analysis	7 (2.1%)	100 (30.5%)	221 (67.4%)
Shaping	12 (3.7%)	109 (33.2%)	207 (63.1%)
Chaining	3 (0.9%)	123 (37.5%)	202 (61.6%)
Token economy	36 (11.0%)	127 (38.7%)	165 (50.3%)
Group contingency	77 (23.5%)	89 (27.1%)	162 (49.4%)
Behavior contract	14 (4.3%)	156 (47.6%)	158 (48.2%)
Naturalistic Env. Teaching	78 (23.8%)	100 (30.5%)	150 (45.7%)
Discrete Trial Training	54 (16.5%)	138 (42.1%)	136 (41.5%)
Discrimination training	20 (6.1%)	204 (62.2%)	104 (31.7%)
p Value	<0.001 (Fisher's Exact Test)		

Figure 4:*Distribution of Knowledge Levels Among Skill Acquisition Subdomains*

Antecedent Interventions and Reduction of Behaviors. These two domains of interventions (Tables 7 & 8, and Figures 5 & 6) continue the trend toward a preference for consequence-based methods over antecedent methods and simpler procedures over more complex ones. "In Antecedent Interventions, the Premack Principle and High-p request sequence received lower ratings for high knowledge (33.2% and 29.3%, respectively). Although the noncontingent reinforcement sub domain had the highest percentage of high knowledge (40.5%) across all the domains, it had the highest percentage of no knowledge (21.6%) as well as polarized knowledge. Task modification varied and had a more balanced approach, with the lowest percentage of no knowledge (7.9%), but still had a good representation of high knowledge (40.2%), which may indicate that it is a concept that practitioners may have more understanding or familiarity with.

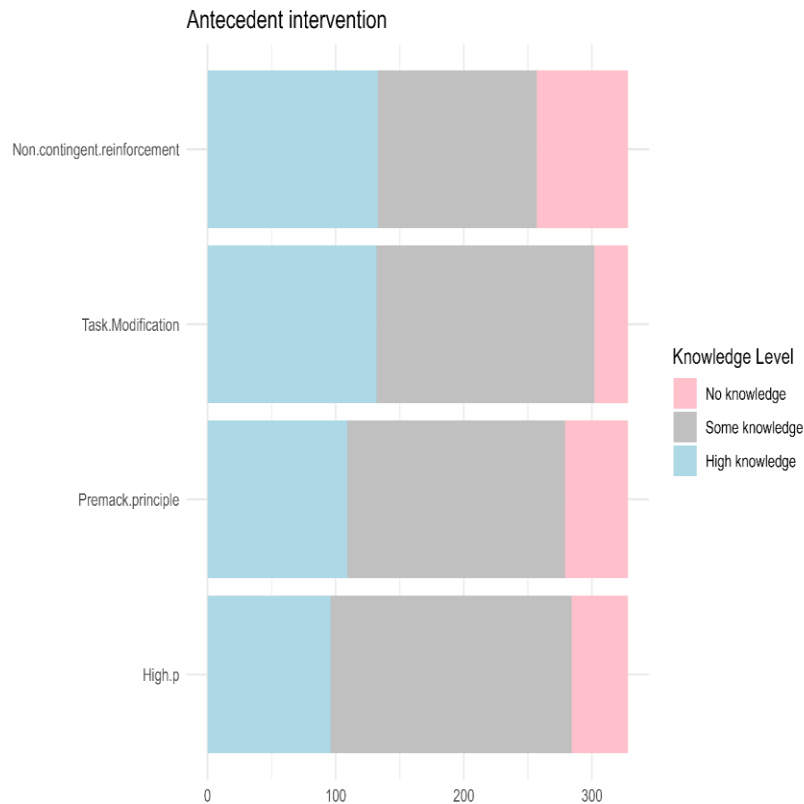
Table 10*Comparison of Knowledge Levels Across Antecedent Intervention Subdomains*

Sub-Domain	No knowledge n(%)	Some knowledge n(%)	High knowledge n(%)
Non contingent reinforcement	71 (21.6%)	124 (37.8%)	133 (40.5%)
Task Modification	26 (7.9%)	170 (51.8%)	132 (40.2%)
Premark principle	49 (14.9%)	170 (51.8%)	109 (33.2%)
High-p	44 (13.4%)	188 (57.3%)	96 (29.3%)
p Value	0.038		

Educational Significance of Behavior Reduction Knowledge Gaps

The finding that overcorrection (60.7% high knowledge) was better understood than differential reinforcement procedures (DRO = 38.1%, DRL = 35.4%, DRI = 28.0%) raises ethical concerns. Differential reinforcement represents best practices by emphasizing reinforcement-based strategies that strengthen alternative or incompatible behaviors while minimizing reliance on punitive or restrictive procedures (Cooper et al., 2020; Vollmer et al., 1993). This pattern suggests that educators may be more familiar with consequence-based procedures that are easier to conceptualize but potentially more restrictive than with nuanced reinforcement-based approaches that require a more sophisticated understanding of behavioral function and reinforcement schedules. This knowledge gap may lead to the overuse of punitive procedures or implementation errors that can result in side effects or treatment failure.

Figure 5:
Distribution of Knowledge Levels Among Antecedent Intervention Subdomains



With respect to behavior reduction, more practitioners knew about overcorrection (60.7% high knowledge) and DRA than about differential reinforcement procedures that use reinforcement but are more nuanced and complex (DRO, DRL, and DRI). In fact, of all the procedures, DRI was the least known approach (28% high knowledge). This is a very concerning issue from an ethical and effectiveness perspective. Differential reinforcement procedures are the best practices because they emphasize the importance of strengthening alternative behavior or incompatible behaviors rather than relying exclusively on punitive or restrictive practices (Cooper et al., 2020; Vollmer et al., 1993). If practitioners do not have fluency with these practices, it is likely that they will overuse procedures or make mistakes while they are implementing them, which could result in side effects or treatment failure.

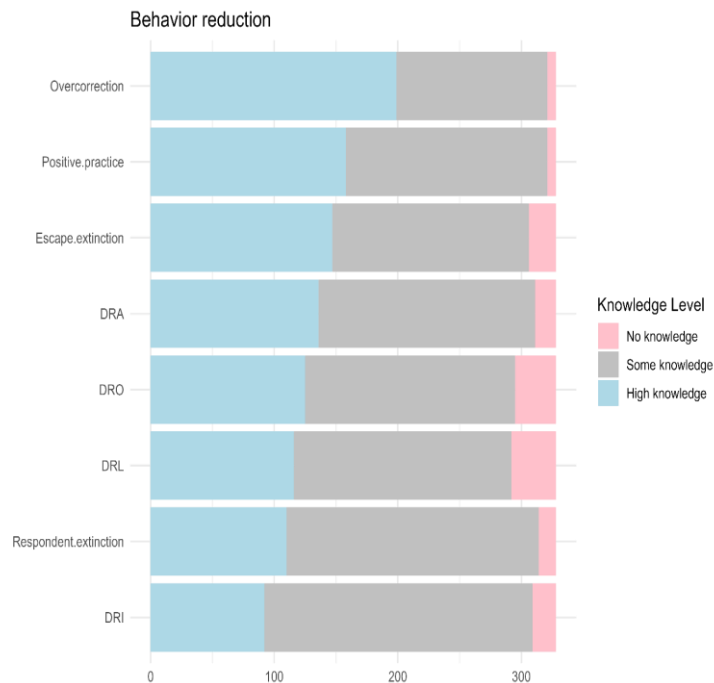
Table 11

Comparison of the Levels of Knowledge Among the Subdomains of Behavior Reduction

Sub-Domain	No knowledge n(%)	Some knowledge n(%)	High knowledge n(%)
Overcorrection	7 (2.1%)	122 (37.2%)	199 (60.7%)
Positive practice	7 (2.1%)	163 (49.7%)	158 (48.2%)
Escape extinction	22 (6.7%)	159 (48.5%)	147 (44.8%)
DRA	17 (5.2%)	175 (53.4%)	136 (41.5%)
DRO	33 (10.1%)	170 (51.8%)	125 (38.1%)
DRL	36 (11%)	176 (53.7%)	116 (35.4%)
Respondent extinction	14 (4.3%)	204 (62.2%)	110 (33.5%)
DRI	19 (5.8%)	217 (66.2%)	92 (28%)
p Value	<0.001		

Figure 6:

Distribution of Knowledge Levels Among Behavior Reduction Subdomains



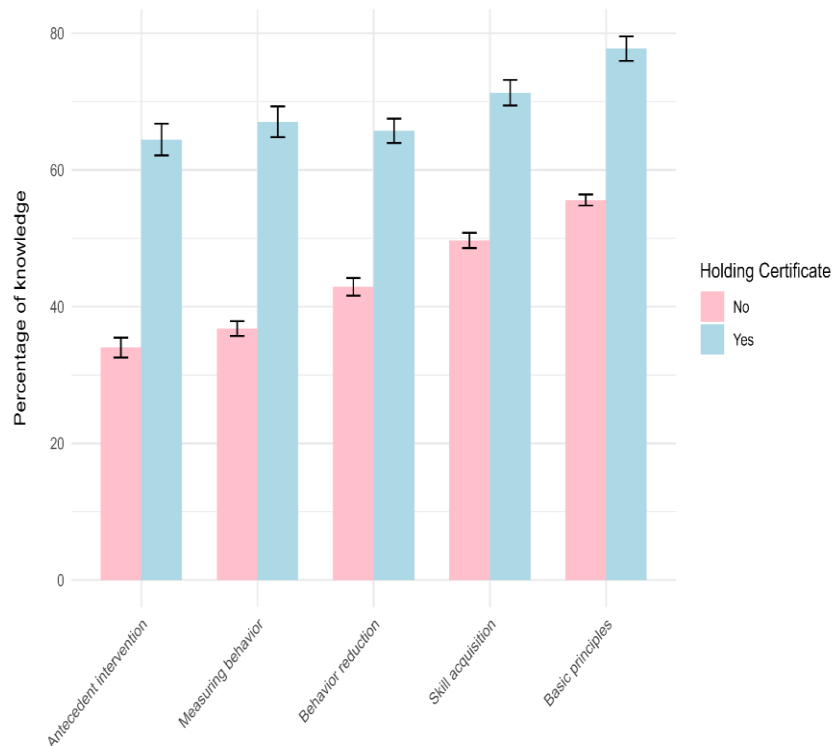
Defining the Impact of Formal Certification (RQ3)

This study's strongest and most consistent result was a clear ABA certification effect. As shown in Table 10 and illustrated in the unstacked bar chart (Figure 7), the performance of the certified participants far surpassed that of their noncertified peers across each of the domains in the study (all p values $< .001$). The effect is not only statistically significant but also has large effect sizes, demonstrating practical significance.

Table 12

Comparison of the Knowledge Percentage of Each Domain Between Certified and Noncertified Participants

Major Domains	Non-Certified (n=228)	Certified (n=100)	p value		
	Mean±Std	Median	Mean±Std	Median	
Antecedent Intervention	34.0 ± 22.0	25.0	64.4 ± 23.3	75.0	<0.001
Measuring Behavior	36.8 ± 16.3	32.1	67.0 ± 22.5	71.4	<0.001
Behavior Reduction	42.9 ± 19.6	37.5	65.7 ± 17.7	71.9	<0.001
Skill Acquisition	49.7 ± 16.8	50.0	71.3 ± 18.7	76.3	<0.001
Basic Principles	55.6 ± 12.1	54.2	77.8 ± 17.9	83.3	<0.001

Figure 2: Relation between Certification and Knowledge among Different Domains

The magnitude of the difference is impressive. When Antecedent Interventions were compared, compared with noncertified teachers, certified teachers demonstrated knowledge that was almost two times greater. The median scores are even more compelling; the average number of certified teachers was three times greater (median = 75) than the average

number of noncertified teachers (median = 25) in Antecedent Interventions. Large, notable gaps exist in measuring behavior and behavior reduction as well. These findings provide substantial support for Hypothesis 3 and a straightforward explanation that can bridge the knowledge gaps identified. Certification programs, such as those regulated by the BACB, provide standardized, competency-based training in all aspects of applied behavior analysis (ABA) practice, from the behavioral principles to direct clinical procedures (Shook & Favell, 2008). This standardized, competency-based approach is clearly far more helpful than the ad hoc in-service training that is common in many school systems. The only other variable that was not as impactful as certification was whether the individual held a job title of a teacher or teaching assistant, graduation/degree equivalency, and/or whether the school was Arabic or bilingual. These variables did not reveal any significant or consistent differences in knowledge levels. Second, if we take the cumulative body of knowledge from the certification programs into consideration, it appears that formal, specialized training in competency is the highest predictor of competency we have to date, well above the difference in terms of job title and language.

INTERPRETATION OF FINDINGS AND CONTRIBUTION TO THE LITERATURE

The present study provides the first comprehensive, data-based examination of ABA knowledge among educators in Kuwait's private special education schools. The findings extend the literature in several ways. First, the perceived knowledge patterns observed—strength in basic principles, weakness in measurement and antecedent interventions—mirror findings from Western contexts (Brock et al., 2013; Randozzo, 2011) and other Middle Eastern countries (Alhossein, 2016; Khaleel, 2019). This consistency across diverse educational systems suggests that the gap between conceptual understanding and procedural application in ABA may be a universal challenge in educator preparation, transcending national boundaries. The persistent nature of these gaps indicates that they reflect fundamental features of how ABA is typically presented in teacher education programs—as a set of principles rather than a comprehensive technology of behavior change requiring specific procedural competencies.

Second, the robust certification effect (median scores up to three times higher for certified participants) provides compelling evidence for the value of standardized, competency-based training. This finding aligns with Shook and Favell's (2008) argument that BACB credentialing ensures comprehensive coverage of ABA knowledge domains. Importantly, this effect held across all knowledge areas, suggesting that certification programs effectively address the very procedural gaps identified as weaknesses in the noncertified sample. The magnitude of the difference—particularly in Antecedent Interventions (median 75 vs. 25)—indicates that certification is not merely additive but transformative in shaping practitioners' knowledge base.

Third, the absence of significant differences by job title or school language suggests that within the Kuwaiti private school context, formal

ABA training supersedes other professional characteristics in determining knowledge levels. These findings have practical implications: interventions to improve educator competency should prioritize access to certification pathways rather than targeting specific subgroups.

Limitations

Several limitations warrant consideration when interpreting these findings.

- Measurement Limitations.
- Instrument Coverage.
- Sample Characteristics.
- Cross-Cultural Considerations.
- Causal Inference.

Recommendations

In light of the results, the researcher call more professional development targeting special education teachers employing ABA strategy to strengthen the weaknesses they showed in this study such as data collection (particularly discontinuous measurement), antecedent interventions, and ethical differential reinforcement procedures. Future research should include other professionals (speech-language pathologists, occupational therapists, and school psychologists) to obtain comprehensive pictures of interdisciplinary team readiness to implement ABA.

CONCLUSION

This research provides the first comprehensive, data-based representation of ABA knowledge levels among educators in Kuwait's private special education schools. The findings reveal that a workforce is knowledgeable about basic behavioral principles but lacks the procedural and analytic skills necessary to translate these principles into effective individualized programming for students with ASD. The gap between understanding what behavior analysis is and understanding how to practice behavior analysis is substantial and consequential for student outcomes.

However, a clear pathway forward emerges from these data. The striking knowledge advantage of certified individuals provides compelling evidence for formalizing expertise through credential-level preparation. For Kuwait to fulfill its commitment to providing free and appropriate education to all students, including those with ASD, investment in developing a certified behavioral analysis workforce is not merely recommended but also needed. By acting on these findings, stakeholders can strengthen Kuwait's special education model, grounding it more firmly in evidence-based practice and ultimately enhancing educational quality for students with ASD.

Ethical Considerations

The authors conducted the study in accordance to the ethical considerations stated in the manual provided as the guideline for conducting scientific research. Also, the authors explained the objectives of the study to the sampled students, made sure that they are fully aware that the results obtained will only be used for scientific research purposes and then asked them to sign participation consent form.

AI Use Statement

The authors assure that none of the AI tools have been employed in the study.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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