An Evaluation of the Effectiveness of School Based ABA

by

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An Analysis of School Based ABA and its Effectiveness

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ABSTRACT

Applied behavior analysis (ABA) is defined by the Behavior Analyst Certification Board (BACB) as "the science of behavior, with a history extending back to the early 20th century. Its main philosophy is behaviorism that is based on the premise of attempting to improve the human condition through changing of the behavior (e.g., education, behavioral health treatment) that would be most effective with the behavior as the primary focus of treatment" (BACB, 2022). ABA is commonly offered in clinics, schools, and homes. Previous systematic reviews and meta-analyses have been conducted to evaluate the effectiveness of ABA in homes and clinics. However, no/few systematic reviews exist to evaluate the effectiveness of ABA provided in schools. It is important to analyze the effects of school-based ABA to ensure the effectiveness of implementation are the same as what it would be if it were in a clinic. Therefore, the purpose of the current investigation is to systematically review studies describing the use of ABA in school settings to evaluate their effectiveness and other characteristics. Results focused on differences in the effectiveness and clients receiving treatment between settings. The discussion focused on ways to improve implementation of ABA in school districts.

Keywords: Applied behavior analysis, effectiveness, education, classroom, school, school based, general education.

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An Evaluation of the Effectiveness of School Based ABA

Applied behavior analysis (ABA) is defined as "the science of behavior, with a history extending back to the early 20th century. Its guiding philosophy is behaviorism, which is based on the premise that attempts to improve the human condition through behavior change (e.g., education, behavioral health treatment) will be most effective if behavior itself is the primary focus" (Behavior Analyst Certification Board, 2022). Cooper and colleagues (2019) identified 9 core ethical principles within the field of ABA which are do no harm, respecting autonomy, benefiting others, being just, being truthful, according to dignity, treating others with care and compassion, pursuit of excellence, and accepting responsibility. These core principles guide practitioners in the field through their work and help guide them when applying ABA as a treatment with vulnerable populations such as children with autism spectrum disorder (ASD) and other intellectual disabilities (ID)

Behavior Analysis for Autism Spectrum Disorder

ABA is commonly used as a treatment for ASD. Using the core principles identified above, behavior analysts in the field can work with clients with varying medical conditions and diagnoses, behavioral needs, and social/emotional needs. Examples of duties of behavior analysts practicing ABA includes working on treatment plans, behavior intervention plans, data collection on behaviors and progress of the clients, parent trainings and more. The history of ABA as a treatment for ASD goes back to the 1960's with Ivar Lovaas in California as stated by Rosenwasser (2001). A well-known study conducted by Lovaas in 1987 (*Behavioral Treatment and Normal Educational and Intellectual Functioning in Young Autistic Children)* was one of the first to use intensive ABA to treat symptoms with the use of a control group. Lovaas described the intensity of intervention as "behavioral treatment gains by treating autistic children during

most of their waking hours for many years" (Lovaas, 1987 p.1). The treatment included using

ABA principles to reduce problematic behaviors such as aggression and self-stimulatory

occurrences through planned ignoring, time outs, shaping an alternative, more socially

acceptable behavior or a loud "no" contingent upon the occurrence of the behavior. The

experimenters also worked on building compliance to elementary verbal requests, teaching

imitation skills, and teaching beginning skills of appropriate toy play.

Results from this study exhibited that some of the participants from the experimental

group who received forty hours or more of intensive treatment were able to move into a normal

first grade classroom setting. For these participants, their treatment was reduced from the forty

hours per week that they had received the first two years of treatment down to ten hours or less

per week. Some of the participants in the experimental group did not move into the classroom

and continued to receive forty hours or more per week of one-to-one treatment for more than six

years and eventually showed some improvements over the year but did not fully get

mainstreamed into the regular classrooms (Lovaas, 1987). Some of the experimental group

participants were able to be successfully mainstreamed into the regular classrooms.

Recent Research on the Effectiveness of ABA

Previous research on the effectiveness of ABA from Eikeseth (2002) showed that the

earlier the child enters intensive treatment, preferably before or at age four, they have more

successful outcomes then children who enter intensive when they are older than four years old. It

was suggested that the younger the child, they "have more behavioral and neural plasticity than

older children do" (p. 2). This suggests that these children have the potential to catch up

behaviorally and academically to their typical aged peers and could be eligible to go back into

the schools with their peers in the LRE.

Research conducted by Rafiee (2019), found that ABA was effective in increasing a child's eye contact with peers around them which is socially significant because it allows for conversations, acknowledgement of others in their immediate surroundings, and teaches them to visually pay attention to the peers speaking to them. ABA was also shown to increase social interactions of the children that participated in the study. This is socially significant because it allows the child to build peer relationships along with learning when to ask for help, learning when and how to share with other children and how to respond to simple demands such as "come here", "clean up," and "throw away."

According to research conducted by Yu, Q., Li. E (2020), when children were exposed to long term, comprehensive ABA interventions for development in communication, language development, and daily living skills were shown to be beneficial for their lifelong development in these skill areas. It was also found that language related outcomes such as IQ were shown to be superior to the non-verbal IQ scores when exposed to ABA based interventions for the children in the studies that were analyzed.

According to a study conducted by Leaf and colleagues (2017), home based ABA can also provide the parents an opportunity to gain experience about ABA practices and how to implement techniques and teachings throughout their time at home with their child. When providing services inside of the home, it can promote generalization of the skills taught outside of the home to the familiar setting and across other people such as the parents and the siblings, if any.

According to Grindle (2008) ABA delivered inside the client's home was effective in the areas of practical benefits such as seeing improved social skills, tolerance of other individuals, and improved communication and language skills. The parents who participated in this study found

that their relationships with their child, who was diagnosed with Autism, had improved due to the increase in eye contact, language skills and increased affection.

Settings that ABA is Commonly Provided In

ABA is commonly provided in a multitude of settings such as clinics, client homes, and schools. Treatment using ABA methods have been demonstrated to be effective for a wide variety of issues in these settings, including teaching academic skills, reducing problem behavior, addressing social skills, building developmental skills, and increasing their language skills.

Clinic Based Services

Clinic based services are ABA services that are delivered in a treatment facility that is not the typical or least restrictive setting in which peers the clients' age receive educational services. Clinic based services typically follow a medical model in which goals are specifically tailored to the clients' developmental needs rather than an educational curriculum. However, because the setting where ABA services are delivered is outside a school setting, access to other peers without neurodevelopmental disorders or special education needs are limited. Traditionally, the advantage of clinic-based services is that that treatment can be administered specific to the individual client (although this is possible in different settings).

Clinic services can also help promote the generalization of skills and adult interactions with the children as they have a larger staff of technicians that can work with the child. Promoting generalization can help strengthen the children's skills and social interactions with different adults that they may encounter. Clinic based services also provide more opportunities for social interactions with their peers. Being around other peers in a clinic setting allow for the

technicians to teach the foundational social interaction skills to the children that would not get in other settings such as the home setting according to Leaf (2017).

Effectiveness of ABA in Clinics. When examining the effectiveness of ABA inside of the clinics, research shows that the children who receive a minimum of forty hours a week with intensive interventions can have significant success with their foundational skills as observed by Lovaas (1987). The implementation of early intensive behavioral interventions (EIBI) with younger children can lead to more successful skills being obtained and can have more contrived opportunities to gain experience these skills when inside of the clinic. As stated by Leaf (2017), while home based and school-based sessions may provide a more naturalistic approach to learning, the clinics provide more structured and contrived social interactions, generalization of skills with adults and parental involvement with the treatment decisions. Centers (including those inside hospitals) have been the location of several studies included in a recent meta-analysis of the effectiveness of ABA (see Yu et al., 2020). Results indicated that there were significant gains in socialization, communication, and expressive language when ABA interventions were implemented with the children who had an ASD diagnosis. The authors noted that there were medium to large effects in daily living skills, social functioning, and language development when long term, comprehensive ABA interventions were used in the children's lives.

Home Based Services

Home-based ABA services are those in which ABA services are delivered in the clients' home. This offers the advantage of allowing the client to work on skills in the same environment where many skills *actually* occur. For instance, working on brushing teeth, folding clothes, and following directions can occur with the same materials and in the same place they would be expected to occur in. Home services can also lead to the incidental teaching of ABA

interventions to the parents as they are present and active in the home sessions with the technician and the child. The technician is modeling strategies for the parents to use with the child when they are home alone with the child outside of therapy hours and this could help increase generalization from one adult to the parents and help to establish clear and consistent expectations for the child (see Leaf, 2017). Assessments conducted in the home can "yield greater ecological validity in the identification of real problems" (Leaf 2017, p. 3). They allow for the behavior analyst to get a better understanding of intra-family patterns of behavior and how it is reinforced and provide a more relevant picture of the child's behavior in a realistic setting as opposed to a more sterile/analogue setting.

Effectiveness of ABA in Homes. ABA practices such as EIBI can take place inside the clients home with informed consent from the families and can mimic sessions that would occur in a clinic inside the home. These sessions can include discrete trial teaching (DTT), naturalistic teachings such as descriptive pretend play and functional communication training through a speech generating device or the picture exchange communication system (PECS). Homes have been the location of one study included in a recent meta-analysis of the effectiveness of ABA. Per Dixon. 2016, it was found that while the targeted skills were mastered at a faster rate in the clinics then in the homes, the skills were still being met and worked on in the home and that the parents were being exposed to the interventions so that they could use the interventions when the technicians are not available.

Schools Based Services

School based services using ABA therapy represent a unique opportunity to apply ABA treatment in a "natural" environment where most children learn. This setting also allows clients to be with peers of a similar age with and without neurodevelopmental disorders. In schools,

services can be delivered by school employees (usually a paraprofessional) under direction of a

behavior analyst and/or an intervention specialist. The same treatment principles are utilized as

in homes and in clinics. However, the school setting offers the opportunity to work on social

skills with neurotypical peers and offers the opportunity to address academic and behavior skills

in a natural setting. In the meta-analysis of ABA by Yu and colleagues (2020), three studies took

place in a school.

Effectiveness of ABA in Schools

Grindle (2012) demonstrated the effectiveness of implementing a comprehensive school-

based ABA interventions model that consisted of implementing the interventions in a shared

classroom with ABA services provided for six hours a day. Each child had three therapists

working on the interventions with them. The results showed that after one school year, the

children had statistically significant positive changes on their *Assessment of Basic Language and

Learning Skills* (ABLLS) scores from the beginning of the previous school year. The children

also demonstrated significantly higher IQ score than their baseline score and the overall effect

size was described as moderate.

According to Grindle (2012), the school setting can provide a less intensive intervention

as compared to clinics or homes because it is only during the school hours, there are more days

off due to summer breaks, snow days and federal holidays, and there is less parent involvement.

Another factor as to why the interventions in schools are less intense is predicted to be because

the children typically do not receive a diagnosis until they are past the school starting age

(Grindle, 2012). While this is not the case for every child, it can be the case for some of the

children and therefore their school opportunities can be limited and less intense as compared to

others who have been mainstreamed back into the school setting.

When factoring the effectiveness of ABA services inside of the schools, a component to consider is the teachers' thoughts and relationships with the children in this population. Robertson (2003) investigated this using the Student-Teacher Relationship Scale, a 28 item scale scored on a five point Likert scale that asks questions such as what the teachers feelings were about the students included in their classrooms, the interactive behavior from the student towards the teacher, and the teachers beliefs about the students feelings towards them. Results showed that 29.8% of teachers felt that they were at odds with the students in their classroom, 12.9% felt close to the students in the classroom and 6.2% felt that the students were overly dependent on them.

Individuals with Disabilities Education Act

One relevant legal statue to accessing ABA in the schools is the Individuals with Disabilities Education Act (IDEA) of 1997. IDEA is a federal law that has created rules and guidelines for students in special education. This federal law helps students with disabilities have the rights to a free and appropriate education and services needed to become successful in their academic careers in the public-school setting. Under IDEA, there are six foundational principles that are provided to the students.

The first principle is FAPE which is provided at the public schools' expense under the public supervision. This principle also supports students aged three years old to twenty-one years old including preschool and all of years in high school and is designed to meet all their needs throughout their school years that could be encountered.

The second principle is an appropriate evaluation, and this is to ensure that all students receive an evaluation before being provided with special education services to ensure that they are receiving the proper services and to ensure that they qualify for the services that they are

being evaluated for under the IDEA definition. The parents of the students must provide their

informed consent and permission for the services.

This evaluation should not be based on a single assessment or measurement tool and

should use a variety of strategies such as functional, developmental, and academic to evaluate all

areas of the suspected disability to get a full assessment report. The assessments should be

conducted by someone who is qualified, knowledgeable and has experience running the

assessments. Students can be given a new evaluation when conditions need added information to

support the services, the parent makes the request for a new evaluation, and at the end of the

three-year ETR period for the IEP.

The third principle of IDEA is the Individualized Education Program (IEP), and this

occurs after the student has been evaluated and determined that they qualify for the services

under the IDEA definition. The IEP is a written plan with a set of goals for the teachers to

implement to build the students education and their skill repertoire. This plan is reviewed at least

once a year by the IEP team which includes the parents of the students, the teacher, the principle,

the related services, and the student when it is appropriate for them to be in the meeting.

The fourth principle defines and describes the Least Restrictive Environment (LRE)

which is defined as "any placement outside the general education classroom that is justified by

the child's individual disability related needs" (Ask resource center. 2018). The LRE provides

the student access to meaningful opportunities with same age peers in the school setting such as

participating art class, music class, gym, field trips, assemblies, and any other school event that

their typical aged peers would be participating in.

The fifth principle is parent and student participation in decision making process to

ensure that the parents are active participants in all opportunities that are presented in the school.

Parents are expected to actively participate in the development, review and revision of the IEP, placement decisions and the decision for evaluations. The parents should also be reviewing any relevant data that the teachers and evaluators are taking to ensure that they are up to date with the students' progress or regression. Transition planning should also be something that the parents are participating in with the teachers and the IEP team starting at the age of fourteen years old.

The final principle of IDEA is procedural safeguards, and these are put into place to ensure that the student and their rights are protected and that everyone on the team has access to the relevant information to make informed decisions about what do next with the student and what rights are provided to them when changes need to be made. IDEA also authorizes formula grants for states and discretionary grants for state education agencies, institutions of higher education and other non-profit organizations (see IDEA, 2023). The formula grants are awarded annually to support the early intervention services for children from infancy to youth in special education programs. These grants help states in their assistance to provide a free appropriate public education (FAPE) to children aged three years old to twenty-one years old. The discretionary grants process is a more competitive process as it reviews applications through formal peer reviewed process with a standing panel. This would suggest that not all applications are accepted due to the legislative and regulatory requirements.

IDEA Statistics

In the 2020-2021 school year, it was reported that more than 7.5 million students received supports and services under IDEA (IDEA, 2017). More than 66% of these students were in the general education classroom in the school districts for more than 80% of the school day. ABA can also be provided in school settings as part of a free and appropriate education (FAPE). This would mean that the special education teacher would work with various medical and educational

needs of the students, create, and implement IEP goals, work with the behaviors that the student has, and encourage social/emotional needs through structed play and time in the classroom.

IDEA is relevant to the issue of ABA in schools since IDEA mandates each child be offered FAPE. For some children with ASD, a comprehensive ABA therapy program might constitute FAPE. As mentioned by Grindle (2012), interventions in schools can be less intense due to several logistical constraints. These include the schedule for the school year and availability of staff. Public schools have a responsibility to follow the specific standards set forth by the state they operate in, which might not coincide with the programmatic needs of a comprehensive ABA therapy program. This could potentially create a conflict between the needs of the child and the regulations that public schools must follow.

Statement of the Problem

Previous research has demonstrated that ABA can be effective in a variety of settings. However, limited evidence has been presented in aggregate format to describe the effectiveness of ABA in school settings. In the meta-analysis by Yu (2020), a minority of studies included in the review were in a school setting. School settings offer a unique opportunity to work with the client in a natural setting while affording many benefits of in-clinic services (i.e., greater control than home, specialized staff). Therefore, the purpose of this paper is to search the literature for articles describing the effectiveness of ABA in schools and identify characteristics of these articles that describe ABA in schools. Information from such articles would help describe the background teachers have in the field, information on what interventions is used, and how such interventions are implemented. This paper will also describe similarities and differences between ABA in clinics, homes, and schools. Such information can be used by clinicians, teachers, and other stakeholders to identify best practices for providing ABA therapy.

Method

Articles were searched via Google Scholar, Wiley Library, and Sage Publishing pages using keywords classroom, autism, general education, special education, and education. These keywords were individually entered into the search database for each search engine. The first word entered was ABA along with another keyword such as classroom. ABA was always the first keyword entered into the search engine along with a second keyword following. This order of keywords was used for all the search engine methods to produce articles.

Inclusion Criteria

To be included in the current review, articles had to have been published within the past twenty-five years, have occurred in the United States, and be written in English. Lastly, to be included in the current review articles had to describe the use of ABA in the school setting (see Table 1 for all inclusion criteria).

Article Screening

After the initial search using the keywords above, the researcher read each article to determine if it met criteria for inclusion in the current review. If the articles mentioned school settings but not the use of ABA in the classrooms, the article was not included in the review. If articles mentioned only ABA interventions and results in a home or clinic setting, the article was not included for review. With the keywords used, the searches had to be narrowed down further to ensure that the correct type of research was included in this study. A second reviewer also reviewed each article for inclusion or exclusion (see interrater reliability below).

Article Characteristics

Once screened for inclusion, the researcher reviewed the articles and coded several characteristics of the articles. These included identifying and describing the intervention used,

where the intervention took place, the target of the intervention, the ages of participants, what research design was used, and who supervised the treatment delivered in the school. Table 2 displays the specific information that was coded in each article included in the current review once they passed the initial screening to provide answers to the research question.

Results

Interrater Reliability

Initially, a total of 19 articles were initially located by searching the specified databases with the keywords above. The oldest article was published in 2001 and the most recent was published in 2012. A second reviewer reviewed 100% of the articles included in the current review for inclusion or exclusion during the screening phase. When initial ratings were compared, there were 6 discrepancies which resulted in an initial agreement of 68.4% (13/19). The first reviewer and second reviewer communicated regarding and discrepancies until there was 100% agreement. Five of the six discrepancies (83.3%) were due to the 25-year limit on articles. One (16.6%) was because the article did not describe the use of ABA in schools. This left 13 articles that for final inclusion in the study.

Article Characteristics

Of the 13 articles that used a research design that were included in the final review, 7 (53.8%) were research articles that described intervention using ABA principles. The remaining 6 (46.2%) were review and discussion articles on topics such as the value of ABA in schools or suggestions on how to integrate ABA into schools more effectively (see Table 3).

Setting

Of the 7 articles describing use of an intervention, 2 (28.4%) occurred in a regular mainstream classroom. A total of 2 (28.4%) occurred in a mainstream classroom but students

were pulled out at times for intervention. Mainstream classrooms were the most common setting

for the articles included in the current review. Two articles (28.4%) were survey designs. Lastly,

1 (14,2%) used mixed methods designs (see Table 4).

Interventions Used

Several different interventions were utilized in the current studies. A total of 2 of 7

(28.4%) of research articles utilized comprehensive ABA delivered in a school setting.

Comprehensive ABA included the use of various strategies such as discrete trial training,

specific programming, reinforcement, extinction, and other procedures. A total of 2 of 7 (28.4%)

of research articles were survey designs, therefore there was no true intervention. One of the

seven (14.2%) articles utilized response cards as an intervention. One article (14.2%) was

correlational in nature and another single article (14.2%) used precision requests and

reinforcement (see Table 5).

Targets of Intervention

Across the 7 research articles, the most common intervention target was reducing

challenging behaviors which was targeted in 2 (28.4%) of articles. The other 5 articles each had a

unique target or dependent variable. These included reported teaching strategies, IQ and adaptive

skills, intellectual, visual spatial, language, adaptive measures, parent satisfaction, and parent-

student relationships (see Table 6).

Ages of Participants

For the fourth question, "What were the ages of the participants?" results indicated a

range of 3 to 18 years for students across the 7 studies included in the current review that utilized

a research design (see Table 7).

Research Designs Used

For the 7 articles included in the current review, 2 (28.4%) used a pretest-posttest design. Two (28.4%) used a variation of a withdrawal design (i.e., ABA or ABAB). One article each (14.2%) used mixed methods, correlations, and reported responses on a survey (see Table 8).

Oversight of Treatment

Of the 7 articles included in the current review that contained research, only 2 (28.4%) reported on who oversaw that treatment. In one, a supervisee was specified as overseeing treatment. In the other, a BCBA was specified as overseeing the treatment (see Table 9)

Review/Discussion Articles

As mentioned, 6 of the 13 (46.2%) of the articles included in the current review were review and/or discussion articles that described the value of ABA in the schools. Each of the 6 articles had a different topic. These included description of practice/research areas, exploring challenges to aba in schools, discussion of teacher training needs, review of IDEIA statutes relevant to ABA, review of effective teaching strategies, review of treatment integrity used in schools (see Table 10).

Discussion

A significant takeaway from the current review was the lack of research found on ABA in schools. Of these, the number of articles that utilized research designs was relatively few. This could be for a variety of reasons such as a lack of school based BCBA's, lack of treatment fidelity through IOA, curriculum requirements for public schools, and supervision needs of teachers when implementing the ABA strategies. While surveys are important for specific research questions, more peer-reviewed experimental research would allow for policy makers to better evaluate the effectiveness of ABA in schools.

Some of the research studies included in this review used single case research designs, can be difficult to use in large classrooms. Single subject designs require consistent data collection and monitoring of the students involved, which can be hard for schools with limited resources. Likewise, group designs also have flaws in that they do not specifically provide information on any one students' performance. Since most of the teachers in the studies did not have a background in ABA, their knowledge of interventions, research designs and how to implement and collect data on the various designs such as multielement, multiple baseline design and changing criterion designs is hard to establish.

Another important finding of the current review was that few articles described who oversaw treatment delivery. When coding for supervision of treatment during the experimental phases of the studies, few articles mentioned a second or third observer in the classroom with the teachers to take data, but these observers were not defined in any way. Additional information on what kinds of qualifications those designing services have would be helpful for providing information on the needs of school personnel. If these observers had been defined in a more specific way, the readers would be able to determine if the observing they were doing was effective or done by someone who was qualified in ABA practices such as a BCBA who has experience in the field.

Another area of concern was the lack of supervision or who the supervisor was in the articles reviewed. When coding the selected articles, supervision was limited in the articles and mentioned an observer but did not define who they were of if they had a background in ABA. This lack of supervision could have hindered the implementation of ABA interventions in the classroom because the teachers did not always have someone to educate them on the procedures and provide ongoing supervision of the intervention to ensure treatment fidelity. If more

supervision is provided within the school districts, a more refined and effective implementation of ABA could be done in the classrooms and throughout the schools.

On a related note, there was a lack of ABA training described in the articles in the current review. A lack of training on ABA and its teaching practices in the special education programs, would obviously make effective use of these strategies in school more difficult. If articles described what trainings were involved in teaching staff to use ABA interventions, schools might better provide accommodations and modifications provided to students diagnosed with ASD within the school districts. While students with ASD can attend school in their districts, the quality of education they are receiving can be hindered since there are not enough evidence-based interventions used to meet their educational needs such as token economies, block trialing and generalization of skills across teachers and environments.

Limitations

A limitation with the current review was the use of Google Scholar, Wiley Library and Sage Publishing. If there had been a wider search across more search engines, it could have been possible to find more articles on the topic. This would lead to more information on interventions and research designs used within the school districts. While Google Scholar led to different journal articles and sources, there was not just one journal source used to find results for the research of this study. The keywords used such as ABA, education, classroom, school, effectiveness, school based and general education, provided a wide variety of results were found that only mentioned ABA interventions in a clinic, effectiveness of ABA interventions outside of the school, describing classrooms within the schools, and other non-relevant articles. Using more narrow keywords to get a more refined search of articles that closely relate to the topic could produce more articles. Specific journals could be used for research like the *Journal of Positive*

Behavior Interventions to search a more focused group of research to find more relevant articles. This might produce a more fruitful search. A related limitation possibly due to keywords and the search engines was the low interrater reliability during the screening phase. However, the discrepancies were mostly due to publication year, not the specific content of the articles.

Another limitation was limiting the search just to the United States instead of the United States and other areas such as the United Kingdom. Since there was narrow search, different approaches to ABA in the school districts were not identified to see their effectiveness and the different methods of implementing ABA inside of the schools to better service the children in the special education classrooms. This information could have been useful to compare different countries educational practices to that of the United States classrooms. The information could have identified novel methos to implement ABA in schools in the United States.

Future Directions for Research

One future direction for research would be on the incorporation of ABA into special education teaching programs at the university level to provide a different method of special education teaching within the school districts. This instruction could be used to replace or supplement existing intervention courses. Likewise, specific tracks that provide dual licensure as an education and a BCBA would be very valuable for students in the public schools. While this would be a big change that would take some time to incorporate into university teaching programs, it would be helpful to produce teachers who have expertise in both areas and that schools can presumably hire due to their dual licensure. This, in turn, would keep more students in the LRE. On a related note, if teachers can be educated and exposed to ABA during their professional development at the collegiate level, perception on the use of ABA might change.

Lastly, research on other countries and how they incorporate ABA into their schools would help researchers identify a system of supervision and implementation that would work well in the United States school systems. This could be the need and use of more school based BCBA's, or more supervisors coming into the school systems to supervise and model implementation of ABA interventions. This way, more students can receive effective FAPE in the LRE with their peers.

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Table 1

Screening Questions in the Current Study

Article Screening Questions	Yes or No
Does the setting take place in a school?	
Are ABA interventions used?	
Are the assessments used in the school setting ABA based?	
Has the research been conducted within the last 2 years?	
Did the research occur in the United States?	
Were the children school age?	

Table 2

Variables Codes in the Current Study

Article Screening Questions	Yes or No
What intervention(s) were used in the article?	
Did the intervention take place in a mainstream or resource classroom?	
What was the target of the intervention?	
What were the ages of the participants?	
What research design was used?	
Who supervised the treatment?	

Table 3

Types of Articles in Current Review

Citation	Type of Article
Dunlap et al., 2001	Review/Discussion
Barnett et al., 2021	Review/Discussion
Armendariz et al., 1999	Research Article
Hess et al., 2008	Research Article
Grindle et al., 2012	Research Article
Loiacono & Valenti. 2010	Review/Discussion
Bloh and Axelrod, 2008	Review/Discussion
Harrower & Dunlap, 2001	Review/Discussion
Eikeseth et al., 2001	Research Article
Scully et al., 2000	Research Article
Dillenberger et al., 2012	Research Article
McIntyre et al., 2007	Review/Discussion
Robertson et al, 2003	Research Article

Table 4

Settings for All Research Articles

Citation	Location of Intervention
Armendariz et al., 1999	Regular Classroom
Hess et al., 2008	NA-Survey
Grindle et al., 2012	Mainstreamed with Pull-Outs
Eikeseth et al., 2001	Mainstreamed with Pull-Outs
Scully et al., 2000	Regular Classroom
Dillenberger et al., 2012	NA-Survey
Robertson et al, 2003	NA-Mixed Methods

Table 5

Interventions Used for All Research Articles

Citation	Interventions
Armendariz et al., 1999	Response Cards
Hess et al., 2008	NA-Survey
Grindle et al., 2012	Comprehensive ABA (various interventions)
Eikeseth et al., 2001	Comprehensive ABA (various interventions)
Scully et al., 2000	Precision Requests, Antecedent Strategies, Reinforcement
Dillenberger et al., 2012	NA-Survey
Robertson et al, 2003	NA-Correlational

Table 6

Target Behaviors or Dependent Variable for All Research Articles

Citation	Target/DV
Armendariz et al., 1999	Disruptive Behavior
Hess et al., 2008	Reported Strategies Used in Georgia
Grindle et al., 2012	IQ and Adaptive Skills
Eikeseth et al., 2001	Intellectual, Visual Spatial, Language, Adaptive Measures
Scully et al., 2000	Disruptive Behavior
Dillenberger et al., 2012	Parent Satisfaction
Robertson et al, 2003	Parent-Student Relationships

Table 7

Student Age Ranges for All Research Articles

Citation	Range
Armendariz et al., 1999	8-9 years old
Hess et al., 2008	3-18 years old
Grindle et al., 2012	3-7 years old
Eikeseth et al., 2001	4-7 years old
Scully et al., 2000	8 years old
Dillenberger et al., 2012	8 years old
Robertson et al, 2003	7-9 years old

Table 8

Types of Research Designs for All Research Articles

Citation	Type of Design
Armendariz et al., 1999	ABA Design
Hess et al., 2008	Survey
Grindle et al., 2012	Pretest/Posttest with TAU Control
Eikeseth et al., 2001	Pretest/Posttest with Eclectic Control
Scully et al., 2000	ABAB and Multiple Baseline
Dillenberger et al., 2012	Mixed Methods
Robertson et al, 2003	Correlational

Table 9

Reported Supervisor for All Research Articles

Citation	Supervisor
Armendariz et al., 1999	N/A
Hess et al., 2008	N/A
Grindle et al., 2012	Supervisee
Eikeseth et al., 2001	N/A
Scully et al., 2000	N/A
Dillenberger et al., 2012	BCBA
Robertson et al, 2003	N/A

Table 10

Topics of Review/Discussion Articles

Citation	Type of Article
Dunlap et al., 2001	Description of Practice/Research Areas
Barnett et al., 2021	Exploring Challenges to ABA in Schools
Loiacono & Valenti. 2010	Discussion of Teacher Training Needs
Bloh and Axelrod, 2008	Review of IDEIA Statutes Relevant to ABA
Harrower & Dunlap, 2001	Review of Effective Teaching Strategies
McIntyre et al., 2007	Review of Treatment Integrity Used in Schools