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STUDENTS WITH AUTISM AND AGGRESSIVE BEHAVIOR:
A REVIEW OF EVIDENCE-BASED INTERVENTIONS

A Specialist Project
Presented to
The Faculty of the Department of Psychology
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Specialist in Education

By
Alisha Kelsay

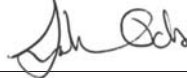
May 2020

STUDENTS WITH AUTISM AND AGGRESSIVE BEHAVIORS:
A REVIEW OF EVIDENCE-BASED INTERVENTIONS

Date Recommended 4-13-2020



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STUDENTS WITH AUTISM AND AGGRESSIVE BEHAVIOR:
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Alisha Kelsay

May 2020

64 Pages

Directed by: Dr. Carl Myers, Dr. Sarah Ochs, and Dr. Thomas Gross

Department of Psychology

Western Kentucky University

Aggression can be present in students diagnosed with autism spectrum disorder (ASD), and may need to be considered within academic environments. Interventions that are evidence-based have been identified to assist educators with issues with aggression in students with ASD. This review of evidence-based interventions highlights the effectiveness and social validity within educational settings that may be useful to instructors and other educational staff. Teachers need to be equipped with interventions that are considered to be effective and easy to implement within the school system. The literature available about the evidence based interventions for students with ASD are limited when the environmental setting is specified, so this review expanded to clinical and community settings. The current review provides an examination of interventions that can applied within the school setting and may be considered a resource for educators, as it emphasizes details that are vital to implementation in public school settings that may not have access to behavioral analysts and instructional assistants with specialized training.

Introduction

Autism has been described as “perplexing and mysterious” (Gabriels & Gaffey, 2012, p. 205), as well as “one of the most intriguing and enigmatic psychopathologies” (Nielsen & Carpenter, 2008, p. 167). Professionals’ interest in autism has grown tremendously over the past decade or two. An electronic PsycINFO search using only the term - autism, resulted in 70,276 citations. However, restricting that search to 2009-2019 yielded 41,603 citations, indicating an increased emphasis on the disorder just within the last decade. Given the extensive literature on the topic, exploring the complexities of autism can be challenging but additional review of current literature on specific topics can be a valuable resource to parents and professionals.

Origins of Autism Spectrum Disorder

Historically, it is believed Drs. Leo Kanner and Hans Asperger, each working independently, first described autism. Baker and Lang (2017) provided the following description of their early work. Asperger worked in Germany while Kanner worked in the United States. Both reported children with autism to have intellectual gifts, as well as social deficits and specific types of unusual behaviors. Asperger was reported by Baker and Lang to have first lectured in 1938 on children who fit such a description. Asperger chose to lecture on four students that he had deemed as not too severe and with greater potential for improvement in behavior. Baker and Lang believe this statement suggested that, even at that early time, Asperger was aware of the wide spectrum or continuum of autism functioning. Baker and Lang also note Asperger had equated his research with individuals of higher intelligence, rather than intellectual disabilities, and had proposed that everyone was familiar with the “autistic scientist.”

Olmsted and Blaxill (2016) reported that Kanner also gave a description of his first patient believed to have autism in 1938, stating that the child had made him “aware of a behavior pattern not known to me or anyone else theretofore” (p. 340). Olmsted and Blaxill noted Kanner’s work with his first 11 clients with autism was published in 1943 in an article titled, “Autistic Disturbances of Affective Contact.” Kanner had also described his clients as having remarkable memorization abilities and a different perception of information about people and objects within their environment (Baker & Lang, 2017). It was thought that Kanner had chosen subjects that did not display characteristics that were associated with cognitive delays, again pointing to the awareness of the differing functional levels of those with autistic traits (Chown & Hughes, 2016).

Current Views of Autism Spectrum Disorder

According to the Diagnostic and Statistical Manual of Mental Disorders, fifth Edition (DSM-5), Autism Spectrum Disorder (ASD) is categorized as a neurodevelopmental disorder (American Psychiatric Association [APA], 2013). Neurodevelopmental disorders are “conditions with onset in the developmental period. The disorders typically manifest early in development, often before the child enters grade school, and are characterized by developmental deficits that produce impairments of personal, social, academic, or occupational functioning” (APA, 2013, p. 31). ASD is characterized by the DSM-5 as symptoms in two main areas. First, persistent social-communication deficits that can be manifested by deficits in social-emotional reciprocity, deficits in nonverbal communicative behaviors necessary for social interaction, and deficits in developing, maintaining, and understanding relationships. Second, restrictive, repetitive patterns of behavior, interests, or activities, as manifested by at least two of the

following: stereotyped or repetitive motor movements, use of objects, or speech, insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal or nonverbal behavior, highly restricted, fixated interests that are abnormal in intensity or focus, and hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment (APA, 2013). The severity of symptoms ranges from Level 1 “Requiring support,” to Level 3, “Requiring very substantial support.” The severity specifiers are used to recognize that symptoms vary across individuals and fluctuate over time within individuals, thus reinforcing that Autism is a “spectrum” disorder. See Table 1 for an overview of DSM-5 severity specifiers.

Table 1

DSM-5 (APA, 2013) Severity Specifiers for Autism Spectrum Disorder

Severity Levels	Social Communication	Restricted Repetitive Behaviors
Level 3 “Requiring very substantial support”	Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others.	Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action.
Level 2 “Requiring substantial support”	Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal response to social overtures from others.	Inflexibility of behavior, difficulty coping with change or other restricted/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.
Level 1 “Requiring support”	Without supports in place, deficits in social communications cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful responses to social overtures of others. May appear to have decreased interest in social interactions.	Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning hamper independence.

Children identified as having ASD usually have educational and behavioral needs that are addressed in the public school system. Some students with ASD may exhibit behaviors in the classroom that are problematic and difficult for teachers and staff to manage, especially in conjunction with other responsibilities. Although public schools can accept a diagnosis of ASD made by clinical or medical professionals based on the DSM-5, federal special education law has its own definition of autism, as outlined in Individuals with Disabilities Education Act (IDEA, Federal Register, 2006). Both, the IDEA (Federal Register, 2006) and KDE define Autism as:

A developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three (3) that adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences. (p. 46756 & p. 3, respectively)

Consistent with the conceptualization of autism as a spectrum disorder, the Kentucky Autism Guidance Document notes that no two students with ASD are alike, or display exactly the same behaviors (Kentucky Department of Education [KDE], 2017). In the area of communication, a wide variety of characteristics could be present. A child could have difficulty expressing their needs to others, delayed or no speech, difficulty processing language, immediate or delayed echolalia, no response to verbal cues, or a lack of engagement in joint attention (KDE, 2017).

Socially, children with ASD can look very different from typically developing peers. Students with autism may have limited social interactions. Typical social

symptoms can include: preferring to be alone, displaying difficulty interacting with peers, avoiding physical contact, little to no eye contact, difficulty initiating conversations, acting or speaking inappropriately, and difficulty interpreting others' emotions (KDE, 2017). Students with ASD have also been reported to have difficulties using and understanding gestures (Gizzonio et al., 2015).

Cognitive and academic areas can be impacted by symptoms of autism. Students with autism might attend to irrelevant stimuli and share unrelated information (e.g., appear off-topic), but recall detailed facts about a particular topic of interest to them (KDE, 2017). Students may have difficulty applying new skills, producing legible text, maintaining organization, and have limited problem-solving abilities (APA, 2013; KDE, 2017).

Repetitive behaviors or stereotypical motor movements (SMM) include repetitive body rocking, mouthing, and complex hand or finger movements (Sadouk, Gadi, & Essoufi, 2018). Additionally, difficulty with transitions, inappropriate attachment to objects, restricted or persistent interests, insistence on sameness, self-injurious behavior, and toe-walking are included in this category (Soto, Giserman Kiss, & Carter, 2016). Some children with autism engage so frequently in these SMMs that education is impeded.

Other symptoms that are common with a diagnosis of ASD include uneven gross or fine motor abilities, sensory processing, over- or under-sensitivity to pain, marked physical over- or under-activity, display minimal awareness of danger, and limited appetite (APA, 2013; KDE, 2017). Atypical sensory processing behaviors have been reported in approximately 82% to 97% of the participants with ASD (Dellapiazza et al.,

2018). Wigham, Rodgers, South, McConachie, and Freeston (2015) also postulated that for participants with ASD, intolerance of uncertainty may play an integral role in sensory abnormalities.

Aggressive behavior is also frequently associated with ASD. According to a study conducted by Hill et al. (2014), who investigated 400 individuals diagnosed with ASD ages 2 - 16.9 years, one in four individuals had scores on the Aggressive Behavior scale of the *Child Behavior Checklist* in the clinical range (T scores ≥ 70). In another study with 1,380 participants with ASD, it was reported by their parents that 68% of the children had displayed aggressive behaviors toward a caregiver and 49% of the children had displayed aggressive behaviors to non-caregivers (Kann & Mazurek, 2011). Kaartinen et al. (2015) also found that males with ASD showed more aggressive behaviors than typically developing counterparts, as well as females with and without ASD.

Prevalence

ASD was once thought to be a rare condition. Very little was understood about the condition, even into 1970's and 1980's. Different editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM) provide a sense of how rapidly prevalence rates of ASD grew over time. The 3rd edition of the DSM (DSM III, APA, 1980) stated the prevalence rate at that time was somewhere between 1 in 2,500 and 1 in 5,000 children. Just a few years later, the DSM III-R (1987) and the DSM-IV (1994) reported that the prevalence rate had increased to approximately 1 out of every 2,000 children. By the time the DSM-5 (APA, 2013) was published, however, the prevalence rate was thought to be 1 out of every 100 children.

The Centers for Disease Control and Prevention (CDC, 2018) estimated that 1 in 68 children had ASD in 2016 and noted those numbers have been increasing steadily throughout the years. The CDC prevalence estimates are for four years prior to the report dates (e.g., 2018 figures are based on data collected in 2014). Based on the 2014 data, it was projected that at the conclusion of 2018, the number of children diagnosed with autism would be 1 in 59. Thus, the prevalence of children with ASD continues to increase.

Ethical and Legal Considerations

In the past, relatively few teachers or educators encountered students diagnosed with ASD and experienced the associated problematic. Due to the increasing prevalence rates of autism, the likelihood of a student diagnosed with ASD being included in general education classrooms has grown considerably. Educators in particular may find it difficult to appropriately respond to a child with ASD displaying aggressive behavior in the classroom, especially with limited previous knowledge of student and the diagnosis (Bolourian, Stavropoulos, & Blacher, 2019). As a result, educators might resort to ineffective responses or even problematic responses (e.g., physical restraint). While all school personnel have a responsibility to assist in intervention implementation for classroom management, school psychologists' competency in educational research and current evidence-based practices makes them uniquely positioned for consultation and collaboration with behavioral and educational needs within school districts.

School psychologists are ethically bound to assist teachers and students by providing evidence-based practices that can enhance educational success. School psychologists follow the ethical principles set forth by the National Association for

School Psychologists (NASP, 2010). Examples of specific ethical principles applicable to this situation are as follows. Principle II.3: Responsible Assessment and Intervention Practices, Standard II.3.9 states that school psychologists:

...use intervention, counseling and therapy procedures, consultation techniques and other direct and indirect service methods that the profession consider to be responsible, research-based practice...Preference is given to interventions described in the peer-reviewed professional research literature and found to be efficacious (NASP, 2010).

In addition, Principle IV: Responsibility to Schools, Families, Communities, the Profession and Society, Standard IV.1.2 states:

School psychologists use their professional expertise to promote changes in schools and community service systems that will benefit children and other clients. They advocate for school policies and practices that are in the best interests of children and that respect and protect the legal rights of students and parents (NASP, 2010).

For school personnel, there is both a legal and an ethical responsibility to actively engage evidence-based practices in order to ensure that all of their students are receiving appropriate education. For instance, in addition to ethical standards, the federal law IDEA-04 (Federal Register, 2006) supports evidence-based practices in special education.

ASD Evidence-Based Interventions

The National Professional Development Center on Autism Spectrum Disorder has identified 27 interventions as evidence-based, when implemented correctly (Wong et al.,

2014). They have identified 12 areas of concern or deficit: communication, social, joint attention, behavior, school readiness, play, cognitive, motor, adaptive, vocational, mental and academic. Three age groups have further divided these 12 areas: 0-5 years, 6-14 years, and 15-22 years old. This specialist project will focus on the interventions in the behavior area.

There are six interventions that are not included in the behavioral area at any age level because they focus on educational strategies. Of the remaining 21 interventions, nine interventions have been classified as effective in two of the three age groups and the four remaining interventions have research to support in at least one of the age categories. This leaves eight intervention strategies that have been identified as having supportive research for all three age groups in the behavioral category (see Table 2). Those eight intervention strategies with supporting evidence across the three age ranges (i.e., antecedent based intervention, reinforcement, differential reinforcement of alternative/other/incompatible behaviors, extinction, functional behavior assessment, functional communication training, response interruption and redirection, and social narratives) will now be briefly reviewed to illustrate the interventions. While the descriptions of these interventions are provided separately, in practice, more than one technique could be used in combination with each other.

Antecedent-based interventions. Antecedent-based interventions, as defined in the Kentucky Department of Education Autism Guidance Document (KDE, 2017), are arranging events or circumstances that precede the occurrence of the interfering behavior and are designed to prevent the behavior of concern from occurring in the first place. These types of interventions would include providing individuals with visual or verbal

Table 2

Evidence-Based Practices by Outcome and Age for Behavior (Wong et al., 2014)

Evidence-based practice	Age in Years		
	0 - 5	6 - 14	15 - 22
Antecedent-based interventions (ABI)	Yes	Yes	Yes
Cognitive behavioral intervention	No	Yes	Yes
Differential reinforcement of alternative, incompatible, or other behavior (DRA/DRI/DRO)	Yes	Yes	Yes
Discrete trial training	No	Yes	No
Exercise	Yes	Yes	No
Extinction (EXT)	Yes	Yes	Yes
Functional behavior assessment (FBA)	Yes	Yes	Yes
Functional communication training (FCT)			
Modeling	No	No	No
Naturalistic interventions	Yes	No	No
Parent-implemented interventions	Yes	Yes	No
Peer-mediated instruction and interventions	No	No	No
Picture Exchange Communication System	No	No	No
Pivotal response training	No	No	No
Prompting	No	Yes	Yes
Reinforcement (R⁺)	Yes	Yes	Yes
Response interruption/redirection (RIR)	Yes	Yes	Yes
Scripting	No	No	No
Self-management	No	Yes	Yes
Social narratives (social stories)	Yes	Yes	Yes
Social skills training	Yes	Yes	No
Structured play group	No	Yes	No
Task analysis	No	No	No
Technology-aided instruction & intervention	No	Yes	Yes
Time delay	Yes	Yes	No
Video modeling	No	Yes	No
Visual support	Yes	Yes	No

Note. A “Yes” indicates at least one study that met inclusion criteria resulted in positive outcomes for a child with ASD related to behavioral concerns. Bolded interventions have evidence-base across age groups.

cues to signal an upcoming transition, especially when it involves stopping a preferred task and moving to a less-preferred task.

Some students with autism can react aggressively to transition times at school because they do not understand what is happening or they do not want to stop the activity. Manipulation of antecedent variables is one possible alternative strategy, because they are preventive and oftentimes resemble naturally occurring teaching strategies. Studies that examine the effectiveness in decreasing stereotypical and disruptive behavior in children that have been diagnosed with ASD in the regular education classroom found that antecedent based interventions have demonstrated a decrease in challenging behaviors (Conroy, Asmus, Sellers, & Ladwig, 2005). In the same study, it was found that the antecedent based intervention, according to the teacher and teaching assistant, was easy to implement within the classroom with minimal adjustments to their prior routine.

Reinforcement. Positive reinforcement (R^+) is the act of encouraging a specific behavior by providing a desired object or activity as a consequence with the intent that the desired behavior will increase (Burden, 2003). A person's behaviors are shaped through his or her reinforcement history (Cooper, Heron, & Heward, 2014). These behavioral principles apply to aggressive behaviors as well. This means that a student displaying aggression has learned that a desired outcome can be accomplished by aggressing towards others.

Usually, reinforcement occurs in the form of receiving attention or avoiding unwanted situations or demands (Foxx, 1996). For example, a student throw items at peers and he receives attention from his peers and the teacher, followed by the behaviors

continuing or intensifying. Then it may be reasonable to conclude that attention is reinforcing the student's throwing behaviors. When students seek teacher attention via inappropriate behaviors, Carr, Severtson, and Lepper (2009) suggest that teachers provide non-contingent attention to students during times when they are not displaying the inappropriate behavior. In this way, the teacher would saturate the student with attention before the aggressive behavior begins and minimize the necessity of the student performing that aggressive action to obtain attention.

Differential reinforcement. Another set of techniques are differential reinforcement interventions. With differential reinforcement, desired behavior is reinforced while providing minimal to no reinforcement for the inappropriate behaviors. The goal is to decrease the likelihood that the participant will engage in the problematic behaviors in the future. There are three often-used types of differential reinforcement procedures: Differential reinforcement of other behavior (DRO), differential reinforcement of alternative behavior (DRA) and differential reinforcement of incompatible behaviors (DRI).

DRO is where the participant is reinforced at any time that the student is not engaging in the problematic behavior, while also putting the target behavior on extinction. In the classroom you may encounter a student who has a tendency to hit other children. The teacher could implement a DRO intervention that involves reinforcing any other behavior that the student does with his hands during a span of time, where the predetermined behavior of hitting others is absent. Using the example of the student who hit others, DRA could be implemented and would involve positively reinforcing the student for alternative behaviors such as high fiving others. Likewise, DRI would involve

positively reinforcing behaviors that are incompatible with hitting others, such as keeping his hands in his pockets.

Extinction. Extinction (EXT) strategies involve the removal of reinforcement that maintains an inappropriate behavior. The extinction process often includes an initial phase, where once the participant's behavior is no longer reinforced. During this phase, the behavior is likely to increase due to a phenomenon called an extinction burst (Cooper et al., 2014). During the second phase, the inappropriate behavior is likely to decrease in response to no longer receiving the maintaining reinforcement.

For example, if a student bangs her fists on her desk and yells obscenities during instruction, the teacher stops to speak with the student about appropriate behavior and her peers are all looking at her. The student could be reinforced by teacher and peer attention given when she acts inappropriately. If this were the case, when the teacher and peers begin to ignore the student's loud banging and yelling in class, the student will likely increase fist banging and expletives attempting to regain the peer and teacher attention. However, when the student learns that she will no longer be reinforced by attention from her peers and teacher, she will decrease her behaviors of banging on her desk and yelling during instruction time.

Functional behavior assessment. It has been hypothesized that behaviors serve to fulfill one of four functions: escape, attention, tangible and sensory (Cooper et al., 2014). Escape refers to someone avoiding a task, person, situation, etc. Attention refers to someone seeking the attention of others. When someone tries to obtain a physical object, that is tangible function. Sensory refers to a person engaging in a behavior for the feeling of it.

Research suggests that interventions that address the function of the problematic behavior have increased potential for success when the function is correctly identified (Kennedy, Meyer, Knowles, & Shukla, 2000) through a functional behavior assessment (FBA). With function-based interventions, participants are taught socially appropriate responses that could be used to achieve the same reinforcement that they received from their inappropriate behavior, while also no longer receiving reinforcement for the inappropriate behavior.

Functional communication training. Functional communication training (FCT) is an example of a function-based intervention (Martinez, Werch, & Conroy, 2016). For example, if it has been determined that a student hits her teacher when she wants teacher attention, she can be taught to ask for attention or signal the teacher when she is needing attention. The new behavior is a socially acceptable behavior and eliminates the need for the student to engage in the aggressive behavior to gain attention.

Response interruption/redirection. Response interruption and redirection (RIR) strategies occur when a participant performs the undesired behavior. The teacher then interrupts the behavior and prompts the participant to a desired response that the teacher may or may not reinforce. This intervention strategy is commonly used to reduce the occurrence of interfering behaviors. For instance, a student with ASD begins to hit himself in the face in the classroom. The teacher will go to the student and prompt him to put his hands in his lap and count to five. This will interrupt the behavior that the student is engaged in and redirect his attention to a different task that is less harmful to him and others (Neitzel, 2009; Tomaszewski, Regan, & AFIRM Team, 2017).

Social narratives. Social narrative interventions are visually represented stories that describe social situations and socially appropriate responses or behaviors to assist individuals with ASD in acquiring new and socially appropriate behaviors. This can include the use of social stories, which are written or visual guides to socially appropriate behavior and can be individualized to many behaviors and situations. The participant is given a social story that depicts that student acting appropriately by engaging in specific appropriate behaviors (Gray & Garand, 1993). This helps to show the student what the appropriate behaviors are and what is expected of them during times when the problematic behavior is likely to occur. Another story could involve a student sitting quietly at a table during lunch, eating her food, with visual and written instructions on how and why this behavior is preferred over her throwing her food at other students (Wong et al., 2012).

Purpose of the Present Study

The number of children identified with ASD is growing (CDC, 2018) and many receive special education services while included in regular education classrooms as part of the least restrictive environment requirement per IDEA (Federal Register, 2006). Some behaviors that are associated with ASD involve aggressive behaviors, which may be problematic in the education setting. The presence of aggressive behaviors will increase the likelihood of danger and injury to staff and peers in the classroom. Also, if aggressive behaviors are present in the classroom, instruction is limited and students' attention to tasks is disrupted. Furthermore, students that are victims of aggression have been found to have increased likelihood of negative outcomes that include depression disorders, relational issues, school refusal or avoidance, and decreased academic performance (Ttofi, Farrington, Lösel, & Loeber, 2011).

When a student's learning environment includes aggression or aggressive behaviors, it has been found that a child's learning can be diminished (Dodge & Pettit, 2003). Finally, a student that displays aggressive behaviors is at risk of being placed in a more restrictive educational environment. It is vital that interventions are available to special education teachers, as well as regular education teachers, to assist with classroom management. Interventions should be easily implemented and reduce problematic behaviors to increase the likelihood of being implemented (Conroy et al., 2005). It can be unpredictable and challenging to manage a classroom when encountering behaviors associated with autism. Assisting teachers and other classroom staff with management methods that include children with ASD could lead to classrooms that are more successful.

This project was a review of the literature available for evidence-based interventions for children with ASD that target aggressive behavior. Results of this specialist project include a description of the interventions that are likely to decrease aggressive behaviors of children with ASD. A determination of an intervention as evidence-based can result from studies that are conducted by highly trained researchers in controlled environments. As such, this review will be limited to those studies taking place within an educational setting to evaluate the feasibility of the techniques for educators. Feasibility is part of what is called social validity. As such, social validity issues will be reviewed for each study as well. The project was to provide and educational professionals with a list of empirically supported interventions that are feasible to use within a school setting to increase the potential of success for their students with ASD displaying aggressive behaviors.

Method

Procedures

There are eight behavioral interventions that have been identified by Wong et al (2014) for use with all age groups of children with autism and this specialist project proposes a review of existing, peer-reviewed literature concerning these eight interventions. A search of three selected computer databases, PsycARTICLES, Psychology and Behavioral Science Collection, and PsycINFO was conducted in May 2019 to identify peer-reviewed articles using the search criteria: autism spectrum disorder or autism or ASD + aggression or aggressive behaviors + intervention, published between the years of 1994 to current. Articles were included if they meet the following criteria: (a) articles were published in a peer reviewed journal, (b) the words aggression, [intervention] and autism or ASD were specifically mentioned in the abstract, and (c) the study assessed the effectiveness of interventions on individuals with ASD displaying aggressive behaviors.

Articles were narrowed based on inclusionary and exclusionary criteria using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, Moher, Liberati, Tetzlaff, & Altman, 2009) as shown in Figure 1. The number of articles found in the initial search was 376. Duplicate articles were removed, leaving 321 articles. Excluding dissertations, books, and magazines narrowed these results further. Additional articles that were excluded were due to age range, studies not pertaining to a classroom or educational environment, articles that included interventions that do not appear on the evidence-based list of interventions (Wong et al., 2014) and those articles that did not include aggressive behaviors. After all of the exclusionary factors were considered, 289 articles were excluded which left 32 articles. The last exclusionary factor that was

considered was full-text access. Of these 32 articles, 13 are linked to a full-text article. It is those 13 peer-reviewed journal articles that were reviewed for this project.

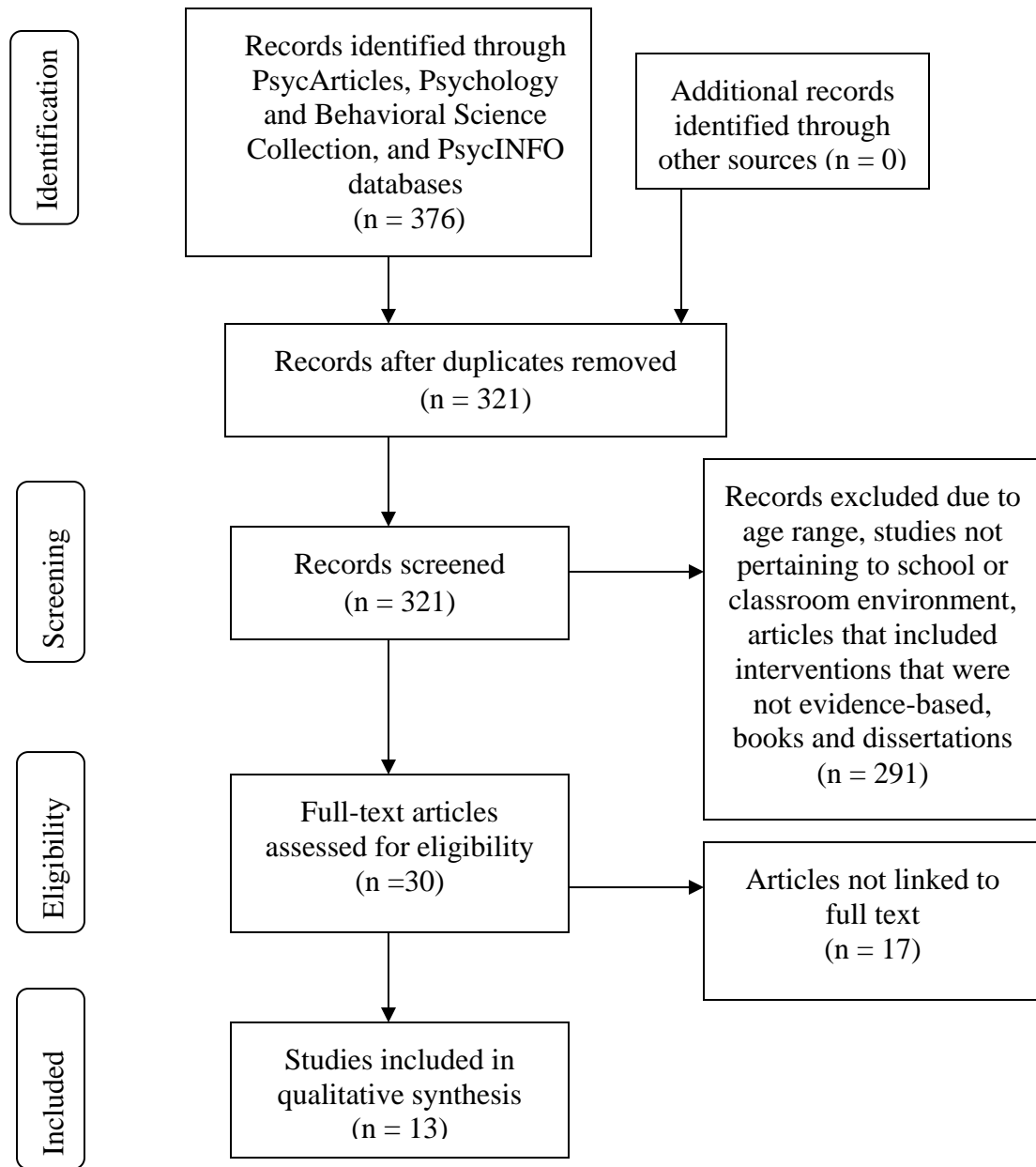


Figure 1. The PRISMA flow diagram (Moher et al., 2009).

Results

Studies were reviewed in terms of sample size, ages of participants, types of aggressive behaviors, environment in which the intervention was implemented, research design, intervention(s) utilized, study outcome, and social validity (if reported). Table 3 provides a summary of reviewed studies' sample sizes, ages of participants, the target behaviors, and the environments, while Table 4 provides an overview of the interventions and outcomes. Across all reviewed studies, there were 22 participants, 20 of which were Caucasian males. The male participants' ages ranged from 3 to 20 years old with a mean age of 10.4 years. The remaining two female participants were one African American and Caucasian, ages 6 and 11 years, respectively. Each participant had a diagnosis of ASD or Pervasive Developmental Disorder.

The most common target behavior was hitting ($n = 12$), followed by kicking ($n = 7$), biting ($n = 7$), hair pulling ($n = 6$), self-injurious behavior ($n = 5$), pinching ($n = 3$), scratching ($n = 4$), head butting ($n = 2$), pushing ($n = 3$), grabbing ($n = 3$), throwing ($n = 3$), yelling ($n = 2$), and eye gouging ($n = 1$). Other behaviors included were body tensing ($n = 1$), choking ($n = 1$), heel dropping ($n = 1$), hand mouthing ($n = 1$), feet stamping ($n = 1$), and spitting ($n = 1$). For the purpose of this review, some participants within the reviewed studies were excluded due to age, non-ASD diagnosis, or non-educational setting.

The studies reviewed were intended to include only public school settings; however, studies fitting this criterion were limited. Of the environments included within the articles reviewed, most took place within a specialized ASD/residential educational setting ($n = 6$), followed by public schools ($n = 5$), clinics ($n = 2$), and one community transition educational program. The review of these articles was intended to be a resource

Table 3

Characteristics of Studies Reviewed, Including Target Behaviors

Study	n	Ages	Target Behavior(s)	Environment
Kennedy (1994)	1	20	SIB (biting self), grabbing others	Public school
Sigafoos & Meikle (1996)	2	8, 8	SIB (hitting/biting himself), hitting, pushing, biting, pinching, throwing objects, & spitting	Classroom at ASD clinic
Braithwaite & Richdale (2000)	1	7	SIB (hitting head), hitting others	Specialized + public school
Luiselli et al. (2000)	2	14, 16	Biting, hitting, scratching, kicking, hair pulling & grabbing	Residential school
Gerhardt et al. (2004)	1	18	Biting	Transition program
Scattone et al. (2006)	2	8, 8	Throwing toys at people, inappropriate comments, pushing	Public school
Foxx & Meindl (2007)	1	11	Hitting, kicking, biting, head-butting, pulling hair, pinching	Residential school
Devlin et al. (2011)	4	6, 9, 10, 11	SIB (hitting self), hitting, kicking, feet stamping, body tensing, hand-mouthing, hand-biting, scratching, hair pulling, finger-biting	Specialized school
Santiago et al. (2016)	1	14	SIB (head-to-hand, head-to-object, body slamming), head-butting, hitting	Residential school
Anderson et al. (2016)	2	5, 6	Yelling/screaming, hitting, kicking, biting, spitting or throwing desks/chairs	Public school
Randall et al. (2017)	1	11	Eye gouging, hair pulling, choking, hitting, slapping, pushing, kicking and scratching	Clinic
Slocum et al. (2018)	3	3-12	Hitting, kicking, grabbing, hair pulling, pinching, & pushing	Public school
Newcomb et al. (2019)	1	13	Hitting, scratching, kicking, biting, & hair pulling	Specialized school

Note. SIB = self-injurious behavior.

Table 4

Interventions and Outcomes of Studies Reviewed

Study	Intervention(s)	Outcome	Social Validity
Kennedy (1994)	ABI	Decreased	Considered socially acceptable, would use this intervention again
Sigafoos & Meikle (1996)	FCT	Decreased	May be implemented by teachers within the classroom with success
Braithwaite & Richdale (2000)	FCT	Decreased	No extensive training or scheduling changes necessary for implementation in school settings
Luiselli et al. (2000)	ABI	Decreased	Completed under naturalistic, real world setting in a residential facility
Gerhardt et al. (2004)	NCR + FCT	Decreased	Required staff retraining, dense schedule of reinforcement
Scattone et al. (2006)	Social Stories	1. No change 2. Increased	Rated 'acceptable' by both teachers
Foxx & Meindl (2007)	DRO	Decreased	Teachers/school officials/parents state that it was acceptable, usable in the future for similar behaviors
Devlin et al. (2011)	R ⁺ /Ext+DRO DRA+EXT R ⁺ /RIR+EXT R ⁺ /EXT/DRA	1. Decreased 2. Decreased 3. Decreased 4. Highly variable, decreasing trend	No social validity reported
Santiago et al. (2016)	FCT	Decreased	Additional training for interventionists and extensive time may be needed for improvements in challenging behavior
Anderson et al. (2016)	Social Stories	Decreased	Cost efficient, customizable, least intrusive, usable in many environments
Randall et al. (2017)	DRO	Decreased	Resources utilized in this study may not be available to public school setting
Slocum et al. (2018)	NCR	Decreased	Time intensive, transferred to natural environment
Newcomb et al. (2019)	NCR	Decreased	Acceptable for clinicians, may require more staff for other settings

Note. ABI = antecedent based intervention, FCT = functional communication training, NCR = noncontingent reinforcement, DRO = differential reinforcement of other, R⁺ = positive reinforcement, EXT = extinction, DRA = differential reinforcement of alternative, RIR = response interruption & redirection.

for public schools to assist with the education of students who have been diagnosed with ASD that also display aggressive behaviors.

Of the studies that were included, it should be noted that a Functional Behavior Assessment (FBA) or a Functional Analysis (FA) were conducted prior to most of the interventions implemented. In Devlin, Healy, Leader, and Hughes (2011), four participants were given four different, yet similar packages, and will be discussed separately. Gerhardt, Weiss, and Delmolino (2004) intentionally combined two interventions to discern if the outcomes were enhanced by that amalgamation.

Of the interventions applied, the most common was functional communication training ($n = 3$), DRO/DRA ($n = 2$), NCR ($n = 2$), social narratives ($n = 2$), and ABI ($n = 2$). Also included were interventions that were presented as packages, including NCR+FCT ($n = 1$), EXT+DRO ($n = 1$), EXT+DRA ($n = 1$), and EXT+RIR ($n = 1$). All but one of these packages were all investigated within the same study by Devlin et al. (2011) and will be discussed separately in their own section of this paper, along with Gerhardt et al. (2004) who also used a combination of interventions. The review of the packages of interventions will follow the review of the intervention studies utilizing a primary intervention strategy. The number of interventions to be reviewed will be greater than 15, due to one article encompassing data for multiple interventions.

Functional Communication Training

Of the interventions applied throughout this review, FCT was the most utilized with four studies that used this as their primary intervention and one study that employed FCT in conjunction with NCR. In this section, FCT used only as the primary intervention will be reviewed.

Sigafoos and Meikle (1996) investigated the effects of FCT on multiple functions of aggressive behavior. Two eight-year-old boys (i.e., Dale and Peter) who participated at a therapy center for children with autism were selected as participants based on the increased frequency of engaging in aggressive behaviors.

Dale was an 8-year-old white male and his behaviors were described as hitting, pushing, biting, pinching, and breaking/throwing objects, as well as, SIB (e.g., hitting, scratching, and biting himself). Dale was nonverbal and his communication consisted of pointing to pictures when prompted to make a request. He was also able to follow simple, familiar verbal and gestural instructions.

Peter was also an 8-year-old white male and his aggressive behavior was defined as similar to those described for Dale (i.e., aggression, SIB, property destruction, stereotyped movements, crying and screaming). Pete was echolalic, was able to follow simple instructions, and could comprehend a few object labels. Results of the FA suggest that the function of aggressive behaviors for both boys was attention and tangible. Dale was trained to gain attention from the teacher by lightly tapping on her hand, and point to drawings of the items that he wanted (e.g., food, drink, or toy). Pete was trained to say the teacher's name and one-word requests for items (e.g., drink, toy). Initially, both boys were given their requested items/attention within one second. Baseline data show that aggressive behavior was frequent. Once Dale and Pete were trained to request preferred items, the rate of challenging behavior decreased and subsequently the frequency of requests increased. When the delay was increased to three seconds, decreased levels of aggressive behavior and increased levels of requests were maintained. Authors of this study concluded that the teacher implemented the intervention successfully in a

classroom under natural conditions, and that “it may be possible for teachers to implement these [interventions] with success in the classroom.” (Sigafoos & Meikle, 1996, p. 82).

Similar results were also seen in Braithwaite and Richdale (2000), which took place in Melbourne, Australia. Michael is a 17-year-old student with diagnoses of ASD and Intellectual Disability (ID). He attended a public primary school for three days a week, as well as a specialized school for students with autism and mild to moderate intellectual disability. Michael is described as having a reasonable vocabulary evidenced through frequent self-talk, however, he rarely used speech as a means of communication. His target behaviors included SIB (hitting his head) and hitting others. Like the previous study, an FA was conducted and it was determined that Michael’s behavior was being maintained by tangible and escape functions. He underwent three twenty-minute sessions of training as described in Day, Horner, and O’Neill (1994), which involved showing Michael a preferred object and giving him verbal prompts to use the taught phrase (“I want please”). He was provided praise and the object requested, when asked for correctly. If he engaged in his target behaviors, he was not given the item and again prompted to use the correct phrase. In the escape condition, training involved giving Michael difficult tasks and prompting him to say, “I need help please.” If he used the phrase correctly, he was given assistance in completing the task. Likewise, if he did not use the phrase, he was not given assistance and was again prompted to use the phrase. It is noted that communication between teachers, therapists and parents occurred to encourage Michael to use the phrase in all settings.

Data show that aggressive behaviors decreased and use of the taught phrases increased in both tangible and escape conditions of the FCT. During the phase in which a five second delay was implemented, there were no instances of the target behaviors. This study also articulated that training and intervention can be incorporated into an individual's program without requiring large-scale changes to the normal routine of the classrooms involved, and suggests that teachers and/or therapists in school settings could implement programs similar to this (Braithwaite & Richdale, 2000).

In the final article implementing FCT, Santiago, Hanley, Moore, and Jin (2016) included two participants in the study; however, one participant was excluded from this review due to her interventions being conducted entirely within the home setting. The remaining participant, Zeke, is a 14-year-old male diagnosed with ASD and attended a residential educational program. His primary communication method was an augmentative and alternative communication (AAC) device and his aggressive behaviors consisted of SIB (head-to-hand, head-to-object, body slamming), head butting, and hitting.

An FA was conducted and determined that Zeke's behaviors were maintained by escape, attention, and access to tangible items. This study was divided into two phases: simple FCT and complex FCT. In the simple FCT phase, Zeke was trained to press an icon on his AAC device that gave the correct request, "May I have my way please?" During the complex FCT phase, he was taught to add pressing the icon to include the phrase, "Excuse me" before the initial taught response. Zeke's data reveal that problem behavior decreased almost immediately, and the frequency of the taught responses increased as well. Some variability in challenging behavior can be seen initially during

the complex FCT phase, however, when the treatment was terminated, his problem behavior was at a zero rate, while complex functional communication responses, tolerance responses, and compliance continued to persist during generalization of the treatment to be used with different individuals. At the time of termination, Zeke's requests for reinforcement were only granted approximately 40% of the time.

The authors of this study state that his teacher was able to lead Zeke's intervention plan; however, she was also receiving additional education in Applied Behavioral Analysis (Master's degree). They suggest that supervision from a Board Certified Behavior Analyst (BCBA) may be necessary to assist with correct interpretation of results and intervention design. This could become costly to a school district who does not have a BCBA already on staff.

Differential Reinforcement of Alternative, Incompatible, or Other Behavior

The first study utilizing DRO was a case study that involved 13-year-old Johnny who was diagnosed with ASD and Disruptive Disorder, not otherwise specified (Foxy & Meindl, 2007). He was echolalic and used one-word phrases to ask for things. His aggressive behaviors were very severe and included: hitting, kicking, pinching, and aggression with objects (i.e., throwing items). However, his most dangerous behaviors included head butting and biting. The severity and intensity of Johnny's behaviors warranted a change in environment to a self-contained classroom at a school for children with special needs. A functional behavioral assessment was completed and revealed that Johnny's behaviors were being maintained by escape of academic/social demands, and to obtain preferred items.

During the baseline condition, the method for responding to Johnny's aggressive behavior was a combination of ignoring and redirecting him to engage in an appropriate behavior. If the behaviors were dangerous, then he was placed in a physical restraint by trained staff. Data revealed that Johnny engaged in aggression an average of 102 times per day during the 3-month baseline condition.

The intervention condition included implementing a number of classroom rules, and teaching Johnny about the intervention program of earning tokens. For every five minute interval that he did not display aggressive behaviors, he was given a token. If he accumulated five tokens, he could exchange them for an opportunity to engage in a highly reinforcing activity. If he did engage in an aggressive behavior, a token was removed. If the behavior occurred during a reinforcing activity, he was required to terminate the activity and begin a work session. Once this session began, he could begin earning tokens again. If Johnny threw items or turned over chairs/desks, he was then required to straighten up the whole room, not just the chairs/desks that he overturned. In addition, if he made a loud noise in the hallway, he would walk down the hallway, practicing staying quiet, multiple times. Physical restraint was also utilized when Johnny's behaviors were dangerous to himself or others.

Data showed that Johnny's aggressive behaviors were reduced by 95%, to 5.06 events per day within the first month. By the sixth month, behavior events were reduced further to an average of 0.29 events daily, and remained at or near zero level for the duration of treatment. In addition, during the first week of treatment, physical restraint was used 23 times. During month 2, restraint was not necessary, and during the duration of the remaining 10 months of treatment, only six additional events of restraint occurred.

The authors also noted that the behaviors began to decrease in severity during treatment, his aggressive behaviors also decreased at home, and that the frequency of positive interactions with peers and adults increased. He was able to be in environments from which he had been previously prohibited for fear of aggression toward others, and showed progress on his academic goals set on his IEP.

The authors report that previous teachers, school officials and his parents agree that the intervention had a high degree of social validity, however, no specific data were documented within the article. It should also be noted that the intervention took place within a specialized school, a PhD level Behavior Analyst oversaw the program, while a master's level ABA intern worked directly with the participant, and the high level of intensity necessitated the use of a classroom with no other students. These resources may not be readily available within most public school systems (Foxx & Meindl, 2007).

Social Narratives

Social interaction deficits are characteristic of a majority of children with ASD, and can manifest in a variety of behaviors and levels of severity (APA, 2013; Scattone, Tingstrom, & Wilczynski, 2006). After the initial search for evidence based strategies identified by the National Development Center on Autism Spectrum Disorder, social narratives (more commonly known as social stories) were recognized as an intervention across all age groups.

The first article relating to using only social narratives, or social stories, as a way to decrease aggressive behaviors, involved three boys that were in a self-contained special education classroom and general education classroom at an elementary school located in the southern United States. Scattone et al. (2006) included participants that

were verbal; however, they did not initiate or respond to peers appropriately or at all during free-time activities per teacher report. For the purpose of this review, only two of the participants will be discussed, as Drew did not engage in behaviors that could be considered aggressive.

Steven was 8-years-old and was the first identified participant who received special education services in a self-contained special education classroom. He was able to independently toilet, feed, and dress himself. At recess, he would isolate himself in the classroom and usually screamed or threw items across the classroom. Billy, was also 8 years old, and was fully integrated in to a general education setting. He was dependent with self-help skills, capable of requesting items or help, but did not initiate, respond or elaborate appropriately. If peers initiated conversations with Billy, sometimes he responded by yelling, “Shut up,” or “Go away.” At recess, Billy would also wave a stick while talking to himself. Both Steven and Billy were unable to read fluently, so a teacher would read the social story to them once daily five minutes before unstructured free time. Each social story was individualized and adhered to the guidelines for social story construction (Gray & Garand, 1993). The social stories were standardized across the two participants, defined free-time, and were written in the first person. The goal of this study was to increase the quantity of the children’s appropriate social interactions with peers. Baseline data were collected during a free-time activity (lunch or recess). The teachers were trained to respond to the children in their usual manner for both baseline and intervention conditions. A multiple baseline design across participants was utilized during this study.

The results indicate that Steven's behavior did not change after the introduction of the social story; his mean level of appropriate social interactions started at 1% of intervals and grew to only 4% of intervals and no change in aggressive behaviors. Billy's data showed that his appropriate social interactions was variable during baseline, from 0% - 22% of the intervals observed, and was also variable during the intervention, 10% - 37% of the intervals observed. It was noted that Billy's intervention phase only lasted for two weeks and trends in the data suggest that his number of appropriate social interactions were increasing. Although Billy's use of appropriate social responses increased inconsistently, it was documented that inappropriate interactions (e.g., pushing, negative comments), increased 15% above mean baseline levels. Discussion of this article includes considering the behaviors of the peers with whom the students attempted to interact. The other students did not always respond appropriately to Billy or Steven's appropriate interactions, thus, inadvertently reinforcing inappropriate behaviors (which occurred with Steven.) In addition, cognitive abilities could be a factor in comprehension and retention of the social stories. This article concluded that social stories could be used with some students with autism spectrum disorder as a sole intervention to increase appropriate social interactions, decrease aggressive behaviors, and that adding a supplemental intervention may increase the efficacy of the social story. To assess social validity, the authors administered an Intervention Rating Profile (IRP-15) (Martens, Witt, Elliot, & Darveaux, 1985) to the teachers involved with the interventions. The IRP looks at the severity of behaviors, type of intervention and the amount of time necessary to facilitate the intervention. Steven's teachers rated the intervention a 55, while Billy's teachers gave

a rating of 68. Scores over 52.5 are indicative of teachers who find the intervention acceptable.

The second article articulated that their goal was to use social stories as a sole intervention (Anderson, Bucholz, Hazelkorn, & Cooper, 2016). Three participants were included in the study, however only two participants will be discussed in this review due to their ASD diagnosis and aggressive behaviors. The third participant did not have an ASD diagnosis, and was eliminated from this review.

Henry was a 5-year-old kindergarten student that received speech/language services, and per teacher report, did not know how to appropriately seek adult or peer attention. This would result in student frustration leading to hitting, kicking, screaming, running, and biting teachers and peers. Jessica was a 6-year-old kindergarten student that also received speech/language services, and per physician statement, was also diagnosed with childhood schizophrenia. She would display similar aggressive behaviors as Henry, but as a form of elopement during writing tasks.

Each social narrative was written specifically for each participant, and was delivered three times daily via teacher narration. The social narrative was put into PowerPoint format with narration from the teacher downloaded to computers accessible to the students. The participants were given 1:1 instruction on how to access the PowerPoint independently, and did so within one week of beginning the intervention. The students accessed these stories when directed by their teacher or paraprofessional. A multiple baseline design was utilized during this study. Baseline information showed that aggressive behaviors for Henry, while in the lunchroom, ranged from 5 to 15 events, daily. Once the intervention was implemented, his behaviors showed immediate decline.

During the first week of intervention, Henry averaged one aggressive event per 30-minute lunch period. Within three weeks of intervention, he averaged zero aggressive events during lunch for the week. Henry enjoyed his social narrative and listened to it each night before bed. He even began generalizing appropriate behaviors to different environments outside of the cafeteria.

Jessica displayed aggressive behavior during writing tasks, ranging from 8-17 aggressive events with an upward trend during baseline data collection. Once the intervention of the social narrative was implemented, Jessica averaged five aggressive episodes in the first week, and 2.6 episodes per 30-minute period during the second week. Her data remained variable; however, the overall level of episodes was at a lower rate.

The authors conclude that a social narrative could be effective in decreasing aggressive behaviors. The authors concluded their study with a statement suggesting that social narratives can be easily implemented within many environments, is cost efficient, customizable per student, and is a nonintrusive intervention with positive results (Anderson et al., 2016).

Antecedent Based Interventions (ABI)

Antecedent based interventions involve arranging events that precede the occurrence of the interfering behavior and are designed to be preventative. The search yielded two articles that used ABIs with students diagnosed with ASD and who displayed aggressive behaviors within the school setting. In Kennedy's (1994) study, three students were selected to be included. The participants were part of a public school, however, they were each 20 years old and only one student had been diagnosed with ASD. This review will focus on only the student with ASD, Edgar. In addition to the diagnosis of ASD, Edgar also had an intellectual disability. He was able to communicate verbally, although

most of his verbalizations were classified as delayed echolalia. He demonstrated the ability to follow two-step instructions, and his problem behaviors occurred during demand situations and alterations in his daily schedule. Edgar's behaviors included perseverative verbalizations, biting himself, and grabbing teachers.

A previously learned work-related task was selected for Edgar (stacking chairs). During the antecedent analysis, each trial consisted of a single task demand and verbal praise was given for correct responses. The rates of demands given to Edgar were manipulated (i.e., high or low). Social affect and problem behavior were ignored. If the student did not respond appropriately, the instructor would pause briefly and deliver another task demand. The analysis of the antecedent conditions indicated high demand conditions resulted in high levels of problem behaviors.

During the intervention sessions, one demand was delivered every 2.5 minutes and six social comments occurred per minute to provide a low demand, high social interaction experience. The intervention resulted in very low levels of problem behavior. To fade the intervention, task demands were gradually increased across sessions. As the task demands gradually increased for Edgar, sustained low levels of problem behavior occurred. During the last six sessions, 3.6 demands per minute were made, with only 0.2 problem behaviors per minute. During the four-month follow-up, Edgar's low level problem behaviors were maintained.

Edgar's teacher rated social validity using the Motivation Rating Scales (MRS) and the Treatment Evaluation Inventory (TEI). Questions focused on student behavior, happiness, and productivity. The MRS indicated that a positive increase was noted for all categories for each student, and Edgar was considered to have improved substantially.

The TEI indicated that the intervention was considered to be a socially acceptable means of reducing inappropriate behavior, and the teachers viewed it as a treatment that they would be willing to use again (Kennedy, 1994).

Further study utilizing ABI included the work of Luiselli, Kane, Treml, and Young (2000). The participants for this study included two males, Glenn who was 16-years-old and Paul who was 14-years-old. Both boys were residents at a private residential school. This study wanted to determine the effects of ABI on the students' aggression, as well as to determine if the use of physical restraint could be reduced.

Aggression was defined as physical contact initiated by either Glenn or Paul, that could include biting, hitting, scratching, kicking, hair-pulling, and grabbing. Physical restraint was defined as the application of a physical hold performed by two or more staff. Duration of the restraints was measured from the time (to the minute) that each application of physical restraint was initiated and terminated. This study utilized a multiple baseline across participants design.

Baseline conditions were described as treatment as usual. Such treatment for Glenn consisted of social praise and a small edible treat when he completed scheduled educational activities, in the absence of aggression. He was also given praise when he followed instructions, and utilized a picture schedule board to assist with expectations of his daily activities. When he engaged in aggressive behavior, Glenn would be physically guided by staff to sit in a designated chair within the classroom, and once he was seated the staff would release the hold. If Glenn sat in the chair for two minutes, he was instructed to return to the previous activity. Frequently, he would not sit for two minutes; he would instead attempt to leave the classroom, run toward staff, and/or begin engaging

in repeated acts of aggression. Staff would guide him back to his chair to start the process over, and on occasion would agitate him further. Once the staff judged him to be unmanageable, they would employ the physical restraint. This procedure included guiding him to a protective mat on the floor, placing him in a prone position, and holding his hands by the sides of his body. Glenn was held in this position, and would be released when he stopped struggling against the restraint and his agitation had subsided for at least 15 seconds. He would then be allowed to return to regular activities. Baseline data were collected for a month before the modified restraint condition.

For the next six months, a modified restraint condition was used where the restraint would be applied upon the initial attempts to leave the chair, therefore introducing the disruption earlier in “chain” of aggressive behavior. The goal was to decrease periods of restraint, if implemented before the student became more agitated and further escalated.

The antecedent intervention continued the modified restraint intervention, while ABI strategies were introduced. When behaviors that frequently preceded the aggressive behavior were exhibited, he was given a choice of staying in the activity he was in or sitting in his chair. If he chose to sit in the chair, he could remain there until he decided to re-join the activity or until staff requested him to return (approximately 10-12 minutes). He received praise whenever he was able to return to the activity after having sat in his chair.

Glenn exhibited aggressive behaviors 42 times and was restrained 19 times during the month-long baseline. The number of restraints used on Glenn increased dramatically during the first week of the modified restraint condition. However, the number of

physical restraints decreased after that to an average of 8.8 restraints per month for the last five months of this condition. Overall, aggressive behaviors occurred an average of 29 times per month. The antecedent intervention condition showed an even further reduction in aggressive behaviors and physical restraints. Glenn engaged in 8.6 aggressive behaviors per month and was restrained an average of 1.1 times per month.

Paul's baseline condition lasted three months, and his behavior support plan included an edible treat or access to a preferred activity when he completed educational activities and did not engage in aggressive behaviors. During Paul's aggressive behavior, the procedure was for staff to move away from him to another area, and to ensure that other students were not in close proximity to Paul. Physical restraint was utilized when Paul walked toward staff and engaged in assaultive behavior. Restraint procedures for Paul were identical to Glenn's. Physical holds were applied until Paul was able to demonstrate 45 seconds of non-agitation (no struggling or screaming).

As with Glenn, the modified restraint condition was first employed with Paul for four months. During the initial aggressive behavior, physical restraint would begin immediately. The antecedent intervention condition increased the number and type of daily activities due to the possibility of Paul becoming bored. Increasing his daily activities would give him a chance to move more. Another assumed antecedent to Paul's aggressive behavior was the proximity of other students during certain educational activities, so they also moved his designated area during these tasks. He was also allowed to sit away from the group upon request.

Paul averaged 9.0 aggressive behaviors and 5.6 physical restraints monthly during the baseline condition. During the modified restraint condition, his aggressive behaviors

increased to 44.6 times per month, and an average of 9.2 restraints a month. During the antecedent intervention condition, Paul's aggressive behaviors averaged 9.6 times a month and physical restraint was used 2.4 times per month.

It was noted by Luiselli et al. that a formal functional behavior assessment was not conducted and the antecedent modifications were made based solely on direct observations. However, aggressive behavior and the use of restraints decreased after the sole use of the modified restraint procedures for both participants during the antecedent intervention condition. This study took place within a residential school, with highly trained staff and personalized restraint procedures. This may not be a realistic resource for public schools. Nor would a public school have the same variables that existed within this residential school, such as the low student to teacher ratio to enable increased staff involvement (Luiselli et al., 2000).

Reinforcement

Newcomb, Wright, and Camblin (2019) investigated the use of a non-contingent reinforcement (NCR) intervention on aggressive behaviors that were maintained by physical attention. Ted was a 13-year-old male that had been diagnosed with ASD that was enrolled in a specialized school. His aggressive behavior included hitting, scratching, kicking, biting, and hair-pulling. The aggressive behaviors were observed in the classroom, cafeteria, bathroom, and areas associated with transition.

The NCR treatment provided reinforcement on a fixed time (FT) interval of 20 minutes. That rate was calculated based on the highest rates of aggression observed during recent school days. Every 20 minutes, for two minutes Ted would receive either a back massage, or deep pressure to his upper torso and legs while in a supine position. The

educational staff would pause the instructional activity for Ted to receive the treatment. In the second treatment, Ted was given non-contingent access to a basketball approximately ten seconds prior to a transition with a verbal prompt, “Ted, here is your ball. Hold onto it while we walk to the ____.” Throughout the transition, he was given continuous access to the ball, and when the transition was over, staff would ask for the ball back. Both the NCR and holding the basketball (competing stimuli) were used simultaneously.

The standard procedure included utilizing a token economy, reinforcement during instructional activities, blocking and physically redirecting of inappropriate or aggressive behavior, and crisis management procedures. Baseline data were collected for 44 days using the standard procedure. Aggression was observed on average of 4.25 times per hour and restraint was employed 12 times. The NCR and competing stimuli intervention were employed for two weeks (ten school days). Post intervention data were collected for 25 additional days following the ten-day intervention phase. During this time, FT 20-minute schedule was kept in place. These results indicate that Ted was engaging in aggressive behavior 0.76 per hour. The rates of aggressive behavior were reduced, however, not eliminated and injuries to staff were noted during the intervention and follow-up phases. The severity and intensity of the aggressive behavior decreased compared to baseline rates, thus restraint was not utilized during the intervention and post intervention phases.

The authors noted that the intervention was easy to implement, straightforward, uncomplicated and relatively brief in terms of the required training for staff. They also mentioned that this intervention was economical and utilized few monetary resources. Conversely, it was recognized that other schools or public schools are not as densely

staffed as the school within this article, and intense amounts of time may be necessary in implementing this intervention (Newcomb et al., 2019).

Extinction

Extinction was not found to have been used as a sole intervention to address aggressive behavior. However, it was found in an article that investigated extinction as part of a multi-component intervention package and will be reviewed in the multi-component intervention section (Devlin et al., 2011).

Response Interruption/Redirection

Response interruption/redirection was studied within a specialized or public school setting, nor within a clinic to address aggressive behavior. It was, however, used within a multi-component intervention, described in the next section (Devlin et al., 2011).

Multi-Component Interventions

A natural progression could be assumed between separate evidence-based interventions that are considered to yield positive results, to the combination of two or more evidence-based interventions to increase the potential for positive outcomes. First, Gerhardt et al. (2004) will be reviewed and then each of the phases in the Devlin et al. (2011) study that implemented multi-component interventions will be reviewed.

Gerhardt et al. (2004) wanted to test the effects of FCT combined with NCR in order to decrease aggressive behaviors in students that have been diagnosed with ASD. Richard was an 18-year-old male with a diagnosis of ASD attending the Community Transition Program of the Douglass Developmental Disabilities Center at Rutgers University in New Jersey. Richard's severe aggressive behaviors led him to become hospitalized and discharged from numerous educational settings. He communicated through the use of a device with 6 picture/symbols that he was familiar with and a limited

number of gestures. Richard's behaviors were classified into two different categories: aggression and high aggression. Aggression was defined as any single instance of hitting, kicking, or grabbing another person. High aggression was defined as more than one aggressive act occurring within a ten second interval or any biting or attempts to bite (Gerhardt et al., 2004).

The authors determined that NCR was potentially useful due to food being identified as a stimulus with reinforcing properties, and literature (e.g. Vollmer, Rangdahl, Raone, & Marcus, 1997) that indicated NCR is both easy to implement in the applied setting and has a low probability of negative side effects. NCR consisted of the delivery of a preferred stimulus item - food, paired with social praise, on a 30 second schedule. FCT was selected as a supplementary intervention because it was determined that Richard needed an alternative way to request his needs without engaging in aggressive behavior (e.g., raising his hand to request a break from work). Staff members were instructed to immediately verbally interrupt any aggression with the phrase, "You want me to leave the room, that was great telling me," and then leave the room. Upon their return they would deliver the reinforcement per the NCR schedule.

Richard's data revealed that he engaged in aggression 95 times on the first day of baseline data collection, with no average of the week's data reported. Once treatment began, acts of single aggression averaged 10.2 episodes per day and acts of "high aggression" averaged 0.4 per day. Richard's aggressive behavior did begin to increase during week 6. The authors investigated intervention integrity at week 7. Upon fidelity observations, it was determined additional training for staff was necessary and that

occurred in week 9 of the 13-week study. His behavior began a decreasing trend from the point of re-training.

This study used historical data to determine a hypothesis for the primary variable maintaining the severe aggression and due to the severity of the aggressive behavior, the authors decided to begin the intervention as soon as possible. Although social validity or environment generalization to a public school setting was not discussed, it was noted that a very dense reinforcement schedule was necessary, as well as a low staff to student ratio. This may not be readily available at a public school and may not be a viable option (Gerhardt et al., 2004).

Devlin et al. (2011) also investigated multi-component behavioral interventions. The participants were four males with a diagnosis of ASD and a history of challenging behavior, primarily aggression and SIB. Each received sensory integration therapy from an occupational therapist (OT). Each participant was assessed with a functional analysis to determine the functions of their behaviors and the interventions were designed to address those functions. There were three phases of treatment: Baseline, Alternating Treatments, and Best Treatment. In the Alternating Treatments phase, the treatments alternated between sensory integration administered by the OT and a behavior intervention package. For participant 1, the behavior interventions consisted of a variable schedule of reinforcement + interspersed requests and fast-pace instruction + errorless learning + extinction and differential reinforcement. Participant 2 received differential reinforcement of alternative behavior (DRA) + extinction + demand fading. Participant 3 received variable schedule of reinforcement + response blocking + extinction + differential reinforcement of alternative response. Participant 4 received variable

schedule of reinforcement + extinction + differential reinforcement of alternative responding. Whichever intervention (i.e., behavioral or sensory integration) yielded fewer aggressive behaviors was implemented during the Best Treatment phase. For all participants, the behavior intervention package was determined to be the best treatment. Each participant will be discussed separately.

Participant 1 was a 6-year, 7 month-old male and his aggressive behaviors included kicking, hitting, crying, head-hitting, and stomping his feet. The FA suggested that his aggressive behavior was maintained by negative reinforcement as a result of escaping or avoiding demanding tasks, and access to preferred tangible items. Participant 1's intervention package included a variable schedule of R⁺, errorless learning, extinction and DRO, positive practice over-correction, and DRA. During the baseline condition, participant 1 had an average of 11 target behaviors per day. During the Alternating Treatment phase, target behaviors were observed to occur an average 16 occurrences per day for sensory integration and six per day for the behavioral intervention package. By the end of the Best Treatment phase, consisting of the behavioral interventions, the rate of aggressive behaviors decreased to a rate of 1 incident per day.

Participant 2 was an 11-year-old male and his aggressive behaviors consisted of stomping his feet, crying, body-tensing, and forcefully squeezing his hands together. Results of his FA indicated that his aggressive behavior was maintained by negative reinforcement as a result of escaping demanding situations, particularly in situations when the student was to transition prior to task completion. His behavioral intervention package consisted of DRA, extinction, and demand fading. The baseline phase for participant 2 averaged 9 target behaviors per day. During the Alternating Treatment

phase the behavioral interventions resulted in an average of 2.6 target behaviors per day, while the sensory training resulted in an average of 6.8 target behaviors per day. During the final phase of the study, when the behavioral interventions were consistently applied, the behavior incidents per day for participant 2 decreased to zero.

Participant 3 was a 10-year-old male. His aggressive behaviors included SIB, scratching and hair pulling. The results of his FA suggested that his aggressive behaviors were being maintained by negative reinforcement in the form of escape from tasks and positive reinforcement in the form of access to tangible items. The package designed for Participant 3 included variable schedule of R^+ , response blocking, extinction, and DRA. During the baseline phase, a mean rate of 8.4 target behaviors per day was observed. During the Alternating Treatment phase, the sensory integration therapy resulted in the essentially same mean rate (8.5 per day) while the behaviors were near zero for the behavioral interventions. The Best Treatment phase was not implemented until after a two-week delay. When the behavioral intervention package was finally implemented, rates of aggressive behavior were initially at very high rates (i.e., 35 times a day). The behavioral interventions reduced the aggressive behaviors to an average of two incidents per day by the conclusion of the study.

Participant 4 was a 9-year-old male. His aggressive behaviors took the form of SIB (biting his fingers). It was suggested that escape from tasks and being denied access to preferred tangibles maintained his aggressive behaviors. The intervention package that was implemented for Participant 4 included a variable schedule of R^+ , extinction, and DRA. Participant 4's mean rate of aggressive behavior during the Baseline phase was 11.4 incidents daily. During the Alternating Treatment phase, his aggressive behaviors

were highly variable under both treatments but resulted in a mean of 7.4 per day on sensory therapy days to 4.2 per day when the behavior intervention package was implemented. During the Best Treatment phase, the aggressive behaviors remained highly variable, ranging from 0 to 6 incidents per day with an average of 3.2 times per day.

While this article involved four participants from a school that used Applied Behavior Analysis (ABA) as treatment for children with autism, the authors did not specify if this was a public or private school. They did discuss that an FA was conducted for each participant that took place within a therapy room with an observation window, but again, did not specify if this had occurred at a different site than the school. Without documentation to the contrary, it could be assumed that the behavior intervention packages could have occurred within a public school's low incidence classroom. Also not specified within the study was who collected data (i.e., researchers or school staff). It is undetermined whether the educators received specialized training or had any credentials that differed from a public school setting. The discussion section of this article concluded that the behavior interventions reduced the challenging or aggressive behavior to zero occurrences for participant 2, and to near zero levels for participant 1. Social validity was not discussed in the article.

In the final article reviewed, Slocum, Grauerholz-Fisher, Peters and Vollmer (2018) also put together a multi-component intervention to determine its effects on aggression in children that have been diagnosed with ASD. Though this review has been limited to only children that have received a diagnosis of ASD, this article stated that the participants were chosen based on their diagnosis of ASD or Developmental Delay. This

suggests that a participant could be included without having the target diagnosis. However, a limited description of the participants was available in the article and the participant(s) that did not have the appropriate diagnosis were not identified. This article review will still look at all three participants but consideration will be made that a participant may not have had an ASD diagnosis.

Clancy, Korey and Reginald were identified as the participants for this study, and were all male that were a part in a local clinic or therapy room at a school. Whether the school was specialized or a regular public school was not mentioned. Clancy, age 7, was non-verbal, however, was able to follow complex instructions. Both Korey, age 3, and Reginald, age 12, spoke in multiple-word sentences and could also follow complex instructions.

The interventions that the authors utilized were NCR and extinction, with a non-concurrent multiple baseline across subjects design. The aggressive behaviors that were exhibited by the participants and targeted for this study included: hitting, kicking, grabbing, pulling, pinching, and pushing. A functional analysis was conducted for each of the boys prior to the implementation of the intervention. It was determined that Korey's behavior was maintained by attention, and Reginald's and Clancy's behaviors were maintained by access to tangibles.

During the NCR condition, eight-minute sessions were used. Therapists provided continuous access to toys or attention and placed aggression on extinction during these sessions. Additionally, the thinning procedure was introduced with a single 10-second interval without access to the functional reinforcer. During this period, the therapist would flip a laminated orange card that was fixed to the wall. The white side of the card

was shown when the reinforce was removed. After a 10-second interval, the card was flipped back to the orange side and the functional reinforcer was returned. If two consecutive intervals with less than or equal to 0.1 behaviors per minute occurred, the thinning schedule was increased to 30 seconds, then to 60 seconds, and finally to 120 seconds.

For Clancy, procedural modifications were implemented after session 37. Increasing behaviors were being seen during session 36 and 37, that persisted even when the removal intervals were decreased. Clancy was attempting to hide his toys or prevent them from being removed. The removal still occurred but became increasingly more difficult and resulted in increased aggressive behaviors. A “warning” was incorporated, in the form of an auditory countdown to when his toys would be removed. The therapist stated, “Ok Clancy, 3, 2, 1” and switched the card from orange to white. This modification stayed in place until the conclusion of the study.

Baseline data revealed that Clancy engaged in aggressive behavior an average of 4.6 per minute. Korey’s baseline was 7.1 aggressive responses per minute and Reginald averaged 1.1 per minute. During the treatment condition, Clancy’s average rate of behavior dropped to 0.2 per minute. Korey’s average problem behavior decreased to 0.02 per minute, and Reginald’s aggressive behavior decreased to 0.01 per minute. Korey and Reginald only had a single event of aggressive behavior during the treatment condition. A 99.5%, 99.7% and 99.1% reduction of aggressive behaviors were observed, respectively.

The discussion session within this article mentioned that the thinning schedules were time intensive and perhaps the students were not able to achieve ‘practical’ schedules within the natural environment. Also, limitations for this study include limited

details about the participants. The type of environment, exact diagnosis, and training necessary to implement such interventions were not available. These details are necessary for this review, and caution should be taken when interpreting the data and generalizability to a public school setting.

The last and most recent research involving multi-component interventions was Randall, Lambert, Matthews, and Houchins-Juarez (2017). This case study followed Ivy, an eleven-year-old African American female diagnosed with ASD. Ivy was ambulatory with limited verbal communication. She could say short phrases to ask for things she wanted, however, would become aggressive when asked to complete tasks at home and at school. Ivy had recently attended a public school, but was referred to a clinic that specializes in emotional and behavioral disorders. This study took place at a clinic in a therapy room with an observation window.

Ivy's behavior was determined to be maintained by social positive reinforcement by accessing attention and tangible items, and negative reinforcement in the form of escape from demands. Ivy's behaviors were considered very aggressive and included: eye gouging, choking, hair pulling, hitting, slapping, pushing, kicking, and scratching. Her mother also stated that she was not able to safely display her hair at home. Trained graduate-level students and therapists collected frequency data on Ivy's behaviors, and conducted the functional analysis used to determine the function of her behavior. An individualized multicomponent intervention that included DRO and punishment, as well as a visual schedule to aid in her tracking daily activities as well as a visual representation of reinforcers. Ivy's intervention package consisted of a multi-leveled intervention. Level 1 (green) was the DRO and provided Ivy with opportunities to access all functional

reinforcers (attention, escape, and tangible). Level 2 (red) was contingent on Ivy's aggression. When she was in red, she was only provided access to escape. To transition from red back to green, she was required to 'earn' three checkmarks on a token board. If she engaged in aggressive behaviors, the check marks were erased and she started over. Movement from the green to the red was signaled through a laminated token board that is red on one side and green on the other.

The 'green' level was when Ivy was taught to ask for breaks and tangible items at contextually appropriate times. She was able to earn higher qualities and longer duration of functional reinforcement when she complied with more demands. She could exchange a 60 second break card at any point for what was considered as a 'low-quality' break from demands. She was also able to earn tokens coupled with brief praise on a fixed ratio schedule of reinforcement for demands. Ivy would use these tokens to fill her token board. Once the token board was filled, she was given two minute breaks, all requests for tangibles were honored, and she was given high quality attention. While in red, requests for tangibles were not honored and she was only given minimal attention.

Ivy's visual schedule was implemented to assist with her knowing when she was getting preferred snack/beverage items and placed them on the visual board, then started a 5-minute visual timer. If she completed 15 minutes of non-aggression, she would receive the preferred snack/beverage. Once she completed this successfully, she again asked what her preferred choices were and the 5 minute intervals began again. If Ivy engaged in aggressive behaviors the pictures of the preferred items were removed and 3 additional time interval pictures were placed in their spot. If aggressive behaviors persisted the preferred beverage was replaced with a glass of water.

Throughout the intervention, Ivy displayed an increase in compliance and a decrease in aggressive behaviors. Within the first four sessions, Ivy's mean rates of aggressive behaviors went from 0.8, 5.6, and 8.8 per minute to zero in session 4. Ivy's intervention was also divided into sessions with a physically larger and a smaller supervisor. With each change in phase, there would be a slight increase in aggressive behavior, but in every phase the aggressive behavior returned to zero occurrences. Protective gear that was worn by staff was eventually faded from treatment. Ivy only aggressed during 3 of the last 42 sessions, and the decrease in aggression generalized to her home, with the intervention being administered by Ivy's mother.

Social validity was not discussed within the article. It was noted that the a physically larger male that was used in the treatment, just happened to be the individual on staff who had received more training and had more experience. Of course, this was also conducted within a clinical setting and not a public or specialized school setting. The staff probably had more specialized training than a school teacher; however, both therapists and Ivy's mother did see a decrease in aggressive behaviors at both the clinic and at her home.

Functional Behavior Assessment

Although FBAs are considered to be an evidenced based intervention, it would be safe to assume that they are used as a tool to determine and guide further intervention. The result of the FBA should inform the function or reason why the behavior is occurring. A functional analysis is considered a part of the FBA, as it is a way to experimentally test how certain changes impact the occurrence of problem behavior. Only one of the reviewed studies mentioned the use of an FBA as part of their

intervention selection process, Foxx and Meindl (2007), and the aggressive behaviors decreased for that participant. Three additional articles stated that the authors utilized an antecedent analysis, which is another process of an FBA to determine the function of a behavior. Each of the three articles resulted in decreased aggressive behaviors. Seven of the articles documented the use of FAs in consideration of intervention determination. Six of those seven articles saw a decrease in targeted aggressive behaviors across participants. The last two articles did not mention the use of any type of functional behavioral assessment. These are the two articles that investigated the use of social narratives, and the functions or maintaining variables were not discussed within either article. One article using social narratives saw a decrease in aggressive behaviors while the other did not.

Given the use of the FBA, FA, or antecedent analysis within most of the articles, and the positive outcomes, it can be assumed that this is a necessary part of the intervention selection process to determine maintaining variables behind the aggressive behaviors (Iwata & Dozier, 2008). While training is necessary to conduct an FBA or FA, the articles noted that graduate students, teachers, and workshop participants were able to gain the skills necessary to complete the procedure with fidelity. Public schools, even with limited resources, should be able to access training to assist with behavior analyses and interventions which, in turn, increase the potential for success with implemented interventions that target the function or maintaining variable of the aggressive behavior.

Discussion

The purpose of this study was to determine the effectiveness and feasibility of evidence-based interventions for children with ASD (see Wong et al., 2014) exhibiting aggressive behaviors in educational settings. Such information should be useful to public school educators when addressing aggressive behaviors exhibited by their students with ASD. Educators need to have procedural data on how to implement these interventions within their classrooms, with their unique students, all while maintaining intervention fidelity. Feasibility and social validity have to be considered before asking a teacher to implement an intervention.

The current analysis of the eight evidence-based interventions for students with autism yielded 13 articles. Results revealed decreases in aggressive behaviors in all but one study. Results from Scattone et al. (2006) indicated that their intervention of social stories did increase the number of positive interactions for one participant; however, an increase of aggressive behaviors was also noted. The other participant in the study showed no changes in positive behavior or aggressive behaviors. It should be noted the other study that evaluated social stories (Anderson et al., 2016) found positive results in decreasing aggressive behaviors. It was not clear if the difference in results was due to the participants' severity of disability, the social story itself, or implementation differences.

Of the 13 studies reviewed, 11 used a FBA/FA and each of those studies saw decreases in a wide range of aggressive behaviors across different ages (Braithwaite & Richdale, 2000; Devlin et al., 2011; Foxx & Meidl, 2007; Gerhardt et al., 2004; Kennedy, 1994; Luiselli et al., 2000; Newcomb et al., 2018; Randall et al., 2018; Santiago et al.,

2016; Sigafos & Meikle, 1996; Slocum et al, 2018.) This would suggest that determining the function of a behavior would be a necessary component of developing any intervention. Having someone on the school's staff with the expertise to conduct such an assessment is crucial. Fortunately, information necessary to complete training to conduct functional behavioral assessments is widely available and appropriate school personnel could obtain such training.

Although this review examined interventions that were already determined to be evidence-based, very few were available that were relative to the educational environment. All but one (Devlin et al., 2011) of the reviewed studies offer discussion about social validity information. Four articles refer to the interventions being "time intensive," or requiring additional staff and training (Gerhardt et al., 1994; Santiago et al., 2015; Newcomb et al., 2018; Slocum et al., 2018.) Reinforcement schedules that were used could be considered dense and requiring additional staff to carry out necessary steps in the reinforcement procedures. One study acknowledged that a public school setting could not support the essential components of the intervention (Randall et al., 2018.) Seven of the remaining studies discussed that teachers rated the interventions utilized as 'acceptable' and would recommend or use the interventions again (Kennedy, 1994; Sigafos, & Meikl, 1996; Braithewaite, & Richdale, 2000; Luiselli et al., 2000; Scattone et al., 2006; Foxx & Meindl, 2007; Anderson et al., 2016). Anderson et al. (2016) reported that the use of social narratives in a public school was cost efficient, customizable, least intrusive, and feasible in many different environments. Foxx and Meindl (2007) conducted their study within a residential setting but teachers, school officials, and parents rated the use of DRO as acceptable and indicated it would be usable

for similar behaviors in the future. Braithewaite and Richdale (2000) implemented an FCT intervention in a public school and a specialized school. No extensive training or scheduling changes were necessary to implement the intervention, and it was acceptable to use in a public school setting.

When encountering a student with ASD who has displaying aggressive behaviors, teachers will need an effective and feasible intervention that can be implemented and maintained. Based on the reviewed interventions, social stories appear to be the simplest to implement, and customizable across environments and students. Next, FCT would be another intervention to attempt, as it was also described as easy to implement and did not require extensive training. ABI interventions were also considered acceptable interventions and likely to decrease aggressive behaviors in a public school setting. Multicomponent intervention packages may effectively decrease behaviors, however, such intervention packages would not likely be developed, implemented, or maintained within the public school setting without guidance from a professional with specialized behavioral expertise.

Limitations and Future Directions

A limitation of this review is the limited number of studies available. Although 32 studies were identified, only 13 were available for review. Thus, having the rest of the article might have resulted in additional, or different, conclusions. Several studies were excluded from this analysis due to having been conducted within a hospital or non-educational setting. Even of the studies analyzed, only five were conducted within a public school. The research that equips us with successful interventions and lends assistance to our students with an ASD diagnosis and behavioral challenges could easily

be construed as too difficult to implement within public schools. The difference in resources between a clinical/residential settings and public schools could be vast. Having fewer resources does not eliminate the need for educators to have the same capability of assisting students with these characteristics.

The completion of this specialist project has highlighted a need for additional research within public schools. Research has confirmed that these interventions can be successful when implemented with fidelity within a clinic or hospital setting. We now need to investigate how these interventions can be applied within the public schools with potentially limited resources.

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