A review of behavioral interventions for the treatment of aggression in individuals with developmental disabilities

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A B S T R A C T
Aggression can present as a significant problem behavior in individuals with a diagnosis of developmental disability. Much research has focused on the prevalence of aggression in individuals with varying degrees of severity of intellectual disability (AD), autism spectrum disorders (ASD) and co-morbidity of ID and ASD. Research has also focused on the impact of aggressive behavior on individuals' development including cognitive, adaptive and social functioning. The literature on Applied Behavior Analysis provides abundant examples of various interventions that are effective in reducing or eliminating aggressive behavior across a range of ages and degrees of developmental disabilities. Many interventions report success using antecedent alterations, reinforcement-based strategies and consequence manipulations. The current review provides a focused, comprehensive examination of aggressive behavior intervention research for individuals with developmental disabilities aged 3–18 years published between 1980 and 2009.

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1. Introduction

A developmental disorder is a disorder that interrupts normal development in childhood. It may affect a single area of development (specific developmental disorder) or several (pervasive developmental disorder). Both intellectual disability (ID) and autism spectrum disorders (ASD) come under the rubric of developmental disabilities. Individuals with such disabilities are at risk for the development of challenging behavior (Farmer & Aman, 2011; Matson & Shoemaker, 2009; Murphy, Healy, & Leader, 2009). Aggression has been found to be more common among individuals with ID than among those in the general population (Holden & Gitselos, 2006) with an added risk factor for aggression for those individuals with a dual diagnosis of ASD and ID (Hill & Furnis, 2006; McClintock, Hall, & Oliver, 2003). Aggression in the developmental disability population warrants study due to its prevalence and the short and long-term implications for those individuals who emit aggression as a topography of challenging behavior.

The rate at which individuals with ASD present with ID has been estimated at 70% (Fombonne, 1999), and within these populations aggression is one of the behaviors most likely to be identified for intervention (Didden, Duker, & Korzilius, 1997; Horner, Carr, Strain, Todd, & Reed, 2002). Aggression can have serious consequences to the quality of life experienced by the individual across their development, in both the short and long term. The potential threat to personal safety and the safety of others has resulted in the institutionalization of many individuals with developmental disabilities as historically most community placements were hesitant to accept individuals who exhibited aggression (de Zubiracay & Clair, 1998). The presence of aggression may result in restrictive environments and the use of intrusive procedures. Jacobson and Ackerman (1993) found that restrictive behavioral programmes were most commonly employed for the treatment of aggression, and that pharmacotherapy was employed more than behavioral methods in a study of 31,000 people in the New York State Developmental Services system. In addition, studies indicate that acceptance of intrusive procedures increases with behavior severity (Witt & Elliott, 1985). At best aggression results in a loss of educational time, at worst it is a major barrier to education as it increases risk of exclusion from the educational setting. Duncan, Matson, Bamburg, Cherry, and Buckley (1999) investigated the differences in social skills among four groups with severe and profound intellectual disability with the presence or absence of co-morbid challenging behaviors including self-injury and aggression. Their findings demonstrated that individuals displaying challenging behavior presented with a restricted range of social behaviors (measured using the Matson Evaluation of Social Skills for Individuals with Severe Retardation) compared to those who did not emit challenging behavior. This study demonstrates the significant impact that aggression may have on multiple areas of functioning with social development being compromised through reduced exposure to social relationships and typical home environments.

Persistent aggression may contribute to the individual having a ‘reputation’ for ‘being’ aggressive; caregivers may then perceive aggressive acts as personalized attacks and as a result behave in a different manner to the individual. Staff burnout and its effects on resistance to work with individuals who are aggressive may drain services where limited funds are available. Studies carried out by Freeman (1994), Hastings and Brown (2002), and Jenkins, Rose, and Lovell (1997) all suggest that direct care staff who are exposed to more frequent and severe levels of challenging behaviors (including physical aggression) are at increased risk of stress. The presence of stress in service providers has been linked to negative interactions with service users (Lawson & O’Brien, 1994). This in turn can impact on quality of intervention for those individuals with developmental disorders who aggress towards others.

Early and effective intervention is essential in order to impact behavior change. The research synthesis by Horner et al. (2002) showed that the early use of behavioral interventions can result in reductions of challenging behaviors by 80–90%. A negative corollary is that in the absence of intervention challenging behaviors tend to persist in individuals with developmental disabilities (Murphy et al., 2005). This persistence can result in increasing limitations on the individual’s social, educational and environmental experiences throughout adulthood. Challenging behaviors, such as aggression, can sustain throughout the lifespan of the individual and may result in the use of psychiatric services and/or psychotropic medications.

Research has shown that the presence of physical aggression can predict the use of psychiatric services in adults with ID (Aman, Sarphare, & Burrow, 1995). Anti-psychotic medication is regularly prescribed to control aggressive behaviors in adults with ID – in the absence of mental illness (Gray & Hastings, 2005). Tsakanikos, Costello, Holt, Sturmy, and Bouras (2007) found that in adults with pervasive developmental disorder and ID, physical aggression independently predicted use of psychotropic medication and that physical aggression and overactivity predicted further involvement of psychiatric services. These findings have serious clinical implications. Evidence supporting the efficacy of medications is inconclusive. Some effectiveness has been demonstrated in the improvement of challenging behavior in individuals with autism who are medicated (Kwok, 2003). However, the mechanism responsible for the improvement is yet not fully understood and this understanding may be at a considerable cost to many individuals. Anti-psychotic medications can have a myriad of side effects many of which impact on learning and social opportunities and as such are a relatively intrusive treatment. Furthermore, the use of medications does not address the function of the aggressive behavior; ‘medications rarely correct underlying causes for aggressive or hostile behaviors...behavioral interventions are the first method of treatments for all types of aggression’ (Powers, 2005, p. 2).

Aggression by individuals with developmental disabilities is a learned behavior or set of behaviors. The individual has learned that aggression towards another individual achieves a desired outcome i.e., the aggressive behavior becomes functionally related to the consequences that reliably follow it (Foxx & Meindl, 2007). Aggression is socially mediated as it
always occurs in a social context (i.e., someone must be present to be the target of the aggressive act). Typically the desired outcome is to either gain attention from the recipient or bystanders (Thompson, Fisher, Piazza, & Kuhn, 1998), to gain access to tangible reinforcers (DeLeon, Fisher, Herman, & Crosland, 2000), to escape or avoid an unpleasant situation or demand (Horner, Day, Sprague, O’Brien, & Heathfield, 1991), or to achieve multiple desirable outcomes (Braithwaite & Richdale, 2000).

As such, establishing the function of aggression in a behavioral context is crucial in the development of effective remediation strategies. Experimental functional analysis (EFA) and functional behavioral assessments (FBA) offer a clinically proven means of determining the function of aggression. In an EFA antecedents and consequences which are considered to be functionally related to the target behavior are arranged so that their separate effects can be observed and measured (Cooper, Heron, & Heward, 2007). FBAs involve both the direct and indirect observation of behavior under naturally occurring conditions. In a quantitative research synthesis on the efficacy of behavioral interventions for reducing problem behavior in persons with autism, Campbell (2003) found that pre-treatment functional assessment was positively related to successful intervention. Furthermore those studies that employed an experimental functional analysis showed significantly greater behavioral suppression than studies using other methods. This finding adds to a growing body of research elucidating the crucial role that functional assessments play in informing effective interventions. This is a robust finding from several other published reviews (e.g., Didden et al., 1997; Horner et al., 2002; Kahng, Iwata, & Lewin, 2002). As a result of much research and advocacy, the Individuals with Disabilities Education Act (IDEA, 1997) prescribes a functional behavioral assessment as part of a behavioral intervention plan, to those students with disabilities whose behaviors place them either at risk of suspension or exclusion and removal to an alternative educational setting.

Recent reviews have evaluated the challenging behavior intervention literature for children with ASD under 8 years (Horner et al., 2002); for school age children (Conroy, Dunlap, Clarke, & Alter, 2005; Odom et al., 2003); and in school settings for students with ASD, age 3–21 years (Machalicek, O’Reilly, Beretvas, Sigafous, & Lancioni, 2007). These reviews contribute significantly to the understanding of the broad range of behavioral repertoires present in persons with ASD and ID. The current review of the literature on the treatment of aggression in developmental disabilities provides an account of the interventions that are most commonly employed to decrease aggressive behavior in persons with ID, ASD or co-morbid ID and ASD from age 3–18 years. The paper also provides an analysis of the efficacy of such interventions.

2. Method

Included in this review are studies that fulfilled the following criteria: (a) participants aged 3–18 with a diagnosis of ASD, ID, or a dual diagnosis of ASD and ID; (b) utilized a single subject design; (c) published in a peer-reviewed journal between 1980 and 2009; and (d) applied an intervention in an effort to reduce aggressive behavior. Electronic searches were conducted using PsychINFO, Academic Search Premier, and Elsevier. Also an examination of the reference sections of the included studies was carried out to identify possible additions to the review. A total of 18 studies were identified that fulfilled the inclusion criteria. Two studies employed a single intervention; the rest implemented a combination of interventions within a treatment package. These procedures were drawn from the following categories.

1. Antecedent manipulations and changes in instructional context: including video priming and environmental enrichment, prompting procedures, progressive time delay, photographic activity schedules, interspersed requests, choice making, and scheduling using the premack principle.

2. Reinforcement based strategies: picture exchange communication system (PECS), functional communication training (FCT), differential reinforcement procedures, non-contingent attention (NCA), and differential negative reinforcement procedures (DNR).


3. Results

3.1. Overview of studies

Studies were reviewed and reported in terms of sample size, age range, diagnostic category, target behaviors, research design, interventions utilized, study outcome, and the presence of functional assessments and social validity measures. An overview of the participant demographics revealed that of the 31 participants, 26 were male and 5 were female, ranging in age from 3 to 18 years with a mean age of 8. Autism was the most common diagnostic category (11) with ID the next most common (9), a dual diagnosis of autism and ID formed the next largest category (6). Table 1 describes the following 5 variables for each of the included studies: sample size, age range, research design, target behaviors, intervention, outcome, and functional assessment.

In the present review the most common target behavior identified for intervention across participants was hitting (n = 25), followed by biting (n = 16), kicking (n = 16), pinching (n = 10), and scratching (n = 9). The designs most utilized was multiple baseline (6), and multi-element (6), followed by reversal design (4), alternating treatments design was employed in one instance, as was an ABCD design.
<table>
<thead>
<tr>
<th>Study</th>
<th>n</th>
<th>Age range</th>
<th>Design</th>
<th>Target behavior</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Functional assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carr et al. (1980)</td>
<td>2</td>
<td>9–14 years</td>
<td>Multi-element</td>
<td>Kicking; hitting; biting; pinching; scratching; hair pulling</td>
<td>Visual cue (antecedent); DNRO/DRA; environmental escape extinction</td>
<td>Decrease to low level</td>
<td>EFA demand/no demand situations</td>
</tr>
<tr>
<td>Dyer et al. (1990)</td>
<td>2</td>
<td>5–11 years</td>
<td>Within subjects reversal design</td>
<td>Kicking; hitting; biting; pinching; scratching</td>
<td>Choice making; response blocking; contingent exercise</td>
<td>Consistent reductions; limited magnitude</td>
<td>No</td>
</tr>
<tr>
<td>Horner et al. (1991)</td>
<td>3</td>
<td>12–14 years</td>
<td>Reversal design</td>
<td>Hitting; biting; showing; hair pulling</td>
<td>Interspersed requests</td>
<td>Dramatic reductions in target behavior</td>
<td>FBA not specified</td>
</tr>
<tr>
<td>Grace et al. (1994)</td>
<td>1</td>
<td>11</td>
<td>Reversal design</td>
<td>Hitting; pushing; throwing objects</td>
<td>FCT; physical restraint</td>
<td>Reduced to zero levels</td>
<td>No</td>
</tr>
<tr>
<td>Charlop-Christy and Haymes (1996)</td>
<td>4</td>
<td>5–7 years</td>
<td>Multiple-baseline across participants using multi-elements</td>
<td>Kicking; hitting; spitting; throwing objects</td>
<td>DRO; time out; reprimand</td>
<td>Reduction in target behaviors</td>
<td>No</td>
</tr>
<tr>
<td>Heckaman et al. (1998)</td>
<td>4</td>
<td>6–9 years</td>
<td>Alternating treatments</td>
<td>Kicking; hitting; biting; spitting; scratching; pulling hair</td>
<td>Least-to-most prompting vs. progressive time-delay; low vs. high effort task demands</td>
<td>Lower rates of target behavior</td>
<td>No</td>
</tr>
<tr>
<td>Thompson et al. (1998)</td>
<td>1</td>
<td>7</td>
<td>Reversal design</td>
<td>Kicking; hitting; pinching; scratching</td>
<td>FCT; planned ignoring; escape extinction; response blocking</td>
<td>Reduced to at or near zero levels</td>
<td>Modified EFA; preference assessment</td>
</tr>
<tr>
<td>O'Reilly et al. (1999)</td>
<td>1</td>
<td>10</td>
<td>Multi-element</td>
<td>Hitting; biting; scratching</td>
<td>Compared extinction and non-contingent reinforcement</td>
<td>Rapid reduction in target behavior NCR superior</td>
<td>EFA</td>
</tr>
<tr>
<td>Braithwaite and Richdale (2000)</td>
<td>1</td>
<td>7</td>
<td>Multiple-baseline across behaviors</td>
<td>Forceful contact to person with head or hand</td>
<td>Extinction; FCT</td>
<td>Rapid reduction to zero levels</td>
<td>FBA: (ABC behavioral interview) EFA</td>
</tr>
<tr>
<td>DeLeon et al. (2000)</td>
<td>1</td>
<td>11</td>
<td>Multi-element</td>
<td>Kicking; hitting; biting; head butting; grabbing</td>
<td>FCT</td>
<td>Reduction in target behaviors</td>
<td>EFA</td>
</tr>
<tr>
<td>Massey and Wheeler (2000)</td>
<td>1</td>
<td>4</td>
<td>Multiple-baseline across settings</td>
<td>Verbal and physical aggression</td>
<td>Photographic activity schedules; most-to-least prompt fading</td>
<td>Successful transitions No TB increased task engagement</td>
<td>No</td>
</tr>
<tr>
<td>Schreibman et al. (2000)</td>
<td>3</td>
<td>3–6 years</td>
<td>Multiple-baseline across participants</td>
<td>Kicking; hitting; biting; pinching</td>
<td>Video filming (transitions); reinforcement absence of target behaviors</td>
<td>Rapid decrease in 1 participant gradual decrease in remaining 2 immediate decrease reduced to zero after 6 days</td>
<td>No</td>
</tr>
<tr>
<td>Frea et al. (2001)</td>
<td>1</td>
<td>4</td>
<td>Multiple-baseline across participants</td>
<td>Kicking; hitting; biting</td>
<td>Picture Exchange Communication System (PECS)</td>
<td>No</td>
<td>FBA not specified</td>
</tr>
<tr>
<td>Mueller et al. (2001)</td>
<td>1</td>
<td>8</td>
<td>Multi element</td>
<td>Kicking; hitting; biting; pinching; head butting; slapping</td>
<td>Antecedent manipulation of reinforcers</td>
<td>Reduction in target behaviors</td>
<td>EFA</td>
</tr>
<tr>
<td>Borrero et al. (2004)</td>
<td>1</td>
<td>13</td>
<td>ABCD</td>
<td>Kicking; hitting; biting; pinching; head butting; throwing objects</td>
<td>Compliance training; non-contingent escape and enriched environment; escape extinction; altered topography of instructions</td>
<td>Immediate decrease of TB to zero increased compliance</td>
<td>EFA</td>
</tr>
<tr>
<td>Borrero and Vollmer (2006)</td>
<td>1</td>
<td>7</td>
<td>Multiple-baseline across settings</td>
<td>Kicking; hitting; biting; spitting</td>
<td>Non-contingent attention + extinction; DNRO/DRA + extinction</td>
<td>Lower rates of target behavior increased compliance</td>
<td>Analysis and preference assessment</td>
</tr>
<tr>
<td>Foxx and Meindl (2007)</td>
<td>1</td>
<td>13</td>
<td>Multi-element</td>
<td>Kicking; hitting; biting; pinching; head butting</td>
<td>Token economy; choice making; response cost; overcorrection; physical restraint</td>
<td>Reduced to at or near zero levels</td>
<td>FBA not specified naturalistic observation</td>
</tr>
<tr>
<td>Ringdahl et al. (2009)</td>
<td>1</td>
<td>18</td>
<td>Multi-element</td>
<td>Pushing; hitting</td>
<td>DRA; non-contingent reinforcement; FCT; positive punishment</td>
<td>Reduced to at or near zero levels</td>
<td>Modified EFA</td>
</tr>
</tbody>
</table>
Of the interventions employed the most common were extinction (7), and functional communication training (5). A number of studies incorporated visual cue prompts (5), and differential reinforcement procedures (5); environmental enrichment was used in three studies. Noteworthy, is the ubiquitous use of extinction in many of the studies (10); procedures such as FCT, non-contingent and differential reinforcement procedures all place the challenging behavior on extinction while reinforcing different target behaviors. All of the studies reported reductions in target behaviors and increases in appropriate behaviors where programmed for. Of the 18 studies in the corpus, five did not include a functional assessment. Of the remaining 13 studies, experimental functional analyses (or modified functional analyses) were the most commonly employed type of assessment (7), functional behavioral assessments accounted for six, while two studies employed preference assessments. Those studies that used functional analyses or assessments found the function of aggressive behavior most commonly identified was escape (5), followed by attention (2) and tangibles (2), multiple controlled behavior was observed in two of the studies, and in five cases the function was not identified. Preference assessments were carried out in two of the studies, and none of the studies implemented a formal measure of social validity. Four studies gave information on follow-up and in these instances aggressive behaviors were maintained at the levels reported at the time of the studies (low/at or near zero levels).

3.2. Studies that employed antecedent manipulations and changes in instructional context

Even though aggression is an acquired behavior that has a functional relationship with the consequences that reliably follow it, there may be antecedent factors that increase the probability that the aggression will occur. These factors can be environmental (e.g., unpredictability in routine), physiological (e.g., sleep deprivation), or social (e.g., the presence of a non-preferred staff member). Preventative behavioral interventions change environments to match the behavioral needs of the people in the environments, antecedent interventions are ongoing and occur between the bouts of problem behavior. These types of interventions can include video priming, environmental enrichment, daily schedules, providing choice, modifying curricula (interspersed requests), or changing the physical characteristics of a setting. Five of the studies in the current review implemented largely antecedent based interventions.

Heckaman, Albert, Hooper, and Heward (1998) compared the effects of a least to most prompting procedure (LTM) to a progressive time delay procedure (PTD) on the error rate and aggressive behavior of 4 students with autism. Their results showed that PTD yielded fewer errors than LTM for all four students and lower rates of aggression for 2 students. Schreibman, Whalen, and Stahmer (2000) implemented a video priming procedure to reduce the aggressive behavior of 3 children with autism in transition situations. The intervention resulted in the reduction or elimination of the challenging behavior and these reductions generalized to untreated settings in all but one instance. Daily schedules are essentially a visual representation of a sequence of events that makes the environment more predictable; their primary function is to facilitate children’s transitions, and they have been shown to help reduce challenging behaviors (Krantz, MacDuff, & McClannahan, 1993). Massey and Wheeler (2000) used individualized activity schedules not only to demonstrate that a child with autism can successfully acquire the skills necessary to follow the schedules independently, but that these skills could also be generalized to other settings with minimal training. Prior to the intervention the child engaged in challenging behavior whenever a transition occurred. However, upon acquiring the capacity to independently utilize his activity schedule he successfully transitioned with minimal prompts from the teacher without episodes of aggression.

Interspersed requests have also been shown to reduce aggressive behavior in the instructional setting (Winterling, Dunlap, & O’Neill, 1987). Interspersed requests, or high probability requests are simple commands that have a high probability of being followed through by the student. Interspersed requests are presented in instructional trials followed by new more difficult tasks (low probability requests) in an effort to increase the responsiveness of the learner to instructions and reduce levels of challenging behavior. Horner et al. (1991) used high probability sequencing to reduce the escape maintained aggression and self-injury of 3 teenagers with ID. Results showed that the high probability sequencing both increased the students’ responsiveness to instructions as well as reducing levels of aggression and self injury.

Individuals with developmental disabilities may have a limited communication system which effectively reduces choice making opportunities. This in turn appears to result in increased occurrences of challenging behavior (Kern et al., 1988). The deliberate creation of choice making opportunities encourages socially appropriate power and control. The combination of choice making with consequential control strategies by Dyer, Dunlap, and Winterling (1990) showed consistently reduced levels of aggression when 3 students with developmental disabilities were given opportunities to make choices among instructional tasks and reinforcers. However, as choices of both reinforcers and tasks were presented as a package, the relative contribution of each element in reducing the aggressive behavior cannot be separated.

Mueller, Wiczyński, Moore, Fusilier, and Trahan (2001) demonstrated the importance of antecedent manipulations involving the relative preference of restricted and non-contingently available stimuli. The authors found that restriction of highly preferred tangibles evoked the highest rates of aggression in an 8 year old boy diagnosed with autism regardless of the preference level of the non-contingently available alternative stimuli. Restricting less preferred stimuli was associated with less frequent but moderate rates of aggression even when the alternative items were more preferred. The importance of antecedent manipulations in the assessment and intervention of aggressive behavior is clear from the results of Mueller et al. (2001).

Frea, Arnold, and Vittimberga (2001) present a case study of the combined effectiveness of picture exchange and choice-making opportunities in the treatment of extreme aggression in a child with autism across home and integrated preschool
settings. The 4 year old participant showed significant decreases (from highly frequent and severe levels to zero levels) following the implementation of a picture exchange procedure.

3.3. Studies that employed reinforcement-based strategies

Two consequence based interventions repeatedly shown to be effective in the treatment of aggression in children with developmental disabilities are differential reinforcement procedures and functional communication training (FCT). FCT is a procedure in which a socially appropriate communicative behavior is taught to replace a less appropriate behavior. The operant function of the behavior (in this review aggression) is identified, reinforcement is provided for the alternative response and the behavior is placed on extinction. The new behavior becomes a more effective means to achieve the desired outcome, thus the necessity to emit the less appropriate behavior is diminished. FCT empowers the individual to regulate the delivery of the reinforcer, thereby exerting more control over their environment. Two studies in the current review utilized FCT as the sole intervention to treat aggression. DeLeon et al. (2000) accurately predicted that the aggressive behavior of a boy with co-morbid diagnoses of autism, bi-polar, and moderate ID would be more probable than the occurrence of appropriate mands when the schedules of reinforcement in place were equal or slightly discrepant. Results clearly showed that mands were more probable when the schedule discrepancy was large. This illustrates a key element in the success of FCT: making the newly acquired mand more efficient than the target behavior (Horner et al., 1991). In other words, if the more appropriate form of communication requires more response effort than the target behavior it is unlikely that the target behavior will reduce. FCT was used as a component of intervention packages in four other studies (Braithwaite & Richdale, 2000; Grace, Kahng, & Fisher, 1994; Ringdahl, Christensen, & Boelter, 2009; Thompson et al., 1998).

Differential reinforcement procedures involve reinforcing a more appropriate response while withholding reinforcement for the unwanted behavior, also known as placing the target behavior on extinction. Differential reinforcement of other behavior (DRO) is a procedure whereby reinforcement is delivered if a target behavior has not been emitted for a specified period of time; and for this reason is also referred to as “omission training”. DRO procedures were utilized within the intervention packages of two studies. In differential reinforcement of alternative behavior (DRA) an alternative, operationally defined and appropriate behavior is reinforced while reinforcement is withheld for the target behavior. In the present review DRA procedures were used in the treatment packages of three studies (Borrero & Vollmer, 2006; Carr, Crighton, & Binkoff, 1980; Ringdahl et al., 2009). Carr et al. (1980) demonstrated that escape-motivated aggression can be controlled by: the introduction of highly preferred reinforcers to attenuate the aversiveness of demand situations; strengthening an alternative and non-aggressive escape response through differential reinforcement (DRA); and implementing an escape-extinction procedure. Borrero and Vollmer (2006) implemented non-contingent attention and two types of DRA across multiple baselines to reduce the multiply controlled aggressive behavior exhibited by a boy with severe ID. Results showed that the separate interventions resulted in a decrease in aggressive behavior and an increase in compliance.

3.4. Studies that employed consequential control or behavior reduction strategies

Extinction is a behavior reduction procedure in which reinforcement for a previously reinforced behavior is discontinued, resulting in a decrease in the future probability of that behavior. Extinction has been shown to be effective in reducing many problem behaviors (Lerman & Iwata, 1996). As extinction does not teach the individual new behavior it is usually implemented as part of a treatment package. In total seven of the studies explicitly identified extinction as a core treatment component. Braithwaite and Richdale (2000) used FCT and extinction to reduce the aggressive behavior and self injury exhibited by a boy with autism. The intervention resulted in the successful acquisition of alternate requests with a concurrent decrease to zero levels of aggression and self injury. O’Reilly, Lancioni, and Taylor (1999) compared the effectiveness of two extinction procedures on the attention maintained aggression of a 10 year old boy with mild ID. Non-contingent reinforcement (NCR – delivery of the reinforcer on a time schedule), and extinction by omission (withholding of the reinforcer) were compared within a multi-element design. NCR produced more rapid reductions in aggression and these decreases were maintained over an extended series of therapeutic sessions and the programme was subsequently implemented by parents in the home setting. Charlop-Christy and Haymes (1996) demonstrated that incorporating mild reductive procedures such as a reprimand and a brief time-out procedure with differential reinforcement, using “obsessive behavior” as reinforcers, resulted in significant reductions in the aggressive behavior of four young children with autism diagnoses.

Where a threat to the safety of the individual or others is of concern, or when aggressive behaviors cannot be reduced by these procedures more intrusive techniques may be required (Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998). Overcorrection is a behavior reduction strategy in which contingent on the occurrence of the target behavior the individual is required to engage in effortful behavior that is logically or directly related to the target behavior. Response cost is a behavior reduction strategy in which the loss of a specific amount of reinforcement occurs contingent on the target behavior. Foxx and Meindl (2007) used a combination of positive reinforcement, choice making, tokens, overcorrection, response cost, and physical restraint to reduce the aggressive and destructive behavior of a teenage boy with autism. Physical restraint was used only as a crisis management procedure when the client’s behavior escalated to the point where he was a danger to himself and others. Due to the intervention package all of the problem behaviors were reduced to at or near-zero levels and the effects were maintained for over a year.
4. Discussion

4.1. Efficacy of interventions implemented

All of the studies reported decreases in challenging behavior attributed to the intervention. Of the studies included, seven reported total or near elimination of aggression at least one individual during intervention in at least one condition (Borrero, Vollmer, & Borrero, 2004; Braithwaite & Richdale, 2000; Foxx & Meindl, 2007; Frea et al., 2001; Grace et al., 1994; Massey & Wheeler, 2000; Ringdahl et al., 2009). Antecedent manipulations, changes in instructional context, reinforcement-based strategies, and behavior reduction strategies each appear to be effective in reducing the occurrence of aggression. Limited conclusions may be drawn regarding the permanency of treatment gains as only four of the studies conducted follow-up assessments. However, each of these studies reported that treatment gains were maintained (Charlop-Christy & Haymes, 1996; Foxx & Meindl, 2007; Grace et al., 1994; O’Reilly et al., 1999).

While a client’s right to effective treatment may dictate the immediate use of a quicker acting, but temporarily more restrictive procedure (Van Houten et al., 1988); it is essential that treatment efficacy and not cultural norms dictate the selection of the intervention. The doctrine of the least restrictive alternative (LRA) mandates that the least intrusive, but most effective procedures be tried before more intrusive procedures. However, to conceptualize reinforcement-based interventions as inherently less restrictive may obfuscate the issue at hand. Interventions that rely solely on reinforcement strategies can impose severe limitations on the individual if they are not implemented properly (Green, 1999). Van Houten et al. (1988) caution against the definition of procedures as ‘good’ or ‘bad’, rather they encourage the evaluation of a procedure’s general level of restrictiveness as “a combined function of it’s absolute level of restrictiveness, the amount of time required to produce a clinical outcome, and the consequences associated with delayed intervention” (p. 383).

Intrusive behavioral interventions continue to be used, and seven studies in the present corpus incorporated punishment procedures to reduce aggressive behavior (Charlop-Christy & Haymes, 1996; Dyer et al., 1990; Foxx & Meindl, 2007; Grace et al., 1994; Horner et al., 1991; Ringdahl et al., 2009; Thompson et al., 1998). Grace et al. (1994) illustrated the difficulty in balancing the treatment effectiveness of an intrusive procedure with social acceptability. The escape-maintained aggression and property destruction of an 11 year old boy with severe ID was treated with both FCT and physical restraint. However, the administrators from the participant’s school stated that their policy would only allow physical restraint for the most severe topographies of the destructive behavior. Results indicated that the more severe behaviors reduced to near-zero levels only when both severe and less severe behaviors were similarly punished. The authors assert that this may be due to both the severe and less severe behaviors forming a response class and the client was not able to discriminate between punished and unpunished members of the response class. Alternatively, the less frequent and more severe behaviors may have represented earlier and later components in a response chain.

Antecedent manipulations and changes in instructional context should be considered as part of designing any comprehensive treatment package for aggression. Such preventative measures can significantly decrease the likelihood of the occurrence of aggressive behavior. It is crucial to identify the precipitating factors that reliably predict the occurrence of an individual’s aggressive behavior. Altering or correcting these factors may reduce the probability of the aggression occurring may diminish the need to use negative consequence-based procedures. Research in the literature on Applied Behavior Analysis demonstrates that the key to ensuring an appropriate response lies in effective function-based assessment and intervention.

4.2. The efficacy of interventions derived from experimental functional analysis and functional behavior assessment

Extant research indicates that the use of EFA and FBA increases the likelihood of treatment success (Horner et al., 2002). Despite this finding, five of the studies in this review did not conduct any type of functional behavioral assessment prior to choosing an intervention to treat aggression. These studies reported positive, but less favourable outcomes than studies that employed either an EFA or an FBA. Reductions in target behaviors were reported as “lower rates” (Heckaman et al., 1998); “consistent reductions but limited magnitude” (Schreibman et al., 2000); “rapid/near zero/dramatic reductions” for three participants but no progress for one participant” (Charlop-Christy & Haymes, 1996); “rapid reductions” for one participant, but “gradual” for the other two (Dyer et al., 1990); and “at or near zero levels” (Massey & Wheeler, 2000). It is imperative that the intervention selected matches the function of the target behavior, and the absence of effective assessment may (in part at least) explain the variability in the findings of these studies (Devlin, Leader, & Healy, 2009).

Seven of the studies carried out an FBA as part of the intervention. This group of studies evidenced the largest magnitude of target behavior reduction: four studies achieved reductions “at” or “near” zero levels (Braithwaite & Richdale, 2000; Foxx & Meindl, 2007; Frea et al., 2001; Grace et al., 1994). Some of these results were achieved rapidly or immediately, and the remaining reported dramatic reductions (Borrero et al., 2004; Horner et al., 1991). The success of the interventions incorporating FBA is encouraging, particularly as they are less time consuming and require less professional expertise than EFAs. Of these studies only three specified the method of assessment used which is unfortunate as this would add significantly to both functional behavioral assessment literature and to future clinical practice.

Eight of the studies conducted an EFA. This group of studies demonstrated a slightly less significant magnitude of reduction in target behaviors: three studies achieved reductions “at” or “near” zero level (Borrero et al., 2004; Ringdahl et al., 2009; Thompson et al., 1998) with decreases to “low levels” reported in three instances (Borrero & Vollmer, 2006; Carr,
Crighton, & Binkoff, 1980; DeLeon et al., 2000). A “rapid decrease” that was maintained at follow-up was reported by O’Reilly et al. (1999), and one study reported “moderate reductions” (Mueller et al., 2001). The success of the EFA in yielding a clear demonstration of the variables that relate to the occurrence of a target behavior is both a function of the complexity of that target behavior and the limited degree to which the EFA can simulate the natural contingencies in the environment that are maintaining the behavior. Not all results of experimental functional analysis yield clear results; sometimes no behavioral function is identified and the results are described as undifferentiated. In a recent review, Hanley, Iwata, and McCord (2003) reported that approximately 4% of functional analyses in the literature reported undifferentiated results.

Undifferentiated results were yielded by EFA in three of the studies in the present review; all of those studies then incorporated new information into subsequently modified functional analyses that identified clear behavioral functions. Ringdahl et al. (2009) conducted an experimental functional analysis on the aggressive behavior exhibited by an 18 year old woman with severe intellectual disability. The functional analysis yielded inconclusive results of the contingencies maintaining her aggressive behavior. Anecdotal reports from the staff claimed that the client would walk continuously in free time. This led the researchers to modify the functional analysis to evaluate whether access to walks consistently followed aggressive acts. A functional relationship was subsequently found between aggressive behavior and escape. The resulting treatment (DRA and FCT), based on the outcome of the modified functional analysis resulted in decreases in aggression to near zero levels. Another account of a successful modified functional analysis was provided by Thompson et al. (1998) in the assessment and treatment of aggression exhibited by a young boy with severe ID and PDD. An initial functional analysis produced inconclusive results and indirect methods were used to develop a second functional analysis which showed that one of the topographies of the aggression (chin grinding) persisted independent of social contingencies. It was concluded that the behavior was maintained by automatic reinforcement. Other topographies were maintained by attention and the treatment, consisting of FCT with extinction, reduced all forms of aggression except the chin grinding. However, when response blocking was incorporated within the intervention chin grinding was also reduced. Borrero et al. (2004) combined descriptive and functional analyses to investigate idiosyncratic variables maintaining the aggression of a 13 year old boy with moderate ID. Environmental enrichment, compliance training, non-contingent escape, and escape extinction reduced levels of aggression somewhat. However, a subsequent component analysis suggested that topography of instruction (i.e., “pleasant instruction”) was the effective component in the intervention. When this was identified and programmed for, aggression immediately decreased to zero levels with a corresponding increase observed in overall compliance. These studies illustrate the efficacy of combining the idiosyncratic information yielded from FBA with the scientific rigour of the EFA. All studies demonstrated achievement of zero or near zero levels of the target behavior when interventions were modified.

4.3. Intervention integrity

The integrity of an intervention is reflected in the functional assessments carried out, the “fit” of the intervention to the behavior, and social validity considerations. Rarely are procedures implemented without consideration of the function of the problem behavior; an assessment of the target behavior provides insight into how it can be changed for the better. The merits of EFA and FBA have been demonstrated above. Comprehensive assessment is more likely to result in an intervention that matches the behavioral function and this includes the use of preference assessments. The success of an intervention depends on the accurate identification and inclusion of potent reinforcers, and a variety of effective stimulus preference assessments can be utilized to measure the extent to which objects or activities may be reinforcing (Fisher et al., 1992; Roane, Vollmer, Ringdahl, & Marcus, 1998). Three of the studies utilized preference assessments as part of their intervention, and the two studies that combined this form of assessment with EFA achieved zero or near zero reductions in the target behavior (Borrero et al., 2004; Thompson et al., 1998).

Schwartz and Baer (1991) describe the term ‘social validity’ as the stakeholder’s satisfaction with a treatment and the viability of carrying out a treatment. Consideration of a contextual fit of a treatment is an essential component of a good intervention plan; an intervention that fits well into existing environmental schedules and structures and is judged to be socially acceptable will have greater success than a treatment that is viewed as harmful and that interrupts existing routines. The fundamental importance of social validity to the design of behavioral interventions was introduced by Wolf (1978) and has been repeatedly espoused as best practice in intervention (Cooper et al., 2007; Schwartz & Baer, 1991). In light of the theoretical significance of social validity it was surprising to observe that of the 18 studies none included a formal measure of social validity; while only one gave an informal indication that the parents were happy with the programme implementation and outcomes (O’Reilly et al., 1999). The informal reports of satisfaction were obtained by researchers directly asking stakeholders questions about the treatment. This however, can lead to false positive answers because the consumer may desire to please the researchers (Schwartz & Baer, 1991). Furthermore, in studies that incorporate formal measures of social validity, the actual magnitude of effect conferred by measures such as likert-type surveys has been questioned; they are likely to produce positive feedback, and tend to be limited to immediate stakeholders (Machalicek et al., 2007). Current methods of evaluating social validity are thus revealed as subjective, devoid of psychometric properties and yielding indiscriminately positive results (ibid).

4.4. Concluding remarks and future research

A comprehensive number of interventions have been evaluated for the treatment of aggressive behavior exhibited by individuals with developmental disabilities. These treatments have included antecedent manipulations and changes in
instructional context, reinforcement-based strategies, and behavior reduction strategies. This review suggests that the treatments implemented have effectively decreased or eliminated aggression in individuals aged 3–18 years. Many of the successful interventions share core features and distilling such core treatment variables may be helpful in determining more robust and effective treatments. Future research could focus on a combined quantitative and qualitative analysis of the data available as well as the replication of treatment success with procedures shown to be effective. This could be further facilitated by consideration of the limitations identified in the current review. Follow-up measures and generalization of treatment gains are rarely reported. Functional behavior assessments, when implemented are often not specified, and this can stagnate the evidence base of such procedures. Treatment effects are described in different and sometimes abstract terms e.g., “low rates”, and only some specify the rate of magnitude change. Measures of social validity are at best tokenistic and at worst indiscriminately positive. The operational definition of methodology and measures is an essential element of rigorous research design as it enables the replication of effects thereby yielding more robust and effective treatments.

References


