

Self-Management Procedures: A Comparison across the Autism Spectrum

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Abstract: Individuals with autism spectrum disorders (ASD) have difficulty generalizing learned behavior to varied environments with independence. This review of 24 empirical studies compares self-management as a systematic procedure for modifying one's own behavior, to increase target behaviors in students with either autistic disorder (AD) or high-functioning autism/Asperger's syndrome (HFA/AS). Twenty-four single subject research studies are included in the review comparing methodological, demographic, procedural, and outcome aspects of self-management studies between the two disorders under the umbrella of Pervasive Developmental Disorder (PDD). Results show that self-management procedures, regardless of components and age of child, are effective in teaching social, vocational, and communication skills, or decreasing restrictive and repetitive patterns of behaviors for individuals with a PDD. General conclusions are made on how the procedures are used differently across levels of functioning within the autism spectrum and PDD. This literature should encourage researchers and practitioners to continue interventions using self-management procedures with this population to broaden the research base and improve methodological adequacy.

Empirically based interventions geared toward students with a disability can increase independence and inclusion within schools and society (Cooper, Heron, & Heward, 2007). Federal mandates of least restrictive environments for students meeting eligibility criteria for special education services have increased inclusion of children within general education alongside their peers. According to Campbell (2006), "As children with autism continue to be educated alongside typically developing children, professionals must continue to understand how best to educate a child with autism in an inclusive educational setting" (p. 268). Students with an autism spectrum disorder (ASD) often have academic capabilities equal to peers but require direct instruction on behaviors to increase success in mainstreamed environments. Empirically-based strategies must be made available to practitioners for use to increase desired behaviors by individuals with ASD. Researchers

must also be persistent in their search for research-based, generalizable strategies for use in inclusive environments.

Autism Spectrum Disorders: A Brief History

Kanner (1943) described a peculiar condition he found across a number of children in a seminal clinical description (cited in Kanner, 1985). The first label of the disorder, infantile autism, was presented in this report. Here Kanner asserted that the 11 children observed had been labeled as "Emotionally Disturbed" or "Mentally Retarded" but displayed no characteristics of a slow learner nor fit the profile of emotional problems. The common characteristics encompassed across the case studies included a desire for aloneness, sameness, stereotypy, and exhibited functional communication and language delays (Rimland, 1985). Based primarily on the work of Kanner and others whom he influenced, the American Psychiatric Association included diagnostic criteria for autistic disorder (AD) for the first time in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, American Psychiatric Association, 1980).

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In 1944, an Austrian doctor, Hans Asperger, described children with what he called autistic psychopathy (Wing, 1981). Although the children spoke at a normal age, Asperger found impairment in social communication, similar to that described by Kanner. In 1981, Lorna Wing's translation of Asperger's report became widely known in the U.S. Wing explained that although the two conditions described by Kanner and Asperger appeared remarkably similar it was debated whether the disorders were "varieties of the same underlying abnormality or are separate entities" (Wing, 1981, p. 115). Discrepancies between clinical features based on Asperger's work, as translated by Wing, and Kanner's work led to discussion of a separate Autism Spectrum Disorder (ASD) subtype.

In 1994, the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV; American Psychiatric Association, 1994) established Asperger syndrome (AS) as one of five pervasive developmental disorders (PDD). According to diagnostic criteria, AS is differentiated from AD in that there is no delay in language or cognitive development, and no qualitative impairment in the communication domain. Witwer and Lecavalier (2008) showed that some children with AS, under diagnosis of the Autism Diagnostic Interview-Revised (ADI-R) and Autism Diagnostic Observation Schedule (ADOS) displayed core symptoms of autism while also having high full-scale intelligence quotients (IQ). Indeed, approximately 33–59% of children with ASD have cognitive deficits (< 70 IQ) according to the Center for Disease Control (2007), however, some children diagnosed with AD ultimately display fewer autistic behaviors while also having higher IQ and language skills (Ozonoff & Rogers, 2003). These children are commonly referred to as having high-functioning autistic disorder (HFA) (Macintosh & Dissanayake, 2004; Witwer & Lecavalier, 2008). A commonality between AS and HFA are impairments in social interactions, restrictive and repetitive patterns of behavior, interests and activities; and significant impairment in social, occupational and other areas of functioning (Thede & Coolidge, 2007). Students with HFA require a different educational treatment approach than persons with AD due to differences in cognitive ability. This

treatment approach would be more similar to interventions for children with AS. Since the distinction between AD and AS remains controversial, and some researchers assert that AS is a milder form of AD along a continuum (Campbell & Morgan, 1998), this review will refer to HFA as separate from AD and combine HFA and AS simply as HFA/AS.

Kanner (1943) purported that these children within his seminal clinical description of children with autism were not "mentally retarded" but displayed poor performance explained by motivational factors. While research over the years show below average full scale IQ for the nearly half of children with AD assessed through developmentally appropriate tests, it is now accepted that although cognition is a deficit for many people with autism, abilities are unusually scattered with nonverbal skills more advanced than verbal skills, with motivation playing an integral role in performance (Volkmar & Klin, 2005, p. 8). Definitions in the DSM-IV-TR (2000) classifying autism subtypes, AD and AS, are general guidelines of diagnosis for psychologists to determine appropriate interventions and educational placement. It is critical to examine empirically-based interventions that increase motivation and learning in individuals with ASD as well as differentiate effectiveness of interventions for those identified as AD versus HFA/AS.

Self-Management

Combining empirically-based interventions such as differential reinforcement procedures and naturalistic approaches (Pivotal Response Treatment [PRT], incidental teaching, etc.) has been shown to increase desired behaviors of people with ASD (Koegel, L., Koegel, R., Harrower, & Carter, 1999; Ozonoff, Rogers, & Hendron, 2003; Scheuermann & Webber, 2002). Not only does motivation play into the performance of people with ASD, these individuals can learn or adopt strategies that will assist in their education, employment, and social life with increased self-awareness (Myles & Southwick, 1999). In accordance with PRT, motivation is critical to learning by children with ASD, as is self-regulation and autonomy. Neurotypical children exhibit the ability to generalize newly learned behaviors to novel

situations and, unlike children with ASD, they are responsive to environmental cues that lead to their independence. Koegel et al. identify self-management as a pivotal area of intervention for individuals with ASD. They assert that children on the autism spectrum can be taught to discriminate between appropriate and inappropriate behaviors through self-management instructional programs.

Self-management strategies are designed to teach individuals to engage in actions that change or maintain a particular behavior (Shapiro, 1981). Within the self-management paradigm, a specific aspect of a behavior is targeted and individuals are taught to record the target behavior when it occurs (Cole & Bambara, 1992). Self-management procedures typically comprise any combination of self-monitoring (also known as self-observation), self-recording, self-evaluation, and self-reinforcement or self-punishment. Self-monitoring requires the individual to determine the occurrence or non-occurrence of target behaviors, which often include self-questioning. For example, at the end of a given time period, the student may ask, "Am I paying attention?" A judgment about the occurrence or nonoccurrence of the target behavior is made as the individual records the answer determined from self-monitoring by physically marking these results on a data collection form, taking a token, or using a counting device (self-recording). The self-evaluation component combines goal setting and determining achievement of the goal. Lastly, self-reinforcement, or self-punishment, is the contingent self-delivery of an earned reward, or with self-punishment, the self-withholding of the reinforcer. This differential reinforcement component is implemented to increase the likelihood of students engaging in the target behavior in the future under self-management procedures.

Cooper et al. (2007) identified a number of advantages of self-management over other behavioral interventions including (a) minimal teacher management along with more time to teach, (b) greater generality of behavior change by the student, and (c) application of strategy in varied environments. Executive function can be thought of as the cognitive system that controls other cognitive processes

including set-shifting, inhibition of responses, self-monitoring, and planning (Happé, Booth, Charlton, & Hughes 2006). Self-reflection and self-monitoring are specific deficits in executive functioning by individuals on the autism spectrum. Also, many inappropriate behaviors emitted by students with ASD are difficult to control because of poor outcomes (i.e., peer disapproval). Self-management can serve as a consequence by restricting stimulus conditions for undesirable behavior. For example, a classic study by Koegel, Koegel, Hurley, and Frea (1992) used self-management with four male participants diagnosed with autism who were unresponsive to teacher and parent verbal initiation. Each participant had receptive and expressive language at or above the 3-year-old level and exhibited behavior difficulties (e.g., tantrums). A multiple baseline design across settings and participants combined with a withdrawal for two participants was used to evaluate the effects of self-observation, self-recording, and self-reinforcement. Yes and no questions were created prior to the study related to children's regular activities. Difficulty levels were controlled. During training in the clinic, researchers modeled appropriate answers to questions and modeled how to record the response on a wrist counter. Researchers followed the same protocol for unacceptable answers to questions and modeled not counting on the counter. The wrist counter was worn by children during role-play sessions. At this point, children were reinforced after every correct response, i.e., CRF. Prompts were faded after three hours of treatment. Self-management procedures were implemented at school, in the community, and in home environments. Data were collected during all sessions for appropriate and inappropriate responses, disruptive behavior, and accuracy of self-recording. Interobserver agreement data were collected throughout the study. It was concluded that self-management procedures were successful in increasing social responses by students with autism in varied environments as well as required minimal teacher presence. Researchers also found a collateral reduction in disruptive behaviors due to possible increased communication skills and a decreased aversion during social interaction.

Lee, Simpson, and Shogren (2007) pub-

lished a meta-analysis of the effects of self-management for students with autism. This report analyzed effect size of single subject research on self-management procedures used to increase target behavior published between 1992 and 2001. They found that self-management procedures have an empowering effect on students' ability to control behavior. They concluded that self-management procedures will facilitate inclusion in the general curriculum, as well as increase students' self-determination, thus improving their quality of life.

General education teachers report high acceptability of self-management procedures, preferring student monitoring to teacher monitoring because it frees teachers to perform other instructional and related activities (Prater & Hogan, 1992). Agran, Snow, and Swanner (1999), however, reported that self-monitoring instruction is limited in applied settings and is provided by only 35% of special educators. At this point, it is imperative that self-management research be analyzed to determine which dimensions of the interventions were effective and with what types of individuals so educators will be to ascertain the effectiveness of self-management procedures with students on the autism spectrum.

While it is not a common practice in educational settings, experts in the area of ASD advocate for use of self-management procedures (Wilkinson, 2005). The primary purpose of this literature review is to examine self-management procedures as an intervention for individuals ages 3–25 with ASD from January 1994 to December 2008. This review compares demographics, procedures, and results of self-management interventions found in the literature between individuals with AD and HFA/AS. Lastly, this review identifies dimensions of self-management programs that need further research.

Method

To identify empirical studies investigating the effectiveness of self-management procedures for students with AD and HFA/AS published over the last 15 years, three types of search methods were used (Wolery & Lane, 2010). An electronic search was conducted through ERIC, Academic Search Complete, Science

Direct, and PsycINFO using the advanced search method with key terms “self-management,” “self-monitoring,” “self-recording,” “self-reinforcement,” “autism,” and “Asperger syndrome.” The text was searched in each article identified with related keywords. Secondly, a hand search of common journals publishing articles describing interventions for the population of interest was conducted. These included the *Journal of Applied Behavior Analysis*, *Journal of Autism and Developmental Disorders*, *Focus on Autism and Developmental Disorders*, *Education and Training in Developmental Disabilities*, and *Behavioral Disorders*. The third method for searching literature was an ancestral search of references cited in articles chosen through electronic and hand search. In consideration of which studies to accept for this review, criteria included: (a) at least one participant in the study was identified as having a pervasive developmental disorder (PDD) including AD, AS, or pervasive developmental disorder—not otherwise specified (PDD-NOS); (b) intervention included an independent variable using a procedure that required a student to take responsibility for behavior through any one or more self-monitoring, self-recording, and self-reinforcement procedures; (c) studies were published in a peer-reviewed journal between January 1994 and December 2008; and (d) a single-subject research design (Gast, 2010) was used to evaluate intervention effectiveness.

Results

The search resulted in 16 studies published in 11 different journals that targeted behaviors of students with AD and eight studies from five different journals that targeted behaviors of student with HFA/AS using self-management procedures: *Journal of Applied Behavior Analysis* (1), *Journal of Autism and Developmental Disorders* (2), *Behavioral Disorders* (1), *Behavioral Interventions* (3), *Education and Training in Developmental Disabilities* (1), *Education and Training in Mental Retardation and Developmental Disabilities* (4), *Journal of Emotional and Behavioral Disorders* (1), *Focus on Autism and Other Developmental Disabilities* (2), *Journal of Intellectual and Developmental Disability* (1), *International Journal of Disability* (1), *Journal of Development and Education* (1), *Journal of Positive Behavior*

TABLE 1

Descriptors of Self-Management Studies for Individuals with AD

<i>Authors</i>	<i>SS design</i>	<i>Gender</i>	<i>CA</i>	<i>Diagnosis/ Functioning</i>	<i>Setting</i>	<i>Behavior</i>
Agran et al. (2005)	Multiple baseline across participants	2/males	14 15	Autism + MIID (NS)	General education classroom	% steps of directions followed
Coyle & Cole (2004)	A-B-A for two participants A-B-A-C-A for one participant	3/males	11 9 9	Autism + ID-DSM-IV	Special education classroom	Time off-task
Embregts (2002)	A-B-A-B	1/male	16	PDD + ADHD + MIID-DSM IV	Residential Setting	Frequency of Appropriate behavior & Inappropriate behavior
Ganz & Sigafoos (2005)	Changing Criterion Design across two participants	2/males	20 19	Autism + MoID-School eval.	Self-contained vocational school	# of tasks completed in 5 minutes
Hughes et al. (2002)	Multiple baseline across participants	1/male	19	Autism + SID-(NS)	Inclusive high school in hall	% of correct responses
Kern et al. (1997)	Multiple baseline across settings with a withdrawal imbedded within the first setting.	1/male	14	Autism + 6 grade levels below-(NS)	Rehabilitation hospital	% time with inappropriate vocalizations
Mancina et al. (2000)	Multiple baseline across settings	1/female	12	Autism + MoID-School eligibility	Special education classroom	% occurrence of vocalizations
Newman et al. (1995)	Multiple baseline across participants	3/males	14 16 17	Autism + MID to MoID-DSM-III-R	ASD after-school program	# transition identified
Newman et al. (1996)	A-B-C-A-C across three participants	3/males	teen	Autism + ID-Independent evaluation	Integrated school in separate room	% appropriate conversation

Interventions (3), *Journal of Developmental and Physical Disabilities* (2), *Autism: The International Journal of Research and Practice* (1), and *School Psychology Quarterly* (1). Tables 1 and 2 summarize pertinent descriptors of each study including: research design, participant gender, chronological age, diagnosis, setting, and target behavior. Five studies included individuals with a disability other than AD or HFA/AS. For these studies, research methodology, de-

mographic, procedural, and outcome variables are examined for students with an ASD.

Single Subject Research Methodology

The merits of studies can be evaluated within the context of single subject research designs. Withdrawal designs provide a demonstration of experimental control by withdrawing an intervention and returning to a previous baseline condition showing a replication of effect

TABLE 1—(Continued)

Authors	SS design	Gender	CA	Diagnosis/ Functioning	Setting	Behavior
Newman et al. (1997)	Multiple baseline across participants (possible noncontingent)	2/males 1/female	12 4 6	Autism+ ID- DSM-IV	ASD after-school program ASD Preschool Bedroom	% intervals with target behavior -out of seat -nail-flicking
Newman et al. (2000)	Multiple baseline across participants	2/males 1/female	6/PS 6	Autism+MID- DSM-IV	Evan and Nancy- ASD school Dan- home	Degree of variations in individual targeted behaviors
Pierce & Schriebman (1994)	Multiple baseline across behaviors replicated across three participants	3/males	8 9 6	Autism+MoID to SID- Outside agency	Clinic room	% of 10-s intervals engaged in on-task behavior & inappropriate behavior
Reinecke et al. (1999)	A-B-A-B across three participants	3/males	4 4 3	Autism+MID/ MOID (NS)	Preschool (NS)	Social and play skills in the form of "sharing"
Shabani et al. (2001)	Multiple baseline across two behaviors.	1/male	12	Autism + ID +ADHD-(NS)	Univ. therapy room	% of intervals rocking
Strain & Kohler (1994)	Multiple baseline across participants and settings.	3/males	4 5 3	Autism+NS- DSM-III	Integrated preschool Small room Home (2)	% of intervals engaged in social interaction
Todd & Reid (2006)	Changing Criterion Design across three participants	3/ males	16 20 15	Autism+ID- DSM-IV	TEACCH classroom	Distance snowshoed/ walked/jogged

Legend: PS = preschool; ID = intellectual disability; MID = mild intellectual disability; MoID = moderate intellectual disability; SID = severe intellectual disability; DSM = Diagnostic and Statistical Manual; ADHD = Attention Deficit/Hyperactivity Disorder; NS = not specified; SM = self-management procedures

(Gast & Hammond, 2010). Four (17%) self-management studies for individuals with ASD used a withdrawal design. Changing criterion designs evaluate shaping behaviors that are currently in an individual's repertoire providing evidence of experimental control through small increases toward a criterion (Gast & Ledford, 2010). Changing criterion designs were used in three (12.5%) of the studies. The most common designs to evaluate self-management treatment packages with individuals with ASD were multiple baseline and multiple probe designs. Their designs show experimental control by first collecting pre-intervention

data across three or more tiers, then staggering the introduction of the intervention across participants, behaviors, or conditions. Five studies (21%) used a multiple baseline across behaviors to evaluate experimental control. Three staggered intervention implementation across settings (12.5%). Multiple baseline design across participants was used in nine studies (37%).

Procedural Fidelity

Billingsly, White, and Munson (1980) introduced the importance of measuring proce-

TABLE 2

Descriptors of Self-Management Studies for individuals with HFA/AS

<i>Authors</i>	<i>SS design</i>	<i>Gender</i>	<i>CA</i>	<i>Diagnosis/ Functioning</i>	<i>Setting</i>	<i>Behavior</i>
Apple et al. (2005)	Multiple baseline across students	2//males 1//female	5	HFA/AS (NS)	Integrated preschool during free play time	# of compliments during 15 min. interval
Barry & Singer (2001)	Multiple baseline across behaviors (not concurrent)	1//male	10	HFA (NS)	Home	% of intervals in which replacement behaviors occur
Delano (2007)	Multiple baseline across responses	1//male	12	AS DSM-IV-TR	Conference room in research office	Total words written, action words, describing words, revisions, quality rating
Lofin et al. (2008)	Multiple baseline across participants	3//males	9 10 10	ASD DSM-IV ADOS	Public ES lunch and recess periods	% of intervals of initiation, interaction, and repetitive motor behavior
Morrison et al. (2001)	Multiple baseline across behaviors	1//female 3//males	11 10 13 11	AS and HFA DSM-IV	Separate room within school for free-time activity	% of intervals with target initiations of requests, comments and shares
Mruzek et al. (2007)	Changing criterion design replicated across participants	2//males	9 10	ED+ADHD & probable AS HFA (NS)	Sp. Ed. classroom for ASD in rural public elem. school	Mean daily % of successful hours (no rule violations)
Palmen et al. (2008)	Multiple baseline across students	7//males 2//females	17-25	ASD with no cognitive impairments DSM-IV	Therapy room for baseline and training and Natural tutorial conversation locations for SM	% Correct questions during a tutorial conversation and response efficiency
Wehmeyer et al. (2003)	Multiple baseline across participants	1//male	13	HFA (NS)	Public H.S. General Ed. classroom	Percent of intervals of inappropriate touching and inappropriate verbalization

Legend: PS = preschool; ID = intellectual disability; MID = mild intellectual disability; MoID = moderate intellectual disability; SID = severe intellectual disability; DSM = Diagnostic and Statistical Manual; ADHD = Attention Deficit/Hyperactivity Disorder; NS = not specified; SM = self-management procedures

dural fidelity. As interventions become more complex and more teacher and practitioners are conducting research in applied settings, it is important that interventions are implemented as planned (Gast, 2010). Only 25% ($n = 6$) of the studies provided evidence of procedural fidelity. Half of those took procedural fidelity data during all conditions (Delano, 2007; Loftin, Odom, & Lantz, 2008; Newman, Buffington, & Hemmes, 1996); one study took procedural fidelity data during training (Agran et al., 2005); two looked at fidelity of procedures during the student self-management phase (Apple, Billingsley, & Schwarz, 2005; Embregts, Didden, Huitink, & Schreuder, 2002).

Demographic Variables

Self-management intervention across gender, age, degree of cognitive impairment, and training setting were analyzed. Tables 1 and 2 provide a summary of these demographic variables under "Gender," "CA," "Diagnosis/Functioning," and "Setting" for each study between AD and HFA/AS respectively.

Autistic Disorder (AD). Thirty-two male participants and three female students with AD received an intervention with components of self-management. The interventions using self-management procedures for this population have been conducted across the spectrum of age and grade levels. Within the preschool age range of 3 to 6, four studies included eight participants (Newman, Tutigian, Ryan, & Reinecke, 1997; Newman, Reinecke, & Meinberg, 2000; Reinecke, Newman, & Meinberg, 1999; Strain & Kohler, 1994). Four studies included nine elementary age children, 6 to 11 years old (Coyle & Cole, 2004; Newman et al., 1997; Newman et al., 2000; Pierce & Schreibman, 1994). Seven middle school aged students, 12 to 15 years old, were participants in five different studies (Agran et al., 2005; Embregts et al., 2002; Kern, Marder, Boyajian, Elliot, & McElhattan, 1997; Mancina, Tankersley, Kamps, Kravits, & Parrett, 2000; Newman et al., 1997; Newman et al., 1995; Shabani, Wilder, & Flood, 2001) and four studies implemented self-management as an intervention for eleven high school age adolescents (Ganz & Sigafoos, 2005; Hughes et al., 2002;

Newman et al., 1995; Newman, Buffington, & Hemmes, 1996; Todd & Reid, 2006).

Criteria for inclusion included participant diagnosis of autism with a cognitive impairment. From the 16 studies reviewed, seven reported using criteria for diagnosis based a version of the Diagnostic and Statistical Manual (Coyle & Cole, 2004; Embregts et al., 2002; Newman et al., 1995; Newman et al., 1997; Newman et al., 2000; Strain & Kohler, 1994; Todd & Reid, 2006). Fourteen of the 16 articles reported specifically that the participants had an intellectual disability but only Newman et al. (1996) reported that the students had a severe shortage of appropriate conversation using short one word utterance and were non-responsive to direct statements and questions, and Kern et al. (1997) reported the participant performing six or more grade levels below.

Ten participants with AD received self-management intervention at a separate school or facility for children with a disability. Four students were taught self-management in a clinic and two children participated only at home. Ten students were receiving the treatment in a public school but received intervention in a separate special education class. Five participants received treatment in an inclusive general education environment with two of those participants' intervention also conducted at home.

High-functioning autism/Asperger syndrome (HFA/AS). In the eight studies, 20 male and four female students with HFA/AS received an intervention with components of self-management. Interventions using self-management procedures for this group have been conducted across the spectrum of age and grade levels. One study included three preschool children ages 4 to 5 years old (Apple et al., 2005). Three studies used self management as treatment for a total of six elementary school children ages 9 to 10 (Barry & Singer, 2001; Loftin et al., 2008; Mruzek, Cohen, & Smith, 2007) and two studies were carried out with six middle school aged students ranging from 10 to 13 years old (Delano, 2007; Morrison, Garcia, Kamps, Parker, & Dunlap, 2001; Wehmeyer, Yeager, Bolding, Agran, & Hughes, 2003). Lastly, the study by Palmen, Didden, and Arts (2008) implemented self-manage-

ment with nine young adults ranging in age from 17 to 25 years.

None of the individuals identified as HFA/AS were identified as having a cognitive impairment and only three reported using criteria for diagnosis based a version of the Diagnostic and Statistical Manual (Delano, 2007; Loftin et al., 2008; Palmen et al. 2008) to identify the student with a PDD. The settings for intervention varied between inclusive classrooms (Apple et al., 2005; Loftin et al.; Wehmeyer et al., 2003), separate room for therapy (Delano; Morrison et al., 2001; Palmen et al.), a special education class (Mruzek et al., 2007), and in the home (Barry & Singer, 2001).

Procedural Variables

Procedural variables analyzed included components of single subject design, procedural fidelity, data collection, self-management packages, support materials used, and targeted autistic-like behaviors. While Tables 1 and 2 show single subject design and dependent measures, Tables 3 and 4 display target skill domain and self-management package components within each study. Common components of most self-management packages included: (a) a timer to alert a student to self-assess, (b) a self-recording form for a student to document the assessment, and (c) a desired reward as reinforcement to maintain the behavior. As these materials are typical for most self-management programs, they are not analyzed across studies. Although each study included an independent variable requiring a student to participate in the management of his/her behavior as part of the intervention, several other components were part of treatment packages.

AD. Target behaviors to be modified and maintained using self-management have been classified into four categories for this review based on prominent characteristics of AD. Four studies addressed self-management to decrease restrictive, repetitive, and stereotyped behavior patterns (Embregts et al., 2002; Kern et al., 1997; Mancina et al., 2000; Newman et al., 1997; Shabani et al., 2001). Five studies attempted to increase social skills including play and social interaction (Newman et al., 2000; Reinecke et al., 1999; Strain & Kohler, 1994; Todd & Reid, 2006). Only

two studies targeted communication skills. Hughes et al. (2002) recorded the percentage opportunities per session in which a participant said, "Thank you," to customers during a cookie sales event, while Newman et al. (1996) provided treatment to increase appropriate conversation. Finally, four studies focused on school/vocational skills including off-task behavior (Coyle & Cole, 2004), following directions (Agran et al., 2005), task completion (Ganz & Sigafoos, 2005), transitioning (Newman et al., 1995), and daily living skills (Pierce & Schreibman, 1994).

Self-management packages included self-monitoring, self-recording, and self-reinforcement in five of the 16 studies (40%). Five studies did not include self-recording but only required students to self-monitor and self-reinforce. Agran et al. (2005), Kern et al. (1997), and Newman et al. (1996) excluded self-reinforcement using solely self-monitoring and self-recording. Lastly, Hughes et al. (2002), required participants to self-monitor alone. Seven studies incorporated a token economy as reinforcement. Coyle and Cole (2004) and Embregts et al. (2002) used video to enhance the procedure through video modeling desired behavior and video self-recording respectively. Two studies used peer training as a part of social skill intervention while the participants self-monitored (Reinecke et al., 1999; Shabani et al., 2001). Pictures were incorporated as prompts in Coyle and Cole (2004) and Pierce and Schreibman (1994). No studies of self-management within the AD population used contracts as a component of the package.

Data were systematically collected during each study with half ($n = 8$) using an interval recording procedure. Seven studies (44%) used event recording procedures to measure behavior change. Kern et al. (1997) used total duration of occurrence recording procedure to calculate percent of time a student engaged in inappropriate vocalizations. In self-management programs, interventionists often collect data on dependent measures differently than student self-recording. Eight researchers (50%) used a different method of data collection. Of those that used the same recording procedures five (31%) used event recording and three (19%) quantified behavior changes with interval recording procedures. Agran et al.

TABLE 3

Comparison of Self-Management Treatment Package and Skill Addressed—AD

	<i>Self-Management Components</i>									<i>Behavior Addressed</i>			
	<i>Self-monitoring</i>	<i>Self-recording</i>	<i>Self-reinforcement</i>	<i>Self-initiation</i>	<i>Peer Training</i>	<i>Contract</i>	<i>Token Economy</i>	<i>Pictures</i>	<i>Video</i>	<i>Restrictive Behavior Patterns</i>	<i>Social Skills</i>	<i>Communication</i>	<i>School/Vocational Skills</i>
Agran et al. (2005)	x	x											x
Coyle & Cole (2004)	x	x	x					x	x				x
Embregts (2002)	x	x	x				x		x		x		
Ganz & Sigafoos (2005)	x	x	x				x						x
Hughes et al. (2002)	x											x	
Kern et al. (1997)	x	x		x						x			
Mancina et al. (2000)	x	x	x	x						x			
Newman et al. (1995)	x		x	x									x
Newman et al. (1996)	x	x										x	
Newman et al. (1997)	x		x				x			x			
Newman et al. (2000)	x		x				x				x		
Pierce & Schriebman (1994)	x		x	x				x					x
Reinecke et al. (1999)	x		x		x		x				x		
Shabani et al. (2001)	x	x	x							x			
Strain & Kohler (1994)	x		x		x		x				x		
Todd & Reid (2006)	x	x	x				x				x		
Percentage	100%	56.25%	75%	25%	12.5%	0%	43.75%	13.3%	12.25%	25%	31.25%	12.5%	31.25%

(2005) and Hughes et al. (2002) did not incorporate self-recording into their self-management treatment package. Embregts et al. (2002) required students to record their behavior using a 20 s to 30 s whole interval recording procedure, while the data were col-

lected using a 15 s partial interval recording procedure. Kern et al. measured treatment effects using total duration recording of vocalization. Three studies evaluated behavior change with interval recording while students self-recorded frequency of the target behavior

TABLE 4

Comparison of Self-Management Treatment Package and Skill Addressed—HFA/AS

	Self-Management Components									Behavior Addressed			
	Self-monitoring	Self-recording	Self-reinforcement	Self-initiation	Peer Training	Contract	Token Economy	Pictures	Video	Restrictive Behavior Patterns	Social Skills	Communication	School/Vocational Skills
Apple et al. (2005)	x	x	x						x		x		
Barry & Singer (2001)	x	x	x			x					x		
Delano (2007)	x							x					x
Loftin et al. (2008)	x	x	x		x					x			
Morrison et al. (2001)	x	x	x		x		x				x		
Mruzek et al. (2007)	x		x	x		x							x
Palmen et al. (2008)	x	x	x									x	
Wehmeyer et al. (2003)	x	x	x					x			x		
Percentage	100%	75%	87.5%	12.5%	25%	25%	12.5%	25%	12.5%	12.5%	50%	12.5%	25%

using event recording (Newman et al., 1996; Pierce & Schriebman, 1994; Reinecke et al., 1999).

HFA/AS. Restricted interests, social skills, communication, and academic skills were the four behavior categories targeted for those with HFA/AS characteristics. The majority of the studies using self-management for students with HFA/AS targeted social skills including complimenting (Apple et al., 2005), interacting appropriately with a baby sibling (Barry & Singer, 2001), initiating (Morrison et al., 2001), and decreasing hugging (Wehmeyer, 2003). Loftin et al. (2008) addressed restrictive behavior patterns (e.g., rocking) and Palmen et al. (2008) addressed communication. Delano (2007) and Mruzek et al. (2007) addressed school related skills.

Seven of the eight investigations (88%) used all three components of self-management: self-monitoring, self recording, and self-

reinforcement. Delano (2007) was the only study that did not incorporate a self-recording component; rather here the student monitored his following of structured editing process for writing and self-reinforced upon completion. Other materials were incorporated into the self-management packages. Mruzek et al. (2007) and Barry and Singer (2001) utilized a contract as a goal-setting component of self-management. Two of the studies reviewed included simple visual cues to self-manage a behavior (Newman et al., 1996; Palmen et al., 2008), while Morrison et al. (2001) used games and social skills charts to guide the students as a group and laminated monitoring charts on which students self-recorded. Similarly, Palmen et al. provided a flow chart to guide student conversations and a simple chart to self-record positive and negative attempts of questioning in the conversation. Two studies included peer training to support

the self-management program (Loftin et al., 2008; Morrison et al.).

Researcher dependent variable measurement systems were the same as students with HFA/AS self-recording in three (31%) of the eight studies (Apple et al., 2005; Delano, 2007; Mruzek et al., 2007). The remaining studies required students to self-record using event recording where the researcher used interval recording procedures.

Outcomes

Self-management procedures were successful in increasing target behaviors for students with ASD.

AD. Self-management procedures increased target behaviors for students with AD. A total of 16 research studies met the original search criteria. All 35 participants using a version of self-management improved and maintained targeted skills. Four of the studies formally collected social validity (Wolf, 1978) data using questionnaires and rating forms. The participant with AD in Hughes et al. (2002) made noticeable significant gains in saying "thank you" to customers using self-management as perceived by a peer and teacher. Both peer and teacher also confirmed that they enjoyed being around the student with AD more after the positive effects of self-management. Kern et al. (1997) reported that school staff perceived self-management as easy to implement and effective in a short duration of time while not being distracting to students. Embregts et al. (2002) reported that video feedback and student self-management was a non-obtrusive and non-confrontational method of changing behavior. Staff reported that self-management produced substantial changes in aggressive behavior of four of five individuals including the student with autism.

HFA/AS. Self-management procedures resulted in increased target behaviors and independence in treatment for 23 of 26 participants. Three out of nine participants in the Palmen et al. (2008) study made gains of 4 to 12 percent of appropriate questions and responses made during a conversation. Otherwise, the range of percent increase of baseline mean to intervention mean in this study was 23 to 96. The independent variable in Palmen

et al. was a game format with individuals using a flowchart to self-observe and move tokens on a game board as a form of self-recording. Intervention could not be staggered across participants as they were all involved in the intervention simultaneously. Although the self-management intervention was replicated across two more groups of three, it was considered a nonconcurrent multiple baseline decreasing the internal validity (Gast, 2010). Palmen et al. was the only study on self-management for adolescents with HFA/AS. All other studies involved 4- year-old to 13-year-old children with HFA/AS.

Five of the eight studies using self-management to change behavior in HFA/AS reported social validity. Loftin et al. (2008) used IEP's to determine target behaviors; teachers and parents gave positive reviews of the goals of treatment, procedures and outcomes. Apple et al. (2005) collected social validity information using parent and teacher reports indicating a perception of increase in general social skills by three of four participants and generalization to nontraining settings after self-management to increase complement-giving behaviors. Palmen et al. (2008) reported self-management as a socially valid intervention to increase conversation skills in adolescents with HFA/AS. Both student participants and coaches found the training effective and acceptable, while meaningful increases in conversation generalized to the natural contexts. Wehmeyer et al. (2003) stated that teacher perceptions of student progress using the self-management were more than expected. Barry and Singer (2001) found replacing the aggressive behavior of a child with autism toward an infant sibling socially valid. Self-management changed potentially dangerous behaviors and parents reported that siblings had developed a good relationship. This indicates that future research might examine improved impact on sibling relationships on parents and other family members.

Discussion

The belief that all individuals have the right to direct their own lives through the choices they make has been emphasized in Individuals with Disabilities Improvement Act (IDEIA, 2004). Self-determination skills indicate a more suc-

cessful transition to adulthood (Wehmeyer et al., 2003). As a critical component of self-determination, self-management should be taught to students with an ASD. As implied by literature on self-determination (Wehmeyer, 1999), research in the area of learning disabilities and behavior disorders shows that techniques to increase self-management are successful for changing behavior in higher functioning individuals with well-established verbal language. The current review indicates that individuals with HFA/AS effectively used self-management procedures to address deficits related to the core characteristics of ASD. Furthermore, added technologies were helpful adaptations to typical self-management procedures (e.g., tokens, pictures, video) to make the interventions viable with lower-functioning individuals with AD.

Children with ASD specifically have been found to have difficulty “directing, controlling, inhibiting, maintaining, and generalizing behaviors required for adjustment both in and outside of the classroom without external support and structure from others” (Wilkinson, 2008, p. 151). Attention should be drawn to the fact that self-management procedures focus on behaviors already in a student’s repertoire, behaviors where differential reinforcement and other interventions alone have not been sufficient to maintain the behavior in inclusive settings. An examination of the methodological adequacy, demographics, and procedures found in 24 single subject research design studies was used to evaluate self-management procedures for teaching skills to students with an ASD. Data show that across participants, settings, or behaviors, self-management interventions resulted in improvements in desired behaviors.

Future Research

While self-management procedures have been used across all age groups for youth, there are gaps in the literature. Tables 3 and 4 display skills addressed using self-management by individuals with AD and HFA/AS. Analyses of these data suggest that future research should focus on the effectiveness of self-management procedures for increasing communication skills in people with ASD. It is also essential that researchers begin to focus on specific

components of self-management programs to evaluate each component’s relative contribution to program effectiveness. Most importantly, future research should evaluate methods for taking self-management procedures into the homes of children with ASD. Studies in the present literature review indicate that students tend to remain reliant on self-management procedures and materials. Researchers need to investigate making the materials and equipment as unobtrusive as possible so they can be generalized to home and community environments and not draw attention to the individual. Examining the use of a Personal Digital Assistant (PDA) as a tool for self-management for individuals with ASD has potential. For individuals with HFA/AS, PDA’s require little training while enabling technologically adept students to emit target behavior and become more independent (Ferguson, Myles, & Hagiwara, 2005; Myles, Ferguson, & Hagiwara, 2007). Further research on the use of PDA’s across age and cognitive levels of individuals on the spectrum is needed.

Limitations of Self-management Research

Effects of self-management procedures as an intervention to increase target behaviors, independence, and generalization of skills for people with autism are limited due to confounding variables. Controlling for various components of the self-management package is difficult. As seen in Tables 3 and 4, each study included various self-management components. It is difficult to make comparisons of effectiveness when treatment packages vary, and it would be premature to say that any specific component of self-management is the primary cause of behavior change. Also, most of self-management procedures were implemented with an existing positive reinforcement procedure. Although some studies attempted to control for reinforcement as a confounding variable by applying noncontingent reinforcement before self-management, the contingency of reinforcement itself then became confounding. Was contingent reinforcement simply more powerful than noncontingent reinforcement?

Procedural fidelity data and social validity of treatment were limited in use across the

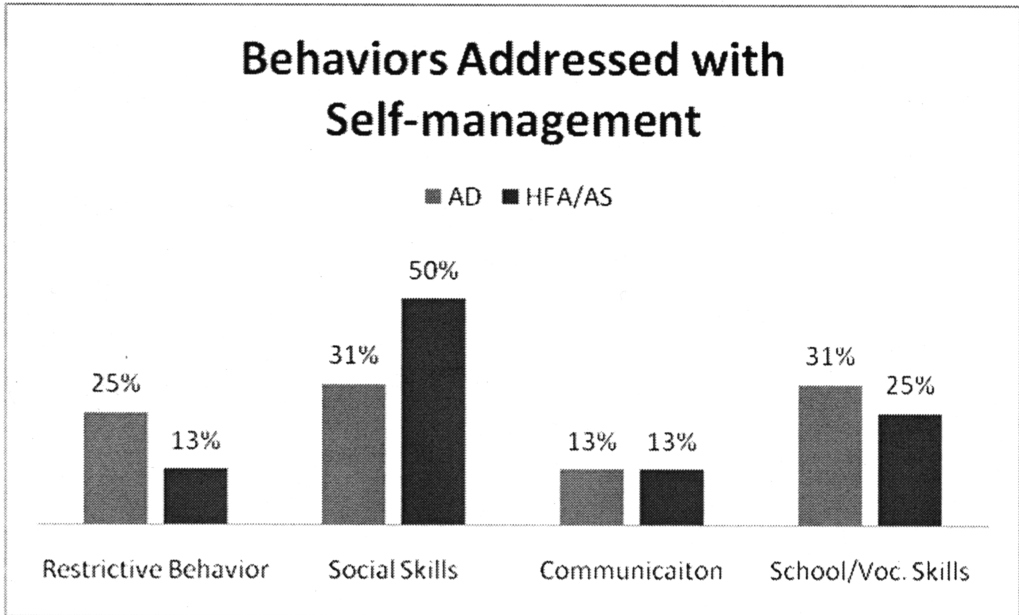


Figure 1. Comparison of percent of studies that used self-management procedures to address core deficits of ASD and school or vocational skills and a second comparison between AD and HFA/AS.

24 articles reviewed on self-management as an intervention. Procedural fidelity issues may not have been of primary concern since self-management is “driven” by the student, not the practitioner. In terms of social validity, self-management procedures have been well established throughout the research over many years (Cooper et al., 2007). Eleven of the 24 articles reviewed included a measure of social validity specific to the self-management procedure and effect implemented. The results of such measures were all positive in regard to the acceptability and feasibility of the procedures.

Generalization of the treatment into the home was seldom assessed with home implementation in four out of 24 studies (17%) with only four of 35 individuals with AD (11%) and one of 24 individuals with HFA/AS (4%). Educators should be encouraged to teach parents to use interventions at home to increase skills taught in school (Heflin & Alberto, 2001).

Research to Practice

There is an increasing awareness that students with an ASD require an intervention approach

that addresses not only academic and vocational skills, but one that addresses the three core deficits that characterize the disorder. Figure 1 compares ASD core characteristic addressed by self-management studies included in this review. The defining characteristic impacting independence in individuals with ASD is social impairment (Heflin & Alaimo, 2006). For this reason it is not surprising that self-management has been widely used to increase social skills, however, data show that an individualized self-management program may be effective in behavior change across all ASD core characteristics.

Self-management has three primary components: self-monitoring, self-recording, and self reinforcement/punishment. Self-monitoring was basic to all interventions reviewed. Tables 3 and 4 show that combinations of self-monitoring and (a) self-recording (b) self-reinforcement or (c) both, while incorporating additional components (e.g., peer training, contracts, token economy, pictures, and video), were individual to each study. Social validity data supported the individualized nature and meaningful outcomes these treatment packages provided. Teachers and par-

ents should feel confident that, when appropriately implemented and individualized for the student needs, self-management can be an effective, unobtrusive intervention strategy within the least restrictive environment.

Self-management interventions are easy to design, simple to use, potentially portable, and practical for teachers. It has been asserted that self-management is a pivotal skill that can generalize behaviors, support autonomy, and produce behavioral improvements across various contexts for children with ASD (Koegel et al., 1999). Based on this idea and current literature presenting self-management as a viable procedure, practical use of self-management procedures is recommended for fostering independence and inclusion of people with ASD.

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