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eHearsay

AUTISM

OSLHA
Unlocking Communication
Ohio Speech-Language-Hearing Association

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Ohio Speech-Language-Hearing Association (OSLHA)

MISSION:
Empowering our members by providing opportunities for professional development, advocacy, and leadership development necessary to foster excellence in the services provided to individuals with communication and related disorders.

HISTORY:
Founded in 1945, the Ohio Speech-Language-Hearing Association (OSLHA) is a professional association representing speech-language pathologists and audiologists throughout Ohio. OSLHA is recognized by the national American Speech-Language-Hearing Association (ASHA) as the official professional organization for Ohio. OSLHA members provide services for the evaluation and rehabilitation of communicative disorders. Members work in a variety of settings including: clinics, health care facilities, hospitals, private practice, schools, and universities. Members must abide by the OSLHA Code of Ethics.

OSLHA
Unlocking Communication
Ohio Speech-Language-Hearing Association

eHearsay: Statement of Purpose

eHearsay, the electronic journal of the Ohio Speech- Language- Hearing Association, is designed to address the professional development needs of the state association.

Issues are may be developed around specific themes and can include invited papers, research articles, review, tutorial, research forum, letter to the editor, clinical focus/forum or viewpoints.

eHearsay is published as a web journal annually. Continuing education credits will be available for each issue.

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In this Issue:
Autism Spectrum Disorder

Our understanding of Autism Spectrum Disorder (ASD) is continually expanding. It can be an overwhelming task to remain current and evaluate the research and materials available to treat those with ASD. Speech-language pathologists (SLP) responsible for supporting and increasing the social communication ability of individuals with ASD must search for relevant, evidenced based practices, integrate information from basic research, and considered how this knowledge applies to an individual with ASD within the contexts of school and family. The contributors to this edition of eHearsay have set our course.

Schea Fissel provides valuable information regarding changes to the DSM-V criteria for ASD and what this means for the SLP. In doing so, Schea also reviews the new diagnosis "social communication disorder." Certainly, this information will have an influence on our practice, as our work too will inform future understanding of severity of ASD and how to best engage in differential diagnosis. As we consider the severity rating for ASD, and criteria specific to restrictive repetitive behavior, the observable behavioral dimension of ASD is evident. Dr. Prizant helps us to better understand this often time confusion aspect of ASD by explaining how awareness of an individual's capacity to regulate emotional states is central. Dr. Barry Prizant provides us with evidence based, yet practical, understanding of how to assist an individual to effectively manage emotional states based on the S.C.E.R.T.S. model he developed (Prizant, Wetherby, Rubin, Laurent & Rydell, 2006).

The role of the SLP in utilizing strategies to enhance emotional regulation can assist the person with ASD achieve a state of readiness for learning by decreasing maladaptive behaviors. The submission by Dr. Diane Williams then becomes most relevant. She provides a comprehensive overview of neurocognitive research specific to the individual learning style of a person with ASD. Her contribution goes beyond a review of basic research literature to application with solid strategies to support learning. Her paper along with that of Dr. Howard Shane and colleagues gives us the most current review and understanding of the language learning style of those with ASD. Dr. Shane and colleagues applied research, reported in this issue, highlights how integrating visual strategies and technology can assist those with ASD in processing information, comprehending language, and thereby demonstrating more engaged, focused behavior.

Dr. Shahriari's paper reviews another contemporary treatment model, Relationship Development Intervention (RDI, Gutstein, 2009). He emphasizes the value of creating a responsive social context in supporting dynamic thinking. His submission reminds us that although ASD is a neurocognitive disorder, human development, including cognition, is influenced by the quality of the social interaction.

Together, these authors have helped us to pull it all together. Autism is a neurocognitive disorder that influences emotional regulation, language learning, and social interaction. Although we may initially view the maladaptive behavior that meets criteria as restrictive repetitive behavior as a confusing entity, the content of this issue emphasizes that to be effective we must understand the unique learning style of those with ASD along with their social-emotional needs. Doing so, we can simultaneously address the emotional, social and language learning needs of this population. As a result, our work can embrace the premise that individual with ASD are developing human beings.

I am grateful to these authors for their contributions, to the peer reviewers for the valuable input, and to Laurie Sheehy, executive editor of eHearsay, for her guidance and support. My hope is that the content of this edition will encourage all of you in your work to enhance the quality of life for those with ASD and their families.

Lisa R. Audet, PhD, CCC-SLP

Use of Augmented Input to Improve Understanding of Spoken Directives by Children with Moderate to Severe Autism Spectrum Disorder

Rebecca Remner, Melissa Baker, Christian Karter, Kevin Kearns & Howard Shane

Abstract

The purpose of this investigation was to explore whether augmented input in the form of static and dynamic scene cues improved language comprehension of prepositional phrases for moderately to severely impaired children with an autism spectrum disorder (ASD). The study is an extension of Schlosser et al. (2013) that reported a significant improvement in participants' ability to follow prepositional commands when auditory directives were augmented with scene cues. Scene cues are a novel form of augmented input and Schlosser et al. (2013) is the singular research on the benefits of such visual cues to improve prepositional phrase understanding. Accordingly, the present study was intended to replicate the findings of the facilitative effects of scene cue usage on language performance in individuals with an autism spectrum disorder. Using a within-subjects design involving ten children with an ASD, the present study found that scene cues (both static and dynamic) improved comprehension of prepositions. Using different subjects and stimuli, findings were comparable to those of Schlosser et al. (2013), lending further evidence as to the potential benefits of augmented input (scene cues) as a means of improving language comprehension for children with moderate to severe ASD.

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Learning Objectives

1) State the efficacy of adding visual static cues and dynamic cues to instruction directives for children with Autism Spectrum Disorder (ASD).
2) Discuss the need for assessment in the area of visual representation to determine which types of visuals the individual learner best comprehends.
3) Explain the limitations of verbal presentation of materials and repetition alone for children with ASD.

It is well documented that individuals with an autism spectrum disorder (ASD) have difficulty understanding spoken language (Kover et al., 2014; Mechling & Hunnicut, 2011; Swensen, Kelley, Fein, & Naigles, 2007). It can also be argued that receptive skills are an area too often ignored in interventions for this population. Often, it is observed that these individuals learn routines associated with directions and, in taking advantage of environmental and routine-based cues, appear as if they understand (Hall, McClannahan, & Krantz, 1995; Mechling & Gustafson, 2009; Naigles, Kelty, Jaffrey, & Fein, 2011). For example, if a child is told repeatedly to put on shoes as part of a morning routine, that directive may eventually be followed. However, a novel shoe-related directive such as "put your shoes in the locker" may lead to confusion and misunderstanding because this directive has not been introduced as part of an everyday routine. These responses indicate this student may not understand the *language* of the direction, but rather has learned to perform as the result of the routine and behavioral expectation.

The present research explores the effectiveness of two types of visual supports for individuals with ASD: static and dynamic scene cues. Shane and Weiss-Kapp (2008) describe *static* scene cues (SSCs) as images that portray relevant concepts and their relationships in context through pictorial form such as line drawings or photos, while *dynamic* scene cues (DSCs) are images that portray relevant concepts and their relationships in context through full motion video clip. Schlosser et al. (2013) reported that scene cues significantly improved comprehension of prepositional directives.

The specific purpose of this research was to examine whether the use of scene cues will improve the ability of individuals with ASD to follow one-step directions. Consistent with the findings of Schlosser et al. (2013), we hypothesized that the participants would demonstrate greater accuracy in following spoken prepositional directives (e.g., put the X in the Y) when they were paired with static or dynamic scene cues - as compared to verbal directives alone.

Method

Participants

Ten subjects between the ages of 9 years, 10 months and 20 years, 9 months participated in this study. All subjects are students enrolled in a specialized school for children with ASD in Northeast Ohio. Table 1 contains the demographic information for the 10 subjects. All have a primary diagnosis of ASD, and exhibited moderate to severe overall deficits with a co-occurring profound receptive vocabulary deficit (Receptive One-Word Picture Vocabulary Test 4th Edition; ROWPVT-4), which is likely reflective of an overall profound impairment in receptive language skills. The 10 subjects' receptive age equivalency ranged from one year, four months to three years, ten months (see Table 1).

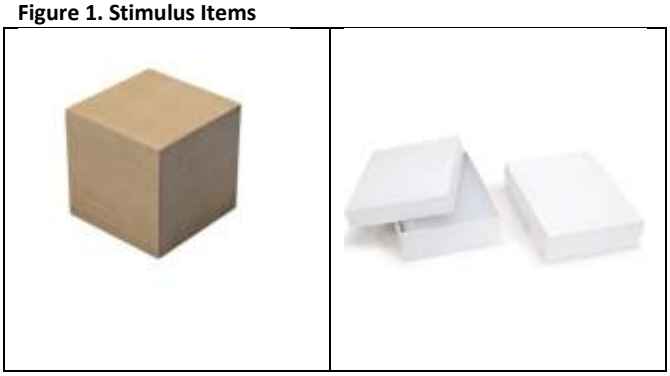
Table 1. Demographics and results of Receptive One Word Picture Vocabulary Test-4th Edition (ROWPVT-4)

Subject #	Age	Receptive Language Level	Age Equivalent on ROWPVT	Diagnoses
1	10.5	Profound Deficit	2.8	Autism
2	20.9	Profound Deficit	2.11	Autism Emotional Disability Cognitive Disability Adaptive Behavior Delay
3	11.3	Profound Deficit	3.4	Autism
4	10.5	Profound Deficit	2.5	Autism
5	13.8	Profound Deficit	< 1.0	Autism Seizure Disorder Infantile Cerebral Palsy, unspecified Moderate Mental Retardation Autoimmune Disorder Developmental Delay
6	16.4	Profound Deficit	3.6	Autism
7	18.11	Profound Deficit	3.10	Autism
8	17.2	Profound Deficit	2.7	Autism
9	19.9	Profound Deficit	1.4	Autism
10	9.10	Profound Deficit	3.2	Autism Complete/Partial Seizure Disorder

Screening to determine eligibility occurred across two days. Eligibility criteria included:

1. Recognition of the two objects used as stimuli during the experimental conditions. These included a block and two boxes. (See Figure 1).
2. Inability to independently follow verbal directions containing the prepositions in, on, under, in front, in back, next to, and between as demonstrated by manipulating a box and block.
3. Ability to imitate gross motor directions viewed from a video clip presented on an iPad independently with 80% accuracy (e.g., touch your nose, stomp your feet, wave your hand).

Figure 1. Stimulus Items



Materials

Stimuli consisted of a half-inch wooden block, and two white jewelry boxes measuring 3 1/2 inches in length by 3 ½ inches in width and 1½ inches deep. An Apple iPad (full size iPad 2) was utilized to deliver both the static and dynamic scene cues for each preposition. Figure 1 depicts the stimulus items. The wooden block and the boxes were selected for this study because of a decreased likelihood they would promote play-like behavior, they could be manipulated, and all target prepositions could be demonstrated by placement of the block in relation to the boxes. This procedure differs from Schlosser et al. (2013) where toy figurines were used to elicit responses from the subjects. The iPad was chosen as the method to deliver the visual supports due to the increased motivation and attention students with ASD have when instructed using technology (Shane & Albert, 2008).

Procedures

Seven early developing prepositions were studied across three conditions using a within – subjects research design. Subjects were expected to follow directions requiring manipulation of the stimulus objects in relation to each other. The directions were presented under three conditions: 1. Verbal speech; 2. Verbal speech accompanied by a static scene cue (i.e., verbal plus picture); and, 3. Verbal speech accompanied by a dynamic scene cue (i.e., verbal plus video demonstration).

A certified speech-language pathologist (SLP) with 10 years of clinical experience, but unfamiliar with the participants served as the experimenter. During the experimental phase, all subjects were tested twice to determine stability of responding. Test 1 and Test 2 were administered during two separate thirty-minute sessions and completed within one week of one another, with one exception: Subject 2 (Table 1) required shortened sessions and increased frequency of reinforcement (small edibles delivered after two minutes of attending to task) in order to complete testing, resulting in two 15-minute sessions for both administrations of the test. The order of administration of the prepositional directions (Table 2) was randomized prior to testing. This fixed order was then administered to all 10 subjects.

Table 2: Prepositional directions

1	Put the Block in the box
2	Put the Block under the box
3	Put the Block on the box.
4	Put the Block in between the box.
5	Put the Block in front of the box.
6	Put the Block behind the box.
7	Put the Block next to the box.

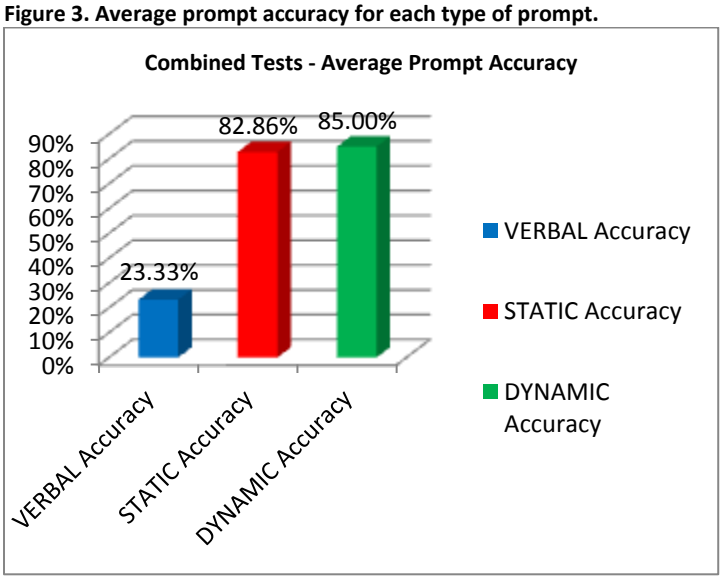
During the test sessions, the subjects and the experimenter sat side by side at an age-appropriate table with the iPad positioned on an *Otter Box* stand 18 inches from and directly in front of the subject. Each experimental session included an initial greeting, the establishment of the reinforcement that would be given at the conclusion of the session, and the use of a visual token board. To ensure each subject could reliably identify the two manipulatives, the experimenter completed an identification test of all materials by giving the verbal directives “give me the box” and “give the block” prior to testing. When the subject successfully identified the materials, the experimenter placed the boxes side by side on the table between the subject and the iPad. The box to the left was placed with the open side up and the box on the right was

Figure 2: Sequence of still shots representing the dynamic scene cue for "put the block behind the box". The last still shot represents the static scene cue for the same directive.

placed with the open side down. As noted, seven prepositions were assessed (including in, on, under, between, in front, in back, next to - see Figure 3). Each preposition was examined according to three conditions 1. Verbal direction alone (e.g., "Put the block on the box."); 2. Verbal direction paired with a static scene cue that displayed the correct response; and 3. Verbal direction paired with a dynamic scene cue of the correct response (Figure 2 provides a sample of images representing the dynamic cue progression with the last image representing the static scene cue). It should be noted that in the full motion dynamic scene cue the directives were embedded in the video clip rather than the experimenter speaking the direction. Directions were given in the same order for all subjects. The subject's attention was gained by asking, "Are you ready?" and gesturing with a hand sweep over the test material.

The verbal directive (e.g., "put the block *on* the box") was given and the examiner handed the block to the subject to complete the direction. A correct response was scored when the subject positioned the items correctly to reflect the preposition within 10 seconds. The response was also scored correct if the subject self-corrected the position of the items. If an incorrect response was given or the subject did not respond within 10 seconds, the experimenter repeated the verbal direction giving a second opportunity for the subject to respond correctly before moving on to the next condition (verbal direction paired with the static scene). When the verbal condition was completed, the examiner gave the verbal direction paired with a static scene cue presented on the iPad. If the subject was correct, the examiner moved to the next condition. If the subject was incorrect, the examiner repeated the verbal direction paired with the scene cue before moving on to the next condition. Next, the examiner gave the verbal direction paired with the dynamic scene cue presented with the iPad. If the subject was correct, the examiner moved to the verbal direction of the next preposition. If the subject was incorrect, the examiner repeated the verbal direction paired with the dynamic scene cue before moving on to the next preposition. After each response, the examiner re-set the materials to their original presentation. The block was given to the subject after each direction was presented to ensure the attention of the subject. When each static and dynamic scene cue was presented, the examiner directed the subject's attention by providing a gestural point in the direction of the screen while giving the verbal direction.

Figure 3. Average prompt accuracy for each type of prompt.



The data from Subjects 4 and 6 were randomly chosen for the reliability testing. A second SLP viewed a video recording of both testing sessions for both subjects. This observer independently scored responses using the same criteria described above to determine a correct or incorrect response. An inter-rater reliability score of 98% across the four tests was obtained.

Research Design

A within-subjects design was used for this investigation in which all subject served in each treatment condition thereby maximizing the opportunity to detect true differences in the experimental conditions.

Results

As shown in Figure 3, the verbal presentation of directives containing prepositions (delineated in blue) yielded an average accuracy rate of 23.3% across all subjects. The presentation of directives accompanied by a static scene cue (delineated in red) yielded an average accuracy rate of 82.8%. Accompanying a command with a dynamic scene cue (delineated in green) yielded an average accuracy rate of 85%. The mean score of the Verbal only condition (x=23.20) is significantly lower than the mean for the Verbal Plus Dynamic (82.7) and the Verbal Plus Static (x=85.1) conditions at the 0.05 level (t = 0.272; df=9; two tailed test). The means of the latter two conditions are not significantly different at the 0.05 level (Dynamic: t= 6.708; df =9; Static: t=7.06; df=9; two tailed) (See Table 3). Although the overall differences between the static and dynamic conditions were not found to be statistically significant, there were four subjects (1, 3, 4.10) who consistently performed better when presented with the Dynamic Scene Cues than the Static Scene Cues. The number of verbal presentations across conditions is presented in Figure 4. It reveals that across subjects and tests, there was an average of 49.85 repetitions given when listening to the verbal direction, 11.43 verbal repetitions when the static visual was presented, and 10.43 verbal repetitions when the dynamic visual was presented. Accordingly, the addition of a repetition did not improve accuracy of following verbal directives, a finding that demonstrates that increased verbal presentation alone does not improve performance.

Table 3. Means and Standard Deviations

Condition	N	Minimum	Maximum	Mean	Standard Deviation
Verbal-Only	10	2.000	60.000	23.200	15.768
Verbal-Plus-Dynamic	10	14.000	100.000	82.700	28.048
Verbal-Plus-Static	10	14.000	100.000	85.100	27.898
Valid N (list wise)	10				

Figure 4. Number of repetitions given by prompt type vs. accuracy score.

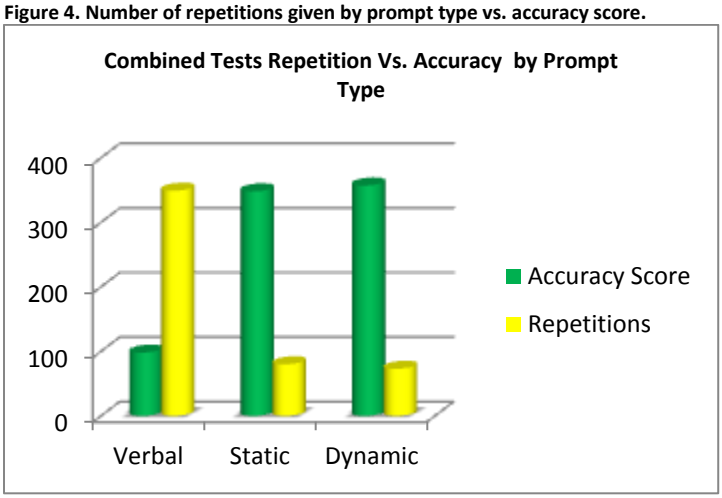
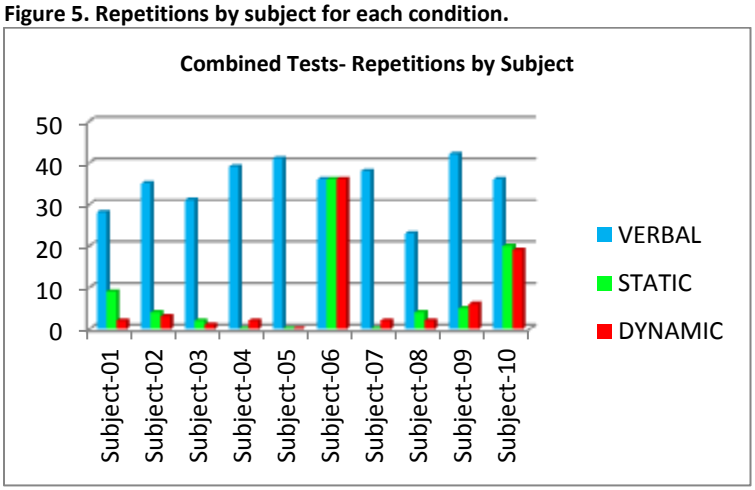


Figure 5 shows that 9 out of 10 subjects (with the exception of subject 9 who responded the same regardless of condition) required more repetitions when presented with verbal information alone compared to the presentation of visual information.

Figure 5. Repetitions by subject for each condition.



Discussion

The results of this study indicate that visual supports in the form of scene cues, whether static or dynamic, improve the ability of individuals with moderate to severe ASD to follow verbal directives that include a locative preposition. Results thus support the hypothesis that persons with moderate to severe ASD respond more accurately to verbal instructions when the directive is accompanied by visual supports. Results replicate the findings of Schlosser et al. (2013), lending further support to the use of visual scene cues as a way to improve comprehension of prepositions. Similar

improvement in comprehension was found across the two studies, emphasizing the need to supplement speech for some individuals with moderate to severe ASD in order to bring about improved comprehension. Prepositions are a difficult concept for many with ASD to acquire (Swensen et al., 2007); however, a scene cue can be viewed as a conceptual learning aid that allows a prepositional phrase to be understood. While the improved understanding does require the addition of an aided form of instruction, one can argue that improved comprehension and independence offsets the inconvenience of creating and presenting the scene cue itself.

These findings suggest several practical implications. First, SLPs should routinely consider examining how accurately an individual follows a spoken directive versus a directive accompanied by scene cue. To accomplish this, a set of visual tools, similar to the ones used in this study, could be incorporated into clinical settings and used in systematic ways as part of a comprehensive, clinically relevant evaluation. For example, the Monarch School for Autism is creating a diagnostic tool kit to systematically compare a child's comprehension of speech alone versus speech augmented with scene cues. The kit, known as The *Preposition Action Concept Evaluation* (*PACE),* is currently under construction. In addition to providing a way to systematically examine prepositional understanding, this tool will also examine scene cues usage for improving the understanding of verbs.

Another practical implication of this investigation is that the mere repetition of a directive as a way to improve comprehension is an ineffective instructional strategy. Results indicated that the repetition of a spoken directive without the addition of a visual support did not lead to improve understanding. To provide greater opportunity to facilitate comprehension, clinicians should provide more visual supports, in the form of cues that visually clarify the essential aspects contained within the verbal directive. Based on a trend of improved performance in the DSC condition versus the SSC condition, it appears that for some individuals, movement is a critical ingredient in getting the benefit provided by a scene cue. As a practical matter this suggests the necessity of a video based cue which in turn points to the need for some form of technology (e.g., mobile device, tablet, or computer screen) to deliver the cue, as opposed to a static cue that can be delivered by a low tech photo, tablet or computer screen.

Further Implications

With mobile technology so readily available and increasingly accessible to the larger population (McNaughton & Light, 2013), the use of scene cues has further potential to be more socially acceptable and widely utilized. Early use of visuals was considerably more cumbersome. For instance, Goossens, Crain, and Elder (1994) examined communication displays worn by the clinician on a Velcro apron, limiting the ability to edit and add necessary icons "on the fly" (Shane & Weiss-Kapp, 2008). Modern wearable technology, such as the Apple Watch, offers the potential for using static or dynamic scene cues inconspicuously in a multitude of different environments and contexts to provide the wearer the support needed in what Schlosser et al. (2015) refer to as *JIT* (*Just in Time)* delivery. We are currently exploring the use of such wearable technology and whether it can be as effective in the delivery of a scene cue through an iPad or other mobile technology.♦

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eHearsay: Electronic Journal of the Ohio Speech-Language Hearing Association

Good Assessment Drives Good Intervention: Practitioner Considerations for DSM-V Changes

Schea Nicole Fissel

Abstract

In 2013, the DSM-V (American Psychiatric Association, 2013a) put forth new diagnostic criteria for autism spectrum disorder (ASD). These changes included: a) revision of the primary "triad of symptoms" (i.e., impairments in language, communication, and behavior) to a dyad of impairments in social-communication and behavior; b) the addition of three severity modifiers based on level of required support; c) the addition of specifiers to establish a profile of comorbid conditions, developmental profile, and cognitive status; and d) the addition of the new diagnostic category, "social communication disorder" (SCD). While these changes have considerably altered practitioners' diagnostic conceptualization of ASDs, the associated effect on service provision is less clear. A narrative review of research from 2013 through the present suggests that changes to the DSM-V will effect assessment, early intervention and prevalence rates of ASD. This paper will review research related to these areas of change and provide practitioners with a roadmap for navigating the shifting clinical landscape of service provision for those with ASD and SCD. This paper will conclude by summarizing methods for connecting differential diagnosis and severity modifiers with prescription of evidence-based interventions.

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Nonfinancial – Has published and presented in areas of Autism Spectrum Disorders, literacy, augmentative/alternative communication and telepractice.

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Learning Objectives

1) State two key features of differentially diagnosing social communication disorder (SCD)
2) State two key features of severity levels and specifiers for Autism Spectrum Disorder (ASD)
3) Discuss the primary effects of DMS-V changes on early assessment and identification of young children with ASD

◆ ◆ ◆

Good assessment drives good intervention. The purpose of accurate, differential diagnosis is to assign a label (reflecting etiology) intended to then guide efficient, effective service provision for individuals and their families (American Psychiatric Association, 2013b). It stands that the more accurate and differential the diagnosis, the earlier and more individualized the intervention provided. In 2013, the Diagnostic and Statistical Manual, now in its Fifth Edition (DSM-V; American Psychiatric Association, 2013a), put forth revisions to the diagnostic criteria for autism spectrum disorder (ASD), by uniting earlier diagnoses of autistic disorder, childhood disintegrative disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), and Asperger Syndrome (AS) as a spectrum of neurodevelopmental disorders. The umbrella term of Pervasive Developmental Disorder (PDD) to capture all five diagnoses was dropped and one term, Autism Spectrum Disorder was adopted. Changes to the DSM-V also encompassed the addition of "specifiers" and severity levels for ASD, the introduction of criteria for significant impairment in adaptive functioning, as well as the introduction of the diagnosis, *social communication disorder* (SCD), with guidelines for its differentiation from ASD. The American Psychiatric Association (2013b) reports that these revisions reflect an improved understanding of autism, and are aimed at accurate, differential diagnosis for earlier and more individualized interventions.

Yet for all of these diagnostic revisions and improvements, ASD is still diagnosed on the basis of behavioral characteristics in the absence of clear etiological biomarkers (Lai, Lombardo, Chakrabarti, & Baron-Cohen, 2013). Research has not yet identified the cause or causes of ASD. Therefore, the resulting assignment of *good* (evidence-based) *interventions* following an earlier, more accurate and differential diagnosis, is still not a clear-cut process. Existing literature examining or reviewing the potential influence of the DSM-V changes suggests that

practitioners may encounter challenges associated with: a) changing prevalence rates of ASD; b) differential diagnosis of SCD; c) assessment and early identification of ASD; d) using new severity levels and specifiers; and e) integrating differential diagnosis with severity modifiers to guide the design and intensity of individualized, evidence-based intervention for persons with ASD (Posar, Resca, & Visconti, 2015). It is this last point that is most meaningful for practicing speech-language pathologists. As one of several core professionals who serve children with ASD and their families beyond diagnosis, practitioners need to know how to better connect earlier and more accurate diagnosis, with better interventions.

This article will provide a brief update on the effects of key changes in the DSM-V from 2013 through the present. Following this review, the focus will shift towards methods for connecting differential diagnosis and severity modifiers with prescription of evidence-based interventions; so that *good assessment can drive good intervention*. This article concludes by summarizing primary themes, and discussing future directions.

Prevalence Rates of ASD

Whenever significant changes are made to diagnostic criteria, naturally occurring consequences in prevalence rates potentially evolve. The most commonly referenced or suggested ramification of the new DSM-V criteria in the literature is on prevalence rates of ASD (Kulade, Smaldone, & Cohn, 2014; Maenner et. al., 2014; Ohashi et al., 2015; Turygin, Matson, Adams, & Belva, 2013; Young & Rodi, 2014). Research and field tests conducted prior to the release of the DSM-V in May of 2013 demonstrated high inter and intra-site reliability (≥ 80%) (Schendel et al., 2012), high test-retest reliability (Regier et. al., 2013), high sensitivity (91%) (Huerta et. al., 2012), and high rates of specificity (0.53) (Huerta et. al., 2012). However, research conducted after the release of the DSM-V (in 2013) has identified concerns that the new criteria may exclude higher functioning individuals who would have qualified for diagnosis under the DSM-IV-TR criteria (Kulade, Smaldone, & Cohn, 2014; Maenner et. al., 2014; Ohashi et al., 2015; Turygin, Matson, Adams, & Belva, 2013; Young & Rodi, 2014). The research reviewed below summarizes the methods, results and limitations of research conducted on the influence of the DSM-V criteria as compared to the DSM-IV-TR criteria for assigning a diagnosis of ASD.

An important research initiative to better understand the prevalence of autism and developmental disability was launched in 2008 by the CDC entitled *Study to Explore Early Development* (SEED; Schendel et al., 2012). This initiative recruited families with children, ages 2-5, who presented with: a) ASD; b) possible ASD; c) another developmental disability (DD); or d) without a developmental disability (typically developing). The primary focus of this initiative included examination of the developmental characteristics of physical status and behavior, identification of comorbid health conditions, and identification of early risk factors related to ASD and DD. In 2014, Maenner and colleagues examined the effects of the DSM-V criteria on prevalence rates, by applying the new criteria to SEED samples obtained in 2006 and 2008 (including 6577 individual cases). Results of the Maenner et al. study conducted using the SEED data revealed that only 81.2% of children previously diagnosed with a PDD under the DSM-IV-Text Revision (TR; American Psychiatric Association, 2000) qualified for a diagnosis of ASD under the new DSM-V criteria.

Kulage, Smaldone, and Cohn (2014) conducted a meta-analysis of 14 studies comparing diagnosis rates under the DSM-V criteria as compared to the DSM-IV-TR criteria. Results of their study indicate decreases in the number of ASD diagnoses when comparing DSM-V criteria to the PDD subgroup diagnosed under DSM-IV-TR criteria. Similarly, Ohashi and colleagues (2015) examined the assignment of ASD diagnoses using DSM-V criteria as compared to DSM-IV-TR for 68 children ages 6-15. Of those diagnosed with PDD, only 68% of these cases would qualify for a diagnosis of ASD using DSM-V criteria. Young and Rodi (2014) corroborate these results, finding that only 57% of those meeting criteria for PDD would meet criteria for ASD under the new guidelines. These studies suggest that a significant number of persons may not qualify for a diagnosis of ASD under the 2013 DSM-V criteria. Although the children did not meet criteria for identification, it is important to note that the researchers indicated these children would still likely require intervention.

Turygin, Matson, Adams, and Belva (2013) provide insight into behavioral and symptomology differences across differentially diagnosed groups of children with ASD (qualifying under DSM-IV-TR or DSM-V criteria) as

compared to a control group. Given that persons diagnosed with ASD are at an increased likelihood for diagnosis of comorbid psychological impairment and/or impairments in adaptive behavior, these researchers wanted to know how results obtained on behavioral and symptomology measures might differ between DSM-IV-TR and DSM-V groups. Participants were child and adolescents ages 2-16 (*N* = 144), assigned to one of three groups: a) those who qualified for a diagnosis of ASD under DSM-V criteria (*N* = 44); b) those who qualified for a diagnosis of autism under DSM-IV-TR criteria (*N* = 22); and c) control group of peers (*N* = 76). Participants were assigned to the DSM-IV-TR group if they had an existing diagnosis of autism under DSM-IV-TR guidelines, but did not meet criterion for ASD under DSM-V criteria.

The purpose of the Turygin et al. (2013) study was to determine if groups differed on standardized behavioral measures drawn from the Behavior Assessment System for Children – Second Edition (BASC-2) (Reynolds & Kamphaus, 2004). The BASC-2 yields composite scores for internalizing problems (e.g., acting in behaviors including anxiety, depression), externalizing problems (e.g., acting out behaviors including hyperactivity, aggression), adaptive behaviors (e.g., functional behaviors of independence such as study skills, leadership, social skills), as well as overall behavior symptoms index (BSI): which includes an atypicality scale and a withdrawal scale. The atypicality scale reflects behaviors that are odd or idiosyncratic, while the withdrawal scale is thought to reflect social avoidant behaviors (Reynolds & Kamphaus, 2004). Between group differences were determined via multivariate analysis of variance (MANOVA). Post hoc univariate tests were used to determine which scores differed between groups.

Results of that study revealed significant differences on measures of externalizing behaviors, adaptive behavior and BSI of the BASC-2 between ASD groups as compared to the control group. Differences between ASD groups (DSM-IV-TR as compared to DSM-V) revealed significant differences on BSI atypicality scale, and externalizing index of aggression. Atypicality and aggression were found to be highest in the DSM-V cohort as compared to the DSM-IV-TR cohort, and higher in the DSM-IV-TR cohort as compared to the control group. No differences were found between the three groups on measures of internalizing behaviors.

The Turygin and colleagues' study (2013) suggests that the DSM-V group represents a significantly more impaired group in areas of atypicality and aggression as compared to the DSM-IV-TR cohort. Because those participants in the DSM-IV-TR group represented those who had an existing diagnosis of autism, but would not qualify for a diagnosis of ASD under DSM-V criteria, these authors caution that the new criteria may exclude a less severe, but still significantly impaired cohort. Turygin and colleagues call for additional research examining the characteristics and needs of persons who would qualify under the DSM-IV-TR diagnosis of autism, but who would not be diagnosed with ASD under the current criteria of the DSM-V.

Provision of a SCD Diagnosis

In addition to diagnostic changes to ASD criteria in the DSM-V, the APA (2013) also introduced the new diagnosis of social communication disorder (ASD), classified under the Neurodevelopmental Disorders domain. Characteristics of the SCD diagnosis include impairments in verbal and non-verbal social-communication, but without the presence of stereotyped behaviors. Although SCD can be diagnosed with other DSM-V communication disorders (e.g., language disorder), SCD may not be diagnosed with ASD (American Psychiatric Association, 2013). The utility of the new SCD diagnosis as opposed to an ASD diagnosis was studied prior to the release of the DSM-V. Evaluation of test-retest reliability, convergent validity, as well as clinical utility/feasibility of DSM-V ASD and SCD diagnoses were conducted via field tests for both adult and child/adolescent participants across multiple sites, with results published in January of 2013 (Regier et al., 2013). Regarding estimated prevalence, when the SCD diagnosis was available; one sampling site reported slightly decreased prevalence rates of ASD under DSM-V criteria as compared to DSM-IV-TR criteria (Regier et al., 2013). Although these field tests report only preliminary estimates of prevalence, it may come that individuals who do not qualify for a diagnosis of ASD under DSM-V criteria, do qualify for a diagnosis of SCD.

However, Swineford and colleagues (2014) in their review of the research implications of this new diagnosis, suggest that the introduction of SCD comes with its own obstacles. The most significant obstacles identified include: a) methods for ruling out a diagnosis of ASD when diagnosing SCD; b) examining the nature of overlap between SCD and other DSM-V

communication disorders (e.g., language disorder); c) the limited research examining the trajectory and prognosis of SCD; d) the validity of the diagnosis itself; and e) lack of empirically tested assessment or treatment guidelines for SCD.

Norbury (2014) highlights similar concerns in her review of clinical implications for practitioners regarding the addition of the SCD diagnosis. Norbury (2014) indicates that well-designed assessments for the diagnosis of SCD are lacking, and that SCD may overlap with other disorders. Certainly, both of these concerns present challenges to clinicians charged with accurate diagnosis. To further complicate utility of this diagnosis, SCD cannot be identified until later in childhood (i.e., 4-5 years old) when prerequisite language skills have been given the opportunity to develop, and a diagnosis of ASD can be ruled out (Swineford et al., 2014).

The limited commentaries and research articles available regarding the reliability, efficacy, and trajectory of the diagnosis of SCD presents challenges to clinicians responsible for accurate diagnose and intervention of those with ASD or communication impairments. Preliminary field tests of ASD and SCD suggest the provision of SCD may capture individuals potentially excluded from a diagnosis of ASD under DSM-V criteria, but this remains to be seen (Reiner et al., 2013). Provision of an SCD diagnosis may not fully capture the needs of this less impaired population, and may overlap with diagnoses of differing etiology (e.g., language disorder; Norbury, 2013; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014). Applied research is clearly needed to develop valid, reliable assessments for the diagnosis of SCD, to identify clear clinical phenotypes and developmental trajectories of SCD, and to develop evidence-based treatments for those diagnosed with SCD (Norbury, 2013; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014).

Early Identification of Children with ASD

In addition to requiring symptomology impairments (in social-communication and behavior) for a diagnosis of ASD, the DSM-V now additionally requires meeting criterion for *significant impairment* in adaptive functioning (American Psychiatric Association, 2013). Zander and Bolte (2015) sought to determine if the new DSM-V criterion, now requiring a significant impairment in adaptive functioning, might affect the diagnosis of ASD in very young children. Specifically these authors examined if children meeting criterion for ASD under DSM-V criteria for symptomology, would also meet the criteria for significant impairment in adaptive functioning. Children (*N* = 127) ages 20-47 months, participated in this study. Diagnoses of ASD under DSM-V criteria for symptomology were determined via the Autism Diagnostic Observation Scale – Second Edition (ADOS-2) (Lord et al., 2012) and the Autism Diagnostic Interview - Revised (ADI-R) (Rutter, LeCouteur, & Lord, 2003). The Vineland Adaptive Behavior Scales – Second Edition (VABS-2) (Sparrow, Cicchetti, & Balla, 2005) was administered in order to determine the degree of impairment (i.e., mild, moderate, severe) in adaptive functioning. Results demonstrated that of the participants who met criteria for ASD under the new DSM-V criteria for symptomology (as determined by the ADOS-2/ADI-R), 88% of these met the impairment criteria (when a mild-impairment cut-off was used); 69% met the impairment criteria when a moderate impairment cut-off was used; and 33% met the impairment criteria when a severe impairment cut-off was used. These results suggest that not all young children who meet criteria for ASD based on symptomology, would meet the impairment criterion, and therefore would not be assigned a diagnosis of ASD. The results of this study suggest the DSM-V changes, specifically the addition of criteria for significant impairment in adaptive functioning, may restrict early identification of young children with ASD.

Effective assessment methods lead to early diagnosis, the development of accurate prognosis for improvement, and serve to guide intervention services (Posar, Resca, & Visconti, 2015; Schendel et al., 2012). The SEED study described above has identified a valid and reliable assessment battery, as well as methods for early provision of an ASD diagnosis under new DSM-V criteria. Procedures for early identification of young children with ASD were conducted across three stages including: self-administered data forms, structured telephone interview, and 1-2 in-person clinical visits. The screening procedures included structured caregiver interview, and administration of the Social Communication Questionnaire (SCQ; Rutter, et al., 2003). The SEED study used a stringent cut-off SCQ score of ≥ 11 that was noted to increase sensitivity/specificity of early identification of participants at risk for autism (Schendel et al., 2012). Primary clinical assessments included the Autism Diagnostic Observation Scale (ADOS) (Lord, Rutter,

DiLavore, & Risi, 2000), and the Autism Diagnostic Interview – Revised (ADI-R) (Lord, Rutter, & DiLavore., 1994); a behavior and social-communication symptomology index (e.g., Child Behavior Checklist (CBCL), now termed the Achenbach System of Empirically Based Assessment (ASEBA) (Achenbach & Rescorla, 2000); as well as cognitive and adaptive behavior assessments using the Mullen Scales of Early Learning (MSEL) (Mullen, 1995), and the Vineland Adaptive Behavior Scales – Second Edition (VABS-2) (Sparrow, Cicchetti, & Balla, 2005). This comprehensive screening and assessment battery (see Table 1) included parent-reported indices (SCQ; CBCL) standardized interview scales (ADI-R, MSEL, VABS-2) and discrete clinical observation (ADOS), which are considered to increase specificity of diagnosis (Huerta et al., 2012).

Utilization of the SEED screening and assessment battery can guide the diagnostic early identification process and increase access to intensive intervention services when young children stand to benefit maximally (Schendel et al., 2012). Beyond early identification and provision of a diagnostic label, the SEED assessment guidelines provide a comprehensive picture of a child's relative abilities and needs, which can be used to assign "specifiers," assign severity levels across diagnostic domains (i.e., social-communication, and behavior), and determine prognosis. Obtaining a comprehensive profile of a child's ability and needs can guide development of systematic and individualized recommendations to maximize early intervention methods and outcomes (Lai, Lombardo, Chakrabarti, & Baron-Cohen, 2013; Weitlauf et al., 2014).

Specifiers and Severity Levels for ASD

Specifiers were added to the DSM-V ASD criteria with the intent to identify characteristics of individuals in ASD population including age of diagnosis, developmental profile, gender specific characteristics, comorbid conditions, cognitive profile, genetic profile and environmental variables (American Psychiatric Association, 2013a, 2013b; Lai, Lombardo, Chakrabarti, & Simon-Cohen, 2013). The DSM-V diagnostic criteria also included the addition of three severity levels that may be assigned to each of the primary diagnostic domains (social-communication and behavior). Severity levels were added with the intent to characterize the heterogeneous spectrum of ASD, and were based on the degree of needed support (American Psychiatric Association, 2013). Severity levels are summarized by diagnostic domain and level in Table 2 (American Psychiatric Association, 2013).

Table 1. ***SEED Screening and Assessment Procedures***

Screening Procedures	• Structured interview and administration of the Social Communication Questionnaire (Rutter, et al., 2003) with a cut-off score of ≥ 11
Clinical Assessments	• Autism Diagnostic Observation Scale (Lord, Rutter, DiLavore, & Risi, 2000) • Autism Diagnostic Interview – Revised (Lord, Rutter, & DiLavore., 1994) • Achenbach System of Empirically Based Assessment (Achenbach & Rescorla, 2000) • Mullen Scales of Early Learning (Mullen, 1995 • Vineland Adaptive Behavior Scales – Second Edition (Sparrow, Cicchetti, & Balla, 2005)

To this author's knowledge, currently only two published articles have suggested potential effects of the addition of severity levels/specifiers to DSM-V diagnostic criteria. In April of 2013, one month before the DSM-V was officially released; Lai, Lombardo, Chakrabarti, and Simon-Cohen published a commentary on anticipated changes to diagnostic criteria and the addition of severity levels in the new DSM-V. The authors identify the clinical utility of severity levels, suggesting these may provide useful tools for practitioners to monitor the degree of needed interventions and supports across the lifespan for those with ASD. However, the authors caution that for researchers, these severity levels may not encompass the heterogeneity across persons along the autism spectrum, and therefore may not fully represent the diversity within persons diagnosed with ASD across domains influencing the expression of clinical phenotypes. With regard to the use of specifiers, these authors suggest expanding the list of specifiers to better characterize individuals with ASD, and move toward grouping or "subgrouping" individuals on the spectrum with similar severity levels and/or specifiers.

Table 2. ***ASD Levels of Support by Domain***

Levels	Social Communication	Behavior
Level 1	Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical or unsuccessful response to social overtures of others. May appear to have decreased interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose to- and-from conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.	Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of organization and planning hamper independence.
Level 2	Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and how has markedly odd nonverbal communication.	Inflexibility of behavior, difficulty coping with change or other restricted/repetitive behaviors appears frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.
Level 3	Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches	Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interferes with functioning in all spheres. Great distress/difficulty changing focus or action.

Weitlauf and colleagues (2014) sought to examine if severity levels reflect and correspond with significant heterogeneity across domains, alluded to by Lai and colleagues (2014). Specifically, these authors sought to determine if conceptually the DSM-V's provision of severity levels, or levels of support might map onto severity of impairment across domains for persons with ASD. Participants included children and adolescents ages (15 months to 17 years), enrolled in a university-based regional autism registry database. The authors retrospectively analyzed data from 726 participant scores on standardized assessments of adaptive behavior (VABS-2), autism symptomology (ADOS), and cognitive skills (e.g., MSEL). Participant scores across standardized assessments were grouped into impairment categories of mild, moderate or severe. Cutoffs for grouping of composite scores using the three leveled impairment ratings for adaptive behavior and autism symptomology were based on each standardized assessments' manual guidelines for assigning impairment level. For example, on the VABS-2, a cut off score of <71 was grouped into the severe impairment rating. Cutoffs for grouping of composite scores using the three leveled impairment ratings for cognitive skills were based on guidelines for ranges of intellectual disability (American Psychiatric Association, 2000). Under each impairment category or grouping, averaged values of participant scores were reported across adaptive behavior, autism symptomology, and cognitive skills. Concordance ratings across these domains were reported by impairment grouping.

Results of the Weitlauf et al. (2014) study indicate that the severe impairment grouping had the highest concordance rates (24.7%), but that moderate and mild impairment categories had much lower concordance rates (3.4% and 0.3% respectively). The authors interpreted these results to suggest that impairment levels may differ across domains assessed (e.g., cognitive, adaptive). Weitlauf and colleagues (2014) caution that although the DSM-V severity levels are generally related to global degrees of impairment in ASD, these severity levels may not align with the domain specific symptomology of ASD. In their discussion, the authors suggested that increased attention should be paid to how severity levels differ across domains, and how severity levels across domains might change over time along the course of development.

Recommendations for Connecting Differential Diagnosis with Evidence-Based Interventions for ASD and SCD

The primary effects of DSM-V changes to ASD diagnostic criteria suggest that 19% to 43% of persons previously diagnosed with a PDD (under DSM-IV-TR criteria) may not qualify under DSM-V criteria (Kulade, Smaldone, & Cohn, 2014; Maenner et. al., 2014; Ohashi et al., 2015; Turygin, Matson, Adams, & Belva, 2013; Young & Rodi, 2014). The primary concern of researchers, practitioners, and families alike is that persons who do not qualify will not receive critical supports (e.g., via education or medical insurance) for needed intervention services (Autism Speaks, 2014). Those who do not qualify for a diagnosis of ASD under the new criteria may be differentially diagnosed with SCD (Reiner et al., 2012). However, the lack of valid/reliable assessments to diagnose SCD combined with a lack of established treatment guidelines for SCD present significant challenges to practitioners (Norbury, 2013; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014). So the question remains, "How can practitioners connect methods of differential diagnosis and severity modifiers with development and prescription of evidence-based interventions for ASD and SCD; so that *good assessment drives good intervention*?" Recommendations for both assessment and intervention practices across both ASD and SCD are indicated below by diagnosis.

ASD. Most importantly, it becomes critical that practitioners identify and implement systematic methods of assessment to characterize and monitor progress of persons with ASD and SCD on their caseloads. The most common methods of assessment used by researchers and practitioners alike to differentially diagnose and monitor outcomes of persons with ASD include the SCQ (the SEED recommends a more stringent cut-off of >11), ADOS/ADI-R, CBCL, MSEL, and the VABS-2 (Schendel et al., 2012; Wiggins et al., 2015). The SCQ, ADOS/ADI-R and CBCL are measures of autism symptomology, whereas the MSEL examines developmental cognitive function and the VABS-2 examines adaptive behavior. Both medical and educational models of service delivery for those with ASD typically employ several professionals who are familiar with administration of one or more these assessments (e.g., school psychologists, speech-language pathologists, occupational therapists, developmental pediatricians). Collaborative assessment teams (via multi-disciplinary and transdisciplinary models) involved in the differential diagnosis of ASD and assignment of severity/specifiers should be developed within educational, center-based and medical programs. Comprehensive assessment of ASD using the tools described above and supported in the literature would allow for both individual characterizations of strengths/needs, as well as progress monitoring for these persons over time. The most common assessment driven progress reporting interims are 6-12 months for center-based, and medical models (e.g., outpatient therapy, center-based day treatment), and every 1-3 years for educational models (via development of Individualized Education Plan (IEP; annually), or Multi-Factored Evaluation/Educational Team Report (MFE/ETR; every 3 years). Although requiring an initial investment of time allocated to coordinating personnel, training, planning and implementing a systematic outcome measures system, the benefits stand to significantly outweigh the initial costs. A coordinated comprehensive process would allow for more accurate differential diagnosis of ASD and coordination of ASD diagnosis with educational (e.g., Ohio Autism Scholarship) and/or insurance-based supports/services. With respect to intervention, the process would assist in understanding expected prognosis (including estimated levels of support and specifiers) to guide clear intervention expectations for families, and establish a comprehensive profile of each child's strengths and areas of needs which can be used to guide the dosing of intervention.

Once comprehensive transdisciplinary assessment procedures are in place (admittedly no small undertaking) and differential diagnoses of ASD/SCD are assigned, recommendations for intervention or "dosing" should be made. "Dosing of intervention" is a concept forwarded by Warren, Fey and Yoder (2007) who sought to operationalize (define and measure) intervention intensity. These authors specifically draw parallels between doctors prescribing medication and practitioners recommending intervention. *Dose or dosing* refers to the number of teaching opportunities per intervention session (e.g., 1 teaching episode per minute), *dose forms* refers to the context in which the teaching opportunities are presented (e.g., discrete trial, milieu teaching), *dose frequency* is the frequency with which dosing is provided per day/week (e.g., 1 session per day, 3 days per week), and *total intervention duration* is the interim of therapy (e.g., 8 total weeks of

intervention). Table 3 provides a summary of the concepts involved in dosing (Warren, Fey & Yoder, 2007). This terminology allows practitioners to quantify, characterize and recommend dosing of best-practice intervention methods and treatment guidelines based on results of comprehension assessment and progress monitoring. Operationalizing progress monitoring procedures and dosing of intervention would allow programs to quantitatively and qualitatively connect profiles or groups of person diagnosed with ASD to an efficient decision-making process for dosing of *good* (evidence-based) intervention (Lai, Lombardo, Chakrabarti, & Baron-Cohen, 2013).

Table 3. ***Summary of Warren, Fey & Yoder's (2007) Definitions of Dosing***

Dose	The number of teaching opportunities per intervention session
Dose Form	The context in which the teaching opportunities are presented
Dose Frequency	The frequency with which dosing is provided per day/week
Total Intervention Duration	The interim of therapy

In 2015, Laura Schreibman and colleagues published a seminal article on evidence-based intervention methods for children with ASD. These authors critically summarize the recent integration of behavioral methodologies with natural developmental principals by best-practice intervention centers for ASD (e.g., Early Start Denver Model). The authors call these integrated methods and principals, Natural Developmental Behavioral Interventions (NDBI's). Schreibman and colleagues identify core elements of successful NDBI's including measures of treatment fidelity and methods of child learning. These authors suggest that specific measures of treatment fidelity should include a manual describing practices, fidelity checks, progress monitoring procedures, and individualized goal development. Core intervention methods of NDBI's including use of a three-part contingency (beginning, middle, end; antecedent, behavior, consequence), natural reinforcement and emotive learning principals, prompting, modeling, reciprocal play routines, imitation, expanding attention, and manipulating environmental arrangement(s). Table 4 provides a summary of treatment fidelity and intervention methods outlined by Schreibman and colleagues (2015). Adapting the principles defined by Schreibman et al. within educational, center-based and medical treatment programs can guide the implementation of comprehensive assessment, progress monitoring, and dosing of intervention procedures.

SCD. Assessment and treatment guidelines for SCD are not nearly as well informed (Norbury, 2014; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014). The limited recommendations for assessment and treatment guidelines for SCD suggest adapting assessments and methods of intervention of pragmatic language impairment (PLI) for SCD (Norbury, 2014; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014), or using the same or similar interventions for SCD as for ASD (Kim, Fontbonne, Koh, Kim, Cheon, & Leventhal, 2014). Per the DSM-V, SCD is now diagnostically and therefore etiologically and theoretically distinct from ASD. Although existing recommendations for assessment and intervention of SCD presently involve adapting interventions for PLI or ASD, it is important that practitioners seek to establish and develop theoretically distinct assessments/interventions for this disorder.

For the assessment of SCD, a diagnosis of ASD must be ruled out. Therefore the recommended assessment methods for differential diagnosis of ASD as described above should be used with a focus on establishing or negating the presence of repetitive, stereotypic behaviors core to a diagnosis of ASD. Once ASD is ruled out, diagnosis of other potential comorbid DSM-V communication disorders should be established (e.g., language disorder; Norbury, 2014; Swineford, Thurm, Baird, Wetherby, & Swedo, 2014). In order to establish such a diagnostic profile, Swineford and colleagues (2014) recommend using the standardized assessments, Test of Pragmatic Language (Phelps-Teraski & Phelps-Gunn, 1992) or the Comprehensive Assessment of Spoken Language (Carrow-Woolfolk, 1999). Given the dynamic nature of pragmatic language and social communication, informal assessment or observational scales evaluating structural language skills, pragmatic language, and social communication in naturalistic contexts should also be used (Paul, 2013). Although established valid and reliable observational scales for SCD do not presently exist (yet are sorely needed), language sampling and analysis techniques (Systematical Analysis of Language Transcripts, Miller & Chapman, 2000; Language Environment Analysis, Burgess, Audet & Harjusola-Webb, 2013), event

Table 4. ***NDBI Measures of Treatment Fidelity and Child Learning by Schreibman et al., 2015***

Measures of Treatment Fidelity (Schreibman et al., 2015)	Developing a manual to guide methods and practice Fidelity checks Progress monitoring procedures Individualized goal development
Methods of NDBI's (Schreibman, et al., 2015)	Three-part contingency Natural reinforcement and emotive learning principals Prompting Modeling Reciprocal play routines Imitation Expanding attention Manipulating environmental arrangement(s)

recording or interval sampling methods (Cooper, Heron, & Heward, 2007) applied systematically across naturalistic contexts (e.g., during recess, lunch), may provide important diagnostic information to support or negate a diagnosis of SCD. This combination of standardized and informal/observational assessments may also be used for progress monitoring over time.

Regarding intervention, Swineford and colleagues (2014) as well as Norbury (2014) recommend adapting interventions used for persons with PLI. A variety of school and center-based social-skills interventions have been established for persons with ASD (e.g., Social Tools and Rules for Teens (START), Vernon, Miller, Ko, & Wu, 2016) that may be adapted for SCD in line with recommendations from Kim and colleagues (2014). Although it is not the scope of this paper to review potential interventions that could be adapted for SCD, Diane Paul and Donna Murray (2016) present suggestions for intervention of those with SCD. Specifically, Paul and Murray suggest that intervention methods for SCD may include: parent/communicative-partner (peer) training, structured training and generalization of turn-taking skills in both play and conversation, structured training and generalization of reading comprehension skills with a particular focus on abstract, inferential or predictive concepts. They also suggest using visual supports, social stories and structured scenarios within relevant learning contexts to teach perspective taking, emotional regulation/coping skills, expanded conversational topics and to increase overall success. Specific dosing of intervention (Warren, Fey, & Yoder, 2007) should be applied to SCD based on results of comprehensive assessment as recommended above.

Conclusions and Future Directions

Currently, research is continuing to investigate the effect DSM-V changes will have on prevalence rates of ASD, provision of a SCD diagnosis, assessment and early identification of ASD, and the addition of severity modifiers/specifiers for ASD. The most significant concern of researchers examining the role the DSM-V changes will have on ASD diagnosis is that a population of higher functioning persons with ASD may be excluded from critical services/supports (Kulade, Smaldone, & Cohn, 2014; Maenner et. al., 2014; Ohashi et al., 2015; Turygin, Matson, Adams, & Belva, 2013; Young & Rodi, 2014). These concerns are echoed by practitioners and families alike (Autism Speaks, 2014). More time, more data, and more research will hopefully provide clarity and resolution to these questions and concerns.

More than ever, research connecting assessment to intervention in ASD is being published and disseminated. However, given the "newness" of the SCD diagnosis, research is significantly lacking regarding how to assess and intervene in this population. Clinical scientists and practitioners are presented with significant challenges in the face of such limited research. The challenges presented include the enormous need for systematic research and programmatic development to craft valid and reliable assessment and intervention methods for SCD. Future research should seek to better connect differential diagnosis with evidence-based interventions for ASD and SCD, so that *good assessment continues to drive good intervention.* ♦

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Problems with Auditory Comprehension, Verbal Encoding, and Cognitive Flexibility in Autism Spectrum Disorders: Insights From Neuroscience

Diane Williams

Abstract

Recent findings from neuroscience research are leading to new understanding of the way individuals with autism spectrum disorders (ASD) learn and process language. These findings are consistent with a neurocognitive model of ASD that was previously proposed based on behavioral neuropsychological profile studies. The integration of the results from this behavioral and neurofunctional research can inform the selection and design of interventions that accommodate the way the brains of individuals with ASD function. This article reviews neurofunctional research related to the areas of auditory comprehension, verbal encoding, and flexibility of processing in ASD and the implications of these findings when choosing and designing communication and language intervention.

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Learning Objectives

1) Discuss recent findings from behavioral and neuroimaging research related to auditory comprehension, verbal encoding, and cognitive flexibility in children and adults with autism spectrum disorders (ASD).
2) Compare/contrast these findings to the behavioral performance of individuals with ASD when comprehending and producing language.
3) Discuss the research findings relative to the selection and design of communication and language interventions for individuals with ASD.

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Difficulty with the use of reciprocal, flexible spoken language for social communication is a central diagnostic indicator of autism spectrum disorders (ASD; American Psychiatric Association, 2013). The language/communication problems associated with ASD have been well-characterized with respect to overt or behavioral characteristics. Individuals with ASD are typically reported as having difficulty acquiring spoken language (Eigsti, de Marchena, Schuh, & Kelley, 2011). Even individuals with ASD who develop fluent language skills are described as being challenged with the pragmatic aspects of language such as conversational turn-taking and topic maintenance (Walenski, Tager-Flusberg, & Ullman, 2006). Although somewhat more subtle in individuals with ASD who are higher functioning, problems with auditory comprehension are also evident across the spectrum (Tager-Flusberg, Paul, & Lord, 2005).

Identifying the underlying basis of the difficulty with the acquisition, comprehension, and production of spoken language in ASD has been more challenging than describing it behaviorally. Models of ASD as a problem with theory-of-mind (Baron-Cohen, Leslie, & Frith, 1985), weak central coherence (Frith, 1989), or executive dysfunction (Griffith, Pennington, Wehner, & Rogers, 1999; Ozonoff, 1995; Robinson, Goddard, Dritschel, Wisley, & Howlin, 2009) have provided some insight into the nature of the linguistic challenges experienced by children and adults with ASD. However, these models have not necessarily provided clear guidance in the development of effective interventions to address the communication and language challenges experienced by individuals with ASD; therefore, many current therapeutic approaches target specific changes in the behavioral presentation without consideration of the potential underlying learning mechanisms (American Speech-Language-Hearing Association, n.d.).

A neurocognitive model of ASD based on the results of large neuropsychological profile studies, referred to as the Complex Information Processing model, provides an alternate view of the cognitive and linguistic problems associated with the disorder (Minshew, Goldstein, & Siegel, 1997; Williams, Goldstein, & Minshew, 2006). According to this model, individuals with ASD, who have developed fluent language, perform similarly to individuals with typical development with formal language, such as syntax, morphology, and phonology, but have difficulty with aspects of language that require higher levels of integration (Minshew, Goldstein, & Siegel, 1995). Furthermore, cognitive abilities are not predictive of performance for individuals with ASD in the same way that they are for individuals with typical development. That is, individuals with ASD begin to experience difficulty during tasks that are at a lower level of processing demand than would be expected relative to their overall cognitive abilities (Minshew et al., 1997; Williams et al., 2006). According to the Complex Information Processing model, because of assumed underlying neurobiological differences, ASD is dynamically realized as the person with ASD processes information that the brain's mechanisms cannot accommodate (Minshew, Webb, Williams, & Dawson, 2006). Problems become more pronounced as the mismatch between cognitive resources and the demands of the processing task increase. Language learning and use is affected because these activities require coordination across a number of processing centers. Comprehension and production of language must be integrated with social and/or textual context and flexibly adapted to meet those demands. Because of underlying biological constraints created by neural structural and functional differences, individuals with ASD are not able to meet the demands for integration and flexible response to changing environmental stimuli (Minshew, Williams, & McFadden, 2008).

Because ASD is a neurodevelopmental disorder, behavioral measures, even neuropsychological ones, are limited in the insight they provide into the potential underlying problems with cognitive and linguistic processing in ASD. Beginning a little more than a decade ago, research tools, such as functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and evoked response potentials (ERP) that allow the examination of neurofunction during the performance of cognitive tasks, have yielded new insights into cognitive and linguistic processing in ASD (Groen, Zwiers, van der Gaag, & Buitelaar, 2008; Pina-Camacho et al., 2012; Williams, 2012). Findings from research studies using these tools have both supported and expanded upon the underlying assumption of the Complex Information Processing model that the brains of individuals with ASD are characterized by neurofunctional differences that interfere with the acquisition and use of environmental information (Ecker, Bookheimer, & Murphy, 2015; Kana, Libero, & Moore, 2011; Minshew et al., 2008). These new insights are potential guides for the clinical decision-making of speech-language pathologists when selecting and designing communication/language interventions for individuals with ASD. This article will discuss some of the recent findings from cognitive neuroscience related to the areas of auditory comprehension, verbal encoding, and flexibility of processing in ASD and the implications of these findings when choosing and designing communication and language interventions.

Problems with auditory comprehension

The brains of individuals with typical development have areas that selectively activate to human voices; these areas, along the upper banks of the bilateral superior temporal sulci (STS), differentially respond to vocal and speech sounds as compared to nonspeech vocal sounds (Belin, Zatorre, Lafaille, Ahad, & Pike, 2000). Based on studies with neonates, this preferential processing of human voices is thought to be an early occurring feature of cognitive processing that serves an important function in focusing the attention of infants on human voices, thus, providing an essential bootstrap to early language learning (Ecklund-Flores & Turkewitz, 1996; Hutt, Hutt, Leonard, von Bermuth, & Muntjewerff, 1968). Functional neuroimaging (fMRI and PET) and ERP have been used to address the question as to whether the STS selectively responds to human speech in children and adults with ASD.

The results of an fMRI study examining responses to vocal and non-vocal sounds indicated that male adults with ASD did not have differential activation in the bilateral STS to these two stimulus types whereas, as expected, male adults with typical development did (Gervais et al., 2004). Similarly, abnormal auditory cortical processing was reported from PET studies with adults and children with ASD (Boddaert et al., 2003; Boddaert et al., 2004). Furthermore, an fMRI study of the cortical responsiveness of children ages 1 to 4 years,

who were later diagnosed with ASD, to complex forward speech, simple forward speech, and backward speech, indicated that they had abnormal left hemisphere response to speech sounds and abnormal right-lateralized temporal cortex response to language (Eyler, Pierce, & Courchesne, 2012). Related work, using a behavioral auditory preference measure and an ERP measure, demonstrated that, as a group, preschool-aged children with ASD preferred to listen to nonspeech as compared to 'motherese' speech and also failed to demonstrate a significant brain response (mismatch negativity) to a syllable change (Kuhl, Coffey-Corina, Padden, & Dawson, 2005).

In addition to an innate preference for human voices, behavioral research with infants with typical development suggests that they have an innate mechanism to detect statistical regularities and redundancies in the environment (Kirkham, 2010; Saffran, 2010). In normal language development, the infant brain appears to automatically use prosodic cues to identify word boundaries within a continuous speech stream (Johnson & Jusczyk, 2001) and to compute the probability of syllable co-occurrence, a process that has been referred to as statistical learning (Saffran, Aslin, & Newport, 1996). Work with adults with typical development suggests that statistical learning and language share common underlying neural mechanisms (Christiansen, Conway, & Onnis, 2007). Statistical learning was examined in children with ASD during an fMRI task using an artificial language with frequency and stress cues (Scott-Van Zeeland et al., 2010). The results indicated that the brains of the children with ASD did not differentiate between the conditions with the prosodic and frequency cues and a condition in which the syllables were presented in random order (Scott-Van Zeeland et al., 2010). The children with ASD did not appear to have the same underlying statistical learning process that is characteristic of language learning in individuals with typical development.

The combination of the results of these studies of the responsiveness of the brains of children and adults with ASD to human voices and the important linguistic cues contained within, suggest that they do not selectively attend to human voices versus other competing stimuli in the environment. Moreover, the results of the fMRI study of statistical learning (Scott-Van Zeeland et al., 2010) suggest that they may not be extracting essential prosodic and segmental information that promotes language learning. These potential linguistic processing differences are important to consider when selecting and designing interventions for children with ASD who have challenges in auditory comprehension.

Clinical Implications

It is now well-accepted that, whereas brain development related to language acquisition is guided by genetic codes, it also occurs interactively in response to environmental input (Kolb & Wishaw, 1998). This is assumed to be true even for individuals with neurodevelopmental disorders, although the response of the brain may be affected by the underlying neurofunctional differences (Karmiloff-Smith, 1998). Although a speech-language pathologist may not be able to directly change the way the brain of a child with ASD learns or processes language, he/she can change the environmental input, adapting it to accommodate the underlying neurofunctional differences. Given the results of the neurofunctional research described above, what should these adaptations be?

Interestingly, a number of therapeutic interventions that have some evidence for efficacy with children with ASD and other developmental language problems use adaptations of stimuli that would accommodate the neuro-linguistic processing differences that have been reported for children and adults with ASD with respect to spoken language. If the brain of a child or adult with ASD does not selectively attend to a human voice, then competing auditory information may need to be reduced as much as possible so that the human voice is the obvious point of attention. In addition to a standard recommendation to reduce environmental stimuli (e.g., Nguyen, 2006), additional measures may need to be used with some children with ASD who have significant problems with auditory processing. Personal FM systems and auditory trainers have been used successfully with some children with ASD to reduce the interference of background noise and increase on-task listening behaviors in the classroom (Schafer et al., 2013; Smith, McConnell, Walter, & Miller, 1985). These systems consist of a small receiver worn in the child's ear that receives an auditory signal delivered at a safe and comfortable volume directly from a transmitter and microphone worn by the teacher. FM systems should, of course, be fitted and monitored following the relevant professional guidelines (American Speech-Language-Hearing Association, 2002).

Because of the possible problem with statistical learning, during natural language interactions, the child with ASD may need auditory input that has *clear word boundaries* such as single words or words within phrases or sentences with clear prosodic cues. Some evidence-based practices that are consistent with this recommendation have been developed for use with children with specific language impairment. These include ones that use a slower speaking rate (Weismer & Hesketh, 1996) or emphatic stress (Weismer & Hesketh, 1998) to improve the children's auditory comprehension of language. Additional related approaches that have some evidence for improving comprehension of auditory input include Melodic Intonation Therapy (Miller & Toca, 1979) and Music Therapy (Gold, Wigram, Elefant, 2006; Whipple, 2004).

An additional clinical implication for children who are having difficulty extracting linguistic information from auditory input would be that a spoken word would need to be clearly paired with its environmental referent, particularly because children with ASD have difficulty extracting information from the gaze cues of adults (Norbury, Griffiths, & Nation, 2010). This may mean that the child needs to be handling the object, performing the action as it is named, or that the adult should be clearly pointing to the object when referring to it (Akechi, Kikuchi, Tojo, Osanai, & Hasegawa, 2013). However, because the brains of children with ASD may not guide them to focus on the same features as children with typical development, be aware that the child with ASD may not use perceptual cues such as shape and may focus on other parts of an object (Tek, Jaffery, Fein, & Naigles, 2008). Because of the possible problems with extraction of statistical regularities in spoken language, children with ASD also may need over-repetition of associations between spoken words and referents.

Aided Language Stimulation (ALS) is a method by which an adult pairs a spoken word with a point to a visual representation of the word (Goossens, Crain, & Elder, 1992; 1994). It was originally developed for use with children who had significant physical challenges who were learning to use augmentative communication. ALS can be used to improve the child's ability to comprehend the language directed to them. Visual representations of objects, actions, and other concepts are presented on boards of between 6 to 20 pictures/picture symbols with vocabulary related to a specific activity. Although the number of studies investigating the use of ALS or aided language modeling with children with ASD is limited, they have all reported positive effects with increased symbol comprehension (i.e., identification of symbols) and production (i.e., use of symbols for object labeling) (Drager et al., 2006) and increased length and complexity of spoken utterances (Cafiero, 2001). For children with ASD who have extreme difficulty with decoding and attaching meaning to the spoken language they hear, the visual input of the ALS display may help to focus their attention and help them to process the spoken language input. The use of visual representations may help the child to understand the association between a word and its referent.

Summary

Neurofunctional research has suggested that the brains of children and adults with ASD do not respond to spoken language in the same way as the brains of individuals with typical development. These differences include a lack of preferential or differential processing of human voices as well as a failure to extract statistical regularities of stress, intonation, and phonological patterns that provide a bootstrap to children during language learning and reduce the processing load for adults when listening to spoken language. Intervention strategies that manipulate the auditory input by reducing the amount of information, providing exaggerations of prosodic and stress cues, or providing clear visual associations with spoken words have been shown to be effective in increasing the performance of children with developmental language problems and/or ASD. These strategies would be consistent with the insights provided by neurofunctional research with children and adults with ASD and, therefore, may be appropriate choices when planning interventions for these individuals.

Problems with verbal encoding

Acquisition and proficient use of spoken language is challenging for individuals with ASD (Eigsti et al., 2011). On average, first words are produced at 38 months, approximately two years later than children with typical development (Howlin, 2003). Thirty percent of individuals with ASD have persistent problems with production of spoken language, remaining minimally verbal despite participation in intervention and educational programs (Tager-Flusberg & Kasari, 2013). The neurofunctional bases of the difficulties individuals

with ASD have with production of spoken language are only beginning to be better understood. Several fMRI studies are suggesting that even highly verbal individuals with ASD may have a problem with the encoding of information into a verbal form.

Individuals with typical development are thought to represent concepts both through mental imagery and through a verbal representation (Paivio, 1990). In fMRI, one way this verbal encoding is demonstrated is by the use of a left hemisphere network including language areas during working memory tasks (Smith, Jonides, Marschuetz, & Koeppe, 1998). Furthermore, based on research with split-brain patients, the left hemisphere has been conceived as an 'interpreter' that is automatically engaged to create a schema or story, assimilating stimuli into comprehensible events (Gazzaniga, 2000). This automatic story-telling is thought to allow for elaboration and generalization of information such that order is created from chaos (Wolford, Miller, & Gazzaniga, 2000). In other words, in individuals with typical development, the left hemisphere language areas are engaged to support learning and memory even for information that is initially visual or episodic.

The results of several fMRI studies provide preliminary evidence that even verbally fluent children and adults with ASD may not automatically encode information into a verbal form in the same way as individuals with typical development. An initial fMRI study that raised this possibility used a classic *n*-back verbal working memory task in which individuals see letters presented one at a time and are asked to press a button when they see a target letter (0-back), a letter that is the same as the previous letter (1-back), or a letter that is the same as the letter that occurred two letters previously (2-back) (Koshino et al., 2005). A behavioral study using this verbal working memory task had indicated that children and adults with ASD performed behaviorally similarly on this task as age and ability-matched participants with typical development (Williams, Goldstein, Carpenter, & Minshew, 2005). Whereas, the behavioral performance of the ASD group and the group with typical development was similar in the fMRI study, clear differences occurred in their brain activation patterns. In the *n*-back verbal working memory task, individuals with ASD used a right hemisphere working memory network (usually associated with visual working memory) while the participants with typical development used the expected left hemisphere working memory network (Koshino et al., 2005). The authors of the study suggested that these results indicated that the adults with ASD were performing the task by remembering the visual shape of the letters not by maintaining the letters in a verbal form (Koshino et al., 2005).

A related fMRI study used an *n*-back working memory task with children with ASD with stimuli that were 2-letter words in an attempt to encourage the children to use a verbal strategy (Carter, Williams, Lehman, & Minshew, 2012b). Even with stimuli that were biased toward a verbal form, the brain activation results suggested that the children with ASD relied more on visual strategies to perform the working memory tasks, especially in the low memory load 0-back condition. Unlike the adults, the children with ASD did demonstrate some use of Broca's area (left inferior frontal gyrus) in the 1-back condition, possibly in response to increasing task demands (Carter et al., 2012b).

A third fMRI study that provides additional support for the lack of automatic verbal encoding by individuals with ASD was originally designed to study the neural bases of social judgment in ASD (Carter, Williams, Lehman, & Minshew, 2012a). Children with ASD and age- and ability-matched participants with typical development were asked to select which of two scenes depicted a blonde-haired boy being bad. The behavioral performance of both groups was similar. However, examination of the brain activation data revealed the use of a left hemisphere language network by the children with typical development that was not evident in the data for the children with ASD. This suggested that the children with typical development had automatically used verbal processing during the task; however, this was not the case for the children with ASD (Carter et al. 2012a).

These three fMRI studies suggest that the adults and children with ASD relied more on visual strategies to perform the verbal working memory and social judgment tasks, whereas the groups with typical development primarily used linguistic strategies. The results have been interpreted as an indication that children and adults with ASD have difficulty with the automatic verbal encoding of visually-presented information. This interpretation is consistent with

earlier behavioral work that proposed that the failure of individuals with ASD to encode experiences into language was an underlying cause of difficult with recalling experiences and difficulty with generalization of knowledge (Boucher, 1981).

Clinical Implications

The proposed difficulty with verbal encoding for individuals with ASD becomes a theoretical rationale as to why visual support and verbal mediation would be effective in increasing the spoken output of individuals with ASD. A systematic review, including nine single-subject and two group design studies, found that the use of augmentative-alternative communication (AAC) resulted in gains in speech production for most of the participants (Schlosser & Wendt, 2008). Furthermore, another review article indicates that the use of speech generating devices (SGDs) or voice output devices are effective in increasing the communication skills and spoken language of children with ASD (Ganz et al., 2012). Picture communication boards have also been reported to be effective at increasing the communication attempts of children with ASD who are minimally verbal (Garrison-Harrell, Kamps, & Kravits, 1997). These augmentative communication techniques may supply a needed bridge between the conceptual knowledge or memory store of the individual with ASD that is in a visual form and a verbal form that allows that knowledge to be shared with a communication partner. These strategies provide explicit encoding of the associated verbal form either by the output of the SGD or through the verbal modeling of the communication partner.

Another evidence-based practice that is frequently used with children with ASD for behavioral management that is resonant with the proposed problem with verbal encoding is *Social Stories®* (Gray, 2010). Two main elements of social stories, the organization of the information into a narrative format and the visual depiction of the information, may help the individual with ASD access information that is within their experiential knowledge base but has not been automatically translated into a verbal form.

The provision of verbal descriptions with animations demonstrating scientific principles has been demonstrated to result in better performance on problem solving tests than animation or words alone in individuals with typical development (Mayer & Anderson, 1991). A related intervention, verbal mediation, has been successfully used to promote learning of procedural sequences in older children with language-learning disabilities (Lasky, 1991). In this technique, the adult overtly talks the child through a sequenced task, overlaying language on the activity that is being taught. Verbal mediation is thought to help the child encode the information in procedural memory in a verbal representation in addition to a visual representation. Once the individual learns to do the mediation overtly, they can then be taught to do it covertly, using “inner speech” instead. (Lasky, 1991). Verbal mediation may help individuals with ASD by facilitating the creation of representations in both imagery and verbal forms. Although this is a process that may not happen automatically for someone with ASD, it is one that is important for retrieval and efficient use of information.

Difficulty with verbal encoding may also be related to the reported problem with word retrieval that has been noted in some individuals with ASD who have overall fluent spoken language (Walenski et al., 2006). Therefore, assessment and intervention protocols typically followed for individuals with specific language impairment with word-finding problems may also need to be considered for use with some verbally fluent individuals with ASD (e.g. German, 1992; German & Simon, 1991).

Summary

The results from several fMRI studies suggest that individuals with ASD may have difficulty with verbal encoding. Therefore, they may struggle to tell others “what’s in his/her head.” If a child is storing conceptual knowledge in a visual form and not automatically recoding into language, it may interfere with their ability to speak. Young or lower functioning children may be minimally verbal, whereas older, verbal children may overuse pre-encoded “formulaic” utterances or have problems with word retrieval. SGDs and picture communication systems may promote the use of communication and production of spoken words in minimally verbal children with ASD. Verbal mediation of experiences—externally creating what is typically inner self-talk and helping an individual with ASD construct a narrative version of an experience--may help to support learning, creating mental representations of information that can be retrieved more efficiently so that it can be shared with others. Interventions to

address word retrieval problems may need to be considered for some verbally fluent individuals with ASD.

Problems with flexible cognitive processing

One of the primary diagnostic criteria for ASD is restricted, repetitive patterns of behavior that can be manifested as an insistence on sameness or a lack of cognitive flexibility (American Psychiatric Association, 2013). In neurofunction, cognitive flexibility is manifested by a change in the pattern of processing based on input from the task or stimuli to be processed. Some fMRI studies have provided insight into the problem with flexibility during cognitive processing that is challenging for individuals with ASD. For example, in an fMRI study that was conducted to test the comprehension of high (*The number eight when rotated 90 degrees looks like a pair of eyeglasses.*) and low (*Addition, subtraction, and multiplication are all math skills.*) imagery sentences, individuals with ASD used imagery areas when processing both types of sentences; they had difficulty with efficiently changing their processing pattern when the demands of the stimuli changed (Kana, Keller, Cherkassky, Minshew, & Just, 2006). These results can be interpreted as an indication that individuals with ASD are more reliant on visual processing during language comprehension; however, they also suggest that the individuals with ASD did not vary their cognitive processing in response to differences in the stimuli (Groen et al., 2008). That is, the fMRI results suggest that they used a visual imagery strategy for both the visual and the verbal stimuli.

The results of another fMRI study provide some support for this assumption of the lack of differential response to features of the stimuli in individuals with ASD. In an fMRI study of making inferences during text processing, the participants with typical development recruited a region involved in theory-of-mind processing (right STS) only when it was invited by the textual content (Mason, Williams, Kana, Minshew, & Just, 2008). They used a left hemisphere processing network when making inferences about physical events and only recruited the STS in the right hemisphere when making inferences about the mental state or intentions of others (Mason et al., 2008). However, the participants with ASD recruited a bi-hemispheric language network for all of the passages, irrespective of the processing demands (Mason, et al., 2008). More specifically, they activated the theory-of-mind region even when the task did not require it. Furthermore, the participants with ASD used more processing resources for the less demanding tasks, meaning they had no additional cognitive resources to draw upon when the task demand increased (Mason et al., 2008).

A proposed interpretation of this “task indifferent” pattern of activation for individuals with ASD during language tasks is that they may have difficulty resetting neural networks that are temporally recruited when performing a cognitive task (Groen et al., 2008). This difficulty with resetting may be related to the problems with cognitive flexibility that are characteristic of ASD (Geurts, Corbett, & Solomon, 2009). An underlying problem with differential neural response to changing task demands is consistent with the Complex Information Processing model (Minshew et al., 2008). Individuals with ASD may have difficulty with meeting increasing integrative demands or responding flexibly during behavioral tasks because of difficulty with resetting neural networks needed for these tasks.

Clinical Implications

The implications for learning from the results of these fMRI studies are that individuals with ASD may have more difficulty as the processing demands of a language task increase. In addition, they may not be able to quickly change the way they are doing a task with respect to the underlying cognitive processes that are being recruited to perform the task. That is, the individuals with ASD may have difficulty switching from a visual to an auditory task and vice versa. In addition, individuals with ASD may be employing a maximal cognitive processing strategy in a situation in which a lower level of processing resources would be sufficient. Furthermore, it will be impossible to tell what cognitive strategy the individuals with ASD are using or how hard they are working by only observing their behavioral performance. When the processing demands of the task increase, individuals with ASD may not have additional processing resources to draw upon. This situation may result in a decrement in their behavioral performance or an increase in their level of anxiety, resulting in a withdrawal from the activity or a negative emotional response.

Many of the strategies that are frequently used with individuals with ASD are consistent with addressing a potential problem with the resetting of neural networks. Warnings before transitions, as

recommended by Flannery & Horner (1994), may not only serve to help the individual with ASD prepare behaviorally but may also serve as notice that a change in cognitive processing needs to occur. Explicit instructions given in concrete language, as suggested by Schopler, Mesibov, & Hearsey (1995), may be facilitative because these instructions can also promote the use of metacognitive strategies that the individual with ASD may have not employed if they were solely dependent on the responsivity of their brain to external stimuli. For example, explicitly directing an individual with ASD to focus their attention on the teacher's voice or toward a page of text, or to bolded words within the text may help them direct the needed cognitive resources to the appropriate stimuli. Giving the individual with ASD quiet time between cognitively demanding activities in a distraction-free area (Nguyen, 2006), may allow them the needed time to "reset" their neural networks so that they are more prepared for the upcoming activity. The important implications of the results of these fMRI studies are that, even though, behavioral management strategies may be employed, the underlying cause of the observed behavioral responses are not necessarily willful choices on the part of individuals with ASD. Rather, their behavioral responses are driven by neurofunctional differences and the resultant cognitive processing challenges and should be treated and understood as such.

Summary

Functional imaging research with individuals with ASD suggests that they may have underlying neurofunctional differences that create an insensitivity to changes in environmental stimuli and/or a problem with resetting neural networks that have been temporarily recruited for a cognitive task. These underlying neurofunctional differences may be related to the behavioral difficulty with inflexibility that is one of the primary diagnostic criteria for an ASD. Many of the behavior management techniques that are typically used with individuals with ASD to deal with problems with inflexibility may be successful because they allow the individual time for resetting of neural networks or they provide explicit direction as to the appropriate cognitive strategy that should be used for a particular task.

Conclusion

The results of several behavioral and neuroimaging studies are consistent with a Complex Information Processing model that holds that an underlying perturbation in neural structure and function results in differences in cognitive and linguistic processing that are realized as the behavioral presentation of ASD. Some of the cognitive processes that appear to be affected are preferential processing of human speech, statistical learning, verbal encoding of information, and flexibly changing cognitive processing in response to changing environmental demands. ASD is not simply a problem with social functioning; it is an information processing problem. When selecting and designing language interventions for individuals with ASD, speech-language pathologists should consider the underlying neurofunctional differences that may be affecting cognitive and linguistic processing. ♦

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Emotional Regulation and Autism Spectrum Disorders

Barry M. Prizant & Amy Laurent

Abstract

Speech-language pathologists (SLP) have come to play a central role in supporting individuals with communication and emotional/behavioral challenges including persons on the autism spectrum. The majority of persons with Autism Spectrum Disorder (ASD) experience some form of challenging behavior related to difficulties in maintaining a well-regulated emotional state. Therefore in order to address the complex needs of individuals with ASD and related social communication disorders, it is crucial that SLPs who serve individuals with ASD develop a deeper understanding of the concepts of emotional regulation and dysregulation, core foundations of social and emotional development, and how they may be applied in both assessment and intervention efforts.

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♦ ♦

Learning Objectives

1) Discuss the role of emotional regulation in assessment of people with Autism Spectrum Disorders.
2) State the preventative measure to reduce dysregulation.
3) Discuss how to integrate social communication and emotional regulation goals in clinical practice.

♦ ♦

Over the past few decades, speech-language pathologists (SLPs) have come to play a central role in supporting children and older individuals with communication and emotional/behavioral challenges including persons on the autism spectrum (Prizant, 1982; Prizant et al. 1990). It is estimated that as many as 75% of individuals with communication disorders also experience difficulties in social and emotional development, and as many as 94% of children with Autism Spectrum Disorder (ASD) experience some form of challenging behavior (Jang et al., 2011) related to difficulties in maintaining a well-regulated emotional state (Prizant and Laurent, 2011a). Diagnostically, significant social communication challenges associated with ASD are now recognized as major risk factors for problems in maintaining a well-regulated emotional state, for expressing emotions through problem behavior rather than in conventional and socially desirable ways, and for difficulties recovering from episodes of emotional dysregulation (Prizant and Laurent, 2011b). Therefore, in order to address the complex needs of individuals with ASD and related social communication disorders, it is crucial that SLPs who serve individuals with ASD develop a deeper understanding of the concepts of emotional regulation and dysregulation, of the core foundations of social and emotional development, and how these may be applied in both assessment and intervention efforts.

Emotional regulation and emotional dysregulation defined

Prizant and colleagues (1990, 2006) were the first to identify emotional regulation as a major focus of assessment and intervention in ASD. Emotional regulation has been defined as the developmental capacity to modulate emotion and physiological/arousal level in order to respond adaptively to a situation (Kopp, 1989). Neuroscientists who study human emotion have indicated that it is extremely difficult to separate out physiological state from one's emotional

state in real time as these are closely related and intertwined, even on a neurochemical level (Pert, 1997).

From a longitudinal perspective, emotional regulation is a life-long developmental process underlying attention and social engagement. Importantly, it is essential for optimal social, emotional and communication development, and the development of relationships for all children and adults (Prizant et al., 2006). Emotional regulation may also be considered from the perspective of changes that occur over short periods of time, even from moment to moment. When one is well regulated emotionally, he or she is most available for learning and engaging. In contrast, when one is emotionally dysregulated, he or she is less available for learning and engaging.

Emotional regulation and dysregulation must be viewed on a continuum, from well-regulated states, to mild, moderate and even extreme states of dysregulation. A person may be able to continue to engage and learn, albeit less effectively so, in mild and moderate states of dysregulation. However, in extreme states of dysregulation, a person may have little control over his or her actions, and have a severely compromised ability to process language and other information. Both positive and negative emotional states may vary along this continuum, as one may be mildly anxious or experience extreme panic attacks, or may be mildly content or giddy/ecstatic. Common terminology referring to extreme negative states includes "meltdown," "out of control," or "shutdown."

Self and Mutual Regulation

Emotional regulation may also be described in reference to the types of strategies that a person uses or benefits from in order to maintain a well-regulated state (Prizant et al., 2006). *Self-regulation* is emotional regulation achieved independently by an individual (Prizant et al., 2006). When effectively utilizing self-regulatory strategies, a person is able to achieve a more optimal state of arousal for a given situation or environment that supports emotional well-being. In typical development, self-regulatory strategies become more sophisticated through maturation, socialization, and experience (Prizant et al., 2006). It is important to understand that self-regulatory behaviors vary as to how socially acceptable, conventional and effective they may be. Children and older individuals with ASD and other developmental disabilities may be limited to more primitive, unconventional or ineffective self-regulatory strategies due to their neurologically based disabilities and social learning difficulties. Some early self-regulatory patterns that are attempts to stay well regulated may be regarded by some as problem behaviors, such as repetitive motor behaviors (rocking, jumping. flapping, staring at or flicking fingers), vocalizing loudly to shut out aversive sounds and avoiding certain people, activities, or settings. Older individuals with ASD may demonstrate these early self-regulatory patterns.

Mutual regulation is emotional regulation that occurs in the context of social interaction (Prizant et al, 2006). Effective mutual regulatory abilities allow a person to achieve a more regulated emotional state primarily due to the actions or presence of another person or other people. At more advanced levels of ability, a person may actively seek out mutual regulation by requesting support or assistance from others. As with self-regulation, attempts to maintain a well-regulated state through mutual regulation vary along the dimensions noted above: social acceptability, conventionality, and effectiveness. Examples of less conventional or socially acceptable strategies may include persistent questioning about upcoming events, seeking out particular kinds of sensory input from others through climbing on or "crashing" into others, or verbal or nonverbal expression of refusal or protest in response to demands that may be perceived as threatening and anxiety-provoking.

Children and older persons with ASD have difficulty staying well regulated emotionally

There are many categories of factors that put individuals with ASD at high-risk for experiencing emotional dysregulation (Prizant & Laurent, 2011c). Some are directly related to the neurological basis of ASD, while others are related to characteristics of environments and social demands. It is helpful to think of two categories of factors that we have referred to as risk factors and protective factors. Risk and protective factors may be associated with either the presence or the prevention of emotional dysregulation. Risk factors are psychological, biological, and social factors that make a person more vulnerable to experiencing emotional dysregulation and displaying behaviors that may be perceived by others as problematic. Protective factors are those that make it less likely that dysregulation will occur. An emotional regulation

approach, discussed in greater detail below, strives to minimize risk factors and maximize protective factors. The following is a non-exhaustive list of key risk factors that are critical to our understanding of emotional regulation in ASD.

Psychological/Emotional Factors

Life is filled with uncertainty, unpredictability and unexpected changes in daily routines and environments in which we live. Due to neurologically-based difficulties in predicting other persons' intentions and actions, people with ASD often struggle to anticipate the behavior of others and to understand how activities are logically connected in the "flow" of everyday life (Prizant et al., 2006). Therefore, they may have problems coping with, and adapting to change and uncertainty. Some individuals with ASD have noted that the behavior of others often comes across as unpredictable, sudden, and threatening, which may result in great anxiety and in some cases, problem behavior (Ros Blackburn, personal communication). In addition, perceived lack of control over events and the behavior of others may also induce stress.

Emotional memory, or the memory of the feelings associated with people, places, and activities, is another psychological factor impacting an individual's regulatory abilities (Prizant, 2012). A relative strength of many people with ASD is their strong rote memories, which enable them to recall each element of a place or activity precisely, based upon their previous experiences (Prizant, 2012). While this may serve as a protective factor if memories are positive, it may also be considered a significant risk factor if experiences are associated with negative or stressful feelings. Strong negative emotional reactions may occur accompanied by attempts to avoid those people, places, and activities that are the sources of those feelings—often in the form of problem behavior such as dropping to the floor, bolting, and/or vocal/nonverbal protesting.

Biological/Physiological Issues and Factors

As with all human beings, individuals with ASD have what is referred to as an arousal bias (Prizant et al, 2006). One's arousal bias may also be considered a risk factor when considering emotional regulation. If the individual's bias is towards a high state of arousal, that individual is at risk for dysregulation and behaviors consistent with overstimulation, fight or flight reactions, or withdrawal. Other individuals with ASD have a bias towards a low state of arousal, putting them at risk for dysregulation and behaviors consistent with under-stimulation and disengagement, and difficulty focusing and staying alert. In this case, problem behaviors may be related more to a lack of initiation, passivity, and lethargy.

An additional biological/physiological risk factor associated with variable arousal level is sensory processing. Sensory processing issues may also play a major role impacting and individual's capacity for emotional regulation (Prizant & Laurent, 2011a). Individuals with ASD are often hyper-reactive and/or hypo-reactive to environmental stimulation according to the DSM-5 (APA, 2013). Individuals who possess challenges modulating responses to sensory information occurring within the environment often manifest high states of arousal and low states of arousal associated with dysregulation and problem behavior. Lack of control over events and the sensory world are additional key factors impacting the physiological arousal level and emotional state of a person with ASD. Being placed repeatedly in situations where one has little or no control over the level of stimulation or the behavior of others can cause great stress (Prizant & Laurent, 2011a).

Finally, health status is a critical risk factor that may contribute to problems in staying well regulated emotionally (Prizant et al, 2006). If a person has allergies, gastro-intestinal issues due to food sensitivities, a sleep disorder, or is dealing with other chronic health conditions, he or she will have significantly more difficulty tolerating transitions, delaying gratification, and generally dealing with the stresses of daily life due to discomfort and fluctuating arousal levels.

Social Factors

Problems in social understanding and the resulting social anxiety have a great impact on emotional regulation for persons with ASD and are significant risk factors. Many persons with ASD share that they feel confused and perplexed by how social rules and demands change from one situation to the next; how difficult it is to understand the feelings and intentions of others; and by people who often do not "say what they mean" (e.g., use language non-literally such as sarcasm or cynicism) (Prizant & Fields-Meyer, 2015). Seemingly simple social acts such as initiating interactions or

requesting support may cause overwhelming anxiety and result in problem behavior. The social complexity of a given situation can also be a complicating factor. For example, an individual may experience significant stress when attempting to process language or when attempting to remain engaged in an activity if there are many people present in the environment.
Of great significance to SLPs are the social communication limitations those with ASD possess and that are the diagnostic hallmark ASD (American Psychiatric Association, 2013). Social communication difficulties also serve as risk factors, since the inability to use language or other communicative means for social control, to express emotions, or to seek assistance increases the likelihood that the individual will use socially undesirable communication means such as physical actions to protest, refuse, or escape from challenging circumstances (Prizant & Laurent, 2011d). Limitations in the ability to understand other's use of language and nonverbal behavior can also result in great anxiety (Prizant & Laurent, 2011b). Likewise, these challenges that may include difficulty coordinating social attention can impact an individual's ability to learn new and more sophisticated regulatory strategies. Persistent challenges create, in turn, a need to rely on unconventional, less mature and potentially less effective regulatory strategies.

Signals of emotional dysregulation observed in individuals with ASD

Many examples of behaviors reflecting dysregulation have been cited above, and include nonverbal and physical behaviors, as well as vocal or verbal behaviors. Some patterns may be commonly observed (e.g., nonverbal refusals such as dropping to the floor, or bolting out of a room). Still others may be more idiosyncratic to a particular individual, such as shouting "no dump truck" every time there is a loud noise in the environment, for a child for whom loud noises are associated with dump trucks. Interestingly, many of these signals of emotional dysregulation may also be thought of as attempts to stay well regulated with varying degrees of effectiveness (Prizant & Laurent, 2011a).

Once again it is important to understand that signals of emotional dysregulation, as well as regulatory strategies, may be expressed through means that are considered socially acceptable or not acceptable (e.g., refusing by saying "no thank you", or refusing by screaming or throwing objects). Such signals also may vary in conventionality (e.g., using delayed echolalia or scripting to express emotions using phrases that come from videos, in contrast to expressing emotions using easily understood emotion words), and may fluctuate in terms of effectiveness (e.g., rocking may help an individual to stay calm and participate in an activity, or become frenetic and decrease ability to participate). A major focus of intervention geared towards supporting an individual's emotional regulation abilities is to help the individual with ASD to acquire and use more socially acceptable, conventional, and effective means to stay well regulated, for both self-regulation as well as mutual regulation.

The developmental hierarchy of emotional regulation strategies

Within the context of the SCERTS Model, which prioritizes supporting the development of emotional regulatory abilities for individuals with ASD and related social communication challenges, we have delineated three developmental levels of emotional regulatory strategies that are derived from research on emotional regulation in human development (Prizant et al, 2006). The first and earliest developing level is the "Behavioral Strategies", in which an individual uses sensory motor strategies as the primary means to regulate. Behavioral Strategies are motor actions and sensory experiences that the individual engages in to regulate (i.e., to increase or decrease arousal level), remain alert, and/or self soothe. Common examples include vocalizing, focusing attention on oneself for self-soothing or distraction (e.g., looking at one's hands, seeking oral sensory input), and engaging in repetitive motor actions, such as rocking, spinning, or finger tapping. The purpose of such activity may be to shift attention away from dysregulating events to neutral or more organizing events, or to provide sensory or motor input that in and of itself has a regulating impact. The use of "Behavioral Strategies" for the purpose of regulation persists throughout the course of a person's development and from childhood into adulthood. Examples of more sophisticated behavioral strategies include: going for a run, chewing gum, fidgeting with jewelry, and doodling.

The second level of regulatory strategies "Language Strategies," are developed as a person becomes a symbolic communicator. "Language Strategies" include the use of words or other symbols (e.g., signs, pictures,

photos) that the person uses, or can respond to, that regulate his or her emotional state and arousal level. Such strategies may include a child's ability to respond to information conveyed by partners through the use of symbols (e.g., use of spoken language or visual supports to provide information related to upcoming transitions), or the creative or imitative use of symbols (e.g., words, signs, pictures) to communicate one's emotional state to others or the need for assistance. These may be used in "self-talk" as well as in inner language (e.g., talking self through a task or using a verbal script to cope with a challenging situation). An individual may employ these strategies in an effort to organize actions, express emotional state, or to self-calm when too highly aroused. An example of a language level self-regulatory strategy is a child repeatedly saying or signing, "Don't worry, it's OK" when feeling anxious. An example of a language level mutual regulatory strategy is responding appropriately to information from a partner such as "one more math problem and then time for a break", or requesting assistance from others during a frustrating task, for example, "Help me put my coat on".

The final and most developmentally sophisticated level of regulatory strategies are "Metacognitive Strategies", involving a child's abilities to reflect on, talk about and use regulatory strategies that support organization, decrease anxiety, and regulate attention to stay most available for learning or engaging. At this level, an individual is able to make conscious choices and decisions in using strategies to stay well regulated, based on an understanding of what has been helpful in the past. For example, in a very noisy room, a child may consider his options (e.g., cover his ears, ask for a break in a quieter area, or ask to leave the room) before choosing to engage in the strategy deemed most desirable or effective. The use of more sophisticated symbolic strategies and increasing social awareness supports a person's abilities to reflect on social conventions for adaptive conventional behavior in different social situations, and to consider one's own actions in relation to others and in relation to accepted social standards. Therefore, at their most sophisticated level "Metacognitive Strategies" involve the process of internalizing a "dialogue," inhibiting behavior based on social and moral "rules," and using reflective problem solving (e.g., "If ___ happens, I can always do ___."). For example, a child who is faced with a challenging activity might consider his or her ability to succeed in the activity and to remain well regulated, and subsequently formulate a plan for completing the activity. The plan might include specific regulatory strategies, such a knowing that help can be requested from the teacher if needed.

Strategies that assist in emotional regulation for persons with autism

A comprehensive emotional regulation plan for an individual with ASD is comprised of two general categories of strategies: preventative strategies and reactive strategies Prizant and Laurent, 2011c, 2011d). Preventative strategies are used systematically throughout the day and across environments to help a person maintain a well-regulated state. Examples include exercise and movement opportunities, extensive use of visual supports for schedules and for teaching academics, adjusting adult communication level to the person's comprehension level, and adjusting/reducing sensory input when it proves to be dysregulating. Reactive strategies are introduced when behavioral indicators of dysregulation are already observed. The goal is to prevent escalation to more extreme dysregulation and helping a person "recover" to a better regulated state. SLPs are integral team members in helping to construct emotional regulation plans due to their understanding of the unique regulatory challenges posed by social communicative difficulties and cognitive learning style differences.

The integration of self and mutual regulation goals as a part of a comprehensive educational plan for individuals with ASD are key components in supporting the development of emotional regulation abilities, when the strategies align to individual developmentally levels. That is, emotional regulation may be facilitated through helping the individual with ASD acquire efficient and effective presymbolic sensory-motor means (movement activities, oral sensory support, tactile or proprioceptive supports such as fidgets or deep pressure input), or through new conventional language (symbolic) means. In all cases the strategy to support emotional regulation must be consistent with a person's developmental profile and skill acquisition. Therefore, while the regulatory abilities of a young child are limited due to his or her developmental level (i.e., a presymbolic child cannot use more abstract language-based or other symbolic strategies), the abilities of an older, or developmentally more advanced person may consist of both earlier developing sensory-motor strategies and higher level language and symbolic strategies (e.g. a

child functioning at a symbolic level can use language as well as engage in sensory motor activity to remain well regulated).

When developing a comprehensive plan to address an individual's emotional regulation abilities, it is critical to assess the person's capacities to maintain a well-regulated emotional state across situations by documenting the primary factors supporting or interfering with emotional regulation, along with the specific signals the person gives when he or she needs support. Dysregulating factors may include overwhelming sensory input, changes in routine, inappropriate task demands related to difficulty or duration of an activity, and disorganizing social and linguistic input.

Different behavioral signals of dysregulation are categorized according to different levels, ranging from well regulated to extremely dysregulated, with gradations in between. Next, proactive and preventative measures to support emotional regulation (e.g., alternating sedentary activities with movement activities, reducing the level of sensory input) are identified. As previously mentioned these are strategies that are used consistently to reduce uncertainty and other dysregulating factors, as well as to increase access to regulating inputs and activities. Following the identification of preventative strategies, specific goals and a plan are developed for supporting the person in acquiring and applying self-regulatory or mutual-regulatory strategies that are indexed calibrated to each level of dysregulation (e.g., mild, moderate, and extreme). As emotional regulatory strategies are implemented, the efficacy of the strategies are documented with adjustments made to the plan as needed.

Self-regulatory strategies that help an individual discover ways to maintain an organized state assist him/her in being available for active learning. For instance at levels of mild dysregulation, self-regulatory, sensory motor strategies for self-soothing may include the use of a particular calming or alerting activity (e.g., fidgets or rocking in a rocking chair). For persons who are symbolic communicators, using a schedule to indicate steps within an activity may be useful. At moderate levels of dysregulation, strategies may include those that allow an individual to take an attentional break in his/her current environment (e.g., listening to music or looking at a book). When extreme levels of dysregulation are evident, strategies often allow for a break from the environment (e.g., taking a physical break or removing self from a situation).

In addition to self-regulatory capacities, mutual-regulatory strategies must also be targeted. When an individual is experiencing a high degree of arousal, or is under-aroused, partners need to first read those signals indicative of different states, and then support mutual regulation. Support can be provided by responding in ways that promote the person's ability to focus, and engage, thus being in a state more conducive to relating, learning, and processing of information. Again, capacities for a person to initiated mutual regulation strategies should also align with his or her developmental profile and needs. For example, a child may be taught to request assistance or protest in socially acceptable ways through nonverbal means (e.g., acquiring and using early developing gestures to request, protest, or reject) or verbal means (e.g., acquiring and using specific vocabulary to express emotions, or to indicate refusal). These abilities have been demonstrated to be effective preventive measures to preclude problem behaviors precipitated by emotional dysregulation (Prizant & Laurent, 2011a)

Research evidence to support the use of ER strategies

Research is lacking on the comprehensive implementation of emotional regulation plans involving a wide range of strategies. However, research is available on the use of specific strategies such as relaxation techniques, use of visual supports and visual schedules, and how social communication supports emotional regulation and prevents problem behavior (Mirenda & Iacono, 2009). This is a critical area of need in research, as progress in emotional regulation may be one of the best predictive factors for later outcomes for individuals with ASD. Everyday experience indicates that those children (and older individuals) with greater abilities in emotional regulation: 1) are better able to participate in more complex social settings such as inclusive school environments; 2) are sought out more by other children; and 3) their families experience less stress and greater willingness to include their children in a wider range of activities (Prizant & Fields-Meyer, 2015).

Conclusion

Given the critical role of social communication in supporting a well-regulated emotional state, SLPs must be front and center in team efforts to enhance the ability of persons with ASD to be most available for learning and engaging. With progress in language and communication development, problem behaviors that are an expression of strong emotions can be reduced or eliminated, and it is more likely that additional problem behaviors would be prevented. Progress in social communication is also related to the development of social and play skills and with positive and secure relationships with adults and peers that align with the development of mutual regulation. It is therefore crucial that SLPs, who are trained as experts in social, language and communication development become an essential part of efforts to support persons with ASD. ♦

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An Overview of Dynamic Thinking and the Relationship Development Intervention (RDI) Program for Individuals Diagnosed with Autism Spectrum Disorder (ASD)

Andrew Shahriari

Abstract

This article introduces the Relationship Development Intervention (RDI) program developed by Steven Gutstein, Ph.D., and discusses some of its fundamental principles and guiding strategies related to autism spectrum disorder (ASD). After defining the criteria used to diagnose ASD, the article addresses the issue of static versus dynamic thinking, emphasizing the latter as the primary difficulty faced by individuals on the autism spectrum. The article outlines several core areas of challenge, namely *social referencing, co-regulatory interactions, flexible thinking,* and *episodic memory*, which are addressed through participation in the RDI program. Several guiding strategies are offered to give the reader some practical means of improving competency in these areas. The article concludes with some concerns, such as cost and time commitment, regarding ASD intervention protocols and how the RDI program may benefit those who implement it.

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Learning Objectives

1) Compare/contrast static and dynamic thinking.
2) Explain how to implement five guiding strategies that encourage improved relationships and dynamic thinking with individuals on the autism spectrum
3) Discuss the introductory principles of the Relationship Development Intervention (RDI). program for autism.

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Public awareness of autism is growing with much attention given to celebrities with children on the autism spectrum, research on genetic and/or environmental causes for autism, and educational and social programming (or lack thereof) benefiting individuals on the autism spectrum. Self-advocacy and a growing movement towards acceptance of all persons with neurological differences and challenges is contributing to a better understanding of the perspectives and needs of this population and their families. The paradigm of autism as a "disorder" is shifting towards recognition of it as merely a "difference" that has perhaps been present throughout human history. Authors are giving more attention to the history and culture of autism (e.g., Silberman, 2015; Murray, 2012), while publishers and production companies are increasingly promoting works by autistic individuals or projects that focus on the topic, either as fictional subjects and storylines (e.g., Haddon, 2003; Pencier, Urdang, Vanech & Mayer, 2009), or non-fictional accounts of the autism experience (e.g., Biklen & Wurzburg, 2011; Higashida, 2013; Bascom, J., 2012). To reflect and support this paradigm shift, the terms "autism" or person on the "autism spectrum" will be used throughout my discussion whenever possible.

In the decade that my interest in autism began, as a parent of a child on the autism spectrum, the prevalence of information and resources about "autism spectrum disorders" has increased exponentially. Ten years ago, there was hardly a book on the subject to be found in my local bookstore. Nowadays, a brief visit to the "special needs" section of a Barnes & Nobles Booksellers presents the new parent of a child diagnosed with autism with at least a dozen books on the subject, let alone the more than 70 million hits an Internet search for "autism" will produce. The amount of information (and misinformation) presented about autism is overwhelming for most anyone. Clinicians

working with families and certainly families and individuals on the autism spectrum themselves, are well aware of the additional difficulties sorting through the mountains of material available can bring. Many rely on organizations, such as Autism Speaks and the Autism Society of America, to help them filter through the research and rhetoric in order to find the best means of meeting the challenges of daily living.

A common axiom in the autism community is "when you've met one person with autism, you've met one person with autism," meaning that the manifestation of autism in each person is different and presents different challenges to address. As such, my hope with this essay is not to add to the confusion or present a "pet theory" about what autism is or why it exists that is necessarily applicable to every individual on the autism spectrum, but rather to share my perspective on what has benefited our family and my child in his life journey to this point. I also seek to present a way to view learning and thinking that distinguishes between the acquisition of rote or static skills and emphasizes more meaningful or dynamic thought. As a scholar in a research-oriented discipline (ethnomusicology), I am immediately skeptical of anecdotes and dogma related to any one perspective that asserts a universal theory or "truth" about the human condition. No doubt "evidence-based" research is fundamental to the sciences of the Western world, but there are also clear and logical systems of understanding human behavior and its motivations that are revealed only through experiential learning. The value of a human being and his/her abilities, in my opinion, is not measured through quantitative data.

Although we can analyze behaviors to make assumptions about a person's thoughts and emotions, these assumptions are colored by our own individual and cultural biases, even when we claim them to be "scientific." Certainly, reading personal accounts or interviewing individuals on the autism spectrum may help those of us considered "neurotypical" to understand their behaviors as manifestations of their thoughts and emotions, but asserting interpretations of such behaviors as universally applicable is as futile (and misleading) as it would be for doing so with any human being on the planet. "Why do I jump?" – the answer may be different for each person.

Rather than focusing on behaviors of individuals on the autism spectrum, I believe it is of greater benefit to address some core challenges we all face as human beings that relate most specifically to the life of someone with a condition labeled as autism. While individuals on the autism spectrum may define themselves otherwise, the *Diagnostic and Statistical Manual of Mental Disorders,* better known as the DSM-5**,** for its fifth edition update in 2013 (APA), designates the following criteria for a diagnosis of autism (National Institute of Mental Health, 2015).

1. Persistent deficits in social communication and social interaction across multiple contexts.
2. Restricted, Repetitive Patterns of Behavior, Interests, or Activities.

Additionally, the *DSM 5* (APA, 2013) indicates that the symptoms of autism must be present in early childhood, and that the symptoms together limit and impair everyday functioning and cannot be explained with some other intellectual disability or global developmental delay, such as Down syndrome or cerebral palsy. Though there are numerous subsets of these two basic criteria that focus on how they are manifested, these are the core elements that determine diagnosis.

Although a medical paradigm may identify a person as "having autism," it is merely diagnostic criteria. It does not provide insight into the means for helping individuals on the autism spectrum meet the challenges of their daily lives, nor should such a diagnosis limit them in their personal pursuit of self-discovery and happiness.

I consider these two main diagnostic criteria to describe complementary cognitive processes. The first, "persistent deficits in social communication and social interaction across multiple contexts," refers to dynamic processes, while the second, "restricted, repetitive patterns of behavior, interests, or activities," reflects static processes. A static process, as I define it in relation to human behavior, is one that does not change or can be enacted with a high degree of regularity and expectation. A dynamic process, in contrast, is one that changes frequently and cannot be expected to reoccur with a high degree of regularity (see Gaussen, 2001; Gutstein, 2009). Understanding the distinction between dynamic and static thinking is essential to adopting and integrating a framework that intentionally promotes

flexibility in actions, thoughts, and words for those on the autism spectrum.

Static and dynamic cognitive processes require different, but often complementary skill sets. The former is mastered through repetition, while the latter is developed through ongoing varied exposure to internal and external challenges (see Gutstein, 2009). Our behavior in any given context is dependent on whether or not the situation requires static or dynamic "thinking." Our ability to function "appropriately" (however that is defined in each situation) is based in part on our competency with static and/or dynamic thinking. The world of "things" generally emphasizes capabilities in the realm of static thinking (though certainly not exclusively), while the world of "beings" is generally more unpredictable and requires a higher degree of flexibility (i.e., dynamic thinking).

The predominant intervention protocol for autism for more than 40 years has been Applied Behavioral Analysis, or ABA. ABA therapists were initially concerned with the static processes mentioned in the diagnostic criteria of autism: "Restricted, repetitive patterns of behavior, interests, or activities." This approach to autism intervention is widely accepted because quantitative accomplishment of behavioral goals can be observed. However, the success of ABA in developing dynamic thinking more often required for social communication and interaction is not well researched, in part because determining progress of qualitative achievements can be elusive (Palmiotto, 2015). Within a behavioral model, static approaches may be used to deal with unpredictable situations, as the distinction or importance between dynamic and static thinking is not inherent to the model.

To illustrate the limitations of approaches that emphasize static learning, consider the situation of traveling in a foreign country where you are not a native speaker of the local language. To facilitate communication, you have a phrase book with your language translated into the local dialect that addresses many situations you may encounter in your travels. Such a phrase book can be considered a "static" resource, as the text does not change. Most certainly, a phrase book can help you function in daily life, provided your social interactions follow the "script" provided in the text. You can even attain an apparent level of fluency in the language by memorizing the entire book, something that many individuals on the autism spectrum are capable of doing.

For the most part, becoming good at such static skills requires an initial learning curve and then just practice to become more fluid, since the process does not change significantly. You learn "the rules," you follow them, and you can expect that your successful performance of the acquired skill will produce the desired outcome.

However, even with such a static skill as memorizing an entire phrase book mastered, being competent with "social communication and social interaction across multiple contexts" (see diagnostic criteria above) requires that you can effectively and fluently apply each phrase you have learned to any given context. That includes your interactions with not only people, but often times in interacting with "things" that simulate a social interaction, such as a bank machine "asking" if you want to buy stamps, a gas pump asking if you want a car wash, or a grocery check-out scanner asking if you want to make a charity donation. If a social interaction falls outside of your expectations (e.g., you expect to buy stamps at a post office, wash your car at a car wash, or make donations at a charity event), then even a simple yes/no response requires you to recognize the incongruence and dynamically adapt to the situation. Furthermore, what happens when your memorized phrase book does not provide a relevant response? Can you rely on your phrase book to get you through a dinner party or help you understand idioms particular to the culture, e.g., "dumb as a rock"?

Even the diagnostic criteria, which emphasizes "social" contexts, does not encompass the greater challenge of dealing with dynamic situations in non-social contexts, such as riding a bike, or reading a map. Certainly, acquisition of the static skills to be successful at these activities is essential, yet the context for their implementation can become a dynamic situation at any given instant (e.g., a flat tire, or a detour). The "unexpected" presents a challenge that requires flexibility in thinking. Feeling competent in your ability to resolve such dilemmas is, as mentioned above, developed through ongoing varied exposure to internal and external challenges. Learning static skills is important; however attention must be paid to the development of dynamic thinking skills in order to function and thrive in "multiple contexts."

Our family's personal journey with autism led us to a program founded by Steven Gutstein, Ph.D., called Relationship Development Intervention (RDI, 2001). The program addresses what we feel are essential abilities of our child's development as a person, not just a person with autism; although the focus is on the specific challenges generally faced by individuals on the autism spectrum. Gutstein considers the developmental areas of *social referencing, co-regulatory interactions, flexible thinking,* and *episodic memory* to be core issues to address for a person to become more competent as a dynamic thinker (Gutstein, 2009). Gutstein (2009) refers to this ability to improvise and problem solve in a variety of contexts as "dynamic intelligence."

Social Referencing is the ability to analyze verbal and non-verbal cues from another person in order to obtain meaning and make decisions (Gutstein, 2009). This is often thought of as the "Look at Me" behavioral approach to autism intervention where it is presumed that making eye contact is essential for a person to derive meaning, particularly in relation to emotional cues, such as facial expression. However, social referencing can occur with no visual contact or non-verbal cues (e.g., talking to someone wearing a mask). Prosody (i.e., vocal inflection), as an example, conveys important meaning that can affect decision-making. Uttering "hmm" with a rising inflection, can suggest a question, while a descending inflection can suggest confusion, contemplation, or disapproval.

Co-regulation is the idea of "working together," or joint action (Gutstein, 2009). The emphasis is on "we" rather than "me." It carries over into many aspects of life, a conversation being a common (and extremely complex) example. Other simpler examples of co-regulatory activity could be walking side-by-side, carrying a laundry basket together, playing music together, or playing catch together with a ball.

Flexible thinking is an essential skill associated with both social referencing and co-regulatory communication and interactions (Gutstein, 2009). The interpretation of facial expressions, for example, can have a multitude of meanings. A simple smile does not always equate to feeling "happy," as it can indicate other feelings, such as embarrassment, anger, boredom, coercion, even sadness. An individual must consider these other choices and analyze environmental cues in order to assess the meaning of a smile in any given context. Still, their analysis may not be "correct," which again requires flexible thinking in acknowledging and adapting to other possible interpretations. Non-social examples of flexible thinking might be as simple as using a book to hold down some papers (rather than the expectation that books are for reading), or climbing on a chair to reach a high shelf (rather than the expectation that chairs are for sitting).

Episodic memory considers a specific personal experience that includes both the internal "feeling" associated with the episode, as well as the external "knowledge" of what took place (Brown, 2013). For example, if I burn my hand on a flame, I will presumably remember this as a negative experience that affects my reaction to fire in close proximity on my next encounter. If I am challenged to remember my internal feelings in association with such occurrences, which seems often to be the case with individuals on the autism spectrum, then I may have difficulty appraising the positive or negative prospects of similar events in the future. This deeper meaning of the event, recalling internal feelings, and applying them to new situations would be referred to as the semantic memory aspect, where the meaning of the event is applied to new similar events, allowing flexibility in thinking.

The painful consequences of touching fire may readily trigger our episodic memory, whereas instances with less severe consequences may be more difficult to recall, e.g., remembering names. Where there is a lack of motivation, there is generally less likelihood that a memory will be recalled (Ngaosuvan, 2004). Increasing motivation is a focus for the behavior modification approaches to autism intervention that utilize external reward systems (or in the past, negative reinforcement) as a means of producing internal motivation (Bascom, 2012). While measuring quantitative behaviors can be reliably assessed through such protocols, evaluating the intrinsic motivation of an individual is not necessarily revealed through such methods. Furthermore, such rewards may encourage "restricted, repetitive patterns of behavior, interests, or activities," i.e., static thinking, without addressing "persistent deficits in social communication and social interaction across multiple contexts," i.e., dynamic thinking.

Considering social referencing, co-regulation, flexible thinking, and episodic memory as core challenges for individuals on the autism spectrum, there are several practical strategies that can be initially utilized to create an environment that help to strengthen these abilities. These are considered "guiding" strategies within the RDI program, rather than specific techniques intended to produce an expected response. It is important to emphasize that this protocol focuses on relationship development (and thus, social communication and interaction) as the means to improving dynamic thinking. The *process* of relationship building is valued over any behavioral *product* that might be consequently achieved. Adaptive skills acquisition is not the goal; rather, dynamic thinking skills, which result in the ability to adapt to a variety of situations, are prioritized. With *process* as a primary theme, some initial guiding strategies in working with individuals on the autism spectrum include: *minimize distractions, talk less/wait more, experiment to educate, model your thinking,* and *follow the 80/20 rule* (see Gutstein 2000, 2002a, 2002b 2009). Although these strategies are really nothing "new," the RDI program highlights them for caregivers to be more mindful of their implementation.

Minimize Distractions

The first, *minimize distractions*, seems easy to accomplish, but is often most overlooked. When we think of distractions, we may think of people talking in the back of the room during a speech, the television on while trying to study, texting while driving, etc. Such distractions can certainly affect a person's performance and ability to concentrate. But for individuals with sensory processing challenges, as many individuals on the autism spectrum have, distractions can be much more abundant and unrecognized by others. External distractions, such as bright lights, the humming of an air conditioner, the odor of a floor cleaner, or even the itchy feeling of a t-shirt, can be as overwhelming as staring into the sun, hearing a passing train at close range, taking a hefty whiff of ammonia, or rubbing our skin with sandpaper. Such sensory overload makes it difficult for a child to be available for learning. Responding to a child experiencing sensory overload includes ascertaining and acknowledging what environmental distractions may be affecting performance and removing or altering them when possible, e.g., turn down the lights (light sensitivity) or offer earplugs (sound sensitivity).

Internal distractions can be problematic as well. For example, performance anxiety, such as "stage fright," happens to most everyone, but can be especially stressful for someone on the autism spectrum who is conditioned to perform through external rewards. The "fear" of not performing correctly can be overwhelming and lead to meltdowns. Reassuring the child and helping him or her to re-direct, calm down, and focus on the present can help. Internal distractions are sometimes externally observable, as with the common tendency towards "scripting," a form of echolalia where a person involuntarily repeats words or phrases, such as from a movie script or book. This behavior can be a sign that the individual is feeling either bored or anxious. Acknowledging the behavior and inquiring about the person's feelings at the moment can serve as a reminder to focus on the task at hand. Simply stopping to take some deep breaths or singing a comforting tune, e.g., ABC song, can also serve as a means of redirecting and helping a student to self-regulate.

Talk Less/Wait More

Often times, talking itself can be a distraction. If your words are not consistent with your non-verbal communication, then the recipient is challenged to understand your meaning. If you can convey your message without speaking, do so initially, using language as a means of reinforcing the message, rather than initiating it. Too much talk can be difficult to process and may leave the student feeling bored, overwhelmed, or anxious, prompting them to "tune out". Furthermore, many opportunities for social referencing, co-regulation, and flexible thinking are missed by the intrusion of language. Although this is not always the case, consider whether or not verbal communication is acting as a barrier to the development of dynamic thinking skills and minimize or reduce the amount of talking when you can. (For example, consider the difference between explaining to someone how to tie his shoe versus demonstrating it for him.)

Because of all this internal and external distractive "noise," it is important to "wait more" and allow the child to process any verbal or non-verbal direction you might give them. A good rule of thumb that we follow in our home is to wait approximately 40 seconds after giving a direction. This may initially feel like an eternity, because most people are used to moving at a much faster pace. But for an individual on the autism

spectrum, the "regular" pace of most people is far too fast to process with so many distractions vying for his attention. We constantly expect individuals on the autism spectrum to work at our pace, without adjusting to work at theirs. While most of us recognize the need to slow down when working with special needs learners, small children, the elderly, or a person from another culture, your learner on the spectrum may need more time than you realize. Give them the opportunity to demonstrate their competency by silently counting to 40 seconds (sometimes more) before expecting a response. That initial 40 second wait may be down to 15 or 5 seconds a couple of months later, if you take the time to "slow down to speed up."

Experiment to Educate

Another helpful strategy is to approach educational objectives with an experimental mindset. An experimental attitude suggests you are focused on the "process" of learning, rather than the "product" of what is learned. In certain instances, the end goal may be to reach a desired outcome (e.g., 2+2=4); yet recognizing that learning is a process that comes at a varying pace for each individual is important for encouraging intrinsic motivation towards problem-solving skills (see Dweck, 2007).

The arts in particular provide many opportunities for experimentation – focusing on the process of creation, rather than the product of performance. Very few individuals, for example, can master a Beethoven piano sonata with one listen or by sight-reading a score. Reaching the desired outcome of a "perfect" performance requires persistence and a recognition that the end goal comes only after the process of practicing the music repeatedly (a "static" skill that plays to the strengths of learners on the autism spectrum). The visual arts encourage "process-learning" and experimentation to an even greater extent. A painting of a "sunset," for example, is open to an infinite array of interpretations that can encourage episodic memory and self-expression, as well as develop dynamic thinking skills.

Model Your Thinking

Modeling thinking through explicit descriptive verbalization is another helpful strategy, as it externalizes our internal thought processes, allowing another individual to understand the way we think and analyze our environment. If, for example, I am hanging a picture and must decide whether or not a hammer or screwdriver is better suited for the nail, I can verbally express my choice and why. Modeling thinking processes does not require the child to respond, so there is no pressure for him to perform. Rather, you are externalizing your internal thoughts in an effort to encourage your child to analyze similarly.

Importantly and in keeping with Talk Less/Wait More, to model your thinking does not always require language. "Spotlighting" a moment with a short utterance or non-verbal gesture can similarly externalize our internal thinking and emotions. A quick "gasp," for example, can spotlight a variety of feelings, such as surprise, admiration, or fear. Attention is brought to how the person feels or is thinking about an event or activity without explicitly stating one's thought processes. This ambiguity requires some dynamic thinking on the part of the child trying to assess the meaning of the utterance and its motivation. In the process social referencing and flexible thinking in particular are encouraged, as well as the "we" mentality (i.e., co-regulation) and episodic memory by extension.

80/20 Rule

The 80/20 rule is also aimed at targeting a child's internal motivation. By beginning an activity at a level where a child feels competent and confident for 80% of the time, he is encouraged to push towards a new challenge (the 20%) that is just beyond his present ability. With a special needs learner, a 90/10 ratio may be more successful, so that his/her self-esteem stays intact, which is essential for maintaining intrinsic motivation. Start simple and increase the challenge gradually. A child can achieve much more with this approach than starting with a top-down process, which is common to much ability testing. Such testing typically starts at a child's chronological age, which the evaluator generally knows from the outset is too difficult for the student. When you begin with too great a challenge and gradually simplify to find a child's competency level, you are more likely to discourage the child than to motivate them. Beginning with failure, rather than success, results in a child's potential rarely being realized, even to themselves.

Overview of the RDI® Program

Returning to our initial criteria for a diagnosis of autism, it should be clear that "restricted, repetitive patterns of behavior, interests, or activities" refers to static processes. Thus, programs that focus on repetition to attain mastery of a skill do indeed play to the strengths of an individual on the autism spectrum, i.e., "repetitive patterns of behavior." However, as outlined above, utilizing these skills "across multiple contexts" requires dynamic thinking in the moment for adaptive and successful application. The RDI program addresses this area of weakness with a systematic approach that considers not only the child with autism, but also the primary caregivers that are most affected and influential in the relationship with the child, most typically the parents.

The RDI program considers the family unit as having the most potential for encouraging an individual on the autism spectrum to improve his or her dynamic thinking. A central theme is restoring the Guided Participation Relationship (GPR) between parent and child, whereby the child is considered an apprentice to the primary guide, i.e., parent (Rogoff, 1990). With the adult acting as guide, rather than "following the child's lead," (a practice often used in other developmental approaches) the child learns to navigate the uncertainty of dynamic situations. The trusted relationships of the child's family members, rather than therapists, teachers, or peers, become the foundation for developing social communication and social interaction with others.

While the RDI program is continually being revised and updated in an effort to improve its delivery and effectiveness, the current model is referred to as the Family Consultation Program (FCP). Families work with a certified RDI consultant who tailors the program to the individual needs of the family. A consultant may visit family's home for such training, or meet with them in a clinical setting, such as an office.

The FCP is divided into seven goals as follows with brief description:

- Goal 1: Beginnings. This goal introduces the program principles and helps parents to recognize their essential role in their child's development.
- Goal 2: Child Assessment. This goal is intended to identify the child's competency in the primary areas of coordination, collaboration, and joint attention.
- Goal 3: Personal Assessment and Support. This goal focuses on the parents, rather than the child, to assess their state of well-being, support resources, and time management skills, so that the program can be effectively delivered.
- Goal 4: Set the Stage for Guiding. This goal seeks to identify obstacles both the child, e.g., sensory issues, and primary caregivers, e.g., marital stress, may need to consider for productive guiding. The goal also seeks to promote a mindset of process over product during engagement activities.
- Goal 5: Guiding Methods. This goal provides the key strategies for guiding a child to improve his or her dynamic thinking abilities. Caregivers learn how to "frame" engagement activities, so that distractions are minimized and the child works at his or her "zone of proximal development," referred to as Edge+1 within RDI (Vygotsky, 1978).
- Goal 6: Managing Important Personal Experiences. This goal encourages parents and child to become more mindful of significant moments during engagement activities to promote development of episodic memory.
- Goal 7: Applied Guiding. This goal seeks to develop intrapersonal and interpersonal agency in the child, so that s/he develops an authentic personal and social identity with confidence and competence.

Beyond these primary goals of the FCP is a program focused more specifically on developing Dynamic Intelligence™ of the individual with autism (Gutstein, 2009). The goals of the dynamic intelligence program are essentially extensions of applied guiding (Goal 7), focusing on personal and interpersonal agency, as well as self-development. Social communication and social interaction is more directly addressed, e.g., friendships, and the child is presumably achieving a much higher degree of independence than when the family began the program. The strategies learned in these latter stages are "life lessons" that continue beyond completion of the RDI protocol.

Daily Living Example of RDI Guiding Strategies in Action

An example of how the RDI guiding strategies can be applied in daily living might be a game I call, "Drop the Sock," which is played while doing laundry. To set the scene, imagine a child standing on a small step stool next to a washing machine. The parent drops a sock into the washer, mindful that the child has observed this action. The parent then offers another sock to the child with the expectation that s/he will duplicate the action. Keep in mind that the objective is not that the child succeeds in the task ("product" focus), but that s/he is motivated to share in the experience of doing laundry with the parent ("process" focus). As each child's ability to stay with such an activity will vary, even the smallest gesture of experience sharing, e.g., taking the sock, can be spotlighted with non-verbal appraisal, such as a thumbs up, smile, or approving "gasp" of success. If the child does not repeat the action, consider that s/he may not understand what his/her role in the activity may be.

In our example, let us assume the child has taken the sock, but does not understand that the next step is to put it in the washer. The parent (after waiting at least 40 seconds to feel confident the child is not still processing the next step) may take another sock and motion towards the washer, expectantly holding the sock in the air before dropping it. This pause in the action spotlights the next step, which can also be a time to model thinking, such as, "I need to drop the sock to wash it in the machine." The parent waits for the child to notice the pause before dropping the sock with expressed satisfaction, such as a verbalized "Whoo!" to spotlight the action. Again, the goal is for the child to become intrinsically motivated to share in the experience, not just achieve a behavioral outcome (e.g., "drop the sock").

When the child eventually recognizes and repeats the action, the parent can focus on establishing a co-regulatory pattern in which s/he hands more socks to the child and the child drops each sock into the washer. When the child feels competent in his role of "sock dropper" after several successes, the parent can add small variations to develop the child's dynamic thinking skills. A simple variation would be to hand the child a shirt, instead of a sock. This unexpected change may or may not disrupt the pattern, as the child must consider the new article of clothing and what to do with it. Assuming the child makes the connection and drops the shirt into the washer, the parent can add other small variations, such as holding an item up high for the child to take, increasing the rate in which the clothing articles are passed to the child, or relinquishing the sock only after the child gives it a gentle tug. These slight variations promote dynamic thinking while maintaining a feeling of competence and require that the child stay connected with the parent's lead (Gutstein 2009). The parent should strive to increase the challenge of the interaction without overwhelming the child's sensory system or competence level. The parent can build on this initial framework of "dropping the sock" over the course of time (often several months) to include all of the activities associated with doing laundry, e.g., sorting colors, carrying the laundry basket, folding clothes, etc. Eventually, the child transitions to being able to do this important life skill independently, but as an outgrowth of the guiding relationship initially established with the parent.

The consultant's role in this process is as a coach, rather than player in the activity. To facilitate this, the parent video records such engagements, so that the consultant can observe the interactions and assess obstacles and opportunities for relationship building between the parent and child. After analyzing the video, the consultant offers feedback to the parent through written or verbal correspondence. Face-to-face meetings often include role-playing activities to demonstrate guiding strategies and discuss challenges and progress in the parent-child relationship. The consultant seeks to transfer the ability to assess obstacles and opportunities for relationship development to the parent, so that s/he feels competent in his/her capability of guiding the child through their development into adulthood without assistance.

Relationship Development Assessment – Research Version (RDA-RV)

A common criticism of developmental-relational programs, such as RDI, is that their effectiveness has not been corroborated through "evidence-based" studies. The founders of RDI recognize the need for an evaluative system that can reliably measure qualitative progress in individuals on the autism spectrum, particularly as it relates to their ability to communicate and interact socially. The RDA-RV (Larkin, Guerin & Hobson, 2013) was developed in collaboration with

outside researchers to address this concern, as well as provide a standard coding system to help quantify the current abilities of an individual with regards to two main areas that are of primary concern relative to autism: *Intersubjective Engagement States* and *Interactive Regulation States* (Larkin, Guerin & Hobson, 2013). Intersubjective engagement is defined as the ability for the individual to remain affectively engaged during a shared activity (Palmiotto, 2015). Sub-categories in this area include (a) Lack of Engagement, (b) Coordination of Actions, (c) Coordination of Intentions, and (d) Coordination of Experiences (Palmiotto, 2015). Interactive regulation is defined as the ability for the individual to stay coordinated with a partner while engaged in shared activity (Palmiotto, 2015). Sub-categories in this area include (a) Absence of Contingency, (b) Contingency without Elaboration, (c) Contingency with Unbalanced Elaboration, and (d) Balanced Contingency with Elaboration (Palmiotto, 2015). The focus of evaluation and the corresponding coding system is therefore less on specific behaviors of the individual, but rather his or her ability to relate to another person.

This system and its corresponding assessment tool, though only recently established, allows researchers not associated with the RDI program to utilize the RDA-RV for other developmental-relational protocols, as well as to replicate studies that suggest the effectiveness of such programs in order to validate the results. This is important in order to provide the "evidence-based" research so commonly referenced by doctors and therapists in their support of behavior-based programs and tendency to dismiss other intervention protocols that emphasize a developmental-relational approach to addressing autism. To date, "no one intervention for autism is universally superior to all others," whether they follow a behavioral or developmental approach (Magiati, Charman, & Howlin, 2007). As the RDA-RV primarily evaluates the dynamic thinking abilities of the individual in social communication and interaction, it provides another tool for assessing development in this area of diagnosis.

Time and Financial Concerns

Typical of most autism interventions is a concern over cost, both in terms of time and money. Certainly, private services for individuals with autism are expensive and can exceed $40,000-$75,000 per year. This expense poses excessive challenges to equal access to early intervention as well as to the well-being, emotionally and financial, of a family. The RDI program takes into account the financial and scheduling challenges of the average family in its consultation model of intervention. Families meet with a consultant, rather than a therapist, on a schedule that is manageable for the family. The consultant educates and advises the parents as to guiding strategies associated with the program and provides assignments towards meeting the FCP goals and objectives that lead the child through normal developmental stages. Between visits, the family video records engagements with their child and sends them to the consultant via the RDI-LS (RDI-Learning System), a secure HIPAA-compliant online system. The consultant analyzes the video submissions and offers regular feedback to help the parents become more mindful of their interactions and observant of subtle improvements in their child's development.

Families unable to utilize the system will meet with consultants more regularly, often times in the home. Strategies are demonstrated and enacted with the parents, who are then encouraged to implement them with their child. The consultant's role is not to work with the child directly, but to educate the parents on how to do so themselves. For some, this can be off-putting; the feeling of incompetency in how to parent their child prior to starting the program is often overwhelming. Furthermore, the medical paradigm discourages parents from considering their primacy in affecting change in their child, rather than an outside specialist. RDI consultants are trained to be cognizant of the emotional well-being of the entire family and help parents to transition into the guiding role without dependency on outside professionals.

Addressing the issues of time and money are essential in the consultant's discussions with the parents. The first few months of the program typically require greater cost and time as the family interacts more often with the consultant. As the parents become more confident and competent in the guiding strategies of RDI, the personal visits become less frequent, thereby reducing costs and the time spent with the consultant directly. The guiding strategies become moment-by-moment mindfulness of relationship development that permeate daily activities, rather than a set number of hours in a specialized setting that is atypical of normal living.

Costs for the program vary between consultants with short and long-term contracts ranging from $1500 to $7000 per year. While the length of time to complete the program varies, the RDI literature suggests 18 months as typical. Many families remain committed to the program for several years, "checking-in" with their consultant monthly or a few times a year. The variability of this relationship is dependent on each circumstance, as the ultimate goal of the consultant is for his or her services to no longer be required. This model of intervention is not only more cost effective but assists families in engaging in productive use of time that supports relationships and learning.

Conclusion

The challenges specifically faced by individuals on the autism spectrum most typically involve areas of dynamic thinking, such as social interaction and communication, as well as performing static behavioral skills across multiple contexts. Teaching specific static skills to those on the autism spectrum can be of great benefit, but should be considered within the context of real world challenges where dynamic thinking is essential. The RDI program specifically aims to improve dynamic thinking and experience-sharing relationships by addressing core concerns of autism, namely *social referencing, co-regulatory interactions, flexible thinking,* and *episodic memory*. This is done through guiding strategies, e.g., "minimize distractions," rather than the development of specific static skills, e.g., brushing teeth.

Utilization of the RDA-RV to assess progress in qualitative interactions has the potential to allow researchers to evaluate more objectively the effectiveness of the RDI program, as well as other relationship-based protocols, child focused, and developmental programs as interest in developmental-relational programs grows, scientific support for their success in improving the quality of life for individuals with neurological and physical challenges will hopefully encourage a shift away from the medical paradigm labeling autism with negative stereotypes towards a more inclusive and accepting view of the unique contributions individuals on the autism spectrum make to our society. ♦

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Use of Augmented Input to Improve Understanding of Spoken Directives

12. Individuals with Autism Spectrum Disorder (ASD) often appear to understand spoken directions by:
    a. Copying the performance of their teacher
    b. Learning to follow a script as part of an everyday routine
    c. Guessing the correct answer
    d. Asking for clarification
13. What are scene cues?
    a. Panoramic pictures
    b. Pictures of movie scenes
    c. Any type of visual
    d. Images that portray relevant concepts and their relationships in context
14. Repetition of a verbal direction is:
    a. An effective method to improve understanding
    b. Just as effective as using a visual scene cue
    c. Not an effective method to improve understanding
    d. Both a and b
15. An example of a dynamic scene cue would be?
    a. Iconic image.
    b. Full motion video clip.
    c. Real image.
    d. None of the above.

Good Assessment Drives Good Intervention: Practitioner Considerations for DSM-V Changes

16. Identify methods of Natural Developmental Behavioral Interventions (NDBI):
    a. Reciprocal play routines
    b. Expanding attention
    c. All of the above
    d. None of the above

17. Identify assessment methods used by the Study to Explore Early Development (SEED):
    a. Autism Diagnostic Observation Scale – Second Edition (ADOS-2)
    b. Vineland Adaptive Behavior Scale – 2nd Edition (VABS-2)
    c. All of the above
    d. None of the above

18. Identify the number of severity levels per the DSM-V:
    a. 1
    b. 2
    c. 3
    d. 4

19. Identify specifiers of the DSM-V:
    a. Cognitive Profile
    b. Developmental Profile
    c. Environmental Factor
    d. All of the above

ASD: Insights from Neuroscience

20. According to the neurocognitive model of autism spectrum disorders described in this article, language learning and use is affected because:
    a. It is a unique human trait that would be affected in a social cognitive disorder like autism spectrum disorders
    b. Language is a later occurring development in evolution making it particularly susceptible to being affected in a developmental disorder
    c. It requires coordination across a number of processing centers within a large neural network
    d. Individuals with ASD don't understand that other humans have thoughts and can't make predictions about what these thoughts might be

21. According to the results of fMRI, PET, and ERP studies, children and adults with autism spectrum disorders have been found to have a number of difficulties with brain processes that are needed for learning language efficiently including:
    a. Processing rapidly occurring speech sounds
    b. Discriminating between phonemes such as /b/ and /d/
    c. Memorizing large chunks of language
    d. Processing human speech as compared to nonspeech sounds

22. An evidence-based practice that is consistent with the idea of helping the child with ASD perceive clear word boundaries is due to an underlying problem with statistical learning is:
    a. Using emphatic stress on key words
    b. Speaking to the child in long sentences so that they get good syntactical models
    c. Using extended pause time of 15 seconds or more so that they have time to respond
    d. Speaking rapidly so that your input matches the child's fast processing rate

23. Based on the results of several fMRI studies, individuals with ASD who are verbal may not automatically encode information into language, therefore, they may have difficulty:
    a. Memorizing large chunks of language from television programs
    b. Constructing a narrative version of an experience
    c. When visual social stories are used to scaffold their language
    d. Understanding information presented visually

Emotional Regulation and Autism Spectrum Disorders

24. Neuroscientists who study human emotion have indicated that:
    a. Physiological state and emotional state are not related
    b. It is extremely difficult to separate out physiological state from one's emotional state as these are closely related and intertwined
    c. Physiological state and emotional state are the same
    d. None of the above

25. Which factor may cause dysregulation for a person with autism?
    a. Sleep deprivation
    b. Violations of routine
    c. Sensory sensitivities
    d. All of the above

26. Which represents the hierarchy of emotional regulation strategies from the least to most developmentally sophisticated:
    a. Metacognitive - behavioral (sensorimotor) – language
    b. Behavioral (sensorimotor) – language – metacognitive
    c. Metacognitive - language - behavioral (sensorimotor)
    d. Language - behavioral (sensorimotor) – metacognitive

27. Which statement is false?
    a. Mutual regulatory strategies should be targeted in an emotional regulation plan
    b. Self-regulatory strategies should be targeted in an emotional regulation plan
    c. External behavior management procedures are superior to emotional regulation strategies
    d. Both self and mutual regulatory strategies should be targeted in an emotional regulation plan

Dynamic Thinking and the Relationship Development Intervention (RDI) Program

28. The Relationship Development Intervention program is a _____ approach to autism intervention.
    a. behavioral
    b. developmental relational
    c. psychological
    d. sensory processing

29. A dynamic process is one that _____.
    a. changes frequently and cannot be expected to reoccur with a high degree of regularity
    b. does not change or can be enacted with a high degree of regularity and expectation
    c. increases in difficulty with regards to regular patterns of behavior
    d. requires competency in behavioral skills

30. An example of a co-regulatory pattern would be _____.
    a. doing a crossword puzzle
    b. playing a video game
    c. riding a bicycle
    d. walking side-by-side

31. _____ is an example of a "guiding strategy" typical of the RDI program.
    a. "Hand-over-hand"
    b. "Look at Me"
    c. "Rapid Response"
    d. "Talk Less/Wait More"

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OSLHA publishes manuscripts relevant to the fields of speech-language pathology and audiology and adheres to American Speech-Language-Hearing Association (ASHA) Guidelines for the Responsible Conduct of Research: Ethics and the Publication Process http://www.asha.org/docs/html/GL2009-00308.html

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Contributed manuscripts may take any of the following forms:

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- ***Research Forum:*** The purpose of a research forum (RF) is to provide a concentrated focus on a special topic deemed to be of high interest to the readership. An RF contains a series of empirical studies centering on a key aspect of speech, language, hearing, or swallowing science and/or disorders. RFs may also comprise a set of scholarly papers presented at a scientific conference.
    - A proposal for an RF must be approved for consideration by the journal editor prior to forum development. Pre-approval by an editor does not guarantee that any or all manuscripts submitted will be accepted for publication. The proposal should (1) provide a forum summary, (2) outline the probable manuscript titles and author lists, (3) state whether a prologue and/or epilogue is planned, and (4) designate one person, a forum coordinator, as the point of contact and coordinator of communications with forum authors.
- ***Letter to the Editor:*** Opinions about material previously published in the journal or views on topics of current relevance. A letter relating to work published in the journal will ordinarily be referred to the author(s) of the original item for a response, which may be published along with the letter. Letters are typically limited to 15 manuscript pages, including citations, tables, and figures.
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- ***Viewpoint:*** Scholarly based opinion(s) on an issue of clinical relevance that currently may be neglected, controversial, related to future legislation, or could serve to update the readership on current thinking in an area.

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A guideline of 40 pages (including title page, abstract, text, acknowledgments, references, appendices, tables, and figures) is suggested as an upper limit for manuscript length. Longer manuscripts, particularly for critical reviews and extended data-based reports, will not be excluded from review, but the author(s) should be prepared to justify the length of the manuscript if requested to do so.

Peer Review

All manuscripts are peer reviewed, typically by at least two reviewers with relevant expertise, an issue editor (if applicable), and the journal editor. Correspondence between authors and editors is expected to be professional in tone. If correspondence is not conducted in a professional manner, an editor has the option to bring the matter before the OSLHA Directory of Technology and Publications and/or OSLHA's Executive Council. After consultation with the Directory of Technology and Publications, the editor may terminate the peer review process for that submission. The author has the right to appeal to the OSLHA Directory of Technology and Publications and/or OSLHA's Executive Council.

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In The Next Issue of *eHearsay* 2016

Happy Summer!!

I'm excited to share this third volume of eHearsay with you in 2016 as Lisa Audet has done an outstanding job of compiling interesting articles on Autism Spectrum Disorders.

I wanted to let you know about some of the upcoming issues of eHearsay that are currently being pulled together.

The next issue doesn't have a theme (i.e., another "special" edition) and contain 5 articles on diverse topics (e.g., stuttering and Tourette's, gifted children, cognitive screening tools in the health care environment and classroom acoustics).

The next two issues after that will contain articles on ***Cultural and Linguistic Differences*** (edited by Kathleen Boltik and Virginia Dubasik) and ***Dysphagia*** (edited by Donna Edwards). So if any of our members are interested in submitting a manuscript on either of those topics, please email me (Laurie.Sheehy@utoledo.edu) or the OSLHA office.

I'm also going to put a plug in for the 2017 OSLHA Convention – the call for papers will be coming out in the fall. Keep in mind that eHearsay would love to have you turn your poster, mini-seminar or short course into an article for our members after convention.

If you (or your students) want to publish a capstone project, I also hope you keep OSLHA eHearsay in mind.

Enjoy the rest of the summer (even if you're still working full time), it just seems easier to relax and catch up on things when it's sunny out.

Laurie M. Sheehy M.Ed. CCC-SLP
Journal Editor