Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 193 (2015) 239 – 245

Procedia
Social and Behavioral Sciences

10th Oxford Dysfluency Conference, ODC 2014, 17 - 20 July, 2014, Oxford, United Kingdom

Dysfluency in Autism Spectrum Disorders

Kathleen Scaler Scott[a]*

[a]*Misericordia University, 301 Lake Street, Dallas, PA 18612, USA*

Abstract

This paper will present the latest information regarding what is known and unknown about the presence, possible causes, and potential effective treatments of fluency disorders in Autism Spectrum Disorders (ASDs). Advanced review of cognitive features of ASDs which may play a role in contributing to dysfluencies in this population will be discussed. Examples of practical application of existing information to evaluation and treatment will be presented.

Peer-review under responsibility of the Scientific Committee of ODC 2014.

*Keywords:*autism; dysfluency; stuttering; cluttering

1. Introduction

Autism spectrum disorder is a developmental disorder with primary deficits in the areas of social interaction and repetitive behaviors. In order to be diagnosed with autism, these deficits must be observed in childhood in multiple environments and have a negative impact upon daily functioning. Social deficits specifically must include difficulties with interpretation of social interactions, nonverbal behavior, and reciprocal relationships. An additional mandatorycriteria for the diagnosis of autism is that of restrictive and/or repetitive behaviors, including restrictive interests or fixations, over or under reaction to sensory stimuli within the environment, inflexibility in behavior, and/or repetitive movements. Once a diagnosis of autism is given, a level is assigned, where Level 1 indicates support is required, Level 2 substantial support and Level 3 very substantial support. Part of levels of support

* Corresponding author. Tel.: 00+1+ 570-674-1437; fax: 00+1+908-782-4984.
*E-mail address:*kscott@misericordia.edu

Peer-review under responsibility of the Scientific Committee of ODC 2014.
doi:10.1016/j.sbspro.2015.03.266

involves level of cognitive abilities, with those with intellectual disability typically falling into the "Level 3" range, and those with average IQ falling into the "Level 1" range (American Psychiatric Association, 2013).

1.1. Patterns of dysfluency observed in autism

Given the nature of social deficits observed in autism, speech-language therapists (SLTs) will often be involved at the least for treatment of pragmatic deficits. Depending upon the level of severity, many individuals may require support in other areas of language and communication. In addition to language deficits, other speech issues have been observed, including difficulties with articulation, voice and fluency.

There has been a gradually growing body of literature documenting fluency issues in autism. The earliest documentation noted repetition of larger chunks of information, such as phrases (Dobbinson, Perkins, & Boucher, 1998; Simmons & Baltaxe, 1975). Over time, documentation narrowed in focus and indicated observations of dysfluencies that could be termed more stuttering and non-stuttering like (Ambrose &Yairi, 1999; Yairi & Ambrose, 1992). Forms of dysfluency currently identified in autism include stuttering, cluttering, excessive non-stuttering like dysfluencies, and atypical dysfluencies, such as word final dysfluencies (WFD). The stuttering-like, non-stuttering like and atypical dysfluencies have been identified in ages ranging from preschool through adulthood, while the cluttering behaviors have been identified in school-age children (see Scaler Scott, Tetnowski, Flaitz, Yaruss, 2014 for review). Awareness of the dysfluencies has been on a continuum ranging from no awareness to negative feelings and cognitive misperceptions by those with both SLDs (Scaler Scott et al., 2014) and WFDs (Scaler Scott et al., 2013).

1.2. Cognitive features of autism related to fluency

There are several theories regarding what the core deficit is that can account for manifestation of all symptoms of autism and the variance of symptoms at different levels of autism. Among these theories are those that support impairments in central coherence or gestalt processing (Frith,1989), theory of mind (Baron-Cohen, 1995), information processing (Minshew & Williams, 2008) and executive functioning deficits (Ozonoff, Pennington, & Rogers, 1991). No one theory has to date been conclusively found to explain all aspects of features of autism in different contexts and in different levels of impairment for different people. However, components of each theory are agreed upon as deficit areas in autism, even if these areas of deficit do not explain the entire disorder.

Examining specific cognitive features of autism may help further explain the manifestation of dysfluencies within this population. Executive functioning skills are the skills one uses to carry out a task from the planning stages through successful completion. It includes skills such as planning, organizing, prioritizing, self-monitoring, and problem solving (Barkley, 1997). Working memory has often been thought to be one of the executive functioning deficit areas in autism (Ozonoff, et al., 1991). Working memory involves the skill of holding information in your mind to work with it in some way, such as holding numbers in one's mind while solving a complex math problem. Working memory is important to fluent conversation. Non-stuttering like dysfluency such as interjections can result when one loses one's train of thought in conversation, forgetting where one is going (Clark & Fox-Tree, 2002). In those for whom this occurs frequently, conversational speech is likely to be highly disfluent, including features of non-stuttering like dysfluencies (NSLDs) such as interjections and revisions. Several researchers have noted excessive NSLDs in autism (Lake et al., 2011; Scaler Scott et al., 2014; Stirling, Barrington, & Douglas, 2007).Whether deficits in working memory play a role in the presentation of excessive NSLDs has yet to be investigated.Excessive NSLDs are also a feature of cluttering (St. Louis and Schulte, 2011), which has been noted in autism (Scaler Scott et al., 2014).

In examining the existing literature on working memory in autism, we find conflicting results. Williams, Goldstein, Carpenter, & Minshew (2005) compared performance on an N-back letter task in a sample of children and adolescents and a sample of adults to two control samples. An N-back letter task requires a participant to recognize previous test stimuli that was presented "N" positions back (Kirchner, 1958). For example, for a 2-back letter task, a participant must respond when the same letter is presented that was presented 2 letters prior. This type

of task requires the participant to hold and manipulate information in working memory. Williams et al. (2005) found deficits in spatial working memory but not in verbal working memory tasks. Neuropsychological testing results have been criticized as not telling the whole story (Minshew & Wiliams, 2008), given that a test given to assess one area (e.g. working memory) may in reality be assessing multiple areas of functioning (e.g, working memory, processing speed, inhibition, etc.). When delving into findings more deeply, Joseph et al. (2005) found that during a self-ordered pointing test, school-age children with autism did not use words to mediate the demands on their working memory as the control participants did. This finding suggested that these students with autism used a different system than controls to manage working memory demands. Similarly, during an N-back task completed under fMRI in adults with autism, researchers found that those with autism used visual rather than verbal codes to perform tasks (Koshino et al., 2005). This again was a different strategy in using working memory than control participants. Overall, the literature in autism suggests that students with autism may think differently and respond to demands on their working memory differently than those without autism. This difference in types of strategies used may be related to result in a difference in response to overload on working memory during connected speech. For example, when a person loses their train of thought during a conversation, they may pause, use interjections, or back up from where they are to regain their original train of thought. It is possible that those with autism who exhibit WFDs may be using excessive NSLDs as a placeholder in an attempt to regain their train of thought. The dysfluencies may be excessive due to deficits in working memory. Additionally, in pilot studies, some individuals with autism with WFDs have decreased their use of WFDs with increased pausing (Scaler Scott et al., 2013). This suggests that perhaps WFDs also serve as atypical ways to compensate for overload on working memory.

Another executive functioning deficit present in individuals with autism at all levels is that of self-monitoring. Individuals with autism often have difficulty recognizing what behaviors they are engaging in in the moment, and how these behaviors may come across to others. Part of self-monitoring involves the ability to filter or inhibit responses. Individuals with Attention Deficit Hyperactivity Disorder (ADHD; Combined Type) have been shown to make more repairs when planning verbal sentences (Engelhardt, Corley, Nigg, & Ferreira, 2010). These increased repairs are hypothesized to be related to difficulties with response inhibition. For some individuals who have difficulty with response inhibition, they may exhibit more repairs in speech and/or cluttering-type behaviors. In the literature on autism there are mixed findings as to whether or not individuals with autism exhibit deficits in response inhibition from a behavioral perspective. Agam et al. (2011) found that 11 adults with autism had more difficulties with response inhibition during anti-saccadic tasks than controls. More specifically, those who displayed more difficulty with response inhibition also exhibited more restrictive and repetitive behaviors. It is possible, then, that part of these restrictive or repetitive behaviors may relate to increased repetitions among some with autism and/or increased ability to terminate a final sound when speaking, as described below.

Perseverative behavior, where one continues with a behavior repetitively, is a feature of autism. The root of perseverative behavior must always be thoroughly investigated. The behavior may perform a variety of functions for the individual, including attention seeking, sensory providing, or difficulties with flexibility of thought. This difficulty with "shifting gears" may account for some of the dysfluency patterns observed within autism. Word final dysfluencies have been described in the literature as difficulties with termination of sounds. Perhaps this difficulty with termination of a sound relates to an individual seeking sensory feedback. Given that analyses of WFDs have found this behavior on specific sounds, further investigation into the sensory properties of these sounds may shed some light (McCallister& Kingston, 2005). It is also possible that the lack of sound termination is being used as a placeholder by the individual rather than the traditional (and more socially acceptable) interjection. Finally, in an analysis of a story retell by a boy with high functioning autism, Stirling, Barrington, & Douglas (2007) found that the boy made multiple revisions in an attempt to find the perfect wording. Therefore, multiple repairs may be used strategically by someone with autism in an effort to word something in a specific way, especially given the "detail focus" (Frith, 1989) that is present in autism. Multiple repairs resulting in increased NSLDs may also be a result of difficulties with rapid retrieval of information (Rapin& Dunn, 2003).Increased typical dysfluency has been noted in those with either a history of recovered language impairment (Boscolo, Bernstein Ratner, & Rescorla, 2002) or a current level of language impairment (Van Borsel & Tetnowski, 2007).Additionally, increased stuttering-like dysfluencies have been noted among those with neurological impairments (Van Borsel & Tetnowski, 2007).

Overall, the cognitive literature on autism provides multiple potential factors which may contribute to disfluencies in this population. Variations in the level of executive functioning deficits in people with autism may account for variations in presentation of fluency symptoms within this population. Further investigation of relationship of specific variables to disfluency in autism would help further delineate possible contributing factors.

1.3. Treatment of fluency disorders in autism

The only published study of a treatment program for dysfluency in autism involved the treatment of SLDs. In this case study, Brundage, Whelan and Burgess (2012) reported success with treatment of the SLDs in an adult with autism. The applied treatment involved a modified version of Runyan and Runyan's "Fluency Rules" (1986). Similarly to documentation of spontaneous recovery in stuttering, there is documentation of spontaneous recovery from WFDs, both in preschool years (Mowrer, 1987) and in later school-age years (McCallister & Kingston, 2005). In none of these cases was there a diagnosis of autism, and formal assessment of pragmatic language skills (hallmark of autism) was not completed. Treatment of WFDs has by identification and correction has been documented in a case study of a 12-year-old boy with no diagnosis (Van Borsel, Geirnaert, & van Coster, 2005) and a school-age boy with autism (Tetnowski et al., 2012). The existing treatment literature suggests that there is therefore both spontaneous recovery and management of long term difficulties with WFDs in autism, as well as management of typical SLDs following traditional stuttering treatment plans in autism. Studies of larger numbers of individuals with varying age and ability levels and approaches to treatment are needed.

1.4. Clinical perspectives in evaluation and treating autism given what we know at this time

Given that SLDs, excessive NSLDs, WFDs, and cluttering have been identified in individuals of preschool, school-age and adults with autism, evaluation of fluency should remain a consider to SLTs when conducting speech-language evaluations. Additionally, because awareness and response to dysfluencies varies, assessment of the affective and cognitive components of each fluency disorder should be a standard consideration during evaluation.

2. Conclusions

Identification of types of fluency disorders and specific presentations of fluency symptoms in autism is a slowly growing body of literature. Also growing is the body of literature explaining cognitive differences in autism. Continuing to follow these bodies of literature for new data, while using the existing data on the two will allow the SLT to make sound assessment and treatment decisions for clients with autism.

Acknowledgements

The author acknowledges the Faculty Research Grants Committee at Misericordia University for helping to make this project possible.

References

Agam, Y., Joseph, R. M. , Barton, J. S., and Manoach, D. S. (2010). Reduced cognitive control of response inhibition by the anterior cingulate cortex in autism spectrum disorders.*Neuroimage, 52(1),* 336-347.

Alm, P**.** (2011).Cluttering: A neurological perspective. In D. Ward & K. Scaler Scott (Eds.).Cluttering: Research, Intervention and Education. East Sussex: Psychology Press.

Ambrose, N. G. and Yairi, E., 1999, Normative disfluency data for early childhood stuttering. *Journal of Speech, Language, andHearing Research*, 42, 895–909.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders*, 5th edn (Washington, DC:APA).

Ardila, A. and Lopez, M. V. (1986). Severe stuttering associated with right hemisphere lesion. *Brain and Language*, *27*, 239–246.

Barkley, R. A. (1997). *ADHD and the nature of self-control*. New York: The Guilford Press.

Baron-Cohen, S. (1995).*Mindblindness: An essay on autism and theory of mind*. Cambridge, MA: The MIT Press.

Bijleveld, H., Lebrun, Y. and Van Dongen, H., 1994, A case of acquired stuttering. *Folia PhoniatricaetLogopaedica*, *46*, 250–253.

Boscolo, B., Bernstein Ratner, N. and Rescorla, L. (2002). Fluency of school-aged children with a history of specific expressive language impairment: an exploratory study. *American Journal of Speech–Language Pathology*, *11*, 41–49.

Brundage, S. B.,Whelan, C. J. and Burgess C. M. (2013). Brief Report: Treating stuttering in an adult with autism spectrum disorder. *Journal of Autism and Developmental Disorders*,*43(2),* 483–489.

Clark, H. H., & Fox-Tree, J. E. (2002).Using uh and um in spontaneous speaking.*Cognition, 84(1),* 73-111.

Cosyns, M., Mortier, G., Corthals, P., Janssens, S. and Van Borsel,J. (2010). Word-final prolongations in an adult male with neurofibromatosis type I. *Journal of Fluency Disorders*, *35,* 235–245.

Dobbinson, S., Perkins, M. R., & Boucher, J. (1998).Structural patterns in conversations with a woman who has autism.*Journal of Communication Disorders, 31,* 113-134.

Engelhardt, P. E., Corley, M., Nigg, J. T., & Ferreira, F. (2010).The role of inhibition in the production of disfluencies.*Memory and Cognition, 38(5),* 617-628.

Frith, U. (1989). *Autism: Explaining the enigma*. Oxford, UK: Blackwell Publishers.

Hall, P. K. (1977). The occurrence of dysfluencies of language disordered school-aged children. *Journal of Speech and Hearing Disorders*, *42*, 364–369.

Hall, N. E. (1996). Language and fluency in child language disorders: changes over time. *Journal of Fluency Disorders*, *21*, 1–32.

Hall, N. E., Yamashita, T. S. and Aram, D. M. (1993).Relationship between language and fluency in children with language disorders.*Journal of Speech and Hearing Research*, *36*,568–579.

Hietala, A., & Spillers, C. (2005, November).Dysfluency patterns in children with autism spectrum disorders. Poster session presented at the Annual ASHA Convention, San Diego, CA.

Joseph, R. M., Steele, S. D., Meyer, E., and Tager-Flusberg, H. (2005). Self-ordered pointing in children with autism: Failure to use verbal mediation in the service of working memory? *Neuropsychologia, 43*, 1400-1411.

Kirchner, W. K. (1958), *Age differences in short-term retention of rapidly changing information.* Journal of Experimental Psychology, 55(4), 352-358.

Klin, A., Volkmar, F. R., and Sparrow, S. S. (2000). Asperger Syndrome. Guilford Press.

Koshino, H., Carpenter, P. A., Minshew, N. J., Cherkassky, V. L., Keller, T. A., & Just, M. A. (2005). Functional connectivity in an fMRI working memory task in high-functioning autism.Neuroimage, 24, 810-821.

Lake, J. K., Humphreys, J. R. and Cardy, S. (2011). Listener vs.speaker oriented aspects of speech: studying the dysfluencies of individuals with autism spectrum disorders. *PsychonomicBulletin and Review*, *18*, 135–140.

Lebrun Y. and Leleux, C. (1985).Acquired stuttering following right-brain damage in dextrals.*Journal of Fluency Disorders*,*10*, 137–141.

Lebrun, Y. and Van Borsel, J. (1990).Final sound repetitions.*Journal of Fluency Disorders*, *15*, 107–113.

Luna, B., Doll, S. K., Hegedus, S. J., Minshew, N. J. and Sweeney, J. A. (2007). Maturation of Executive Function in Autism.*Biological Psychiatry, 61*, 474-481.

McAllister, J., & Kingston, M. (2005). Final part-word repetitions in school-age children: Two case studies. *Journal of Fluency Disorders, 30*(3), 255–267.

Minshew, N. J. and Williams, D. L. (2008). Brain-Behavior Connections in Autism (pp. 44-65). In K. Dunn Buron and P. Wolfberg (Eds.).Learners on the Autism Spectrum. Shawnee Mission, KS: Autism Asperger Publishing Co.

Mowrer, D. (1987). Repetition of final consonants in the speech of a young child.*Journal of Speech and Hearing Disorders*, 52,174–178.

Ozonoff, S., Pennington, B. F., & Rogers, S. J. (1991). Executive Functioning Deficits in High-Functioning Autistic Individuals: Relationship to Theory of Mind. *Journal of Child Psychology and Psychiatry, 32(7)*, 1081-1105

Paul, R., Shriberg, L.D., McSweeny, J., Cicchetti, D., Klin, A., &Volkmar, F. (2005). Brief report: Relations between prosody performance and communication and socialization ratings in high functioning speakers with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *35*, 861-69.

Plexico**,** L., Cleary, J. E., McAlpine, A., & Plumb, A., *Dysfluency*Patterns Observed in Young. Children With*Autism Spectrum Disorder* (2009, Nov.). A poster presentation at the annual convention of the American Speech-Language-Hearing Association, New Orleans, LA.

Rapin, I., & Dunn, M. (2003). Update on the language disorders of individuals on the autistic spectrum. *Brain and Development, 25,* 166-172.

Rehfeldt, R. A., and Chambers, M. R. (2003).Functional Analysis and Treatment of Verbal Perseverations Displayed by an Adult with Autism.*Journal of Applied Behavior Analysis, 36,* 259-261.

Rosenfield D. B., Viswanath, N. S., Callis-Landrum, L., Didanato, R. and Nudelman, H. B. (1991) Patients with acquired dysfluencies: what they tell us about developmental stuttering. In H. F. M. Peters, W. Hulstijn and C. W. Starkweather (eds), *Speech Motor Control and Stuttering* (Amsterdam: Elsevier) pp. 277–284.

Runyan, C., &Runyan, S. (1986). A fluency rules therapy program for young children in the public schools. *Language, Speech, andHearing Services in Schools, 17(4),* 276–284.

Scaler Scott, K. & Reeves, N. (2010, Sept.).Dysfluencies in Autism Spectrum Disorders: Best Practice. A workshop presented to the Plano Independent School District, Plano, TX .

Scaler Scott, K., &Sisskin, V. (2007, Nov.).Dysfluency and Autistic Spectrum Disorders: Treatment Considerations for the Clinician. A seminar presentation at the annual convention of the American Speech-Language-Hearing Association, Boston, MA.

Scaler Scott, K., Ward, D. & St. Louis, K. O. (2010). Paul: Treatment of Cluttering in a School-Age Child. In S. Chabon and E. Cohn (Eds.).*The Communication Disorders Casebook: Learning by Example* (pp. 261-272). Boston: Pearson.

Scaler Scott, K**.,**Tetnowski, J. A., Flaitz, J., &Yaruss, J. S. (2014).Preliminary study of dysfluency in school-age children with Autism.*International Journal of Language and Communication Disorders, 49*(1)*,* 75-89.

Scaler Scott, K., Block, S., Reardon-Reeves, N., Healey, K., Kerestes, K., LaRussa, R., Nelson, S., &Kidron, M. (2013, Nov.).Dysfluency in Autism Spectrum Disorders: Treatment Outcomes and What They Mean for School-Based Speech-Language Pathologists. A seminar accepted for presentation at the annual convention of the American Speech-Language Hearing Association, Chicago, IL.

Scott, K. S., Grossman, H. L., Abendroth, K. J., Tetnowski, J. A., & Damico, J. S. (2006). AspergerSyndrome and Attention Deficit Disorder: Clinical dysfluency analysis. In J. Au-Yeung & M. M. Leahy (Eds.). Research, treatment, and self-help in fluency disorders: New Horizons. *Proceedings of the Fifth World Congress on Fluency Disorders.* Dublin, Ireland: International Fluency Association.

Shriberg, L.D., Paul, R., McSweeny, J.L., Klin, A,.Cohen, D.J., & Volkmar, F.R. (2001). Speech and prosody characteristics of adolescents and adults with high-functioning autism and asperger syndrome.*Journal of Speech, Language, and Hearing Research, 44*, 1097-1115.

Simkins, L., Kingery, M., & Bradley, P. (1970).Modification of cluttered speech in an emotionally disturbed child.*The Journal of Special Education, 4(*1), 81-88.

Simmons, J. Q., &Baltaxe, C. (1975). Language patterns of adolescent autistics. *Journal of Autism and Childhood Schizophrenia, 5*(4), 333-351.

Sisskin, V. (2006). Speech dysfluency in Asperger's Syndrome: Two cases of interest. *Perspectives on Fluency and Fluency Disorders, 16*(2), 12-14.

Stirling, L., Barrington, G., & Douglas (2006). Two times three little pigs: dysfluency, cognitive complexity, and autism. Annual Meeting of the Australian Linguistic Society, Brisbane, Australia.

St. Louis, K. O. and Schulte, K. (2011).Defining cluttering: the lowest common denominator. In D.Ward and K. Scaler Scott (eds), *Cluttering: Research, Intervention and Education* (Hove:Psychology Press) pp. 233–253.

Stansfield, J. (1995). Word-final dysfluencies in adults with learning difficulties.*Journal of Fluency Disorders*, *20,* 1–10.

Tetnowski, J., Richels, C., Shenker, R., Sisskin, V. and Wolk, L. (2012).When the diagnosis is dual.*ASHA Leader*, 14 February,10–13.

Van Borsel, J. and Tetnowski, J. A. (2007). Fluency disorders in genetic syndromes. *Journal of Fluency Disorders*, *32*, 279–296.

Van Borsel, J., Geirnaert, E. and Van Coster, R. (2005).Another case of word-final dysfluencies.*Folia Phoniatrica et Logopaedica*,*57*, 148–162.

Van Borsel, J., Van Coster, R. and Van Lierd, K. (1996). Repetitions in final position in a nine-year-old boy with focal brain damage. *Journal of Fluency Disorders*, *21*, 137–146.

Williams, D. L., Goldstein, G., Carpenter, P. A. and Minshew, N. J. (2005).Verbal and Spatial Working Memory in Autism.*Journal of Autism and Developmental Disorders, 35(6)*, 747-756.

Yairi, E. and Ambrose, N. (1992).A longitudinal study of stuttering in children: a preliminary report. *Journal of Speech andHearingResearch*, **35**, 755–760.