The Strengths of Speech Delay: Getting a Grip on the Sensory-Motor Complexity of Autism

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Abstract

This article analyzes the visual, auditory, vocal, and motor advantages among autistic people with speech onset delay (A-SOD) compared with autistic people without speech delay (A-NoSOD) and sometimes non-autistic people. Importantly, their intelligence and communication skills are often underestimated. In addition, this paper provides suggestions to leverage strengths and address weaknesses from a sensory-motor perspective. Visual strengths are applied to IQ testing, reading and writing, and interpreting facial expressions. Auditory applications range from pain to music to speech development. Implications include suggestions for both production and perception of speech. The recommendations address both language’s relationship to motor development and the role of general language learning. Paradoxically, strengths in auditory perception may contribute to speech delay but also help A-SOD catch up to A-NoSOD, and continue to help A-SOD develop. Understanding A-SOD’s strengths may help to recognize how they make developmental gains in speech and language, and build from their strengths.

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Key words: neurodiversity, strengths, speech delay, visual perception, auditory perception, pitch, motor skills

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The neurodiversity movement offers a holistic framework for understanding and supporting autistic people, which complexly recognizes strengths, neutral differences, and weaknesses (Kapp, 2020). Strengths can present selective advantages and functional challenges (Russell et al., 2019), and valid subtyping cannot happen without regard for them (Kapp, 2023). The distinction of autism and Asperger’s in the DSM-IV depended on speech delay for autism, which may stem from strengths like pitch perception that delay language and continue to impact communication and behaviour (Eigsti & Fein, 2013). The paper shows that perceptual strengths especially apply to autistics with speech onset delay and strength-based assessment

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and support may help autistic people (including with intellectual disability or minimal speech) demonstrate intelligence (Girard et al., 2023; Courchesne et al., 2015), learn to read (Ludlow, Wilkins, & Heaton, 2008), and acquire speech (Chenausky et al., 2022).

Autistic people with speech onset delay (A-SOD: lack of single words by age two and communicative phrases used by age three: American Psychiatric Association, 1994) often (go on to) have comparable IQ and developmental level to autistics without that delay (A-NoSOD; Happé, 2011; Bennett et al. 2008; Howlin, 2003; Szatmari et al., 2009). This paper analyses the visual, auditory, vocal, and motor advantages among A-SOD compared with A-NoSOD and sometimes non-autistic people that enable this developmental feat. It also provides suggestions to improve assessments and guidance for families from a sensory-motor perspective, focusing on suggestions for both leveraging strengths and addressing weaknesses. It is critical to understand the advantages of A-SOD because understanding their strengths may help to recognize how they make developmental gains in speech and language, and build from their strengths.

**Visual Perception and IQ**

An autism-typical strength in perceptual reasoning (Dawson et al., 2007) especially applies to A-SOD (Nader, Jelenic, & Soulières, 2015; Soulières et al., 2011) and autistics with lower verbal comprehension (Nader et al., 2015; Soulières et al., 2011; Bölte, Dziobek & Poustka, 2009). IQ tests like the Weschler heavily require language and prior learning. The Raven’s Progressive Matrices IQ test, however, only uses problem-solving with visual geometric designs. A-NoSOD (Hayashi et al., 2008) and particularly A-SOD (Nader et al., 2015; Soulières et al., 2011) have earned Raven’s scores that match their Weschler peak performance, and that outperform non-autistic peers with comparable Weschler scores (Chen, Planche, & Lemonnier, 2010). Compared with typical adults, A-SOD have faster visual-spatial (Sahyoun et al., 2009) and general processing speed (Barbeau et al., 2013), whereas A-NoSOD have the slowest processing speed (Bucaille et al., 2016). Therefore, IQ tests that emphasize verbal abilities and deemphasize visual-spatial skills may underestimate autistic people’s intelligence, particularly A-SOD, necessitating strength-informed and flexible testing (see Recommendations: IQ).

**Auditory Perception and Learning**

A-SOD often benefit from enhanced auditory perception that supports their learning. A-SOD may exhibit more accurate hearing, as among children A-SOD are less likely to misperceive auditory-visual speech than A-NoSOD, Down syndrome, and typically developing peers (Bebko, Schroeder, & Weiss, 2014). Moreover, among adolescents and young adults, A-SOD, but not A-NoSOD, demonstrate high brain activity in response to sound (Samson et al., 2015) and strong abilities to distinguish between tones (Bonnel et al., 2010; also see Yau et al., 2015) or identify musical notes (Jones et al., 2009). Aversive hypersensitivity to sound more often occurs in A-NoSOD (Jones et al., 2009) and has shown the largest adverse effect on classroom learning among sensory modalities in autistic children and adolescents (Ashburner, Ziviani, & Rodger, 2008; Howe & Stagg, 2016). Considering that almost all autistic children “over”- or “under”-perform in academic achievement in relation to their IQ score (Estes et al., 2011), pain from ordinary sound may interfere with learning for many autistic people (Stiegler & Davis, 2010; O’Connor, 2012; Williams et al., 2021b). Aversive auditory hypersensitivity impedes learning how to present oneself as non-autistic, as youth who masked their autism showed less reactivity to noise in early life (Troyb et al., 2014).

**Vocal Pitch**

From infancy through adulthood, autistic people tend to produce high within-person variability in vocal pitch and tones across the speech trajectory (DePape et al., 2012; Diehl et al., 2009; Nadig & Shaw, 2012; Paul et al., 2011), cries (Esposito et al., 2014, 2009; Sheinkopft et al., 2012), and amongst different cultural and lingual contexts (Bonneh et al., 2011; Filipe et al., 2014; Sharda et al., 2010). Thus autism affects the expression of acoustic qualities of speech such as stress and intonation, especially for A-SOD rather than A-NoSOD in childhood (Peppé et al., 2011). Among adults, A-SOD had lower vocal pitch range and understanding of vocabulary but speech more rhythmically aligned with its information structure than A-NoSOD (Sharda et al., 2010). This may suggest that A-SOD use more precise auditory processing to support
music-like rhythm in speech. Autistic children show reduced processing of spoken language as a function of verbal abilities (Sharda et al., 2015), and heightened processing of song or musical abilities relative to their IQ (Bhatara et al., 2013), verbal skills (Lai et al., 2012), and experience (Depape et al., 2012). Paradoxically, A-SOD’s enhanced processing of acoustics of speech may interfere with processing speech’s meaning.

Motor Skills

Among adolescents, A-SOD have demonstrated stronger bimanual (Barbeau et al., 2015) and eye movement skills (Takarae et al., 2004) than A-NoSOD matched for IQ, age, and gender. Uniquely, A-SODs’ motor problems do not relate to their perceptual reasoning scores (Barbeau et al., 2015). This could suggest that motor problems may interfere with their speech rather than their nonverbal intelligence. Bimanual coordination may suggest stronger communication across the brain’s hemispheres and regions (Gooijers & Swinnen et al., 2004). A-SODs’ better eye movement skills may suggest developmental catch-up in part through flexible visual scanning (Kelly, Walker, & Norbury, 2013).

Recommendations

Visual Perception

IQ

Across the autism spectrum, perceptual performance and behaviours show atypically robust prediction of intelligence (Girard et al., 2023). Among IQ tests for autistic people, scores for the Raven’s Progressive Matrices fare best, outperforming the fellow nonverbal Leiter test (Courchesne et al., 2015), which in turn outperforms the standard Weschler (Tsatsanis et al., 2003) and Stanford-Binet (Groundhuis & Mulick, 2013) tests, especially for people with lower verbal IQ (Nader et al., 2015; Soulières et al., 2011; Bölte, Dziobek & Poustka, 2009). Autistic children deemed “untestable” on standard tests often complete the Raven’s Colored Progressive Matrices and demonstrate autism-typical perceptual strengths (Courchesne et al., 2015). Adaptations such as visual supports (Muchetti et al., 2013), adjustments for attention (Courchesne et al., 2019), and relaxed time (McGonigle-Chalmers & McSweeney, 2013) allow many minimally speaking children to further improve performance. Reading Facial Expressions and Words Autistic people, especially A-SOD, tend to have subtle difficulties perceiving motion (Takarae et al., 2008). Neural response to shifts in but not static eye gaze in infants predicts autism diagnosis by age three (Elsabbagh et al., 2012). Similarly, autistic adolescents and young adults show atypical neurological processing of videos of people and dynamic representations of social stimuli, but not static images (Weisberg et al., 2014). Consequently, slowing down facial expressions shows atypically strong benefit for various autistic children’s ability to recognize (Gepner, Deruelle, & Grynfeltt, 2001) and imitate them (Tardif et al., 2007; Lainé et al., 2011).

Consider colored filters of an autistic child’s choice to support reading a) words, and b) people. Colored filters overlaid onto words or photographs showed significant benefit for improving autistic but hardly typically developing children’s ability to read (Ludlow, Wilkins, & Heaton, 2006) or interpret emotional expressions (Ludlow, Taylor-Whiffen, & Wilkins, 2012; Whitaker et al., 2016). This aligns with the notion that visual overload contributes to social difficulties (Nyström et al., 2015; Wagner et al., 2016).

Tablets can help language-delayed autistics develop or complement speech (Kasari et al., 2014), through their strong visual design. Indeed, despite handwriting and motor impairment, perceptual reasoning but not motor skills positively relates to hand-writing skill in autistic adolescents but not typically developing peers (Fuentes et al., 2010).

Hearing

Assess for decreased sound tolerance causing pain or fear (Williams et al., 2021ab). Consider music for autistic children’s recreation (Boerebach et al., 2012; McMurray, 2012; Williams, 2012) and developmental growth (Paul et al., 2015), such as singing with synchronised drum-playing to learn speech (Chenausky et al., 2022). Consider toning down the exaggerated pitch of baby talk to autistic children (Ochs, Solomon, & Sterponi, 2005; Solomon, 2011), as the intonations may distract from the meaning of language. Autism-
typical (Rosenhall et al., 2003; Russo et al., 2009) auditory hypersensitivity in infancy predicts difficulty with speech and an autism diagnosis (especially for social interaction traits) at age three (Cohen et al., 2013). Enhanced perceptual processing of speech in autistic children may interfere with processing the linguistic components (Järvinen-Pasley, Pasley, & Heaton, 2008; Norbury, Griffiths, & Nation, 2010), even in tonal languages, as autistic children may experience enhanced simple perception of melodies but poor processing of spoken language (Jiang et al., 2015).

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Many autistic children (about two-thirds in early life) may have under-recognized difficulties forming speech sounds (apraxia of speech), which may require assessment (Tierney et al., 2015).

Encourage lip-reading as a strategy to build speech and communication. Autistic people with and without language impairment from infancy through adulthood have shown communicative benefit from attention to speakers’ mouths (Elsabbagh et al., 2014; Falck-Ytter et al., 2010; Klin et al., 2002; Norbury et al., 2009; Tenenbaum et al., 2014). This may occur because the speech sounds and lip motion provide auditory-visual integration (Klin et al., 2009) – an area of challenge across autistics’ lifespan and speech abilities (Iarocci et al., 2010; Saalasti et al., 2012; Smith & Bennetto, 2007).

Additionally, avoiding eye contact when listening may support autistic people’s speech processing. When perceiving auditory-visual speech, the auditory component has shown more influence for autistic children than typically developing peers (Iarocci et al., 2010). Autistic people can process high loads of visual (Remington, Swettenham, & Lavie, 2012; Remington et al., 2009) and auditory (Remington & Fairnie, 2017) information independently (Mottron et al., 2006), but they may find speech’s movements challenging to process alongside sounds. Avoiding eye contact may help autistic children concentrate on the words when listening to speakers, which may explain their pattern of averting eye contact in response to another’s speech but not when speaking (Doherty-Sneddon, Riby, & Whittle, 2012; Falck-Ytter, 2015). Similarly, looking away helps autistic and non-autistic people perform cognitively demanding tasks (e.g. math problems: Doherty-Sneddon et al., 2012; Riby, Doherty-Sneddon, & Whittle, 2012). It may also especially help autistic people in emotionally demanding contexts (Dalton et al., 2005; Kleinhans et al., 2010; Tottenham et al., 2014).

Language and Motor Development

Consider the role of language and assess for it. A-SODs’ perceptual peaks in ability contrast with A-NoSoDs’ stronger language (Choido, Majerus, & Mottron, 2017; Choido, Mottron, & Majerus, 2019; Duret et al., 2018), although exceptions to these trends exist (Cheng, Lam, & To, 2017). General difficulties with receptive language difficulties account for whether autistic people struggle with understanding figurative language (Gernsbacher & Pripas-Kapit, 2012). Similarly, ability to generalize in verbally fluent autistic children and adolescents relates to receptive vocabulary but not age (de Marchena, Eigsti, & Yervs, 2015). Therefore, general language learning appears to play a significant role in the developmental catchup by A-SOD.

In contrast to gross motor skills’ relationship to general language development in autistic people (Bedford, Pickles, & Lord, 2016), oral-motor and fine motor delays in autistics’ infancy through early childhood particularly relate to expressive language (Belmonte et al., 2013; Gernsbacher et al., 2008; Iverson & Wozniak, 2007; LeBarton & Iversion, 2013). This ability to spontaneously, precisely match another’s movements in young autistic children predicts spoken language growth (Stone & Yoder, 2001; Miniscalco et al., 2014). Similarly, many autistic children have dyspraxia – poor manual dexterity to command (e.g. gesture) use tools (e.g. control and share objects as in playing), and consciously imitate (Dziuk et al., 2007). These difficulties distinguish autistic children from the motor difficulties of ADHD (MacNeil & Mostofsky, 2012) and even developmental coordination disorder (Killroy et al., 2022). Fine motor skills play a role in common routes to joint engagement (Bhat, Landa, & Galloway, 2011; Jawal & Ahktar, 2019), which promotes language development (Adamson et al., 2019).

Responsive and imitative caregiving may help. When parents synchronize or match their behavior (e.g., mirroring the child’s rhythm or pace) in response to their autistic child’s, this predicts higher joint engagement and child language (Guilserud et al., 2016).

Conclusion
While every person is different, it is important to understand that strengths and weaknesses are often inextricably and paradoxically linked, and to leverage strengths to build developmental skills. Compared with A-NoSOD, the A-SOD group’s visual-spatial and perceptual reasoning strengths and processing speed, and enhanced pitch perception alongside auditory filtering, may contribute to speech delay. Yet these strengths may also empower development of control over their own vocal pitch and arm and eye movements, helping A-SOD develop language. Auditory strengths may contribute to speech delay through enhanced perception of the acoustics of speech that distract from the meaning of speech. Nevertheless, auditory strengths also help A-SOD catch up to A-NoSOD through improved filtering. Understanding A-SOD’s strengths may help to recognize how they make developmental gains in speech and language. Autistic people with speech delays or impairments are often underestimated. Applying lessons from evidence on their sensory and motor strengths can support recognition of their intelligence and communication.

References


