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The Additional Burden of Auditory Processing Skill "Deficits" for a Young Person with Multiple Exceptionalities: A Case Study of a Twice-Exceptional Student

Michelle Ronksley-Pavia

ABSTRACT

This article reports on the findings of a qualitative case study exploring the auditory skill "deficits" of a twice-exceptional male student who had multiple exceptionalities, including deficits in auditory processing skills, which contributed to learning issues and social connection difficulties in unique ways. Auditory skill deficits are an under-researched area in the field of gifted education, yet these are requisite skills necessary for learning in school. For this case study, auditory deficits were related to phonological processing, auditory sequential memory, lowered auditory recall abilities, and weaknesses in auditory analysis skills. The role that these auditory skill deficits played in the educational experiences of this young person is explored. Findings suggest that the presentation and impact of auditory processing deficits is very individual.

KEYWORDS

ADHD; auditory processing disorder; auditory processing skill deficits; autism; case study; dyslexia; multi-exceptionality; twice-exceptional

Twice-exceptional learners have been well-recognized in the literature. These are learners who are gifted and have another exceptionality (disability), or multiple exceptionalities, such as attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), dyslexia, dysgraphia, dyscalculia, physical disabilities, mental health conditions, and disabilities that impact on their learning (Reis et al., 2014, Ronksley-Pavia, 2015). However, identification and diagnosis of these individuals is often a long, challenging, and complicated process for parents, children, clinicians, and teachers.

Twice-exceptional learners are frequently overlooked for giftedness and for inclusion in gifted education programs because their achievement often appears average (Baum & Olenchak, 2002). Identification remains challenging due to the disparities between potential and achievement for these learners, particularly when there is an emphasis placed on below-grade-level achievement for interventions and support, without attending to ability and *relative* weaknesses against a child's measured potential (Gilman et al., 2013). As the educational demands increase through the grade levels, the achievement of twice-exceptional students frequently begins to falter, as the cognitive and educational demands increase and move beyond their compensation and coping strategies (Gilman et al., 2013). Often, it may not be until the later years of elementary school, or even high school, that the performance of these learners falls below grade level. Indeed, twice-exceptional learners can remain unidentified and unrecognized at school. It may not be until they go on to tertiary education (if they indeed do) that they might eventually be identified (Ferri et al., 1997, McCoach et al., 2001).

Much empirical research has been undertaken that examines the roles that particular exceptionalities (disabilities) may play in the lives and educational experiences of twice-exceptional learners; for example, written language disabilities (e.g., Assouline, Foley Nicpon, et al., 2009); ASD (e.g., Assouline, Foley Nicpon, et al., 2009, Cash, 1999, Foley Nicpon et al., 2010, Wu et al., 2019); specific learning disabilities (e.g., Assouline et al., 2010, Baum et al., 2001, Brody & Mills, 1997, Reis et al., 1995); ADHD (e.g., Baum & Olenchak, 2002, Moon et al., 2001); and research on the social and emotional characteristics of twice-exceptional learners (e.g., Barber & Mueller, 2011, Vespi & Yewchuk, 1992). Yet, few studies have explored the role and impact that auditory skill "deficits" play in the educational experiences of twice-exceptional or multi-exceptional learners.

The Australian context and the conceptualization of giftedness

Australia is a federation of six states and two territories, each having independence to develop and implement its own educational policies and practices. Each jurisdiction has some form of strategy around inclusive education; giftedness and twice-

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exceptionality should come under this remit (Ronksley-Pavia, 2023). However, not all states and territories have inclusive education policy directives for gifted students (Ronksley-Pavia, 2023). Furthermore, there is little exposure to gifted education practices in initial teacher education (Ronksley-Pavia et al., 2019), and the Australian Professional Standards for Teachers (Australian Institute for Teaching and School Leadership, 2017) do not specifically recognize gifted or talented students (Henderson & Jarvis, 2016).

Across most Australian educational jurisdictions, however, there is a general acceptance that Gagné's model of giftedness (2021) forms the guiding definition (Ronksley-Pavia, 2020). Gagné's differentiating model of giftedness and talent (DMGT; 2021) embraces inherent differences between conceptualizations of *gifted* and *talented*, whereby giftedness is about an individual's *potential* across six domains of *aptitudes* (i.e., intellectual, creative, social, perceptual, muscular, and motor control). Talent relates to an individual's *achievement* in the form of talent actualization, evident through any of nine *competencies* (i.e., academic, technical, science and technology, arts, people services, management/sales, business systems, sports and athletics, and games; Gagné, 2021). Giftedness is said to constitute the top 10% of age peers in any of the six aptitude domains, whereas talent is said to be recognized by an individual's outstanding mastery of a competency that is in the top 10% of those working in any of those fields. Importantly, this model recognizes that talent may take a lifetime to develop (Ronksley-Pavia, 2023).

Despite educational jurisdictions having a shared conceptualization of giftedness and talent from the DMGT, the presence of advocacy groups (e.g., the Australian Association for the Education of the Gifted and Talented), and notwithstanding two senate inquiries (which strongly recommended the implementation of gifted and talent provision across educational jurisdictions; Commonwealth of Australia, 1988, 2001), no provision for gifted education has been implemented across Australia (Ronksley-Pavia, 2015, Ronksley-Pavia et al., 2019). Essentially, Australia has no national policy or mandate for defining or for supporting gifted or twice-exceptional learners (Ronksley-Pavia, 2020).

Consequently, the potential of gifted students, and subsequently of twice-exceptional students, remains at the mercy of individual state and territory understandings, identification practices, and interventions. This has important implications for talent development across the lifespan for twice- exceptional students; that is, only by understanding cognitive and affective impairments and advancing identification and interventional procedures can advances be made that will support the talent development of twice-exceptional individuals (Olenchak et al., 2016).

Literature review

Central auditory processing is the perception of aural information by the central auditory nervous system and then the processing of that information that has been heard (Liu et al., 2021). An individual with central auditory processing disorder (CAPD), or auditory processing (AP) deficits, can have hearing acuity that is within normal limits. The issues in AP lie in the way the brain processes auditory information. Children with AP issues exhibit auditory skill deficits or difficulties with comprehending speech-in-noise; they often ask for repetition of auditory information and have auditory memory and auditory attentional deficits (Liu et al., 2021, Moore et al., 2018).

Diagnosing auditory processing deficits

Not only is twice-exceptionality difficult to identify, but so too are AP deficits. Subjective behavioral testing has been used for decades to assist in identifying AP issues. These tests are divided into verbal tests and nonverbal tests and include areas of assessment relating to temporal processing tests (processing of acoustic stimuli over time), dichotic speech tests (assessing the concurrent presentation of different speech stimuli to each ear), and auditory discrimination tests (assessing phonological awareness). However, behavioral testing on its own is seen as inadequate as it can be influenced by the testing environment and by a child's test behavior and engagement (Liu et al., 2021). Electrophysiological testing is an objective testing that is used by audiologists to assess neural integrity of AP at multiple levels of an individual's auditory system (Liu et al., 2021). The test involves electrodes being placed on a child's head. These are connected to a computer and record brain wave activity in response to auditory stimuli presented to the child via a headset; the brain waves show when the individual hears sounds. The child does not need to actively respond at all as the results are displayed to the clinician on a computer screen. Recently, Liu et al. (2021) suggested that the value of electrophysiological testing methods for screening children for AP deficits required further study. However, for better accuracy, it is considered that any testing for AP deficits should use both behavioral and electrophysiological testing methods (Liu et al., 2021).

As can be seen, methods for identifying AP deficits vary; however, Arehole and Rigo (1999) suggested that

both electrophysiological testing *and* behavioral testing methods may be useful, particularly for identifying AP deficits in underachieving gifted learners. There is evidence to support the role of AP deficits in underachievement for gifted students, yet to date there has been limited research on the role of AP skill deficits for twice-exceptional learners. Perhaps this testing holds promise for assessing for AP deficits in twice-exceptional learners who might also be underachieving, particularly when compared to their potential (e.g., as assessed on the Wechsler Intelligence Scale for Children [WISC]). It is hoped that by identifying patterns of brain activity through electrophysiological testing we may begin to understand some of the causes of underachievement for twice-exceptional learners in connection with AP deficits. This shows promise for improvements in interventions and support for these learners (Cunah et al., 2019).

Multiple area deficits in AP skills

The etiology for AP deficits is said to lie in impaired speech perception, and/or deficits in phonological processing, and/or deficits in auditory sequential memory, and/or auditory closure deficits, and/or auditory recall abilities, and/or weaknesses in auditory analysis skills—all areas central to AP (Gokula et al., 2019, Halliday et al., 2017). All together these are skills that relate to multiple areas of auditory skills. Research strongly suggests that children are more likely to have multiple AP deficits across many areas, rather than isolated skill deficits; for example, deficits related to areas such as language skills, memory skills, reading, attentional skills, and working memory (Gokula et al., 2019).

Despite extensive research over the last 40 years or so, the impact of AP skill problems and disabilities, particularly specific learning disabilities (SLDs; e.g., dyslexia), are not well understood (Gokula et al., 2019). Irrespective of the causes of AP deficits there seems to be a growing body of evidence to support the comorbidity of many disabilities that impact on learning with AP deficits. Certainly, AP issues are a strong complicating factor for students with SLDs (Cunah et al., 2019), and a complete psychometric evaluation is recommended. The prevalence of CAPD in children with SLDs is 2%–3% (Chermak & Musiek, 1997). However, there is a much larger incidence of AP deficits for children with both SLDs *and* ADHD, which is 30%–70% (Brewer et al., 2016, Chermak & Musiek, 1997). Indeed, Chermak et al. (1999) found that there was a clear relationship between ADHD and AP disorders, suggesting the clinical profiles overlapped, yet they were "clinically distinct entities" (p. 289). The prevalence of AP deficits among children "diagnosed" as twice-exceptional is unknown; however, it is likely to mirror that of children with SLDs (among other disabilities), given that one area of disabilities in those with twice-exceptionality is often one or more SLDs.

Comorbidities with AP deficits

It is well recognized in the SLD literature that children with comorbid disabilities, such as dyslexia, speech delays, specific language impairment, ADHD, working memory deficits and so forth, frequently also have accompanying AP deficits (Gokula et al., 2019, Halliday et al., 2017). These SLDs are seen as "developmental disorders of language and communication" (Halliday et al., 2017, p. 139), and are generally diagnosed based on excessive delays in acquiring oral language and/or written language. There are also a growing number of theories attributing disabilities, such as dyslexia and ADHD, to difficulties with AP. Moreover, comorbidities are commonly associated with attentional problems (e.g., ADHD), which Ramus (2001) referred to as the "hidden factor" (p. 395). This body of research provides evidence to indicate that twice-exceptional children could also be impacted by the coexistence of AP skill deficits and multiple comorbid disabilities.

Overlapping AP deficits

Previous research has suggested that gifted students who underachieve may have AP deficits in such areas as auditory attention (focusing on what is being said while ignoring irrelevant and competing sounds), short-term auditory recall (problems recalling words, verbal items, and language-based memory), auditory discrimination (the ability to recognize, compare, and distinguish between separate sounds), and auditory sequencing (the ability to understand and recall the order of words and sounds (Arehole & Rigo, 1999, Silverman, 1989, Waldron and Saphire, 1990). Because language is both phonological *and* verbal, that is, it is both auditory and written, there are implications for developing individual abilities when one or both of these areas are impacted (Song & Porath, 2011). Moreover, Silverman (1989) found that many gifted learners had auditory sequential processing deficits—impairments with phonics, rote learning, timed tests, spelling, and handwriting. Indeed, Silverman's research pointed to chronic otitis media (middle ear infections) in the early years, suggesting that prolonged issues with hearing may have interfered with the development of AP skills, in particular, auditory sequential skill

development (Borges et al., 2013, Katz et al., 2019). Chronic otitis media in infancy is a recognized risk factor, but by no means the only cause; there are some suggestions that there may also be a genetic factor (Brewer et al., 2016).

Importantly, early identification and intervention is required to support learners with coexisting disabilities, auditory skill deficits, and giftedness. Indeed, Olenchak et al. (2016) suggested that identifying twice-exceptional learners as early as possible would "serve as a flag for educational and psychological professionals to initiate interventions" (p. 274), providing a crucial foundation to addressing gaps between disabilities and abilities. Researchers have endeavored to understand potential profiles of these learners in order to develop and implement support, beginning with those with coexisting SLDs and AP deficits.

Wechsler intelligence scale for children profiles

Distinct profiles have emerged that strongly suggest a reliable WISC (Wechsler, 2003, 2014) profile for groups of learners with specific disability diagnoses (Cunah et al., 2019, Mayes & Calhoun, 2006). For example, children with SLD, ADHD, and coexisting ASD have been found to have "lower mean scores on the WISC FDI [Freedom from Distractibility Index] and PSI [Processing Speed Index], than on the VCI [Verbal Comprehension Index], the Perceptual Organization Index, and the Coding versus Symbol Search subtest" (Cunah et al., 2019, p. 126). Furthermore, Cunah et al. (2019) observed that children with SLDs and coexisting AP skill deficits had lower FSIQs, verbal IQs, and VCIs than those who had only SLDs. Interestingly, these findings suggest that these students may be "disadvantaged regarding general intelligence and specifically crystallized intelligence … with lower scores in subtests such as Comprehension, Information, and Similarities" (Cunah et al., 2019, p. 126). This indicates the need for further exploration with regard to twice-exceptional learners, who may have high general intelligence, crystallized intelligence, and high scores on some WISC scales, such as Comprehension, Information, Similarities, Vocabulary, and Matrix Reasoning, but lower scores on subtests (e.g., Block Design, Digit Span, Symbol Search).

SLD and ADHD profile patterns in connection with AP deficits have some connections with attempts to discover patterns of WISC subtest scores for identifying twice-exceptionality. It is well established that twice-exceptional learners generally have lowered FSIQs due to the impacts of deficits in areas of the WISC scales, such as PSI and WMI (Working Memory Index). Majkut and Rogers (2005) suggested that a VCI or PRI score in the "Very Superior" range on the WISC–IV (Wechsler, 2003) is suitable for identifying twice-exceptional learners, and that "FSIQ could not be considered a reliable indicator of global ability" (p. 9). Gilman et al. (2008) suggested that any one of four scores in the "Very Superior" range should be considered sufficient for an identification of giftedness on the WISC–IV: FSIQ, General Abilities Index (GAI), VCI, or PRI. Moreover, the National Association for Gifted Children (NAGC) position statement (2018), about using the WISC–V (Wechsler, 2014) to identify twice-exceptional students recommended the use of any index score that concentrates on verbal or reasoning abilities. This recommendation was based on research that proposed twice-exceptional learners often have large discrepancies among index scores on the WISC–V, which can render the FSIQ uninterpretable (Maddocks, 2020). Furthermore, Silverman and Gilman (2020) supported the NAGC position statement and recommended the abandonment of FSIQ altogether, instead suggesting the use of any one of six expanded index scores, that "are a better measure of abstract reasoning … alternate index scores are less biased and better able to document the strengths" (p. 1578).

While there remains controversy surrounding the potential of WISC subtest scatter in identifying twice-exceptionality, the connections are clear between AP skill deficits SLDs, ADHD, and ASD, indicating the overlapping role that auditory deficits play in these disabilities. The same could well be the case for twice-exceptionality.

Supporting twice-exceptional learners at school

Some of the challenges to supporting twice-exceptional learners are well recognized in the literature, and include elements such as inadequate initial teacher education, teacher training, teacher understanding of the paradoxical notion of the coexistence of giftedness with disabilities (Ronksley-Pavia, 2015, Ronksley-Pavia et al., 2019), and inadequate knowledge of how to use approaches, such as strengths-based approaches (Baum et al., 2014), to support these learners to develop their potential in school (Ronksley-Pavia & Hanley, 2022). Alongside these challenges is the conundrum of serving twice-exceptional learners with co-existing AP skill deficits and multiple exceptionalities.

Some suggestions for supporting children with AP skill deficits may also be appropriate for twice- exceptional children with AP issues, such as using visual aids, writing instructions on the board, enabling the child to sit close to the teacher to reduce distractions related to sound and sight, and video recording of lessons for later review by the student. There is no one size fits all

approach, and multimodal interventions are recommended that build on an individual twice-exceptional learner's strengths (i.e., area/s of giftedness) to address their areas of AP skill deficits. Strengths-based approaches have their foundations in the field of positive psychology and involve approaches to teaching and learning, such as curriculum differentiation, that specifically align with a student's interests, areas of strength, learning profiles, and cognitive assessments (Baum et al., 2014, Ronksley-Pavia & Hanley, 2022, Tomlinson, 2018). Importantly, strengths-based approaches do not ignore the disability, but leverage a student's existing strengths while concurrently providing additional support, accommodations, and remediation for any coexisting disabilities.

The study

The current case study was drawn from a wider qualitative study investigating the educational experiences of twice-exceptional young people. This case study aimed to explore the additional burden that AP skill "deficits" played in the educational life of a twice-exceptional learner—Ivan (male), aged 14 years. The research question guiding the case study was broad: What role do auditory processing skill deficits play in the educational life of a gifted young person with multiple exceptionalities?

Auditory processing skill deficits are an under-researched area in the field of twice-exceptionality; therefore, it is important to ascertain what role these areas of deficit played in, and contributed to, the educational and social and emotional difficulties of this case study student. As such it is essential to outline the participant's diagnoses, gifted identification, and the timeline for these, along with related clinical information from the diagnostic testing that the participant underwent at different times across his young life. All assessments were undertaken by specialist practitioners prior to, and independent of, the current project. The study took place in a regional area of Australia.

Researcher positionality

Before I present the methodology, data collection, and analysis, and as a self-reflexive researcher, I acknowledge my viewpoint as a white, disabled, educated woman from a working-class background. As an educator of more than two decades (in many education contexts), a researcher, advocate, active gifted education community contributor, and a parent to twice-exceptional offspring, my standpoint is informed by my own lived experiences of disability, giftedness, twice- exceptionality, and of education systems.

In order to address any bias, I took a reflexive approach to this study, grounded in the interpretivist foundation. This was undertaken by journaling as a form of monitoring and reflecting on my positionality (Richardson, 2000). Regular reflection was a central part to ensuring my explicit cognizance of my role in the study. I aimed to achieve *empathetic neutrality* by this reflexive approach, striving to "avoid obvious, conscious, or systematic bias and to be as neutral as possible in the collection, interpretation, and presentation of the data" (Ormston et al., 2014, p. 22). However, I acknowledge that no matter how reflective I was, it remained impossible to objectively describe the "reality" as found during this project (Dubois, 2015). Furthermore, as experience is constructed by individuals, subjectivity is inherent to this process (von Glasersfeld, 1998).

Theoretical foundation

An interpretivist approach was used as the theoretical foundation for this study, which connected the qualitative case study methodology through, and with, my positionality as researcher (i.e., a focus on reflexivity). Interpretivism has foundations in constructivism and phenomenology, whereby patterns of meaning are inductively developed from the data (Creswell & Creswell, 2018, Crotty, 1998). Interpretivism embraces understandings that social constructions (e.g., shared meanings) exist through the lens of individuals ("actors")—their experiences and consciousness; further, that meaning and subsequent interpretation are dependent on these individual differences and how these inform meaning-making and the "production of reconstructed understandings of the social world" (Denzin & Lincoln, 2018, p. 197). Through using the theoretical foundation of interpretivism, I recognize that multiple realities exist, and that no single "truth" remains. Thus, "reality" is not objective; rather, it is socially constructed through the interactions of actors within subjective social, cultural, and political contexts (Ronksley-Pavia et al., 2019).

Trustworthiness and authenticity

Within the interpretivist paradigm, the conventional positivist criteria of internal and external validity are exchanged for the terms trustworthiness and authenticity (Quintão & Almeida, 2020). This qualitative case study, with its foundation in interpretivism, is subjective; it is, therefore, important to recognize the aforementioned issues of potential researcher bias and trustworthiness of the data. To address trustworthiness, primary data

generated in this study were drawn from a number of different sources: interviews with the three participants (Ivan and his parents); the assessments and reports generated by professionals (e.g., psychologist, audiologist) conducted prior to and independent of the current study; and the valid and normed instruments used by these professionals (e.g., WISC and Weschler Individual Achievement Test [WIAT]). By using multiple sources of evidence, qualitative approaches to traditional methods of triangulation can be assured, that is, structural corroboration (Eisner, 1998) and crystallization (Ellingson, 2009). Through structural corroboration, "the confluence of multiple forms of evidence" (Eisner, 1998, p. 55) is used to aid in validating findings (Ronksley-Pavia et al., 2019). Crystallization moves away from the assumptions of a fixed triangulation point to recognize a multifaceted (crystallized) approach where "what we see depends on our angle of repose" (Richardson, 2000, p. 522).

Methodology

An individual, in-depth, qualitative case study design was used for this study because it denoted a "spatially delimited phenomenon (a unit) … [which] comprises the type of phenomenon that an inference attempts to explain" (Gerring, 2007, p. 19). As such, the case is comprised of a single participant and his parents (as the unit) in a bounded system—a collection of documentary and interview data consisting of one bounded, individual case of twice-exceptionality. Prominence is given to what the case is and is not, keeping the boundaries to the case clearly defined as the one twice-exceptional student with multiple exceptionalities, including AP skill deficits.

For this case study there is no need for demands for generalizability to similar cases; representativeness acquiesces to assurances that this case is well described and in sufficient depth so that readers are able to recognize "essential similarities to cases of interest to them [thus establishing] the basis for naturalistic generalizations" (Stake, 2009, p. 22). In the social sciences, a single case study features complex descriptions that are holistic and include a multitude of accessible variables (Stake, 2009). Themes arising from the case study are important but are subsidiary to understanding the case as a whole (Yin, 2014). One of the best uses of case study is its contribution to existing knowledge, experiences, and human understanding (Stake, 2009, Yin, 2014).

Data collection and analysis

The data set for this case study consisted of documents about Ivan's exceptionalities, academic report cards, and transcripts of interviews. Data collection consisted of three weekly one hour individual semi-structured interviews with Ivan, the last of which was followed by one hour semi-structured interview with his parents. Interviews were audio recorded and transcribed for analysis. Documentary data consisted of a cognitive assessment (i.e., WISC–IV), school academic reports, standardized testing results, and other disability diagnoses and reports.

Report data were analyzed for key information relating to diagnoses of disabilities and confirmation of giftedness. A timeline was established for the participant and details of the reports were added to show a clear timeframe of assessments, testing instruments, and testing results to aid in the data analysis. The results and findings from these are summarized, along with relevant qualitative findings from reports, in the data presentation and findings section.

Interview transcripts were analyzed for themes following Braun and Clarke's (2006) framework, with the goal of identifying patterns in the data that were important and of interest for the case study focus on auditory skill deficits, in this way aiming to interpret and make sense of the documentary data in conjunction with the interview data for the case. The phases in Braun and Clark's framework begin with (a) becoming familiar with the data (reading and re-reading the transcripts and, separately, the documents); (b) generating initial codes/themes (organizing data into "chunks" of meaning); (c) searching for themes (characterized by how significant each one was); (d) reviewing initial themes (gathering all data relevant to each theme to review, modifying and further developing); and (e) defining the themes (identifying what the theme was saying).

Participants

The participants were a twice-exceptional male aged 14 years with the pseudonym of Ivan, a gifted individual with multiple exceptionalities including AP skill deficits; and his parents (pseudonyms: Lois and Brendan). The twice-exceptional participant was purposefully selected from a wider study that investigated the educational experiences of twice-exceptional learners. The rationale for selection was based on this being an interesting case with multiple interconnecting facets relating to AP skill deficits as part of the overall complexity of twice (or multiple-) exceptionality.

At the time of the study, Ivan was in Grade 10 in a Christian school. His areas of interest and passion spanned science, mathematics, information and communication technologies, hiking, and online gaming. Ivan was from a middle-class family who lived in regional Australia. An overview of Ivan's twice-

Table 1. An overview of Ivan's twice-exceptionality

Diagnosis	Age of diagnosis
• Behavioral optometry - Eye teaming and accommodation/focusing issues	7 years, 3 months
• Low muscle tone	7 years, 11 months
• Joint hypermobility	7 years, 11 months
• Dysgraphia	7 years, 11 months
• Auditory processing skill deficits	8 years, 2 months
• Phonological skill deficits	8 years, 3 months
• Twice-exceptional	9 years, 3 months
• Generalized anxiety disorder	9 years, 3 months
• Dyslexia	9 years, 11 months
• ASD	11 years, 1 month
• ADHD	11 years, 1 month
• Confirmation of generalized anxiety disorder	11 years, 1 month

exceptionality profile is presented in Table 1. These diagnoses are explored further in the subsequent section.

Data presentation and findings

This section outlines the case and provides an overview of Ivan's assessments, which were conducted prior to and independent of the current study, and other documents included in the case. To add to the depth and richness of the case study, pertinent quotes from the participants are presented under two themes (*overwhelmed* and *interrelating*) in the latter part of this section.

Ivan's assessments and diagnoses

Ivan underwent substantial testing and interventional support from the age of 7 years 3 months (Grade 2), commencing with a behavioral optometrist assessment, with his final diagnoses of ASD, ADHD, and confirmation of generalized anxiety disorder (by a developmental

Table 2. Ivan's timeline of assessments and results

Age (Grade)	Practitioner	Assessment/s	Diagnosis/Results
7 years, 3 months (Grade 2)	Behavioral Optometrist	Behavioral optometry to assess impact of vision on learning	• Convergence eye teaming – occasional loss of attention on sustained tasks • Accommodation/Focusing: Insufficient for task demand • Oculomotor skills: Smooth with concentration • Visual acuity (sight): High • Recommendation: Spectacles for all indoor activities
7 years, 11 months (Grade 2)	Occupational Therapist (non-school based)	Occupational therapy (OT) assessment	• Low muscle tone and joint hypermobility, dysgraphia – ongoing OT therapy (finished at 11 years, 9 months, Grade 6)
8 years, 2 months (Grade 3)	Neurosensory Auditory Specialist Clinic	Auditory processing assessment (audiology report)	• See Tables 3 and 4
8 years, 3 months (Grade 3)	Speech Language Pathologist (non-school based)	SPAT-R (Sutherland Phonological Awareness Test – Revised) Clinical Evaluation of Language Fundamentals, Fourth edition (CELF-4)	• Overall score 3rd %ile: Onset identification 3rd %ile; Non-word spelling 3rd %ile; Non-word reading 3rd %ile; all others Developed/Average • Core Language SS 100 PR 50th %ile, Average range • Receptive Language SS 116 PR 86th %ile, Above Average range • Expressive Language SS 99 PR 47th %ile, Average range • Language Structure SS 103 PR 58th %ile, Average range • Ongoing speech language therapy up until 11 years, 9 months (Grade 6)
9 years, 3 months (Grade 4)	Psychologist	WISC-IV WRAML2 WIAT-II	• See Tables 5 and 6 • See Table 7 • See Table 8
9 years, 11 months (Grade 5)	Dyslexia diagnostic clinic	Bangor Dyslexia Test-II	• Developmental dyslexia
10 years, 2 months (Grade 5)	Elementary school support teacher – literacy and numeracy	Neal Analysis of Reading Ability – Revised (Form 2) South Australian Spelling Test Sutherland Phonological Awareness Test (SPAT-R) (Form A)	• Reading age: 10 years (44th %ile – Average) • Comprehension age: 11.8 years (71st %ile, Above Average) • Raw score 27, spelling age 7.8 years (critical low score < 28), confusion of letter order (e.g., "frie" for fire), over-reliance on sounding out strategies to spell words • SPAT-R total score: 56th %ile; Non-word Spelling In-Depth Analysis: 22nd %ile, SPAT-R total Form A: Just above median percentile for Grade 4
11 years, 1 month (Grade 6)	Developmental Paediatrician	Unknown Unknown Unknown	• Autism Spectrum Disorder (ASD) • ADHD • Generalized anxiety disorder (confirmation)

Table 3. Teacher assessed SIFTER results for Ivan

Content area	Total score (Out of 15)	Passing score range (Marginal score range)	Fail score range
Academics	6^	10–15 (8–9)	3–7
Attention	7*	9–15 (7–8)	3–6
Communication	12	11–15 (8–10)	3–7
Class participation	13	9–15 (7–8)	3–6
School behavior	9*	10–15 (8–9)	3–7
Teacher qualitative comments	Ivan receives learning support for literacy, mainly for writing and spelling. Ivan enjoys talking to his friends, which often serves as a distraction to him.		

Note. ^Fail; *Marginal.

Table 4. Ivan's SCAN-C test results

Test for auditory processing disorder	Raw score	Standard score (Normal range 7–13)	Percentile rank
Filtered Words	31	9	37
Auditory Figure Ground	34	11	63
Competing Words	36	9	37
Competing Sentences	14	10	50

Table 5. Ivan's WISC-IV results

Scale	Index score	Percentile rank	95% Confidence range	Description
Verbal Comprehension	140	99.6	128–144	Very Superior
Perceptual Reasoning	108	66	97–113	Average
Working Memory	86	21	81–98	Below Average
Processing Speed	94	34	85–105	Average
FSIQ	113	81	106–109	Above Average

Table 6. Ivan's subtest scores on the WISC-IV

Subtest	Scaled score (Av. =10)	Subtest	Scaled score (Av.=10)
Similarities	17	Block Design	10
Vocabulary	16	Picture Concepts	12
Comprehension	18	Matrix Reasoning	12
(Information)	(14)	Coding	10
(Word Reasoning)	(16)	Symbol Search	8
Digit Span	7		
Letter-Number Seq.	7		

Table 7. Ivan's WRAML2 results

Index	Score	Level
Verbal Memory Index	117	Above Average
Visual Memory Index	103	Average
Attentional/Sequential Memory Index	82	Below Average
General Memory Index	101	Average

Table 8. Ivan's WIAT-II results

Area assessed	Score	Level
Word Reading Score	99	Average
Reading Comprehension Score	118	Above Average
Spelling Score	88	Below Average
Pseudoword Decoding Score	90	Lower End of Average
Written Expression Score	93	Lower End of Average
Maths Reasoning Score	90	Lower End of Average

pediatrician) at age 11 years 1 month (Grade 6). Ivan's timeline of assessment and diagnoses is detailed in Table 2.

Occupational therapy assessment

Prior to his identification as twice-exceptional (Grade 4; aged 9 years 3 months), Ivan's parents reported concerns about fine motor skill development, and an occupational therapist assessment at 7 years 11 months (Grade 2), suggested his visual perception skills were average, but due to joint hypermobility and poor muscle tone, he had difficulty with fine motor coordination. This led to a diagnosis of dysgraphia at age 7 years 11 months. Ivan underwent OT interventional therapies until aged 11 years and 9 months (e.g., fine motor skill exercises).

Audiology assessment

At aged 8 years 2 months (Grade 3), Ivan underwent an audiology assessment at the behest of his teacher who reported to his parents their concerns about his listening and concentration skills at school. Ivan was also reported to have difficulties with writing and spelling. Prior to his assessment at an audiology clinic, an informal Screening Instrument for Targeting Educational Risk (SIFTER; Anderson, 1989) was completed by his teacher to assess Ivan's in-class listening skills. The results of the SIFTER (see Table 3) suggested that he required repetition of

spoken information and was easily distracted in school. The questionnaire also indicated that he was below the class average in the areas of Academics and Attention; with a Fail score in Academics (6/15), a Marginal score in Attention (7/15), and a Marginal score in School behavior (9/15). All other areas were within the passing score range.

During the clinical assessment, a pure tone audiogram was used to assess Ivan's hearing acuity, speech discrimination (ability to understand speech in quiet and noisy situations), and impedance (middle ear pressures); these were all within the normal ranges for his age. Central auditory pathway function was assessed using subtests of the SCAN–C Test for Auditory Processing Disorders in Children–Revised (Keith, 2000) (see Table 4), Rapidly Alternating Sentences (results were within normal limits for age), Auditory Brain Stem Response (results were within normal limits for age), the test of Auditory Analysis Skills, the Auditory Pitch Pattern Test (results were normal for age), and Short-Term Auditory recall.

Ivan's SCAN–C results were within the normal range for each subtest; although the percentile ranks for Filtered Words (37th percentile) and Competing Words (37th percentile) were very low, they were still considered to be in the "normal" range for his age. Despite the normal range findings, the low percentile on Filtered Words suggested Ivan had difficulty with the auditory closure skills needed to successfully complete this task (i.e., the ability to combine sounds heard into words). The Competing Words subtest was a dichotic listening task and performance on this test was used to assess the maturity of his AP system and how effectively his ears could work simultaneously. For Ivan, the low-percentile rank was suggestive of difficulties in this area, despite it being assessed in the normal range for his age. Ivan was found to demonstrate a right ear advantage greater than usual for his age; this suggested a maturational delay. A right ear advantage means that when two words are presented in competition with each other, more words could be understood in the right ear than in the left ear. These tests were conducted in a quiet auditory booth in a clinical setting; the results suggested that in a busy, noisy environment (e.g., a classroom), Ivan would have difficulties in these areas of AP. Ivan's auditory brainstem function was assessed electrophysiologically with the auditory brainstem response. This involved the measurement of auditory evoked potential—changes in the brain's neuroelectrical activity in response to receiving auditory signals (Arehole & Rigo, 1999). The test obtained repeatable responses from both ears. The clinician noted that all "absolute and interpeak latencies were within normal limits. There was no significant interaural asymmetry."

Another test performed at the audiology clinic was the Test of Auditory Analysis Skills (Rosner, 1993), which is a screening assessment to evaluate a child's ability to realize the individual sounds in spoken words and the sequences in which the sounds are organized (phonological awareness). These skills are critical for progress in areas of reading and spelling and are usually acquired by the age of 8 years (Ivan was just over 8 years old at the time of the assessment). Ivan's results showed delays in these skills. He was unable to identify and manipulate the final sounds within words (e.g., say "fame;" say it again but don't say/m/, "fay"), and embedded sounds within a consonant cluster (e.g., say "stale;" say it again but don't say/t/, "sale"). The results suggested that Ivan may not have been able to use phonological or sounding out approaches when he encountered unfamiliar words in reading and spelling. Ivan's auditory recall abilities were in the lower level of normal abilities for his age; memory for sentences was reduced for his age. This suggested limitations to the amount of information that would be retained from verbal instructions or directions, which could influence his ability to carry out complex verbal instructions.

The results from Ivan's auditory assessment showed normal hearing sensitivity and normal, but overall lowered, AP skills. Ivan showed weaknesses in his short-term auditory recall and auditory analysis skills (phonological awareness); phonological awareness being required for development of reading and spelling. However, this testing was also administered in a quiet, controlled clinical environment, free from visual and auditory distractions. The clinician noted that a noisy classroom environment would likely impact on Ivan's AP skills, and further, that if he were distracted, tired, or unwell, his auditory processing (listening) performance could be considerably impacted.

Speech language pathology assessment

Ivan underwent further specialist assessments a month after the audiology clinic evaluations, which included speech language pathology testing and subsequent interventions at age 8 years 3 months (Grade 3), which confirmed problems with his phonological awareness. The Sutherland Phonological Awareness Test–Revised (SPAT–R) was administered by the speech language pathologist. The SPAT–R is an individually administered Australian-normed test that provides a diagnostic overview of a child's phonological and phonemic awareness skills (e.g., phoneme identification and manipulation) involved in literacy development (Neilson, 2003). Ivan's overall score was on the third percentile for the SPAT–R (see Table 2). Ivan underwent speech language interventions (e.g., to develop his phonological awareness) until he was 11 years and 9 months of age.

Identification as twice-exceptional

Ivan was identified as twice-exceptional at the age of 9 years 3 months (Grade 4) on a WISC–IV assessment undertaken by a registered psychologist (see Tables 5 and 6). Ivan's FSIQ (113) was in the "Bright" range; however, it did not represent the large range in his abilities and the psychologist stated that "it should not be used as a measure of his intelligence," yet the clinician did General Ability Index (GAI).

The more significant issue from Ivan's results was the very large discrepancy between his verbal and language skills compared to his nonverbal skills. On verbal and language tasks he showed a "Highly Gifted" level of reasoning skills (VCI 140). In contrast, on nonverbal skills, while his reasoning scores were above average, they were significantly lower. It is important to note that Ivan scored highly on the verbal tasks that involved both knowledge and reasoning. Thus, his difficulties lay in channel use—it was only through the verbal language channel that he could show his true gifted potential. Ivan showed a very high level of abstract verbal reasoning when forming associations and concepts. He showed a very high level of vocabulary and understanding of language ideas; his language expression was highly developed. One of his higher scores on the WISC–IV was on the Comprehension Subtest (Scaled score 18). This measured verbal comprehension and, in a more general way, his understanding of everyday life issues (i.e., practical intelligence); verbal comprehension is often associated with a high level of social maturity. Ivan's general knowledge was well above average. His flexible reasoning on novel verbal tasks was very high. His ability to understand subtle or implicit information was also very high. However, in direct contrast, Ivan showed significantly lower performance on the Working Memory area of the WISC–IV, suggesting problems with initial attention and with auditory information processing. This was consistent with previous findings of relatively lower performance in this area. His speed of word retrieval orally was well above average; this confirmed a good level of verbal fluency. His phonetic decoding of new words in the reading test was at the bottom end of the average range. Thus, Ivan continued to show a specific learning disability in auditory and phonological processing.

Ivan showed above average ability to form nonverbal concepts and to flexibly problem solve on novel nonverbal tasks. His visuospatial ability was relatively lower but still in the average range. His copying skills were acceptable when copying simple designs but tended to be lower on more complex designs. This suggested Ivan may have had difficulty with more complicated visual motor production involving a higher degree of integration of perceptual ideas with motor planning. His nonverbal processing speed was in the average range for straightforward copying tasks; however, this slowed when he had to make decisions and analyze perceptual material. Accordingly, the results suggested that Ivan was generally lower on the nonverbal area with his visual analysis and visual spatial skills. This made it more difficult for him to show his true gifted potential on such tasks; specifically, he still showed difficulties with more complicated fine motor production and visual motor integration.

Other tests administered at the same session as the WISC–IV included the Wide Range Assessment of Memory and Learning–2nd Edition (WRAML2; see Table 7) and the Wechsler Individual Achievement Test (WIAT–II; see Table 8). The WRAML2 (Sheslow & Adams, 2003) is a broad memory assessment that measures memory functioning and learning.

The WRAML2 provides scores similar to IQ scores across verbal memory, visual memory, attentional/sequential memory, and general memory index. The memory scores for Ivan trended a relatively better performance in the verbal channel as opposed to the nonverbal channel/visual channel. As would be expected from his high verbal skills, his ability to remember language-based material in the form of stories was excellent. However, he scored lower on the rote learning task, but was still in the average range. This task required a higher degree of working memory, an area he scored lower on in the WISC–IV. This suggested that Ivan had difficulty with memory tasks where he needed to use the temporary holding bay of working memory in order to analyze and organize material.

In the visual memory area of the WRAML2, Ivan's overall average score was boosted by a very good memory for practical everyday material. However, he scored well below average on tests of more complicated abstract symbolic visual memory. He had great difficulty holding onto spatial relationships and connectedness in his mind and this also, potentially, connected to his issues with working memory.

Another key difficulty for Ivan was in the area of his sequential memory. Both auditory and visual sequential memory were below average. He showed a similar finding in his audiology clinic assessments (Grade 3, aged 8 years 2 months), so it continued to be evidenced as an area of ongoing difficulty for him. Difficulties with sequential memory meant that his basic automatic learning was compromised, at the level of Ivan taking in and remembering sequences of letters, sounds, and numbers.

This finding also had similarities to the results of the audiology assessments. Ivan's basic executive

functioning was satisfactory in terms of planning and organization. His sustained concentration on tasks was mostly satisfactory but there were occasional lapses. It was noted that Ivan did get relatively more tense on some tasks, which was suggestive of him becoming internally anxious about his performance; this could explain his occasional lapses in concentration during the testing. As observed by the psychologist, the presence of anxiety compromised tasks that required a higher degree of working memory, as working memory is sensitive to any fluctuations in anxiety.

In terms of achievement, the psychologist also administered the WIAT–II, which provided scores that are similar to IQ scores across academic areas (see Table 8). There are two ways to look at Ivan's WIAT–II results. First, the index scores reflected his performance compared with others his age. Under this level of analysis, his scores were reasonably in line with those of his age peers. His word reading was in the average range, whereas his reading comprehension was well above average. Ivan showed some mild difficulties with his ability to decode new words as evidenced by the lower score on the Pseudoword Decoding test; this could be related to his areas of AP difficulties previously diagnosed.

Ivan's spelling was below average. This was consistent with his difficulty with sequential memory and phonological difficulties (and subsequent diagnosis of dyslexia at age 9 years 11 months—Grade 5), as spelling relies heavily on both auditory and visual sequential memory. Ivan's written expression was satisfactory overall compared to others his age, mainly because of his good language skills and ideas. The mechanics of his writing showed difficulties, which was consistent with his diagnosis of dysgraphia (Grade 2, aged 7 years 11 months). His handwriting was very difficult to understand and the way he set out his writing according to the testing psychologist was "quite chaotic." This was consistent with his lower skills in the area of visual motor integration and production. The Maths Reasoning test was presented in a verbal format; despite this, Ivan still scored only just in the average range, suggesting that his mathematical development was relatively behind.

The second way to look at Ivan's WIAT–II results would be to compare them with his own potential as represented by his verbal IQ (VCI 140). Under this analysis there were clear and statistically significant discrepancies between most of his school achievement scores and his own potential. The psychologist noted that Ivan was "significantly underachieving compared to his own potential." The only score that was not significantly below his own abilities was the Reading Comprehension Score. This suggested that Ivan was learning to compensate for his information processing difficulties by using his prodigious language skills to interpret what words were with the aid of meaning from the text. The psychologist noted that "the rest of the scores reflect[ed] the debilitating effect of his information processing difficulties on his practical applied scholastic skills."

As the WIAT–II is a screening test, it is also important to compare Ivan's results with his actual performance in the classroom to gain a full picture of his academic functioning. Table 9 provides an overview of Ivan's academic grades at the time of testing (Grade 4 report card) for comparison with the WIAT–II results taken in the clinical setting.

Ivan's academic results in Mathematics (C grade) are reflective of his average Maths Reasoning results in the WIAT–II. The C grade result for English likely reflected his areas of difficulty evidenced in the WIAT–II (i.e., Spelling Score and Written Expression Score). Ivan's result on the Grade 4 Standardized English test (D Grade) was likely reflective of his disabilities and of the test type, which consisted of listening to a spoken message, responding in writing to questions about the message, then composing a short letter based on the information. This type of test would have likely been problematic given his AP skill deficits, his average score on the WIAT–II Spelling, and lower end of average score for Written Expression.

In summary, the psychologist stated that Ivan could be described as "twice-exceptional" with a number of specific learning disabilities. The conclusion was that he was "significantly underachieving compared to his own ability in his schoolwork." Otherwise, he was a "highly gifted child."

Dyslexia diagnostic clinic

Ivan's next diagnosis was developmental dyslexia at 9 years 11 months (Grade 5) after being administered the Bangor Dyslexia Test–II (Miles, 1997) at a dyslexia diagnostic clinic. Ivan returned a positive score for dyslexia on six and a half of the nine subtests (the full test results were unavailable). During the test the clinician observed

Table 9. Overview of Ivan's academic report (Grade 4, aged 9 years)

Curriculum area	Achievement (Descriptions)
English	C (Satisfactory)
Mathematics	C (Satisfactory)
Science	B (Very Good)
Social Sciences	B (Very Good)
The Arts	B (Very Good)
Information and Communication Technologies	C (Satisfactory)
Standardized English test (undertaken by Grade 4 students)	D (Needs Attention)

that Ivan displayed "typical dyslexic responses," such as using his fingers during the Subtraction subtest and confusing months and seasons (Months Forward and Months Reversed subtests). On the Left-Right subtest, Ivan was observed to repeatedly look at his hands, also noted as being suggestive of a "typical dyslexic response." Ivan showed "b-d" confusion on that subtest, and difficulty with times tables. A potential familial history of dyslexia was noted on the paternal and maternal sides, although no formal diagnosis had been undertaken for either possible instance.

Developmental pediatrician: ADHD, autism, and anxiety

Ivan's parents moved him from a government school to a private school for Grade 6 and Grade 7. In Grade 6 (aged 11 years 1 month) Ivan was diagnosed with ASD, ADHD, and generalized anxiety disorder by a developmental pediatrician. It is not known what assessments were used, nor the basis for the clinical diagnosis, as all that was available was a summary letter to the family's doctor. The developmental pediatrician noted in his letter that Ivan's autism symptoms had likely been present from an early age but had been masked by his high-verbal abilities, and that his symptoms did not fully manifest until social demands began to exceed his capacities. Earlier assessments performed had suggested that his difficulties were, at the time, likely better explained by other disabilities. Although Ivan possessed excellent language and verbal skills, it was noted that he had persistent deficits in communicating in social situations and interactions across contexts, particularly with making inferences, pragmatics, and nonverbal communication in social situations. Yet, he did not appear to have persistent difficulties with spoken language, only with written language.

Ivan was diagnosed with ADHD (no details of the assessments used in the diagnosis were available). The clinician's letter to the family doctor provided a brief outline of Ivan's poor concentration skills and difficulties keeping his mind on the work at hand, particularly if it was not of interest to him. It was noted that Ivan often made "careless mistakes" on schoolwork and was often easily distracted. He frequently gave up easily and avoided schoolwork, particularly when it became "too hard." He had generally high activity levels; although not seen as being restless, at times he appeared impulsive, interrupting others, and he had difficulty keeping quiet when expected in the classroom. It was stated, in line with previous assessments, that Ivan had difficulty learning and remembering concepts. An area of particular difficulty for Ivan was noted as planning and organizational skills. The clinician remarked that Ivan had poor connection to his peers and was not well accepted by the peer group at his school, although he had some friends outside school from his previous primary (elementary) school.

Changing schools

Ivan remained at the private school until the end of Grade 7; however, he had severe social difficulties and was relentlessly bullied. Due to these factors, and the school failing to support Ivan's twice-exceptionality—neither accommodating his disabilities nor supporting his areas of strength (giftedness)—his parents moved him to a Christian school, where he was in Grade 10 at the time of this study. In this new school Ivan received ongoing learning support, social and emotional support, along with government funding to support the school's accommodation of his disabilities (e.g., development of an individual education plan and learning support interventions). Ivan was in the accelerated mathematics class (Grades 8–10). Testing undertaken at the new school had shown prodigious mathematical ability, which was in direct contrast to his WIAT–II results and his Grade 4 report card. Other than inclusion in the accelerated mathematics class, he received little support for talent development at the new school.

Participant interview data

Ivan was interviewed at his family home on three different occasions (weekly for 3 weeks), for approximately one hour per interview. The third and final interview with Ivan was followed by a one hour interview with his parents. The interviews were transcribed and analyzed. Key findings from these interviews are presented under two thematic headings in this section (*Overwhelmed* and *Interrelating*), with a focus on the areas of AP skill deficits, in line with responding to the research question: What role do auditory processing skill deficits play in the educational life of a gifted young person with multiple exceptionalities?

Overwhelmed

Under the theme of *Overwhelmed*, the participants identified the impact that noise and the learning environment had on Ivan, both at school and outside school. It was not so much sound that bothered him, it was the loudness and intensity of sounds, and often the unexpected nature of these noises that was particularly troubling. Ivan's parents, Lois and Brendan, shared that Ivan had always been bothered by loud, busy environments,

from when he was very young, and especially unexpected loud noises like thunder and the school fire drill siren:

> He would get frustrated and anxious at the loudness of the classroom, he hated the fire drills . . . and he would cry, and cry as if in physical pain and cover his ears. We just put it down to sensitive hearing. Until we knew better and had his cumulative diagnoses to learn from.

Lois explained how Ivan started to become very anxious at school from Grade 1, when he started struggling with writing and fine motor skills. The teacher pointed out that he was having trouble copying off the board, which was when Ivan's parents sought the behavioral optometrist evaluation. Ivan began to wear glasses, but not a lot of difference was noticed in his writing and tracking from the board to his workbook. Indeed, Lois remarked that in Grades 1 and 2, Ivan seemed to have his own written language:

> He seemed to have his own code, he could read what he'd copied off the board, but no one else could. It was like a foreign language . . . I found at home, when I read things to him aloud, he had no problem copying it down, and I could read it too.

Accordingly, it did not appear that Ivan had problems with understanding words and translating them to written form. It was about this time that Ivan began to show anxiety, particularly about schoolwork and attending school. Lois elaborated:

> He would get upset every morning [before school] . . . In the first few years of school, I would barely get him back to the car [at the end of the school day], ready to drive home, and he would just collapse in a crying heap of exhaustion.

With hindsight, and the extensive testing reports to look back on, Lois now realized that Ivan's ASD and AP issues had come into play as part of his anxiety around school, emphasizing that:

> He was just so overwhelmed and trying to cope with every day at school, with all of what was going on in his body and mind, and the expectations from school, and all the noise. He always hated a lot of noise. Especially loud noises from when he was very little. Thunderstorms would see him hide under the bed covers or on the couch under a pile of pillows! He couldn't very well do that at school!

Lois first noticed Ivan's issues with processing and mimicking sounds when he was a toddler, but at the time she had chalked it up to a "normal" part of his development; it was not until much later, again with the knowledge that hindsight brings, that she realized this preceded his diagnoses:

> When he was learning to talk, he would mimic sounds, like I guess all toddlers do, but his were a little off from exact mimicking, like he was missing part of the sound. So, for example, when he would mimic the word balloon, he would say "boomboom." There were other examples too, like fruit was "fuooot," really emphasizing the middle sound but missing the subtlety of the "r" sound.

This was clearly evident in Ivan's auditory processing report, in the speech language pathologist's report, in the WRAML–II (below average auditory memory), and in his difficulties with phonological awareness. Lois detailed when she first made the connection to auditory skill deficits with Ivan, and how it had impacted on his reading:

> He had difficulty distinguishing individual sounds in words, this affected his reading along with his dyslexia, but surprisingly his reading comprehension was good. He was obviously using compensatory strategies to support him in understanding what he was reading. Often that would be the context . . . working that out on his own. But it must have been tiring.

Ivan explained how his auditory deficits were impacting him in the classroom, "[I] had difficulty remembering instructions and following them, when they were given verbally. It's surprising how many teachers don't write down instructions on the board or on a sheet for students." Lois elaborated:

> If I gave him more than three verbal instructions at once, he'd usually do the first, and then I'd find him sometime later in his room, reading or something, having either totally forgotten the other things he was supposed to do, or not hearing them properly, or maybe it was his ADHD distracting him.

Interrelating

Under the theme of interrelating, it began to become evident how Ivan's AP skill deficits were inextricably connected to his other disability diagnoses. Not only did Ivan's disabilities intersect; interrelating also played out in terms of problems connected with having multiple aspects to his identity, being gifted, and having multiple intersecting disabilities. Brendan explained some of the complexities:

> Often it was hard to tell what disability was causing what response, or behavior. It was only when he was about 11 when we started to get a really good picture, when we started to see all of his disabilities and giftedness, his strengths, all together that we could really see his true potential and why he did what he did.

Ivan found that he was frequently in trouble at school, either with the teachers for his behavior, or with peers

for his unintentional behavior during social interactions, which he described as "clumsy," elaborating that:

> I didn't find people understood me, that I was trying to be friendly, I guess part of it was maturity, but a lot to do with autism, my ADHD . . . butting in to conversations, talking too much. Those kinds of dumb things, I guess.

Lois talked about how being in seemingly constant trouble for his behavior at school had its roots in Ivan's AP skill deficits, but how this also interconnected with his other disabilities like ADHD, ASD, and dyslexia:

> He was often in trouble at school for silly things that he had misunderstood, as the information or rules were told verbally, he would miss some of what was being said, or only hear the first part and not the final part, or the first and last bits of the information but not "hear" or get the bit in the middle. This got worse as he went through school and the work and demands of school became more intense.

Brendan elaborated further about the interrelationships of Ivan's disabilities and the cumulative effects of having multiple diagnoses:

> I think phonologically, dyslexia is directly linked to his auditory processing difficulties, you can see it in his spelling, which still isn't good. . . . The speech language pathologist found that his areas of phonological awareness and difficulty were quite complex.

Lois attempted to seek the causes of Ivan's disabilities, stating, "He had lots of middle ear infections when he was a toddler, I think that may have impacted on his picking up language, I don't know, I've often wondered that."

What remained paradoxical was how well developed Ivan's language skills were: his verbal precocity, despite his AP skills deficits. Lois explained how this always puzzled her: "How well his language abilities—verbal language abilities that is, were. He has always been outgoing and is really articulate, his vocabulary has always been very advanced for his age." Ivan's parents believed that his strong language skills had "really helped him in advocating for himself and describing his difficulties to others, especially the specialists and his psychologist," which had become more evident as he moved into high school.

Further highlighting the interconnectedness of Ivan's multiple disability diagnoses and his giftedness, Lois explained the complexities of trying to tease out which disability impacted what area of his functioning:

> He still can't sit still! I think that's the ADHD, although when he's really engaged in something, especially something he's interested in, it's difficult to . . . get him to move onto something else, which I think is his autism. He really struggled with that at school. . . . He used to get quite upset. Coupled with . . . the noise and fuss of transition times in the classroom, it all affected his anxiety.

What appeared to underpin and connect many of the multiplicity of his disabilities was his auditory processing difficulties, as Ivan explained:

> I could do the maths work. I loved maths. There weren't many words to try and read and comprehend, you know, before I could do the problem . . . I didn't need to worry about spelling, and letter sounds, the instructions were written in the textbook, I just had to follow that. Sometimes I'd mix up pages and exercise numbers, which was a problem, as I'd get into trouble with the teachers . . . them thinking I'm not listening. My hearing's fine, I just don't sometimes process all of the verbal instructions.

Ivan appeared to have a very good understanding of his disabilities and how they impacted him.

Discussion

The aim of this case study was to explore the additional burden presented by AP skill deficits for a young person with multiple exceptionalities, and in so doing, to ascertain what role AP deficits played in the educational life of Ivan—a gifted young person with multiple exceptionalities. Ivan commenced full-time formal schooling at the age of 5 years 7 months. However, it was not until the age of 9 years 3 months that he was identified as twice-exceptional (via WISC–IV), so he had been at school for nearly 4 years before he was identified as twice-exceptional. Prior to his WISC–IV assessment, Ivan had only been assessed based on his areas of difficulty (disabilities), rather than his areas of giftedness (i.e., abilities/potential). Collectively, Ivan's profile of twice-exceptionality showed a complexity of disabilities and giftedness, impacted by AP skill deficits. Together, this complexity had a debilitating impact on Ivan's academic attainment due to his information processing issues, clearly underpinned by deficits in AP skills, which connected many of his multiple disabilities, impacting on his scholastic achievements.

Overall, Ivan had lowered AP skills, particularly in the areas of auditory closure skills, dichotic listening, delayed phonological awareness (impacting his reading and spelling), weaknesses in auditory analysis skills, and auditory recall. The speech language pathologist found deficits in his phonological processing skills (3rd percentile on SPAT–R). The WISC–IV assessment showed that Ivan had high levels of

abstract reasoning, and that he was highly gifted in verbal and language skills, in combination with difficulties with fine motor skills, visual motor production deficits, and auditory and phonological processing deficits. The WRAML–II showed deficits in both auditory memory and sequential memory, impacting on Ivan's ability to take in and remember letters, sounds, and numbers. The WIAT–II showed Ivan's spelling ability was below average, and that he had consistent difficulties with sequential memory and visual sequential memory, with the psychologist concluding that he was "significantly underachieving." ASD was masked by Ivan's high-verbal skills, and he had difficulties with nonverbal communication. Ivan also had ADHD, which impacted on his ability to learn and remember concepts and caused distractibility and restlessness. His profile was further complicated by anxiety, which his parents had first noticed in Grade 1, later confirmed by two psychologists. Anxiety seemed to pervade all of Ivan's educational experiences.

Consistent with previous literature, the etiology for Ivan's AP deficits lay in weaknesses in his phonological processing, auditory sequential memory, his lowered auditory recall abilities, and deficits in his auditory analysis skills; as noted by others (e.g., Gokula et al., 2019, Halliday et al., 2017), all areas central to AP. Taken together, these AP skill deficits showed crossover with Ivan's multiple disabilities, in particular ADHD, ASD, dyslexia, and anxiety. As prior research has shown, comorbid disabilities are frequently accompanied by AP deficits (Gokula et al., 2019, Halliday et al., 2017), and this was the case for Ivan. Indeed, the *Diagnostic and Statistical Manual of Mental Disorders–Fifth edition* (DSM–5–TR; American Psychological Association, 2022); states that ADHD is a common comorbidity with ASD. ADHD is also associated with reduced academic performance and attainment and shares the symptom of inattention with anxiety disorder. Certainly, other researchers have connected ADHD and dyslexia to AP deficits (Chermak et al., 1999). So, there were other areas of overlap between Ivan's disabilities. Yet essentially, AP deficits appear to have had overlapping roles in the presentation and impacts of the combination of Ivan's exceptionalities. In particular, students who are identified both as gifted and as having SLDs and other disabilities, have significantly more AP deficits than either students with SLD, or students who are solely gifted. This was certainly the case for Ivan. It was also seen in Ivan's case that his clinical profiles overlapped in these areas even though he had distinct clinical disabilities.

Ivan's profile showed multiple deficits across numerous areas, including attentional skills and working memory. Low working memory has also been associated with AP skill deficits (Chermak et al., 1999). Unlike individuals with SLDs and other comorbidities associated with AP deficits, Ivan had highly developed language skills ("Highly Gifted" in this area), meaning that he was able to compensate for his disabilities; that is, up to a point. Once the demands of the curriculum and the classroom environment exceeded his capacity, Ivan began to struggle academically, as was evidenced in the WIAT–II results in comparison to his actual school achievement. Indeed, Ivan was relying on his prodigious language skills to compensate for his AP deficits, a strategy that left him physically and mentally exhausted, according to the interview data.

Another aspect of Ivan's profile was his generalized anxiety disorder. It appeared that this developed as a complicating factor due to the rigors of school (beginning in Grade 1), which also impacted on his working memory and AP skills. A likely reason why Ivan's academic achievements were not all similarly impacted was his strong reading comprehension skills as well as his ability to use compensatory strategies, such as context, to understand texts. This had placed him at an advantage in mathematics, where he was excelling in Grade 10 in the accelerated class.

Ivan showed AP deficits in auditory attention, auditory sequencing, and auditory memory, also consistent with findings relating to the underachievement of gifted learners (Arehole & Rigo, 1999, Silverman, 1989, Waldron & Sapphire, 1990). Particularly problematic for Ivan were the areas of phonological awareness, spelling, and handwriting (associated with both his dyslexia and dysgraphia), a finding that concurs with Silverman (1980). Furthermore, Ivan's mother detailed the chronic otitis media that Ivan suffered when he was young, which may have interfered with the development of his auditory sequential processing. This finding concurs with Borges et al. (2013) and Katz et al. (2019).

When reviewing Ivan's WISC–IV, WRAML–II, and WIAT–II results in light of the distinct profiles for learners with specific disability diagnoses (as found by Cunah et al., 2019, Mayes & Calhoun, 2006), the overlapping role that AP skill deficits played in Ivan's educational experiences is clear—the difficulties were having a debilitating impact on his learning, on his ability to demonstrate evidence of his learning (i.e., achievement), and on his social interactions. Ivan was clearly underachieving compared to his own potential.

Ivan's difficulties impacted on his relationships with peers and teachers, which was evidenced in the interview data from both Ivan and his parents, and in the statements from clinicians; for example, his issues with social interpretation (ASD diagnosis), distractibility

(ADHD), and the combined impact of working memory deficits and AP deficits. This was particularly obvious in terms of the impacts on Ivan's academic achievements, especially where tasks like writing, spelling, visual motor production, and remembering auditory information were concerned. As many classroom learning tasks integrate all these skills, Ivan was particularly disadvantaged. Furthermore, the impacts on tasks involving working memory, where Ivan was required to hold on to information in his mind, perform a mental task with that information, and then produce a result, was particularly problematic for him in being able to show achievement at school.

Paradoxically, Ivan showed highly developed verbal language skills, which strengthened his reading comprehension. Usually with AP skill deficit there is a relationship to poor oral language development and developmental disorders of language (Halliday et al., 2017). This was clearly not the case for Ivan. Interestingly, Song and Porath (2011) found that such evidence of strong and weak verbal-linguistic abilities appeared contradictory yet could be explained by what they termed a "between-domain contributing ratio" (p. 222). In this contributing ratio, both auditory and visual domains form independently *and* in integrated ways, but in different *ratios*; that is, variations exist depending on the activity being undertaken, where a high visual memory and processing ability may compensate for lowered AP ability (Song & Porath, 2011). For example, Ivan showed below average spelling ability, skills that rely heavily on both auditory and visual sequential memory. However, his reading comprehension was well above average, despite his phonological and word decoding skill deficits.

Unlike children with AP deficits and SLDs (Cunah et al., 2019), Ivan's WISC–IV profile showed an average FSIQ but with a "Very Superior" VCI. Ivan was clearly more advantaged with regard to general intelligence and crystalized intelligence than is often the case for students with SLDs (Cunah et al., 2019). Ivan's WISC–IV scores showed high scores on the Similarities, Vocabulary, Comprehension, and Word Reasoning, and lower comparative scores on Block Design, Digit Span, Letter-Number Sequencing, and Symbol Search, showing the potential impact of his disabilities and AP skill deficits on his WISC-IV assessment.

Interestingly, only the final school that Ivan was enrolled in developed an individual education plan for him, detailing his educational needs. His previous schools had done little to support his areas of disability or to develop his talent. Ivan's verbal and language skills were the dominant channel through which he could learn; however, in school he was frequently in trouble for talking, and was often prevented from engaging in dialogic learning. Interventions could have focused on using Ivan's strengths to support his learning, as strengths-based, talent-focused approaches to learning are highly appropriate for supporting twice-exceptional students (Baum et al., 2014, Ronksley-Pavia & Hanley, 2022).

The findings from this case show the significant individual variability inherent in twice-exceptional (or multi-exceptional) children, and that it is essential to recognize that the comorbidity of AP deficits may be common for twice-exceptional learners, as was the case for Ivan. Given the weight of evidence that shows children are likely to have multiple skill deficits rather than isolated skill deficits (Gokula et al., 2019), this finding could have wider implications for other similar cases. Had Ivan's parents stopped at the one clinical assessment, it is likely he would never have been identified as gifted; it is also likely that the confounding impacts of his AP skill deficits and distinct disabilities would have continued to impact his learning, and that he would have continued to underachieve at school.

Limitations

There is no consensus for diagnostic criteria for twice-exceptionality, nor for diagnosing AP skills deficits. Different assessments were used by clinicians to assess Ivan based on best clinical judgments made at the time, and independent from this study. These assessments may not represent current "best practices" for assessing the identified disabilities and giftedness explored in this case. Furthermore, for all assessments, the child's status, stability of testing instruments, and testing environments may have affected the test results.

It was not the focus of this study, and it is beyond the scope of this study to review the veracity, accuracy, and reliability of the testing instruments used in Ivan's diagnoses, as these were based on judgments of the clinicians who administered the tests, independent and separate from this study. There could potentially be inaccuracies in these results due to testing errors. There also may be disputed use of certain tests for diagnosing certain conditions. These evaluations were not part of the study; however, they are acknowledged as potential limitations in this case study.

Another limitation relates to potential generalizability of this case, yet this was not the intention of this study. There is no need for generalizability to similar cases as representativeness in case study methodology yields to assurances that this case is described in depth, so that

readers may recognize potential similarities to other interesting cases, thus establishing the basis for naturalistic generalizations rather than representational generalizability. As one of the primary roles of this type of methodology, this case study aims to add to existing knowledge experiences and to human understanding in the field.

Conclusion

As this case study demonstrates, the presentation and impact of twice-exceptionality, or in Ivan's case, multiple exceptionalities, is very individual. For Ivan, connections were evident between his multiple disabilities, indicating the overlapping relationships that AP skill deficits played and how this impacted on him. It is only by understanding how the specific clinical diagnoses affected Ivan and the relationship between his disabilities, AP skill deficits, and giftedness, that interventions could potentially be individualized to meet his needs. Unfortunately for Ivan, this came later in schooling when much of the debilitating effects of his multiple disabilities and AP deficits had already impacted on his academic achievement and social and emotional well-being. Even when he was in a school that attended to accommodating his disabilities, Ivan was given little support for fully developing his talents.

Consideration should be given to AP skill screening for twice-exceptional students (indeed, for all students) early in their schooling to assist in ensuring suitable interventions to address a potential complicating factor in underachievement before it becomes an embedded factor. Because AP skill deficits coexist clinically with other disabilities, early screening could assist in understanding the impacts of multiple disabilities combined with AP skill deficits.

The findings from this case study suggest the need for a multidisciplinary assessment and interventional approach for identifying and supporting twice-exceptional children. A multidimensional battery of assessments, including AP screening, speech language pathology, and a comprehensive psychometric assessment (i.e., WISC and WIAT) should be implemented for all children suspected of having SLDs and other comorbid disabilities, with or without giftedness.

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