

Written Language Profile of Children and Youth with Asperger Syndrome: From Research to Practice

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Abstract: The current study investigated written language skills of children and youth with Asperger Syndrome (AS). Sixteen children and youth with AS and 16 neurotypical peers were compared on a standardized test of written language skills and legibility of handwriting. To investigate more detailed characteristics, informal analyses were also made for written samples from these standardized tests. In written language skills, significant differences were not found between standardized scores of both groups; however, in hand writing skills, the group of individuals with AS produced significantly less legible letters and words than the neurotypical group. Informal analyses of written samples further reveal that the group of children and youth with AS appear to be able write quantitatively similar to their neurotypical peers with using grammatical rules but had difficulty producing qualitative writing. Implications for translating research to practice in teaching writing skills for children and youth with AS are discussed.

Much of what we know about the school functioning of individuals with Asperger Syndrome (AS) comes from Hans Asperger's writings in the 1940's. He quantified the academic performance of children and adolescents he worked with as uneven at best and many who had intelligence quotients that were above average failed core academic subjects. According to Asperger, "The very same children who can astonish their teachers with their advanced and clever answers fail miserably at their lessons" (Asperger, 1991, p. 75). Within this uneven profile, Asperger commented on the writing deficiencies seen in those he studied. Years later debate exists on the quality and quantity of composition and handwriting skills produced by children and youth with AS.

The few empirical studies conducted in this

area have had equivocal findings. For example, Gross (1994) reported that while individuals with AS had no specific areas of academic skills that were strong or weak penmanship, difficulties were common for many children with AS. For example, Gross (1994) described Paul, a seven-year old with, AS, by stating, "His work – written work in particular – was very slow. . . . His drawings and handwriting were uncoordinated" (p. 104). She further indicated that composition and handwriting skills are generally recognized as problematic for children and youth with AS.

That same year, Ghaziuddin, Butler, Tsai, and Ghaziuddin (1994), reported on motor skills of 11 individuals with AS. They found that both fine and gross motor skills were impaired as measured by a norm-referenced standardized motor assessment. Ghaziuddin et al. further reported that children and youth with AS experienced significant difficulties with these skills as compared to neurotypical peers.

The work of Gross (1994) and Ghaziuddin

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and colleagues (1994) was followed by the first investigation of the composition and handwriting skills of students with AS in a school setting (Church, Alisanski, & Amanullah, 2000). Church and colleagues used a review of student records to identify the handwriting patterns of 39 elementary-aged children and youth with AS. Anecdotal reports in the students' files indicated that overall handwriting was an extremely challenging task for most of the students and many were provided with paraprofessionals to help with this task. Church et al. found that, "Several children were very slow and meticulous workers, obsessive about every single detail. A few teachers reported that the students would erase their work so many times, trying to make it perfect, that they left holes in their papers" (p. 16). Over one-half received occupational therapy to address fine motor skills such as pencil grasp and handwriting. This pattern seemed to continue into high school. Reporting on a sample of five students with AS in high school, Church et al. report that:

English (language arts) was the most difficult subject for all five boys, especially because of the creative and analytical writing required. The boys found it very difficult to organize thoughts, start and end thoughts, or develop essays that required drawing from other learning. All five boys found writing to be physically challenging. Three of the five used laptop computers almost exclusively for completing assignments. Their handwriting was almost illegible. This is interesting to note because one of the boys was a gifted (drawing) artist and another was a gifted piano player, and neither had trouble with those activities (p. 19).

A pattern of composition and handwriting problems in individuals with AS was not evident in an investigation of writing skills conducted by Griswold, Barnhill, Myles, Hagiwara, and Simpson (2002). Twenty-five children and adolescents with AS were administered the norm-referenced and standardized *Wechsler Individual Achievement Test* (The Psychological Corporation, 1992) in an attempt to identify performance patterns. Student aggregate performance on the Writing Composite (mean = 99.22; *SD* = 18.99) was within the

average range as were the scores of the two subtests that comprised the composite score (Written Expression mean = 90.36, *SD* = 18.90; Spelling mean = 98.92, *SD* = 16.12). The authors noted that one participant refused to take the Written Expression subtest and four students did not complete the subtest because of fatigue, expiration of the test session and an inability to reschedule additional testing time.

Thus, the body of literature appears to present a somewhat contradictory profile of the written expression skills of children and youth with AS. The purposes of this study were to analyze written language samples of adolescents with AS using both formal and informal measures, and to identify effective means of providing written language instruction for children and youth with AS.

Method

Participants

Sixteen children and adolescents with AS and 16 neurotypical peers participated in this study, which was a part of a more extensive study conducted by a large midwestern university. All participants resided in a large midwestern community. Participants with AS included 15 males and one female who ranged in age from 8-years, 0-months to 16-years, 4-months (mean = 11-years, 7-months). Fourteen males and two females whose ages ranged from 8-years, 2-months to 16-years, 1-month (mean = 11-years 6-months) comprised the neurotypical peer group. All were Caucasian and had been diagnosed by a licensed psychiatrist using DSM-IV criteria (APA, 1994). Participants with AS had a mean Verbal IQ score of 103.00 (*SD* = 25.59); mean Performance IQ score of 102.33 (*SD* = 24.58); and a mean Full Scale IQ score of 103.08 (*SD* = 24.96) on the *Wechsler Intelligence Scale for Children -Third Edition* (Wechsler, 1991).

Instruments

Instruments used were the *Test of Written Language* (TOWL-3; Hammill & Larsen, 1996) and the *Evaluation Tool of Children's Handwriting* (Amundson, 1995). In addition, the written language sample generated by students

who completed the TOWL-3 was analyzed informally.

Test of Written Language. The TOWL-3 is a norm-referenced measure designed to identify students who have difficulty in writing that requires special assistance, determine students' strengths and weaknesses in writing, and document progress in writing achievement through assessment of the three components of written language: conventions, linguistics, and cognition (Hammill & Larsen, 1996). It assesses writing through both contrived formats that focus on isolated units of writing (i.e., spelling, capitalization, punctuation, and word usage) and spontaneous samples that assess students' ability to write meaningfully. The TOWL-3 contains eight subtests and three composite scores that measure the foundation of writing. The mean standard score for the subtests is 10 ($SD = 3$) and 100 ($SD = 15$) for the composite scores. Table 1 describes the subtests and composites that are represented in this measure.

Informal analysis of written language samples. An informal analysis of the TOWL-3 written language samples was conducted to measure the complexity of the work products. Analysis contained elements mirrored in the majority

of research conducted in this area: (a) indices of total morphemes, t-units, sentences, and words; and (b) sentence complexity as measured by use of complex and simple t-units, fragments, and simple, compound, and compound/complex sentences (Gregg, 1982, 1986; Gregg, Coleman, Stennet, & Davis, 2002; Gregg, Hoy, McAlexander, & Hayes, 1991; McGill-Franzen, 1979).

Evaluation Tool of Children's Handwriting (ETCH). The ETCH (Amundson, 1995) is a norm-referenced measure used to evaluate legibility and/or speed of writing tasks that are similar to those performed in the classroom. It measures letter, word, and number legibility; letter and word formation; letter and word spacing; and letter size and alignment in individual sentences and composition. Each is assessed using the following criteria: (a) it is recognized at first glance out of context; (b) it is not distorted, reversed, rotated or poorly formed; (c) parts are not omitted or properly closed; (d) overlap does not occur or share parts with other characters; (e) it is not confused for other letters or words; or (e) it is not omitted or misplaced.

The spontaneous writing portion of the TOWL-3 was excerpted and analyzed for legi-

TABLE 1
Description of TOWL-3

Subtests	
Vocabulary	A sentence is written that contains a stimulus word to demonstrate understanding of the meaning of that word
Spelling	Spelling is evaluated in a dictated sentence
Style	Punctuation and capitalization is measured in dictated sentences
Logical Sentences	A dictated sentence is edited for meaning
Sentence Combining	Two or more short sentences are combined into one sentence
Contextual Conventions	Capitalization, punctuation, and spelling are assessed in a story generated from a visual stimulus
Contextual Language	Vocabulary, sentence construction, and grammar are evaluated in a written language sample generated from a picture
Story Construction	Plot, prose, character development, and other composition constructs are assessed in a spontaneous written language sample
Composites	
Overall Writing	Vocabulary, spelling, style, logical sentences, sentence combining, contextual conventions, contextual language, and story construction in dictated and spontaneous written language samples
Contrived Writing	Vocabulary, spelling, style, logical sentences and sentence combining in dictated samples
Spontaneous Writing	Contextual conventions, contextual language, and story construction in a written language sample from a picture stimulus

bility, spacing, and alignment according to the criteria outlined in the ETCH manual. Scoring criteria were followed according to ETCH Task VII, Sentence Composition criteria outlined in Table 2. The occupational therapist who scored the writing samples using the ETCH was trained over three two-hour sessions as was a second licensed occupational therapist who had an undergraduate degree in occupational therapy and a graduate degree in AS/autism who established interrater reliability. Scorer reliability was determined by completion of the ETCH-Manuscript Tutorial with a pass rate of 90% on the two competence quizzes recommended in the manual.

Procedure

The 16 children and youth with AS were part of a comprehensive research study on AS conducted by a large midwestern university. Participants were located through use of a database of members of a parent support group for families of individuals with AS. Letters were sent to the membership informing them of the study.

Convenience sampling was used to recruit neurotypical peers. That is, 16 peers matched for age and gender were recruited from one of the schools in the Midwest suburban com-

TABLE 2
Etch Scoring Criteria

<p>Numeral Legibility</p> <ol style="list-style-type: none"> 11. It is not easily and quickly recognized out of context and at first glance. 12. It is poorly formed, distorted, reserved or greatly rotated. 13. It has additional, extraneous parts and/or dark writings over poor erasures; 14. Parts are omitted or improperly closed; 15. Numerals are joined, share the same part, or overlap to form individual numbers; 16. It is confused for another letter or numeral or a group of letters or numerals; 17. It is omitted or misplaced in sequence. <p>Lower-case Legibility</p> <ol style="list-style-type: none"> 1. It is not easily and quickly recognized out of context and at first glance; 2. It is poorly formed, distorted, reversed, or greatly rotated; 3. All of its descender is on or above the writing baseline; 4. It has additional, extraneous parts and/or dark writings over poor erasures; 5. Parts are omitted or improperly closed; 6. Letters are joined, share the same part, or overlap to form individual letters; 7. It is confused for another letter or numeral; 8. It is confused for a group of letters or numerals; 9. The entire letter is omitted or misplaced in sequence. <p>Upper-case Letter Legibility</p> <ol style="list-style-type: none"> 1. It is not easily or quickly recognized out of context and at first glance; 2. It is poorly formed, distorted, reversed or greatly rotated; 3. It has additional extraneous parts and/or dark writings over poor erasures; 4. Parts are omitted or improperly closed; 5. Letters are joined, share the same part, or overlap to form individual letters; 6. It is confused for another letter or numeral; 7. It is confused for a group of letters or numerals; 8. The entire letter is omitted or misplaced in sequenced. <p>Composed Word</p> <ol style="list-style-type: none"> 1. Word is not quickly, easily and correctly read as the intended word; 2. Word is confused for another word; 3. Intended word is not phonetically or alphabetically spelled appropriately; 4. Extraneous letters and forms are in the word; 5. Word includes cursive letters; 6. Word is poorly erased and rewritten; 7. Word is omitted or misplaced in sentence.

munity from where participants with AS were recruited.

Interested parents contacted the researchers expressing their willingness (and that of their child) to participate. Upon agreement to participate in the project and prior to testing, parents completed a consent form and provided demographic information. Student assessments were administered individually in a clinical setting. Testing sessions were held in a small classroom with worktables, adequate lighting and minimal auditory and visual distractions. Graduate students enrolled in an AS/autism graduate program who were trained in the administration of standardized measures and had extensive experience administered the TOWL-3 assessments. Graduate students were members of the AS Assessment Team and had received in-depth training in AS through academic study and practica experiences.

A graduate student seeking graduate degrees in speech-language pathology and AS/autism scored the TOWL-3 protocols. A licensed occupational therapist with an undergraduate degree in occupational therapy and was completing a graduate degree in AS/autism scored the written language samples using the ETCH. Interrater reliability was established by a second licensed occupational therapist that had an undergraduate degree in occupational therapy and a graduate degree in AS/autism.

Reliability

Reliability checks were performed on 20% of the TOWL-3 protocols. Interrater reliability was computed at 100%. Six of the 24 written language samples scored using the ETCH were analyzed for interrater reliability. Word legibility reliability was 92% and letter legibility reliability was 96.5%. Interrater reliability was determined by dividing number of agreements by total number of items and multiplying by 100.

Results

Analysis of TOWL-3 Assessment

Although students with AS scored higher than their nondisabled peers on four of the eight

subtests, no significant differences existed in the TOWL-3 subtests or composite scores obtained by children and youth with AS and their neurotypical counterparts. As shown in Table 2, both groups performed in the average range on this measure. Children with AS received a mean Overall Writing score of 99.38 ($SD = 19.14$) while their peers' average score on this composite was 99.81 ($SD = 10.13$). Table 3 provides an overview of the subtests and composite scores for both groups.

Informal Analysis of the TOWL-3 Written Language Sample

As shown in Table 4, neurotypical students produced significantly more morphemes than did their peers with AS ($t = -3.563; p < .05$). In fact, morphemes generated by the participants without disabilities nearly doubled that of their counterparts with AS. A similar pattern was seen in t-unit production with neurotypical peers generating a mean of 14.5 t-units ($SD = 5.38$) and 139.25 words ($SD = 49.39$), to the 9.31 t-units ($SD = 5.50$), 77.69 words ($SD = 47.07$) written by those with AS. The two groups, however, did not differ in the number of sentences they wrote ($t = -.92; p > .05$). Students without disabilities created an average of 10.88 sentences ($SD = 4.82$) and participants with AS wrote a mean of 8.94 sentences ($SD = 6.97$).

Analysis of ETCH Results

Manuscript handwriting of 12 of the 16 students with AS was analyzed using the ETCH. The remaining four students had written their samples using cursive writing which could not be analyzed using the ETCH protocol. The written language samples of four neurotypical students were also excluded from the study. Students whose writing was not analyzed were matched by age and gender to the adolescents with AS whose protocols were not scored.

A t test revealed that a significant difference existed in the percent of legible letters generated by the two groups ($t = -3.19; p < .05$) with 89.84% and 75.02% of legible letters written by the adolescents without AS and those with AS, respectively. A similar pattern was seen in legible word production ($t = -2.74, p < .05$).

TABLE 3

Scores of Students with AS and their Neurotypical Peers on the TOWL-3

TOWL-3	Asperger Syndrome		Neurotypical		t-test
	Mean Score	SD	Mean Score	SD	
Subtests					
Vocabulary	9.94	2.52	10.38	2.47	.45
Spelling	10.31	2.82	9.63	1.96	-.71
Style	9.88	3.90	10.13	2.06	.20
Logical Sentences	9.25	3.34	8.94	1.39	-.31
Sentence Combining	9.81	3.39	9.00	1.79	-.81
Contextual Conventions	10.31	3.05	9.81	2.99	-.45
Contextual Language	8.94	3.38	10.38	2.22	1.19
Story Construction	10.69	3.22	11.81	1.76	.99
Composites					
Contrived Writing	98.25	18.69	95.63	12.79	-.39
Spontaneous Writing	100.88	20.10	104.25	10.85	.51
Overall Writing	99.38	19.14	99.81	10.13	.07

Specifically, 87.80% of the words generated by students without AS were legible while only 71.09% of the words written by individuals with AS met the same criteria. As shown in Table 5, significant differences existed in the letter alignment, formation, size and spacing of the two groups with neurotypical youth making significantly fewer errors in three of the four categories.

Discussion

Administration of the norm-referenced standardized TOWL-3 revealed that as a group,

students with AS performed similarly to individuals without disabilities. Without further investigation, it could be concluded that students with AS do not need additional assistance in written composition skills. However, a visual analysis of the data reveals that participants with AS demonstrated more variability in their written language performance than did neurotypical peers as evidenced by the standard deviation scores of the six subtests, conventions, and composite scores on the TOWL-3. When individuals with AS are compared to neurotypical individuals solely through analysis of aggregate data, erroneous

TABLE 4

Informal Analysis of the Written Language Samples of Students with AS and their Neurotypical Peers

Written Language Component	Asperger Syndrome		Neurotypical		t-test
	Mean Score	SD	Mean Score	SD	
Total morphemes	87.25	54.04	156.06	55.20	-3.56*
Total t-units	9.31	5.50	14.50	5.38	-2.70*
Total words	77.69	47.07	139.25	49.39	-3.61*
Total sentences	8.94	6.97	10.88	4.82	-.92
Sentence fragments (%)	9.82	17.55	1.09	3.29	1.96
Run-ons (%)	25.04	39.33	18.36	25.00	.57
Simple sentences (%)	65.78	40.60	54.15	28.23	.94
Compound sentences (%)	6.19	10.17	17.69	18.71	-2.16*
Compound/complex sentences (%)	1.98	4.53	2.08	8.33	-.04

* = significant at .05 level.

TABLE 5

Analysis of the Manuscript Writing of Students with AS and their Neurotypical Peers

<i>ETCH Component</i>	<i>Asperger Syndrome</i>		<i>Neurotypical</i>		<i>t-test</i>
	<i>Mean Score</i>	<i>Range</i>	<i>Mean Score</i>	<i>Range</i>	
Letter Formation	31.40 (28.40)	2.20–96.90	9.60 (5.20)	2.50–26.80	2.58*
Letter Size	0 (0)	—	.10 (.10)	—	–2.21*
Letter Alignment	2.80 (4.60)	0–14.30	.10 (.20)	0–5.00	–3.61*
Letter Spacing	5.50 (8.80)	0–31.20	1.80 (2.70)	0–8.80	.18

Note. Component scores were calculated as a percent of legible letters. Mean percents are presented; standard deviations are in parentheses. * = significant at .05 level.

conclusions may be drawn and a wealth of information regarding within group differences may be overlooked.

Informal analysis revealed a different and perhaps more informative picture of the students’ skills. Students with AS demonstrated that they can produce sentences similar in number to their peers, but sentences generated are brief and not as complex as demonstrated by the number of morphemes, t-units, and words. Furthermore, students with AS do understand rules of sentence construction as evidenced by run-ons and sentence fragments that were not different than their peers.

Although the sample size in this study limits its generalization, these data serve to increase the knowledge base in the area of academic profiles in Asperger Syndrome. Individuals with AS demonstrated considerable variability in their written language scores when compared to the group with AS and the nondisabled peers. Future research efforts may focus on analyzing differences within the group of individuals with AS and also on analyzing the differences within individual student’s test profiles.

Implications for Practice

These findings have implications for formal education and suggest that instruction for individuals with AS may need to focus on teaching elaboration of thoughts in written form rather than on the writing conventions such as punctuation and spelling.

1. This study supports what we all know, namely that programming suggestions

cannot be drawn from norm-referenced standardized measures. Norm-referenced standardized measures were not designed for this purpose; rather they were designed to indicate student performance as compared to a norm.

2. Examination of the student’s intrasubtest variability is suggested so that a more comprehensive picture of strengths and weaknesses can be determined. This information is critical to the development of the student’s individual education program.
3. Educators and practitioners need to be aware that when students with AS perform in the average range of a norm-referenced measure, it may not be suggestive of “average” performance nor is it an indicator that they do not need specialized instruction or support. Further analysis is needed to correctly identify student needs.
4. Having a scribe write the student’s verbal responses may also be considered in future evaluation and research efforts to determine if the lower written language scores are due to lack of embellished thoughts or a motoric problem in getting the thoughts on paper. This, of course, would be accomplished by a complete evaluation of motor skills.
5. The process of writing may be so taxing for a writer with AS that it might limit the student’s ability to prepare written projects commensurate with their ability. Perhaps having the student tape record his or her verbal responses, which may be more elaborate than their written product, and then copy the tape-recorded re-

sponses onto paper may increase elaboration and the number of words used.

6. Provide instruction on sentence and paragraph construction, including information on sentence fragments and run-ons. Consider using pre-constructed paragraphs as media for practice in recognizing construction errors.
7. Teach the concepts of writing drafts and proofreading so students can learn to write content first and focus on mechanics second.
8. Teach students with AS how to elaborate within written projects by using their own samples.
9. Motivate students to write by encouraging them to write about their special interests.
10. If repeated instruction in penmanship focusing on letter formation, size, and alignment has not resulted in increased legibility, alternatives to handwriting, such as the use of a computer or word processor, may need to be explored.

References

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders (4th edition)*. Washington, DC: Author.
- Amundson, S. (1995). *Evaluation Tool of Children's Handwriting*. Homer, AK: O.T. Kids.
- Asperger, H. (1991). 'Autistic psychopathy' in childhood. In U. Frith (Ed. & Trans.), *Autism and Asperger Syndrome* (pp. 37–92). New York: Cambridge University Press. (Original work published 1944).
- Church, C., Alisanski, S., & Amanullah, S. (2000). The social, behavioral and academic experiences of children with Asperger Syndrome. *Focus on Autism and Other Developmental Disabilities, 15*, 12–20.
- Ghaziuddin, M., Butler, E., Tsai, L., & Ghaziuddin, N. (1994). Is clumsiness a marker for Asperger Syndrome? *Journal of Intellectual Disability Research, 38*, 519–527.
- Gregg, N. (1982). *An investigation of the breakdown in certain aspects of the writing process with college age learning disabled, normal, and basic writers*. Unpublished doctoral dissertation, Northwestern University, Evanston, IL.
- Gregg N. (1986). College learning disabled, normal, and basic writers' sentence combining abilities. *B. C. Journal of Special Education, 10*, 153–166.
- Gregg, N., Coleman, C., Stennett, R. B., & Davis, M. (2002). Discourse complexity of college writers with and without disabilities: A multidimensional analysis. *Journal of Learning Disabilities, 35*, 23–38.
- Gregg, N., Hoy, C., McAlexander, P., & Hayes, C. (1991). Written sentence production error patterns of college writers with learning disabilities. *Reading and Writing: An Interdisciplinary Journal, 3*, 169–185.
- Griswold, D. E., Barnhill, G. P., Myles, B. S., Hagiwara, T., & Simpson, R. L. (2002). Asperger Syndrome and academic achievement. *Focus on Autism and Other Developmental Disabilities, 17*, 94–102.
- Gross, J. (1994). Asperger Syndrome: A label worth having? *Educational Psychology in Practice, 10*, 104–110.
- Hammill, D., & Larsen, D. (1996). *Test of Written Language – 3rd Edition*. Austin, TX: Pro-Ed.
- McGill-Franzen, A. (1979). Beyond illiterate, what can you say? *Learning Disability Quarterly, 54*, 148–156.
- The Psychological Corporation. (1992). *Wechsler Individual Achievement Test*. New York: Author.
- Wechsler, D. (1991). *Wechsler Intelligence Scale for Children-Third edition*. New York: Psychological Corporation.