

Anomic Aphasia in Childhood

George W. Hynd, EdD; Janet Leathem, PhD; Margaret Semrud-Clikeman, PhD;
Kelly L. Hern, PhD; Mathew Wenner, PhD

ABSTRACT

Documented cases of anomic aphasia in childhood are rare, due to their low prevalence and relatively subtle clinical manifestations and because of probable referral bias. Such cases are important, however, because they may shed light on the nature of lesions that produce anomia in children and because they may contribute to our understanding of brain-behavior relations in children. This case involves a 10-year-old girl who experienced a left temporoparietal hematoma. Recovery over an 8-month period was good, with near normal verbal-expressive (Verbal IQ = 86) and normal perceptual-motor abilities (Performance IQ = 100). Reading, spelling, and repetition were preserved. Spontaneous speech was good, although initially circumlocutory and marked by obvious word-finding difficulty. Consistent with reports involving adults, there was significant disturbance in naming characterized by frequent literal and semantic paraphasias. Although she had significant difficulty on confrontational naming, she could accurately spell and read the name of the objects presented to her. This case is discussed relative to localization of lesions producing anomic aphasia and regarding the course of recovery in childhood. (*J Child Neurol* 1995;10:289-293).

Despite the fact that childhood aphasia is one of the rarest of the behavioral neurologic disorders in children, interest in these disorders has been great because careful consideration may reveal similarities or important differences in their manifestation during the developmental period.^{1,2} Although there appear to be some important similarities between cases of childhood and adult aphasia, there are significant differences in terms of prevalence, type, and perhaps prognosis as well. For example, crossed aphasia in right-handed adults is rare, occurring only in about 1% to 4% of the population.³ Among children who are right-handed, however, the reported prevalence of crossed aphasia ranges from 7% to 47%.^{4,5} Further, evidence suggests that although the prevalence of concurrent apraxia and acalculia, as well as recovery rate, is not different between adults and children, the neuropsychological profiles may be considerably different on examination.⁶

The prevalence of fluent (Wernicke's) aphasia seems lower in children than in adults.^{6,7} For example, van Don-

gen, Loonen, and van Dongen⁸ noted that only four (15%) of 27 aphasic pediatric patients in their clinic over a 4-year period had fluent aphasia. They suggested that the reported prevalence of fluent aphasia, and perhaps other more subtle aphasic syndromes such as anomic aphasia, is underreported in pediatric populations. This suggestion is consistent with earlier conclusions that potential reporting biases exist in the literature, affecting estimates of prevalence and our knowledge of the neuropsychological and neuropathologic correlates of different aphasic syndromes in children. In this context, very little is known about anomic aphasia in childhood.

As a specific symptom, anomia has been reported in adults with frontal lesions,⁹ caudate and putamen lesions,¹⁰ and lesions of the anterior region of the corpus callosum.^{11,12} Although the disruption of various cortical and subcortical systems may produce anomia, lesions of the left temporoparietal region (area 39) typically produce the significant and unique word-finding difficulty found in adults with anomic aphasia.¹³ Very few cases of anomic aphasia exist in the childhood aphasia literature.⁷ Thus, there is value in reporting these cases because they may reveal how circumscribed lesions in children produce aphasic syndromes more commonly seen in adults.

In this report, we describe a case of a 10-year-old right-handed child who developed anomic aphasia, characterized by circumlocutory speech with obvious word-finding difficulty and literal and semantic paraphasias, subsequent to removal of a left temporoparietal hematoma.

Received Oct 12, 1994. Received revised Feb 21, 1995. Accepted for publication March 2, 1995.

From the Departments of Special Education and Psychology (Dr Hynd), University of Georgia, Athens, GA; Department of Psychology (Drs Hynd and Leathem), Massey University, Palmerston North, New Zealand; Department of Educational Psychology (Dr Semrud-Clikeman), University of Washington, Seattle, WA; The Rehabilitation Center (Dr Hern), Evanston, IL; Alta View Center for Counseling (Dr Wenner), Salt Lake City, UT.

Address correspondence to Dr George W. Hynd, Center for Clinical and Developmental Neuropsychology, 570 Aderhold Hall, The University of Georgia, Athens, GA 30602.

CASE REPORT

Clinical History

A normal 10-year-old girl reported a sudden severe headache, her speech became slurred, and she lapsed into a coma while visiting her father. In the hospital, she experienced a brief seizure, with subsequent dilation of her left pupil. Computed tomographic (CT) scan revealed a large (3.5×6 cm) left temporoparietal intracerebral hematoma with bleeding into the lateral ventricle, secondary to a presumed ruptured arteriovenous malformation. Neurologic surgery was successful, although it failed to reveal the source of the bleeding. Cerebral arteriography performed several days later revealed an aneurysm branching off the second middle cerebral artery in the sylvian fissure. Neurologic surgery was again performed, with Yasargil clips employed to stem the flow of the feeding vessel. A hard, giant aneurysm (15 to 16 mm) was removed. The patient tolerated both procedures well, and recovery progressed well over follow-up. Figure 1 shows her CT scan on the day of admission, and Figure 2 presents her CT scan 2 days later.

The patient had a normal developmental history. She was the product of a full-term pregnancy and weighed 3374 g (7 pounds 7 ounces) at birth. Mother and child left the hospital within 2 days. Developmental milestones were reached at expected ages: she sat alone at 5 months, spoke her first word at 10 months, walked at 11 months, and spoke in short sentences at 2 years of age. She attended preschool and was in elementary school before the accident. Her grades were all As and Bs in her academic subjects at school. There were no reported behavior problems in school or at home. Her parents divorced when the patient was 5 years old. Both parents completed high school; her father was a carpenter and her mother worked as a clerk. No significant medical history was reported in her immediate family.

Neurologic Examination

The neurologic examination 6 weeks after her second surgery revealed that the patient's voice was normal for pitch, rate of speech, quality, prosody, and volume. Her speech was normal,



Figure 2. CT scan performed 2 days after admission shows considerable resolution of the left temporoparietal lesion.

although some signs of verbal apraxia were observed. She had notable problems in confrontational naming. Her mother indicated that her naming difficulties seriously affected her ability to perform in school. Reflexes were normal and symmetric. Cranial nerves I through XII were intact. Gross and fine motor coordination and balance were normal, eye movements and visual fields were normal, and she was fully oriented. Specifically, tandem walking (heel-to-toe), skipping, and static balance (15 seconds on each foot) were assessed. There was no evidence of hemiparesis or hemiplegia. Repetition was intact, short-term memory was normal (seven digits forward and five digits backward), and delayed memory for learned words was good at both 5- and 20-minute intervals. Speech therapy was recommended, as well as a neuropsychological examination for follow-up. She was placed on phenobarbital for 3 months and experienced no seizures postoperatively.

Neuropsychological Examination

The patient was initially seen 6 weeks after her admission to the hospital. At that time, she was cooperative, oriented, and demonstrated good effort throughout the evaluation session. Although she was somewhat anxious over her performance, particularly on tasks involving naming, she demonstrated insight into her difficulties and expressed an excellent sense of humor over her inability to name common objects. Table 1 presents a summary of her performance on both the initial and follow-up evaluations.

Due to time constraints, the patient was administered only the verbal subtests of the Wechsler Intelligence Scale for Children-Revised (WISC-R).¹⁴ Severe difficulty was noted in all areas, resulting in a Verbal IQ of 46. This significantly low score was due in large part to her serious naming difficulties, which manifested as vacant speech typified by sentences that were circumlocutory and generally void of nouns. For example, when asked on the Vocabulary subtest to tell what a nail was she responded, "Thing you hit—go like this" (demonstrates hammering a nail). When asked to define clock she responded, "Thing that when you get up and it goes bing, bing, bing." A request to define bicycle

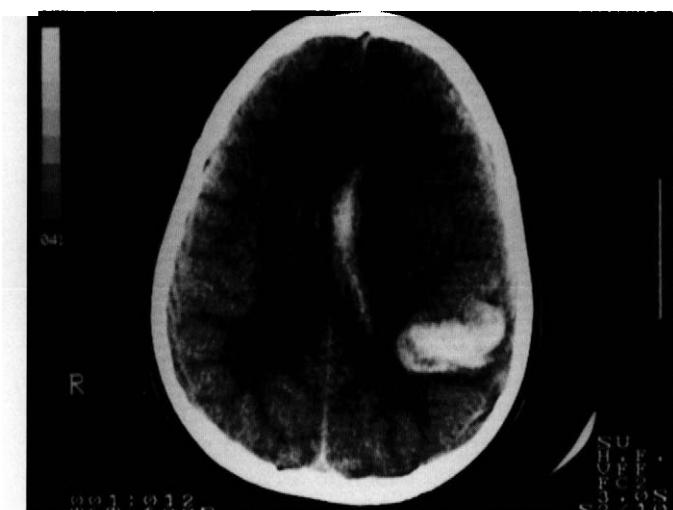


Figure 1. CT scan performed on the day of admission revealed a large left temporoparietal intracerebral hematoma with bleeding into the lateral ventricle secondary to a ruptured arteriovenous malformation.

resulted in the response, "Thing that like this, you go" (demonstrates riding a bicycle). Receptive language abilities were assessed by the Peabody Picture Vocabulary Test-Revised,¹⁵ and on this measure she obtained a scaled score of 62.

Naming abilities were significantly deficient and resulted in her naming only five items correctly on the Boston Naming Test.¹⁶ Stimulus and phonemic cues did not seem to aid recall on the Boston Naming Test. Semantic and literal paraphasias were observed on this measure ("elevator" for escalator; "whistle" for harmonica; and "brush" for broom) and also when she was asked to name on confrontation common objects including a knife (response, "fork") and a match (response, "fire"). On the Aphasia Screening Test,¹⁷ she again performed poorly, especially on tasks involving naming. For example, when shown a drawing of a square and asked to name it, she responded "trail"; for cross she responded "gross"; and for triangle, she referred to the drawing as "trixen." Importantly, however, when next asked to copy these drawings, she could correctly reproduce the drawings and then when immediately asked to spell what these drawings showed, she was able to correctly spell square, cross, and triangle. Moreover, when then asked to read aloud what she had spelled, she was able to correctly read her own spelling. Figure 3 shows her drawings and spellings on the Aphasia Screening Test.

Repetition was assessed using the Sentence and Story Stimuli from the Verbal Memory (Parts I and II) subtest from the

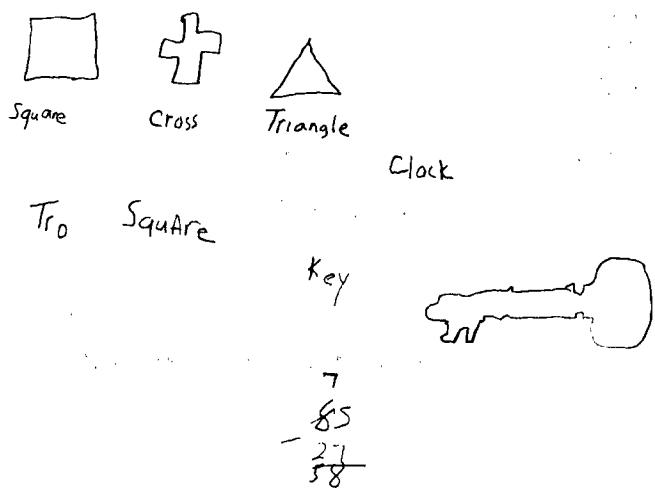


Figure 3. The patient's drawings and spellings from the Aphasia Screening Test. Although not able to name on confrontation line drawings of a square, cross, or triangle, she was able to reproduce the drawings and then correctly spell what the drawings depicted. She could then correctly read aloud her own spelling of the objects.

McCarthy Scales of Children's Abilities.¹⁸ She was able to correctly repeat 14-word sentences and received 10 of a possible 11 points in repeating a short story. Thus, it was concluded that repetition was relatively intact.

Visual-spatial functioning seemed to be within normal limits. She performed well on the Benton Facial Recognition Test¹⁹ and on the Benton Judgement of Line Orientation.²⁰ Grip strength was average for her age, and she was strongly right-handed on all observed tasks, achieving a laterality quotient of 100% right on the Edinburgh Handedness Inventory.²¹

Academic abilities were briefly assessed using the Wide Range Achievement Test-Revised.²² On this measure, she obtained a standard score of 74 on the Reading (word recognition) subtest, 102 on the written Spelling subtest (to dictation), and 99 on the Arithmetic subtest. Thus, although computational arithmetic abilities and spelling seemed preserved, word recognition skills had been differentially affected by her trauma, because on this measure, her performance was equal to or greater than only 7% of the population of children her age.

Assessment of emotional adjustment revealed no significant problems in attention, impulse control, motor activity, aggression, or social skills. A structured psychiatric interview revealed that she did experience anxiety when separated from her parents, but this was not deemed unusual, considering her recent trauma.

Eight months after her initial assessment, the patient was again assessed, and her WISC-R Verbal IQ had recovered significantly; she obtained an 86. Her Performance IQ was 100, and her Full-Scale IQ was 91. Her expressive vocabulary was still more than one standard deviation below age expectations, as shown by her scaled score of 6 on the Vocabulary subtest of the WISC-R. Naming abilities, although very significantly improved, were still more than one standard deviation below age expectations (35 correct on the Boston Naming Test), and her speech, although also significantly improved, was still characterized by circumlocution and occasional paraphasias. Word recognition abilities had

Table 1. Neuropsychological Test Data for Initial and Follow-up Assessment at 8 Months

Test	Initial	Follow-up
Intelligence (WISC-R)		
Verbal IQ	46*	86
Performance IQ	NA	100
Full-Scale IQ	NA	91
Linguistic functioning		
Expressive Vocabulary (WISC-R)	1*	6†
Receptive Vocabulary (PPVT-R)	62*	92
Naming (Boston)	5*	35†
Aphasia Screening Test	16*	5
Visual-spatial functioning		
Facial Recognition (Benton)	41	37
Line Orientation (Benton)	15	20
Laterality		
Manual Dominance (Edinburgh)	100%(R)	100%(R)
Achievement		
Reading (WRAT-R)	74†	89
Spelling (WRAT-R)	102	105
Arithmetic (WRAT-R)	99	102
Emotional adjustment		
Depression (CDI)	6	7
Anxiety (PIC)	63	63
Adjustment (PIC)	61	69
Somatic Concerns (PIC)	51	54
Motor speed (finger tapping)		
Right (dominant hand)	35.6	36.5
Left	34.7	33.8
Motor strength (grip)		
Right	17 kg	15 kg
Left	13 kg	12 kg

WISC-R = Wechsler Intelligence Scale for Children-Revised; NA = not administered; PPVT-R = Peabody Picture Vocabulary Test-Revised; Boston = Boston Naming Test; Benton = Benton Facial Recognition Test, Benton Judgement of Line Orientation Test-Form V; Edinburgh = Edinburgh Handedness Inventory; WRAT-R = Wide Range Achievement Test-Revised; CDI = Children's Depression Inventory; PIC = Personality Inventory for Children.

*Two standard deviations below age expectations.

†One standard deviation below age expectations.

improved as well, as the patient achieved a standard score of 89 (23rd percentile) on the Wide Range Achievement Test-Revised Reading subtest. Also, her performance on the Aphasia Screening Test had improved to age-appropriate levels. All other assessed abilities remained age-appropriate, including visual-spatial skills, motor skills, and laterality. Her emotional adjustment was no longer characterized by separation anxiety, and she had improved in her academic and social adjustment in school.

DISCUSSION

This case of anomic aphasia is consistent with those reported for adults, both in terms of localization of the lesion in the left temporoparietal region and in relation to the severe deficits in confrontational naming, even in consideration of her initial difficulties in central language processes.^{1,2,13} Further, this patient's vacant speech and semantic paraphasias seem similar to Luria's amnestic aphasia,²³ which is most often caused by dominant temporoparietal lesions. In this case, the lesion extended deep into the left insular and posterior temporoparietal region, with significant intrusion into the white matter. This constellation of clinical symptoms, including the semantic paraphasias and very significant deficits in confrontational naming, as well as the location of the lesion, correlate well with adult cases reported in the literature.

This patient demonstrated an awareness of her naming deficit and even found humor in her inability to name on confrontation, despite the fact that her naming difficulties were the source of concern over her ability to perform academically as she had previous to her accident. Further, and of considerable interest, she clearly had lexical access to the names of common objects because she could correctly spell the names of objects presented to her, as noted on the Aphasia Screening Test. In turn, she could then correctly read her spelling of the word she had previously been unable to recall. This finding is consistent with a 25-year-old patient described by Henaff Gonon and colleagues¹³ in that their patient with anomic aphasia had poor phonologic representation of target words but had a significantly better graphologic image. Other studies of anomic aphasic adults support the notion that the deficit in naming is relatively specific to inhibition effects in semantic retrieval.^{24,25} In fact, Blaxton and Bookheimer²⁴ report evidence that as cues provided to aid recall increased in their semantic-relatedness, inhibition effects similarly increased. Consequently, in anomic aphasia there appears to be a category-specific deficit in semantic recall, although some factors such as word frequency or concept familiarity may impact on word recall.^{24,26}

The recovery seen in this patient 9 months after her ruptured arteriovenous malformation seems very positive, but deficits in naming still exist and manifest on a measure of expressive vocabulary (Vocabulary subtest of WISC-R). Her performance on the Boston Naming Test was significantly improved on follow-up, but her level of performance was still one standard deviation below age expectations. The rate of recovery in this case is consistent with that

reported in other cases of childhood aphasia, in which most children still had not achieved complete recovery, even at 1 year.²⁷ Thus, although the degree of recovery may be quite remarkable in childhood cases of aphasia, including anomic aphasia, the course or rate of recovery is similar to that seen in adults with similar syndromes.⁶

Earlier studies suggested that the manifestation of the clinical syndrome of aphasia in children is age dependent.²⁸⁻³⁰ It was generally believed, for example, that non-fluent (motor) aphasia in children had a better prognosis for rapid and complete recovery than in adults. However, more recent evidence suggests that aphasic syndromes in children over age 5 years^{31,32} closely resemble those seen in adults. Nonetheless, to what extent age of insult impacts on eventual recovery or the differential proportion of aphasic syndromes in children has yet to be determined conclusively. Also, criteria for recognizing and diagnosing less common aphasic syndromes, such as fluent or anomic aphasia in children, are not well articulated in the literature.⁷

However, in this case, the nature and location of the lesion, the significant deficit in naming, and the rate of recovery all seem similar to what might be expected in cases of anomic aphasia in adults. There is a need for further exploration of why semantic recall is specifically inhibited in retrieval and why phonologic or graphic representation remains relatively unchallenged in both adult and childhood cases of anomic aphasia.

Acknowledgment

The authors thank Dr Scott Rubin for providing a critical review of an earlier draft of this article.

References

1. Satz P, Bullard-Bates C: Acquired aphasia in children, in Sarno MT (ed): *Acquired Aphasia*. New York, Academic Press, 1981, pp 399-426.
2. Van Hout A, Evrard P, Lyon G: On the positive semiology of acquired aphasia in children. *Dev Med Child Neurol* 1985;27: 231-241.
3. Rasmussen T, Milner B: The role of early left-brain injury in determining lateralization of cerebral speech functions. *Ann N Y Acad Sci* 1977;299:355-379.
4. Woods BT, Teuber HC: Changing patterns of childhood aphasia. *Ann Neurol* 1978;3:273-280.
5. Basser LS: Hemiplegia of early onset and the faculty of speech with special reference to the effects of hemispherectomy. *Brain* 1962;85:427-460.
6. Basso A, Scarpa MT: Traumatic aphasia in children and adults: A comparison of clinical features and evolution. *Cortex* 1990; 26:501-514.
7. Klein SK, Masur D, Farber K, et al: Fluent aphasia in children: Definition and natural history. *J Child Neurol* 1992;7:50-59.
8. van Dongen HR, Loonen MC, van Dongen KJ: Anatomical basis for acquired fluent aphasia in children. *Ann Neurol* 1985;17: 306-309.
9. Hadar U, Jones C, Mate-Kole C: The disconnection in anomic aphasia between semantic and phonological lexicons. *Cortex* 1987;23:505-517.
10. Sonobe N, Yashima Y, Takahashi Y, et al: Three cases of anomic aphasia after lesions in and/or around the basal ganglia. *Fukushima J Med Sci* 1991;37:29-40.

11. Possili C, Bastianello S, Padovani A, et al: Anterior corpus callosum atrophy and verbal fluency in MS. *Cortex* 1991;27:441-445.
12. Leiguarda R, Starkstein S, Berthier M: Anterior callosal hemorrhage: A partial disconnection syndrome. *Brain* 1989;112:1019-1037.
13. Henaff Gonon MA, Bruckert R, Michel F: Lexicalization in an anomic patient. *Neuropsychologia* 1989;27:391-407.
14. Wechsler D: *Wechsler Intelligence Scale for Children-Revised*. New York, Psychological Corp, 1974.
15. Dunn JM: *Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN, American Guidance Assoc, 1981.
16. Kaplan E, Goodglass H, Weintraub S: *Boston Naming Test*. Philadelphia, Lea & Febiger, 1982.
17. Reitan RM, Wolfson D: *The Halstead-Reitan Neuropsychological Test Battery*. Tucson, Neuropsychology Press, 1985.
18. McCarthy J: *McCarthy Scales of Children's Abilities*. New York, Psychological Corp, 1972.
19. Benton A: *Test of Facial Recognition*. Boston, Cambridge University Press, 1981.
20. Benton A: *Judgement of Line Orientation*. Boston, Cambridge University Press, 1981.
21. Oldfield RC: The assessment and analysis of handedness: The Edinburgh Handedness Inventory. *Neuropsychologia* 1971;9:97-113.
22. Jastak J, Jastak S: *Wide Range Achievement Test-Revised*. Wilmington, DE, Guidance Associates, 1992.
23. Luria AR: *Higher Cortical Functions in Man*. New York, Basic Books, 1980.
24. Blaxton TA, Bookheimer SY: Retrieval inhibition in anomia. *Brain Lang* 1993;44:221-237.
25. Silver LS, Halpern H: Word-finding abilities in 3 types of aphasic subjects. *J Psycholinguist* 1992;21:317-348.
26. Stewart F, Parkin AJ, Hunkin NM: Naming impairment following recovery from herpes simplex encephalitis: Category specific? *Q J Exp Psychol* 1992;44:261-284.
27. Loonen MC, van Dongen HR: Acquired childhood aphasia: Outcome 1 yr after onset. *Arch Neurol* 1990;47:1324-1328.
28. Geschwind N: Disorders of higher cortical function in children, in Cohen R, Wartofsky W (eds): *Selected Papers on Language and the Brain*, vol 16. Dordrecht, Reidel, 1974, pp 467-481.
29. Alajouanine TH, Lhermitte F: Acquired aplasia in children. *Brain* 1965;88:653-662.
30. Lenneberg E: *Biological Foundations of Language*. New York, John Wiley, 1967.
31. Paquier P, van Dongen HR: Two contrasting cases of fluent aphasia in children. *Aphasiology* 1991;5:235-245.
32. Visch-Brink EC, van De Sandt-koenderman WME: The occurrence of paraphasias in the spontaneous speech of children with an acquired aphasia. *Brain Lang* 1984;23:258-271.

Historical Vignette

William S. Gosset, "Student"

William Sealy Gosset (1876-1937) was born in Canterbury, England, the eldest son of Colonel Frederic Gosset, RE, an old Huguenot who had left France after the revocation of the Edict of Nantes. Educated at Winchester and Oxford, Gosset studied chemistry and mathematics. He began working for Mr Guinness as a brewer in 1899. In 1906, he married Marjory Surtees and they had one son and two daughters.

Nobody is quite sure exactly how or when Gosset's interest in statistics became aroused. The brewing process with its variable materials and susceptibility to temperature change and short series of experiments revealed the limitations of large sample theory. This led to Gosset's discovery of the distribution of the sample standard deviation and a correct method of handling small samples. During his year at University College, while studying under Karl Pearson, he developed the sampling distribution of a statistic now known as Student's *t* and introduced small-sample estimation by means of the *t*-distribution family. This theory was published in his paper, "The Probable Error of a

Mean." Gosset wrote under a pseudonym because the brewery did not allow publication of its research. Why he chose the name Student remains a mystery.

Gosset not only performed statistical work for the brewery but was involved in every aspect of the brewery from barley production to yeast fermentation. Along with his responsibilities at the brewery, he performed consultative statistical work and published many papers. In addition, he had many domestic and sporting interests. He enjoyed growing fruit and experimenting with his own strains of barley. He was an accomplished carpenter and built a number of sailing and fishing boats. He was an energetic walker, cycler, and golfer. Gosset was described as being a very kind, tolerant, and patient man who was never in a hurry.¹

Christie E. Burgin, MS

University of Oklahoma College of Public Health
Oklahoma City, Oklahoma

Reference

1. Pearson ES, Kendall MG: *Studies in the History of Statistics and Probability*. London, Charles Griffin, 1970, pp 355-402.