Grammatical comprehension in developmental semantic–pragmatic disorder
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Introduction

Specific language impairment (SLI) presents when children present language maturation at least 12 months behind their chronological age in the absence of sensory or intellectual deficits, pervasive developmental disorders, evident cerebral damage, and adequate social and emotional conditions [1]. SLI cases can present great variability in clinical manifestations concerning language. One approach to dealing with this heterogeneity involves the identification of clinical subtypes of SLI [2].

For example, Rapin and Allen [3] described three subtypes of SLI and six profiles of language problems based on the evaluation of spontaneous and directed language, taking into account the level of linguistic analysis, in terms of phonological, morphosyntactic, semantic–lexical, and pragmatic analysis. The three subtypes of SLI were as follows:

1. \textit{Mixed receptive expressive disorders}: Verbal auditory agnosia and phonologic–syntactic deficit disorder.
2. \textit{Expressive disorders}: Verbal dyspraxia and phonological programming deficit disorder.
3. \textit{Higher-order processing disorders}: Lexical–syntactic deficit disorder and semantic–pragmatic disorder.

Five of these six profiles have found empirical confirmation in a study by Conti-Ramsden \textit{et al.} [4] that combined clinical and test information. A cluster analysis was performed on the children's performance, and the children were divided into six groups. One of the groups had no match with Rapin and Allen's categories because it comprised children who appeared to be performing within the normal range. In contrast, the 'verbal auditory agnosia' group described by Rapin and Allen was not found. Van der Lely [5] proposed SLI classification of five subtypes, which includes the following: semantic–pragmatic SLI, primarily phonological SLI, primarily syntactic SLI, mixed primarily phonological SLI who show impairment in both phonology and syntax with more phonological than syntactic impairment, and mixed primarily syntactic SLI whose syntactic impairment is more apparent (or more persistent) compared with phonological deficits.

Children with pragmatic impairment have problems using language appropriately in a given context. Although they can present in the early years with language delay and poor social development, often these difficulties seem at least superficially to be overcome by the school years and children may be fluent with seemingly normal syntax and adequate articulation. However, problems such as understanding discourse, literal use of language, impaired understanding of social inference, and the social use of language remain substantial [6]. They may have difficulty with speaker
listener roles, turn taking, and the relevance of language in conversation. These children do not compensate for their language difficulties by developing a rich repertoire of nonverbal communication [7]. In addition, they also share a number of conversational problems with high-functioning autistic children (e.g. they have a tendency to talk about personal preoccupations, inappropriate questioning style, with repetitive speech and some stereotyped speech), although they do not appear to have the same degree of cognitive rigidity or obsession tendency as seen in those with autism spectrum disorders [8]. As a result, their language use leads to listener’s impression of inappropriateness.

Rapin and Allen [9] pointed out that it is not known to what extent inappropriate language reflects a ‘thought disorder’, or a cognitive deficit, in addition to a ‘communication disorder, or a linguistic deficit. Cognitive deficits refer to problems with concepts, whereas linguistic deficits refer to problems with linguistic form – that is, the pairing of form and concepts. Bishop and Adams [10] suggested that cognitive deficits could account for this inappropriateness and did not propose an alternative linguistic explanation.

In contrast, Snow [11] supported the linguistic explanation, which implies that the child’s concepts are appropriate, but he or she has difficulty selecting the correct linguistic form to convey the intended meaning. He proposed that the child’s inappropriate responses reflected poor comprehension of some of the questions addressed to him, which extended the scope of the linguistic explanation to include the receptive deficit.

The aim of this study was to determine whether the linguistic hypothesis especially in its receptive part warrants further investigation in study of this population to prove that the breakdown in receptive syntax is linguistic in origin.

Methods
Information about each child included full name, date of birth, age, address, and order of birth. Language assessment was based on the Arabic Language Test [12]. Psychometric evaluation was carried out using the Stanford Binet Intelligence Scale [13].

Statistical analysis
Data were analyzed using SPSS, version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were presented using mean and SD. Qualitative data were presented using frequency and related percentage. Comparison between groups was made using the \( \chi^2 \)-test. A \( P \) value of 0.05 was chosen as level of significance. Post-hoc test was used to compare the linguistic quotients (language age/chronological age) across the different groups, including the control group.

Results
The dataset consisted of 105 children (60 \( \frac{5}{9} \) and 55 \( \frac{5}{9} \)), with a mean age of 4.3 years (Table 1).

The age of various linguistic parameters varied from 2 to 8 years, with the lowest mean age for receptive syntax (3.97 years) and the highest mean age for semantics (4.07 years) (Table 2).

Tables 3–5 provide estimates of the quotients of various linguistic parameters in the three groups. Because receptive syntax was impaired in 16 (45.7%) children of the 35 in the semantic–pragmatic group, receptive syntax quotient did not reach the

| Participants and methods |
|--------------------|
| This case–control study included 105 Arabic-speaking children (60 \( \frac{5}{9} \) and 55 \( \frac{5}{9} \)) in the age range of 3–6 years (mean age 4.27 years) who were selected from the Phoniatric clinics of Al Demerdash and Al Zahra University Hospitals. Of the 105 children, 35 children presented with semantic–pragmatic SLI (the semantic–pragmatic group), 35 with delayed language development due to mental retardation (the delayed language group), and 35 children with normal language development (the control group). The study was approved by ethical committee. |

| Table 1 Characteristics of the study group |
|------------------------------------------|
| Characteristics | Study sample |
| Total number (n) | 105 |
| Age (mean ± SD) | 4.2729 ± 0.9610 |
| Sex [n (%)] |
| Male | 60 (57.1) |
| Female | 55 (52.3) |
| Order of birth [n (%)] |
| 1st order | 37 (35.2) |
| 2nd order | 40 (38) |
| ≥ 3rd order | 28 (26.6) |

| Table 2 Age of linguistic parameters |
|--------------------------------------|
| Language parameters | n | Minimal age (years) | Maximal age (years) | Mean age | SD |
| Semantic | 105 | 2 | 8 | 4.0794 | 1.1985 |
| Pragmatic | 105 | 2 | 8 | 4.0206 | 1.2077 |
| Receptive syntax | 105 | 2 | 8 | 3.9775 | 1.1950 |
| Expressive syntax | 105 | 2 | 8 | 4.0144 | 1.1984 |
| Phonology | 105 | 2 | 8 | 3.9919 | 1.2145 |
| Total language age | 105 | 2 | 8 | 4.0119 | 1.2181 |
normal level as expressive syntax and phonological quotients.

Table 3 Comparison between the semantic–pragmatic group and the control group as regards linguistic parameters

| Language quotients          | Control       | Semantic–pragmatic | P  |
|-----------------------------|---------------|--------------------|----|
| Pragmatic quotient          | 1.0055 ± 0.0538 | 0.7178 ± 0.08041   | 0.000 |
| Semantic quotient           | 1.0130 ± 0.0624 | 0.7724 ± 0.06273   | 0.000 |
| Receptive syntax quotient   | 1.0101 ± 0.06291| 0.8820 ± 0.10758   | 0.000 |
| Expressive syntax quotient  | 1.0146 ± 0.06189| 1.0211 ± 0.10516   | 0.085 |
| Phonological quotient       | 1.0055 ± 0.04516| 1.0117 ± 0.09409   | 0.006 |
| Total quotient              | 1.0182 ± 0.06440| 0.8218 ± 0.07160   | 0.000 |

P < 0.005, significant.

Table 4 Comparison between the delayed language group and the control group as regards linguistic parameters

| Language quotients          | Control       | Delayed language   | P  |
|-----------------------------|---------------|--------------------|----|
| Pragmatic quotient          | 1.0055 ± 0.0538 | 0.6518 ± 0.11755   | 0.000 |
| Semantic quotient           | 1.0130 ± 0.0624 | 0.6858 ± 0.10810   | 0.000 |
| Receptive syntax quotient   | 1.0101 ± 0.06291| 0.6767 ± 0.11920   | 0.000 |
| Expressive syntax quotient  | 1.0146 ± 0.06189| 0.6905 ± 0.11528   | 0.000 |
| Phonological quotient       | 1.0055 ± 0.04516| 0.7124 ± 0.16340   | 0.000 |
| Total quotient              | 1.0182 ± 0.06440| 0.6792 ± 0.10448   | 0.000 |

P < 0.005, significant.

Table 5 Comparison between the semantic–pragmatic group and the delayed language group as regards linguistic parameters

| Language quotients          | Delayed language | Semantic–pragmatic | P  |
|-----------------------------|------------------|--------------------|----|
| Pragmatic quotient          | 0.6518 ± 0.11755 | 0.7178 ± 0.08041   | 0.000 |
| Semantic quotient           | 0.6858 ± 0.0624  | 0.7724 ± 0.10810   | 0.000 |
| Receptive syntax quotient   | 0.6767 ± 0.11920 | 0.8820 ± 0.10758   | 0.000 |
| Expressive syntax quotient  | 0.6905 ± 0.11528 | 1.0211 ± 0.10516   | 0.000 |
| Phonological quotient       | 0.7124 ± 0.16340 | 1.0117 ± 0.09409   | 0.000 |
| Total quotient              | 0.6792 ± 0.10448 | 0.8218 ± 0.07160   | 0.000 |

P < 0.005, significant.

Discussion

Although SLI has been viewed as a heterogeneous condition in which children may present with a wide range of different disturbances in language processing [14], sufficient information on grammatical comprehension in patients with semantic–pragmatic SLI was absent. In the present study, comparison between the control group and the semantic–pragmatic group showed a significant difference between the two groups in certain parameters only (semantic, pragmatic, and receptive syntactic), whereas the comparison between the control group and the delayed language group showed a significant difference in all parameters. This proves that the delayed language group due to mental retardation has a linguistic affection in all parameters, and this is due to delayed development and maturation in all aptitudes; even motoric development is delayed.

The receptive syntax may be affected in a large number of patients with semantic–pragmatic SLI, particularly with complex sentence, despite the fact that they can express the same sentence in a better way. This supports that the child’s inappropriate responses reflects poor comprehension of some of the questions addressed to him, which extends the scope of the linguistic explanation to include the receptive deficit.

Rinaldi [15] indicated that impairment of receptive syntax in these children may be explained by their impaired semantic abilities. Semantic abilities concern the understanding of meaning of words or phrases and their expression [8]. This finding is in agreement with the criteria we find in the language of children with semantic–pragmatic disorder and it is also proved by statistical analysis.

This result is in agreement with that reported by Leonard [16] as well. He suggested that children with SLI may be 1 year below age level in one set of features, 1.5 year below in another, 6 months below in a third, and so on.

In light of growing evidence that developmental disorders may also have neurogenic explanation [17], syndromes differentially affecting morphosyntactic and lexical form classes may also implicate different sites of involvement [18].
Acknowledgements

Conflicts of interest
None declared.

References

1 SR De Vasconcelos Hage, Cendes F, Montenegro MA, Abramides DV, Guimarães CA, Guerreiro MM. Specific language impairment: linguistic and neurobiological aspects. Arq Neuropsiquiatr 2006; 64(2A): 173–180.

2 Nation K. Developmental language disorders. Psychiatry 2005; 4:114–117.

3 Rapin I, Allen D. 1987; Developmental dysphasia and autism in pre-school children: characteristics and subtypes. Proceedings of the First International Symposium on Specific Speech, and Language Disorders in Children. University of Reading: AFASIC.

4 Conti-Ramsden G, Crutchley A, Botting N. The extent to which psychometric tests differentiate subgroups of children with SLI. J Speech Lang Hear Res 1997; 40:765–777.

5 van der Lely HK. Specific language impairment in children: research findings and their therapeutic implications. Eur J Disord Commun 1993; 28:247–261.

6 Adams C. Intervention for developmental pragmatic language impairment. Aula Abierta 2003; 82:79–95.

7 Parisse C, Mailart C. Specific language impairment as systemic developmental disorder. J Neurolinguistics 2009; 22:109–122.

8 Botting N, Adams C. Semantic and inferencing abilities in children with communication disorders. Int J Lang Commun Disord 2005; 40:49–66.

9 Rapin I, Allen D. Developmental language disorders: nosologic considerations. In U Kirk, editor. Neuropsychology of language, reading, and spelling. New York: Academic Press 1983; 20:33–37.

10 Bishop DVM, Adams C. Conversational characteristics of children with semantic pragmatic disorder. II: What features lead to a judgment of inappropriacy? Br J Disord Commun 1989; 24:241–263.

11 Snow D. A linguistic account of a developmental semantic pragmatic disorder: evidence from a case study. Clin Linguistic Phonetic 1996; 10:281–298.

12 Kotby MN, Khairy A, Barakah M, Rifaie N, El Shoubary A. Language testing of Arabic speaking children. Proceedings of the XXIII World Congress of International Association of Logopedics and Phoniatrics; Cairo; 1995.

13 Delancy E, Hopkins T. The Stanford Binet Intelligence Scale, fourth edition, examiner's handbook. Illinois, USA: The Riverside Publishing Company; 1987.

14 Bishop DVM. Diagnostic dilemmas in specific language impairment. In: L Verhoeven, J Van Balkom, editors. Classification of developmental language disorders. Mahwah, NJ: Erlbaum; 2004. 309–326.

15 Rinaldi W. Pragmatic comprehension in secondary school-aged students with specific developmental language disorder. Int J Lang Commun Disord 2000; 35:1–29.

16 Leonard LB. Children with specific language impairment. Cambridge: MIT Press 1998; 45:94–100.

17 Rapin I, Allen D. Syndromes in developmental dysphasia and adult dysphasia. In: F Plum, editor. Language, communication, and the brain. New York: Academic Press; 1988.

18 Snow D, Swisher L. Neurobehavioral analogies between syndromes of acquired and developmental language impairment: hypotheses for research. Aphasiology 1996; 2:211–229.