

A preliminary study to investigate the expressive syntactic ability of normal speakers

Grammatical problem was one of the most prominent characteristics of speech in persons with aphasia (Gordon, 2006) and progressive aphasic syndromes (Knibb, Woollams, Hodges, & Patterson, 2009). Measures used to investigate the grammatical deficits on the discourse performance of persons with aphasia could be roughly classified into two categories, one related to the level of lexicon, the other concerned with the level of syntax. Most of the measures belonged to the former category used words to analysis the variation on the speech performance, such as correct information units (CIUs; Nicholas & Brookshire, 1993), type token ratio (TTR); while the measures applied in studies related to the syntactic ability was more varied. Such as proportion of sentences well formed, auxiliary scores, proportion of verbs inflected, proportion of obligatory determiners in quantitative production analysis (QPA) (Gordon, 2006), and the mean length of the syntactic units, the proportion of syntactic units suggested by Lind, Kristoffersen, Moen, and Simonsen (2009). However, the measures used to depict the syntactic ability of a person was separated, could not provide a profile to reveal a pattern of syntactic ability in a consecutive picture. In order to develop a syntactic scoring system that can capture the changes in the characteristics of narrative speech, we adopted the concept from studies in child language development (Hsu, 2003) and widen the category to encompass the imperfect parts in natural speech. The applicability of this scoring system was firstly tested by the normal population in order to examine if the range of the scope is suitable for reflecting the expressive syntactic ability of a normal speaker.

Methods

Participants

Six female and two male adults without brain damage with a mean age of 49.8 (SD = 8.5 ranged from 34-61) and a mean education year of 11.9 (SD=2.9, ranged from 9-16) served as the participants in this study.

Experimental Design and stimuli

A repeated measure design was adopted in this study. The pictures employed to elicit the spontaneous narrative speech were adopted from two formal tests. One was the Picnic picture in the Concise Chinese Aphasia Test (CCAT; Chung, Lee, & Chang, 2003); the other was the Cookie Theft picture in the Boston Diagnostic Aphasia Examination (BDAE; Goodglass & Kaplan, 1983).

Procedures

All of the participants were asked to use complete sentences as many as possible to

describe the pictures. No more hints or demonstrations were given during the description procedures in order to collect the spontaneous narrative performance of the speakers. The verbal performance was recorded and then transcribed into a written format. The transcripts served as the speech sample for further analysis. The two pictures were administered with the same sequence for all the participants.

Data analysis

A syntactic classification system, the syntactic level (SL) scoring system, developed by the authors was employed to conduct the analysis. Table 1 illustrated the classification units and criterion for each level of scoring. All comprehensible, related and correct syntactic units will gained a score equal or more than 4 depended on the syntactic level of the performances. Unrelated, repeated or redundant words were scored below 4. Detailed information for scoring criteria was provided in Table 1.

In order to catch the linguistic characteristics of the speaker, all the raw speech samples were included for conducting the SL analysis, including sound and word fillers, distorted sounds, error words, unrelated words, etc. A descriptive analysis with SL scores was conducted for each participant on the two pictures. Mean, SD, and range of the performances were calculated in the analysis. Wilcoxon signed ranks test was conducted to compare the mean performance on SL scores in the two picture conditions.

Results

In order to differentiate the ability to use comprehensible information in the description from the unrelated redundant information inserted in their utterances, the data was separated into two parts for calculation. The scores of SL equal or more than 4 would be tallied together to obtain a mean SL score (mean SL) to represent the expressive syntactic ability of the speaker; the scores below 4 would be computed together to generate a filler SL score (filler SL) to reveal the redundant characteristics in their description.

The mean scores of SL for each participant were illustrated in Table 2. The syntactic level of the performance ranged from word to compound complex sentence in both of the picture. Same ranges of syntactic levels between the two pictures were identified in five of the eight participants across the two pictures. The mean SL in the Cookie Theft picture was 7.78 and the mean SL in the Picnic picture was 7.52. The results indicating that a syntactic level from simple to complex sentence was most frequently used by normal speakers. No significant difference was found between the two pictures ($Z=-1.12$, $p=.263$), representing that the performance on SL measures was independent from the content of the picture. A graphic illustration of the distribution of SL scores equal or more

that 4 on both pictures for each participant was depicted in Figure 1.

Table 3 illustrated the results of SL scores less than 4 (the filler SL). Unrelated fillers were identified from all of the participants. The mean filler SL scores in the Cookie Theft picture was 1.78. The mean filler SL score in the Picnic picture was 2.12. No significant difference was found between the two pictures. ($Z = -1.68, p = .093$). The distribution of filler SL scores for each participant was shown in Figure 2.

Discussion

This study provided a syntactic scoring system to investigate the expressive syntactic ability of normal speakers. The data obtained from this study revealed that most of the utterances used by a normal speaker in the picture description task fell between the category of simple and complex sentences. As the purpose for developing the SL scoring system was to provide a classification system to differentiate a normal speaker and a person with communication disorder, and to evaluate the progress of linguistic ability of individual with aphasia, more studies with large sample size of normal speakers with different ranges of age was needed in order to build a norm reference for person with communication disorder.

The system was firstly tested by normal population. The applicability of the range of syntactic level on population with communication disorders was unknown. Further investigation should be done to explore the sensitivity for the SL measures on representing the syntactic ability of a person with communication disorder and the limitation for its usefulness on different populations.

One hypothesis in respect to this study was that if the syntactic ability of a person is a stable characteristic, the measure used to evaluate the ability will be relatively stable and not be influenced by repeated measures or measures with different procedures or varied stimuli. In this study, we used two pictures with contextual information to test the hypothesis. A preliminary result revealed that no significant difference was found between the two pictures on mean scores of SL. However, the finding was derived from a small sample size. Further study with more participants and different testing procedures were suggested to verify the finding in relation to this study.

References

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Table 1 An illustration of the syntactic level (SL) scoring system.

SL	Expressive syntactic ability	Criterion of performance	Illustrations
0	None	No verbal response	No communicational verbal sound was produced.
1	Sound fillers	Meaningless or incomprehensible utterance	Distorted speech, sound fillers, or jargons
2	Error word	Comprehensible, unrelated or incorrect words	Perseveration, word repetition, paraphasia, or incorrect words
3	Word fillers	Comprehensible, unrelated or repeated redundant words fillers	Repeated use of a word as a filler at the beginning of middle part of an utterance
4	Word	Comprehensible, related, and correct	Any types of words, such as n. v. adj. adv. ...
5	Phrase		Any types of phrases, such as NP, VP, AP....
6	Broken sentence		Incomplete sentences with a verb included
7	Simple sentence		A completed simple sentence.
8	Complex sentence		A completed sentence with location, time, double verbs or co-verbs.
9	Compound complex sentence		A completed sentence with conjunction or embedded clause

Note. SL score 4 to 9 represented the maximum unit of the meaningful expression.

Table 2 A comparison of the mean syntactic level (mean SL) performance on the two pictures. SL scores equal or more than 4 were included in mean SL calculation.

Subjects	Cookie Theft Picture			Picnic picture		
	n	Mean (SD)	range	n	Mean (SD)	range
N1	14	7.71 (1.33)	4-9	19	7.16 (1.39)	4-9
N2	5	8.6 (.89)	7-9	8	8.25 (.89)	7-9
N3	5	8.6 (.89)	7-9	7	8.0 (.82)	7-9
N4	6	8.17 (.75)	7-9	13	7.38 (.65)	7-9
N5	9	7.33 (1.32)	5-9	19	7.74 (1.15)	5-9
N6	6	6.33 (1.37)	4-8	13	7.15 (.56)	6-8
N7	7	8.0 (.82)	7-9	39	7.15 (.96)	5-9
N8	4	7.5 (1.0)	7-9	7	7.29 (.49)	7-8

Table 3 A comparison of the filler syntactic level (filler SL) performance on the two pictures. SL scores below 4 were included in filler SL calculation.

Subjects	Cookie Theft Picture			Picnic picture		
	n	Mean (SD)	range	n	Mean (SD)	range
N1	21	1.57 (.598)	1-3	14	1.29 (.611)	1-3
N2	7	2.00 (.577)	1-3	4	3.00 (.000)	3-3
N3	10	2.10 (.994)	1-3	3	2.67 (.577)	2-3
N4	5	1.40 (.548)	1-2	6	2.17 (.753)	1-3
N5	6	1.50 (.548)	1-2	27	1.48 (.753)	1-3
N6	6	2.33 (.516)	2-3	27	2.07 (.917)	1-3
N7	11	2.00 (.894)	1-3	43	2.30 (.860)	1-3
N8	3	1.33 (.5770)	1-2	2	2.00 (1.414)	1-3

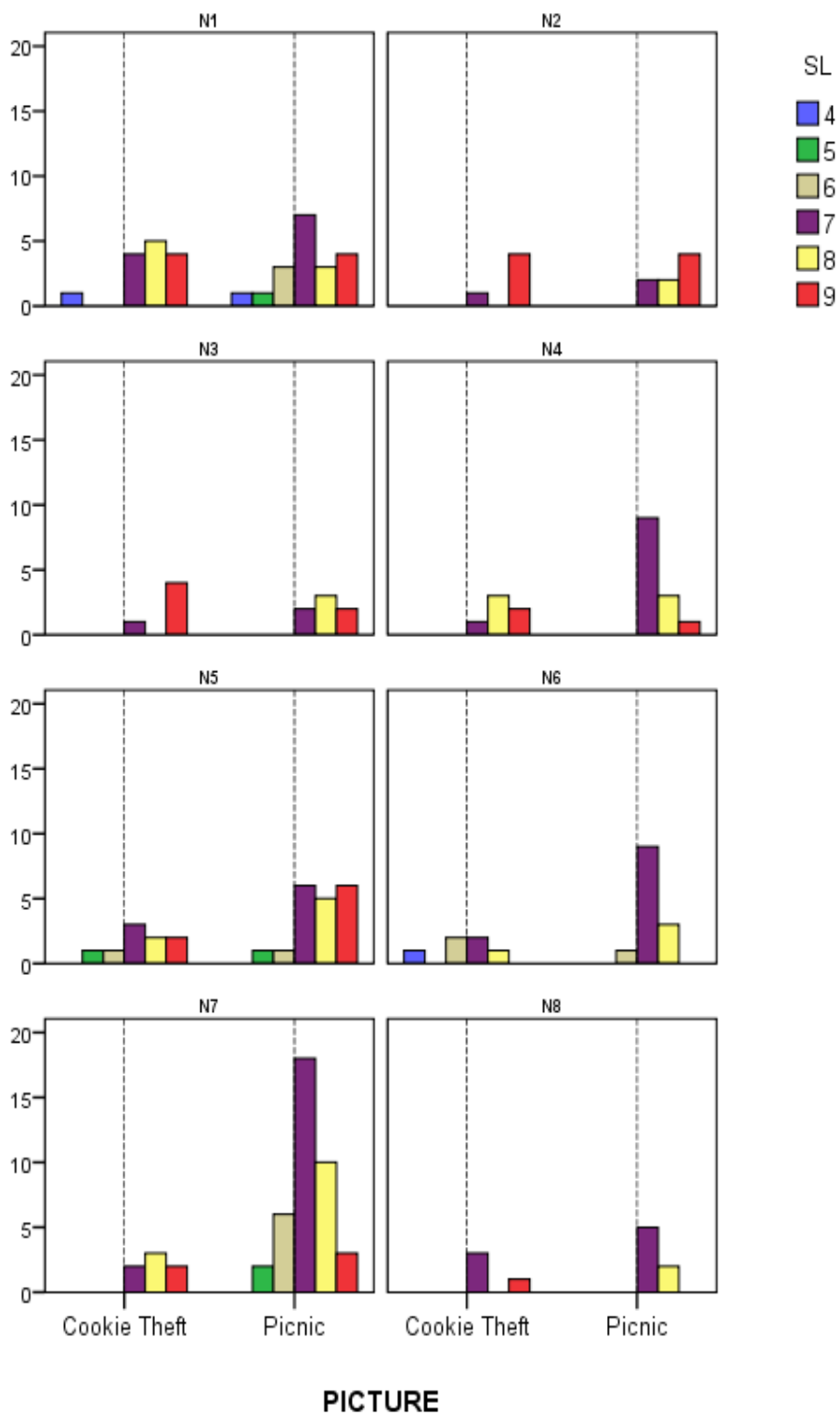


Figure 1 The distribution of syntactic level (SL) scores equal or more that 4 on the two pictures by each participant. The vertical dashed line was marked between score 3 and 4 to indicate the separation between related correct performance and unrelated redundant performance.

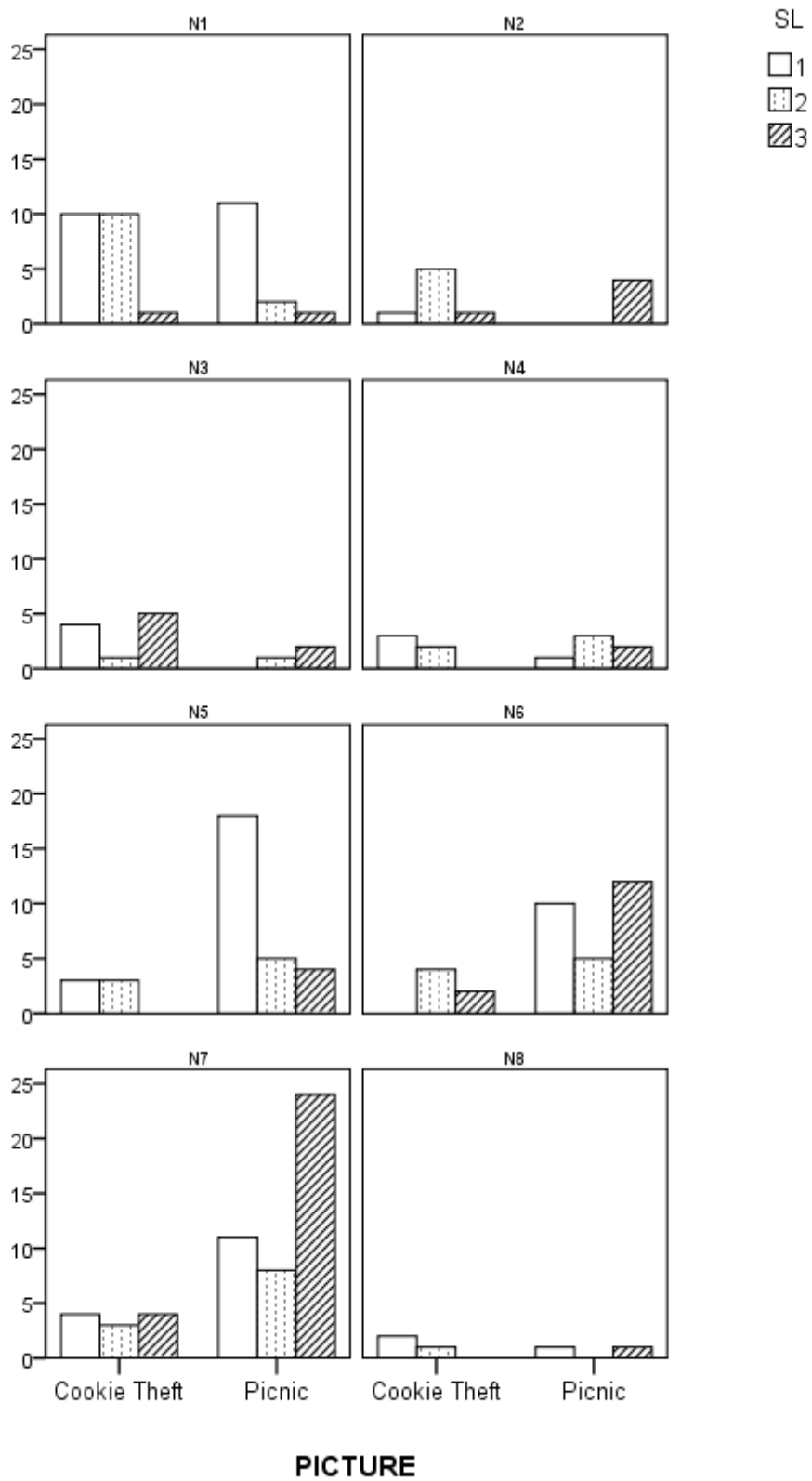


Figure 2 The distribution of syntactic level (SL) scores below 4 on the two pictures by each participant.