Master Clinical Language, Speech and Hearing Sciences

Master's Thesis

Development of Speech Disruptions in Narratives of Dutch-Speaking Children with Specific Language Impairment

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Abstract

Purpose: This study examines the development of speech disruptions in Dutch speaking children with specific language impairment. The prediction was that frequency of speech disruptions and duration of silent pauses will decrease over time. Decrease of disfluency is indicative of gradual mastery of sentence formulation procedures. The children with SLI have been exposed to language for a longer period of time and acquired more experience with grammatical forms with age. If children with SLI, despite the disorder, improve their ability to formulate sentences, it is expected that the disfluency rate will decrease.

Method: Nineteen children with SLI were followed longitudinally at ages 8, 9 and 10. Silent pauses, filled pauses, interjections, whole-word repetitions, part-word repetitions, revisions and (complex) stalls in the narratives of these children were analysed.

Results: No significant differences between ages were found in total rate of silent pauses and vocal hesitations. However, some other significant changes were found: the rate of longer silent pauses (1000-2000 ms and >2000 ms) decreased and the rate of the shortest silent pauses (250-500 ms) increased between the ages 8 and 9. Furthermore, the results showed an increase in MLU-5 and complex sentences.

Conclusions: These findings suggest that children with SLI become somewhat more fluent over time with respect to longer silent pauses. An explanation could be the progress in language ability of the children. Another explanation could be that there is a trade-off between longer silent pauses and vocal hesitations. Further research is necessary to investigate the development of the total amount of silent pauses, (complex) stalls, filled pauses, revisions and repetitions and interjections.

KEY WORDS: specific language impairment (SLI), speech disruptions, narratives, longitudinal

Introduction

In recent years, researchers have become increasingly interested in children's speech disruptions as a source of information on the development of language production processes. Speech disruptions interrupt the steady flow of language production. It is interesting to study the fluency of speech and language production, because speech disruptions could reflect underlying linguistic processes. Speech disruptions can help us understand what makes a sentence difficult for a speaker. Disruptions can occur when the speaker encounters difficulty in retrieving a particular word or building up the syntactic structure of a sentence. In addition, changes in fluency behaviour may indicate changes in language growth or attempts to use new strategies or structures during language acquisition (Goldman-Eisler, 1968; Guo, Tomblin and Samelson, 2008).

Speech disruptions often occur in spontaneous speech of children and adults and are a normal phenomenon of language development (Schaerlaekens, 2000). There are different types of speech disruptions; silent pauses, filled pauses, interjections, repetitions and revisions. Silent pauses are moments in spoken discourse in which no speech is audible and no signs of silently articulating are present. Filled pauses are non-lexical filler vocalizations (e.g., *eh*). Interjections are words or phrases which do not contribute meaning to a sentence (e.g., *nou* 'well', *hoe heet het ook alweer* 'what's the name again'*)*. Repetitions are repeated linguistic units which do not signal emphatic meaning. Repetitions can occur with whole words (whole word repetitions) and with parts of words (part word repetition). Rispoli (2003) divided speech disruptions into stalls and revisions. Stalls are sentence disruptions that add no new phonological, lexical or grammatical material to the original utterance. By contrast, revisions are changes that children make in phonology, lexical choice and morphosyntax (Rispoli, 2003).

Different studies show a relationship between language complexity and speech disruptions. Longer and more complex sentences are expected to increase the processing difficulties in sentence production. The effect of complexity has been examined in several studies. Tetnowski (1998) argues that syntactic complexity contributes to a greater incidence of speech disruptions. Rispoli and Hadley's (2001) results support this: disfluent sentences were longer and more complex than fluent ones. Furthermore, studies by Wijnen (1990) and Kowal et al (1975) found that children become more fluent as their language abilities enhance.

Researchers suggest different types of speech disruptions reflect different aspects of language formulation. Silent pauses, filled pauses, interjections or repetitions may occur with processing difficulties during sentence production. The use of these speech disruptions gives the speaker more time to deal with the difficulties. Specifically, silent pauses occur when speakers have difficulties in forming concepts, activating syntactic frames or retrieving syntactic and semantic information (Levelt, 1989; Postma & Kolk, 1993). Insertion of filled pauses and interjections allows speakers to keep the floor while processing and formulating the sentence (Clark, 2002). According to Rispoli (2003) filled pauses and interjections may buy more time for the speaker to deal with processing difficulties. Furthermore, a speaker repeats words or phonemes to gain more time for sentence planning (Clark, 2002; Maclay & Osgood, 1959; Guo, Tomblin and Samelson, 2008). Revisions are distinct from the other types of speech disruptions. Guo, Tomblin and Samelson (2008) stated that "*Revisions take place when speakers detect and attempt to repair planning errors*".

Researchers also examined the distribution of speech disruptions across syntactically important positions, specifically phrase, clause and sentence boundaries. Hawkins (1971) studied the syntactic location of speech disruptions in conversations and narratives by typically developing children (age 6;6 to 7;0). Children produced most of the disruptions at constituent boundaries, especially at clause boundaries. Wijnen (1990) reported that children produced disruptions at phrase and sentence boundaries as grammar developed. According to Wijnen (1990) these boundaries attracted more disruptions because this is where sentence planning occurs. Furthermore, the results of Guo, Tomblin and Samelson (2008) showed that children with specific language impairment (SLI) produced more speech disruptions than age matched controls at phrase boundaries, but not at sentence and clause boundaries or non-boundary positions.

The current study investigates the development of speech disruptions in narratives of Dutch speaking children with Specific Language Impairment (SLI). Although children with SLI show a significant limitation in language ability, neurological damage, hearing deficits or mental retardation are not evident. SLI affects about 7% of the children; its prevalence is higher in males than in females (Leonard, 1998). An important question is whether children with SLI are less fluent than normally developing children. Different studies show there is a relation between language ability and speech disruptions. For example, Finneran, Leonard and Miller (2009) analysed the rate of speech disruptions in simple sentence production in school-age children with SLI and typically developing age-matched peers. The specific language impairment group demonstrated a significantly greater number of speech disruptions compared to typically developing children. Boscolo, Bernstein Ratner and Rescorla (2002) examined speech disruptions in the narrative speech of nine-year old children with and without a history of expressive specific language impairment (HSLI-E). They found that the HSLI-E group was significantly more disfluent than their typically developing age-matched peers in stuttering-like disfluencies (i.e. part-word repetitions, prolongations, broken words and tense pauses) but not in normal disfluencies (i.e. filled pauses, interjections, phrase and whole-word repetitions and revisions). In addition, Guo, Tomblin and Samelson (2008) found that children with lower language ability (i.e. children with SLI) had higher disruption rates than those with higher language ability (the age matched control group) however not higher than their language matched peers. The difference in disruption rates between SLI and CA groups was restricted to silent pauses of 500-1000 ms. The SLI and CA groups did not differ significantly in rates of any specific type of vocal hesitations.

The development of speech disruptions in children with SLI has already been studied in the past. Hall (1996) examined the development of fluency in preschool children with language disorders (ages 3;5 - 5;11). These subjects were seen for follow-up at ages seven and/or nine. Hall (1996) concluded that children with language disorders who exhibit high rates of disfluencies at preschool age will continue to show these disfluencies at age seven and nine. The results showed decreases in all measures of disfluency between preschool and seven years of age. At nine years of age the mean percentages for total and normal-type disfluencies were slightly higher than observed at age seven, but lower than observed in preschool ages. Furthermore, the percentages stuttering-type disfluencies were larger at age nine than at preschool age and age seven.

Colburn and Mysak (1982) conducted a longitudinal study on disfluency and related speech disruptions to syntactic ability. They followed four typically developing children in the period of 2 to 3 years of age. They reported that the incidence of speech disruptions was related to the emergence of new structures during the acquisition of grammar. Syntactic structures acquired relatively recently were most likely to be disrupted. Disfluencies appeared to co-occur with syntactic structures that were learned and used regularly, reflecting practicing of that structure. Colburn and Mysak (1982) interpret these findings as a “practice effect”. Similarly, Rispoli and Hadley (2001) concluded that an increased incidence of disruptions is a reflection of integrating a new morphosyntactic procedure into a child’s repertoire of procedures. Grammatical complexity could lead to disruptions because more complex sentences entail a larger number of procedures than simple ones. Furthermore, a child uses simple structures more often than complex structures and consequently these simple structures become well practiced. The more often a procedure is carried out, the smoother its execution will become (Rispoli and Hadley, 2001). Finneran, Leonard and Miller (2009) proposed that it is important to consider both knowledge of grammatical forms and the ability to use this knowledge to formulate grammatical utterances. Once a child has acquired knowledge of a grammatical form, the child may need practicing this form for a period of time in order to achieve a high level of accuracy. Children with SLI have less experience using certain grammatical forms than their peers and therefore are less proficient in their language formulation abilities (Finneran, Leonard and Miller, 2009).

Few studies have investigated the development of fluency in children with SLI. Only studies by Van Weerdenburg (2006) and Zwitserlood (2007) examined Dutch children with SLI in a longitudinal setting. However, this type of research can contribute to diagnostics and treatment of children with SLI. As mentioned before, speech disruptions could reflect underlying linguistic processes. Speech disruptions can help us understand what makes a sentence difficult for a child with SLI. This knowledge could contribute to the development of treatment programmes, because grammatical weaknesses of the children with SLI are identified. Knowledge about the development of fluency could also contribute to diagnostics of children with SLI, because it is possible that the measurement of speech disruptions is sensitive enough to distinguish between children with SLI and typically developing children. Therefore, the current study examines the development of fluency of Dutch children with SLI longitudinally between the ages 8 and 10. The question addressed in this study is whether frequency, types and distribution of speech disruptions change between the ages 8, 9 and 10. The prediction is that the frequency and duration of speech disruptions will decrease between the ages 8 and 10. Decrease of disfluency over age is indicative of gradual mastery of sentence formulation procedures (i.e. the processes by which lexical and syntactic knowledge is put to use in formulating sentences). We could expect that the ability to formulate sentences of the children in this study improves over age; the children with SLI have been exposed to language for a longer period of time and acquire more experience with grammatical forms with age. Furthermore, these children were educated at special schools for children with language impairment. If children with SLI, despite the disorder, improve their ability to formulate sentences, it is expected that disfluency rates will decrease.

Method

Participants

Nineteen (11 boys) children with SLI, who were randomly selected from the database of the longitudinal study by van Weerdenburg (2006), were included in this study. Their mean ages were 8;5 (SD 1.9 months), 9;4 (SD 1.5 months) and 10;4 (SD 1.7 months) at the three successive measurements. These children were enrolled in special schools for children with speech, language and hearing problems and were diagnosed as having SLI by a team of audiologists, psychologists, otorhinolaryngologists, educationalists and speech therapists. The children met the criteria for SLI at all three measurements. The IQ of the children was within the normal range. Children who spoke unintelligibly, children with autism and children who stuttered were not included.

Material and Procedure

Spoken narratives were collected from the Storytelling Task of the standardized Dutch language development test TAK (Taaltest Alle Kinderen; Verhoeven en Vermeer, 2001). In the Storytelling Task the children tell two different stories, each represented by eight pictures. The children are instructed to look carefully at the pictures and tell the story in such a way that someone who does not see the pictures can understand the story. The stories were recorded on tape and transcribed, coded and analysed afterwards.

Transcription, Data Coding and Analysis

The audio recordings of the narratives were digitized and transcribed in CHAT (Mac Whinney, 2000). Each CHAT-file contains two narratives. Segmentation of the transcripts into utterances was done in accordance with the criteria defined by Bol and

Kuiken (1988) and Beheydt (1983). An utterance contains one main clause plus any subordinate clause or non-clausal structure that is attached to it or embedded in it (Bol and Kuiken, 1988). Besides, an utterance should be an auditory unit with a complete sentence melody and delimited by pauses (Beheydt, 1983). Coordinate clauses were considered as separate utterances, unless there was conjunction through reduction.

Measures reflecting morpho-syntactic complexity were mean length of utterance in words (MLU), mean length of utterance of the 5 longest utterances (MLU-5), and proportions of complex sentences. A complex sentence contains a main clause plus at least one clause from the following list: reduced clauses, subordinate clauses, reduction through conjunction and direct speech. Reduced clauses are phrases that function as an adverb in a sentence. A subordinate clause is introduced by a subordinating conjunction or relative pronoun. Reduction through conjunction occurs when two equivalent main clauses connect and form one sentence and the subject from the first clause is not repeated. Finally, direct speech occurs when a speaker gives the exact words used by another speaker. Complex sentences with direct speech exist of a main clause and a direct speech clause with a subject and a verb phrase in both clauses. The rate of complex sentences was measured by dividing the total number of complex sentences by the total number of T-units in the narratives. T-units are main clauses with their attached clauses. Examples of the complex sentences are given below;

<u>(1) Reduced clause:</u>

Ze gingen **huilend** terug naar <papa> vader.
They went crying back to <daddy> father.
While they were crying, they went back to <daddy> father. (age child: 9 years)

<u>(2) Subordinate clause:</u>

Eh **als ze bij de heuvel zijn** springt Sylvia erin.
Eh when they at the hill are jumps Sylvia in.
Eh when they are at the hill, Sylvia jumps in. (age child: 10 years)

<u>(3) Reduction through conjunction:</u>

Hij loopt naar buiten <en> **en** eet wat friet.
He walks outside <and> and eats some chips.
He walks outside <and> and eats some chips. (age child: 10 years)

(4) Direct speech:

En de mevrouw zei: **Wat kan ik voor je doen**?

And the lady said: What can I for you do?

And the lady said: What can I do for you? (age child: 8 years)

Speech disruptions

(a) Silent pauses

Silent pauses longer than 250 ms were measured and categorized as 250-500 ms, 500-1000 ms, 1000-2000 ms and > 2000 ms. Silent pauses shorter than 250 ms can not be reliable associated with utterance planning processes (Guo, Tomblin and Samelson, 2008; Goldman-Eisler, 1968).

(b) Vocal hesitations

The types of vocal hesitations were identified and coded in accordance with Guo, Tomblin and Samelson's (2008) guidelines. Guo, Tomblin and Samelson (2008) combined the taxonomies of Dollaghan and Campbell (1992) and Kowal et al (1975). This taxonomy included: silent and filled pauses, interjections, whole-word repetitions, part-word repetitions, revisions and orphans. Orphans, linguistic units that do not have a reliably identifiable relationship to other units, were not identified in the narratives. Stalls, sentence disruptions which do not add new phonological, lexical or grammatical material to the original utterance, were also coded. These stalls include silent pauses, filled pauses, repetitions and interjections. We also identified complex stalls and computed a total disfluencies measure. Complex stalls were identified when two or more stalls occur in succession (example 5) or when *en* 'and' occurs between the sentence initial stalls (example 6). The total number of disfluencies is the sum of all speech disruptions and includes silent pauses, filled pauses, repetitions, interjections and revisions.

Complex Stalls

(5) (age child: 10 years)

<pause> <toen ging ze> <pause> toen <pause> ging ze helpen ze vader.

<pause> <then went she> <pause> then <pause> went she helping she father.

<pause> <then she went> <pause> then <pause> she went helping her father.

(6) (age child: 10 years)

<pause> en <pause> eh <pause> dochter <pause> en zoon.

<pause> and <pause> eh <pause> daughter <pause> and son.

<pause> and <pause> eh <pause> daughter <pause> and son.

Frequency of speech disruptions

The speech disruption rates per category were computed. The total number of silent pauses in each duration category, filled pauses, repetitions, interjections and revisions were divided by the total number of unmazed words. Unmazed words are words in which no speech disruptions occurred. The rates of every type of disfluency were also computed by dividing the total count by the total number of unmazed words.

Distribution of speech disruptions

This study also investigated the distribution of speech disruptions across different syntactic positions. These speech disruptions were examined before utterances, clauses, phrases and words. A clause must also contain at least a subject and a verb. Speech disruptions before a clause could occur after the main clause and before a subordinate clause or after a subordinate clause before the main clause. In addition, a speech disruption before the clause could occur between two sentences that connect and form one sentence during reduction through conjunction. Speech disruptions before reduced clauses are not included as speech disruption before clauses because these reduced clauses often consist of one word. Furthermore, direct speech was also not included as a speech disruption before a clause. As can be seen in example (3) direct speech is coded on a new line: speech disruptions before direct speech were coded as utterance initial disruptions. Phrases were considered as units in the utterance consisting of one or more words. They must include a head and often include its modifier/adjunct or argument/complement. Finally, a word is a bare head (Guo, Tomblin and Samelson, 2008).

The speech disruption rate before each syntactic unit was computed by dividing the total number of disruptions before each syntactic unit by the total number of possible contexts for each syntactic unit in the narrative. Specifically, we calculated the rate of speech disruptions before the utterance by dividing the total number of utterance-initial speech disruptions by the total number of utterances. The rate of speech disruptions before a clause was calculated by dividing the total number of speech disruptions before a clause by the total number subordinate clauses and clauses in which reduction through conjunction occurred. The rate of speech disruptions before a phrase was calculated by dividing the total number of speech disruptions before phrases by the total number of phrases. Finally, the rate of speech disruptions before words was calculated by dividing the total number of speech disruptions for words by the total number of words.

Statistical methods

Anova repeated measures analysis (General Linear Model) was used to examine within-group differences between measurements. An alpha level of 0.05 was applied.

Results

Background measures

The background measures of the narratives are summarized in Table 1. The total number of words (i.e., tokens), total number of utterances and MLU (in words) increased over time. When the participants get older they use more words and longer utterances. However, a test for within-subjects contrasts (GLM repeated measures) yielded no significant differences between measurements.

Table 1. Background measures of narratives

	Total words		**Total utterances**		**MLU (words)**		**MLU-5 (words)**		**Complex sentences**	
Age	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
8	171.11	62.33	27.84	9.08	6.13	0.88	9.53[a]	1.68	0.06 [a]	0.05
9	195.79	47.72	30.79	7.84	6.44	0.87	10.76[a]	1.56	0.15 [a]	0.10
10	216.53	66.38	32.84	7.69	6.53	0.66	10.64	1.73	0.11	0.08

[a] A significant within-group difference, $p < .05$

A significant effect over time was seen in MLU-5 and the percentage of complex sentences. A test for within-subjects contrasts (GLM repeated measures) yielded a significant difference between age 8 and 9 ($F_{1,18}$=12.487, p=0.002), MLU-5 increased from 9.53 to 10.76. Between age 9 and 10 MLU-5 decreased slightly, but not significantly, from 10.76 to 10.64 ($F_{1,18}$=0.059, p=0.811). A test for within-subjects contrasts (GLM repeated measures) yielded a significant difference in complex sentences between age 8 and 9 ($F_{1,18}$=21.999, p=0.000). The percentage of complex sentences increased from 6% to 15%. Between age 9 and 10 the percentage of complex sentences decreased, but not significantly (Table 1). In the eight-year-old group 6 out of

19 children did not use complex sentences and in the groups of nine-year-old and ten-year-old children only 2 out of 19 children did not use complex sentences.

Silent pauses: duration

Table 2 presents silent pauses rates by age and duration category. A test for within-subjects contrasts (GLM repeated measures) yielded significant differences in the rate of silent pauses of 250-500 ms between age 8 and 9. These pauses increased from 0.069 to 0.088 ($F_{1,18}$=5.429, p=0.032). There was a slight decrease between age 9 and 10 ($F_{1,18}$=1.201, p=0.288). The rate of silent pauses of 500-1000 ms remained stable. In addition, a test for within-subjects contrasts (GLM repeated measures) showed a significant change for silent pauses of 1000-2000 ms between the ages 8 and 9. The rate of these silent pauses decreased from 0.079 to 0.058 ($F_{1,18}$=6.859, p=0.017). Between age 9 and 10 there was a slight decrease ($F_{1,18}$=2.257, p=0.142). A test for within-subjects contrasts (GLM repeated measures) yielded a significant difference in the rate of silent pauses longer than 2000 ms between age 8 and 9 ($F_{1,18}$= 8.451, p=0.017). The rate of these silent pauses decreased from 0.030 to 0.015. Between age 9 and 10 the rate of these silent pauses remained stable (Table 2). Furthermore, table 2 shows a slight decline in the rate of total silent pauses over age, but this decline is not statistically reliable.

Table 2. Development of duration of silent pauses rate

	250-500 ms		**500-1000 ms**		**1000-2000 ms**		**>2000 ms**		**Total**	
Age	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
8	0.069 [a]	0.023	0.093	0.041	0.079[a]	0.037	0.030[a]	0.026	0.261	0.088
9	0.088 [a]	0.031	0.092	0.025	0.058[a]	0.033	0.015[a]	0.013	0.248	0.064
10	0.079	0.079	0.093	0.037	0.047	0.029	0.015	0.015	0.231	0.070

[a] A significant within-group difference, $p < .05$

Table 3 shows the vocal hesitation rates by category and age. A test for within-subjects contrasts (GLM repeated measures) yielded no significant differences between the ages in vocal hesitation rates. Filled pauses and interjections increased between ages 8 and 9 and decreased between ages 9 and 10. Part-word repetition decreased between ages 8 and 9 and remained stable between ages 9 and 10. These changes were not statistically significant. The proportions of whole-word repetitions remained stable over the years and no significant changes were found for revision rates.

Table 3. Vocal hesitation rates by category and age

	Filled pause		Part-word-repetitions		Whole-word-repetitions		Revisions		Interjections	
Age	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
8	0.025	0.026	0.009	0.011	0.033	0.024	0.025	0.010	0.002	0.004
9	0.039	0.039	0.006	0.006	0.033	0.019	0.026	0.016	0.005	0.007
10	0.037	0.032	0.006	0.008	0.032	0.023	0.022	0.012	0.003	0.005

A test for within-subjects contrasts (GLM repeated measures) yielded no significant differences between the ages in total stalls, total complex stalls and total disfluencies. Total stalls and total disfluencies were stable between age 8 and 9, and decreased between age 9 and 10, but this change was not significant. The total amount of complex stalls did not change with age (Table 4).

Table 4. Rate total (complex) stalls and total disfluencies by age

	Total stalls		Total complex stalls		Total disfluencies	
Age	**M**	**SD**	**M**	**SD**	**M**	**SD**
8	0.331	0.103	0.047	0.027	0.356	0.107
9	0.331	0.085	0.052	0.028	0.356	0.093
10	0.308	0.100	0.050	0.027	0.329	0.106

Table 5 displays the speech disruption rates by syntactic position at ages 8, 9 and 10. A test for within-subjects contrasts (GLM repeated measures) yielded no significant differences between ages in disruption rates of the four syntactic positions.

Table 5. Development of speech disruption rate by syntactic position

	Disfluencies Utterance		Disfluencies Clause		Disfluencies Phrase		Disfluencies Word	
Age	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
8	1.191	0.328	0.550	0.730	0.153	0.070	0.063	0.043
9	1.263	0.261	0.356	0.506	0.157	0.098	0.055	0.031
10	1.170	0.347	0.460	0.632	0.148	0.101	0.056	0.031

Discussion

The purpose of this study was to determine whether frequency, types and distribution of speech disruptions would change between ages 8, 9 and 10 in children with SLI. We expected that frequency and duration of speech disruptions would decrease between the ages 8 and 10. No significant differences between ages were found in total rate of silent pauses. However, there is a shift in duration of silent pauses. The rate of silent pauses of 250-500 ms, 1000-2000 ms and longer than 2000 ms changed significantly between ages 8 and 9. The total rate of the longer silent pauses (1000-2000 ms and >2000 ms) decreased between age 8 and 9. By contrast, the rate of silent pauses of 250-500 ms increased between the ages 8 and 9. No significant differences between ages were found in the use of filled pauses, whole-word-repetitions and revisions. The use of filled pauses and revisions even showed a slight increase between age 8 and 9. Furthermore, low proportions of part-word-repetitions and interjections could be the reason that these disruption types did not show a significant change over time. Additionally, the total stalls and the total disfluencies remained equal between ages 8 and 9 and decreased slightly between age 9 and 10. The total rate of complex stalls increased slightly between age 8 and 9 and then slightly decreased between age 9 and 10. The results showed no significant differences over time in the four syntactic positions.

An explanation for the decrease in longer silent pauses could be the progress in language ability of the children. As mentioned before, the children with SLI have been exposed to language for a longer period of time and acquire more experience with grammatical forms with age. Furthermore, these children were educated at special schools for children with language impairment. Different studies showed that children become more fluent as their language abilities enhance (Kowal et al, 1975; Wijnen, 1990). The language ability of children with SLI in this study does increase over time as the results showed a significant increase in MLU-5 (words) and complex sentences between age 8 and 9. Silent pauses may occur due to processing difficulties during sentence production, because pausing provides the speaker with more time to deal with these difficulties. The shift to shorter silent pauses between age 8 and 9 suggests that between these ages the processing difficulties decrease because of improved language abilities. These improved language abilities could enhance skills of forming concepts, activating syntactic frames or retrieving the syntactic and semantic information (Levelt, 1989; Postma & Kolk, 1993).

Another explanation for the decrease in longer silent pauses could be a trade off between the longer silent pauses and vocal hesitations. The longer silent pauses decreased and the use of filled pauses and interjections slightly increased. The children with SLI could discover between age 8 and 9 the ‘benefits’ of filled pauses and interjections. Insertion of filled pauses and interjections could help speakers keep the floor (Clark, 2002).

Guo, Tomblin and Samelson (2008) examined the types, frequencies and distribution of speech disruptions in ten-year-old children with SLI and compared this data with a control group. The results of the ten-year-old children of Guo, Tomblin and Samelson (2008) concerning the silent pauses were similar to the results in this study. In both studies rates of silent pauses of 500-1000 ms were highest, followed by silent pauses of 250-500 ms and 1000-2000 ms respectively. Proportions of silent pauses longer than 2000 ms were small in both studies. However, silent pauses of the second and third category occurred more frequently in the study of Guo, Tomblin and Samelson (2008). By contrast, the filled pauses and whole word repetitions occurred more frequently in the current study. Interjections and part-word repetitions did not occur often in both studies. The differences found between the studies can be explained by the different narrative tasks. Before the children described the pictures in the study of Guo, Tomblin and Samelson (2008), the examiner pointed to and labeled the main character and key elements of another picture set. Then the examiner read a prewritten model story based on the pictures to the child. Before describing the pictures the children had to identify all the key elements in the story. If the child failed to give the anticipated description, the examiner provided the full description for the child. The children in the present study did not receive help from the examiner during the task. They were only instructed to look carefully at the pictures and tell the story in such a way that someone who does not see the pictures can understand the story. We could expect that this task was more difficult than the one in Guo, Tomblin and Samelson (2008). This might explain that filled pauses and whole word repetitions occurred more frequently in the current study. However, the higher number of silent pauses of 500-1000 ms and 1000-2000 ms in the study of Guo, Tomblin and Samelson (2008) can not be explained.

A strength of this study is that the children with SLI were followed longitudinally. Therefore, the development of fluency of the children with SLI was measured over time. Another strength is that narrative tasks can evoke more complex sentence production than controlled speech tasks. Complex sentences demand more sentence planning and this could lead to higher disruption rates. Thus, narrative tasks can reveal more speech disruptions.

This study also has some weaknesses. Firstly, the small number of participants may have influenced the findings. Secondly, all participants met the criteria for SLI, but variation in the group was large. For example, the total rate of disfluencies, when the children were 8 years old, ranged between 21 and 54%. Thirdly, this study did not compare the children with SLI with typically developing children. Previous studies showed that children with SLI are less fluent than typically developing children. It would have been useful if this study showed that patterns of speech disruptions in children with SLI are specific for the disorder.

This issue needs further empirical study. Firstly, it would be useful to enlarge the research population and include a typically developing control group. Secondly, it would be interesting to extensively investigate the distribution of speech disruptions. The distribution of speech disruptions could reveal more information about difficulties with linguistic processes. For example, silent pauses before words could indicate word finding difficulties and silent pauses before phrases could indicate difficulties with syntactic frames. Silent pauses at the beginning of the utterance could reveal difficulty with concept formation.

In conclusion, no significant differences between ages were found in total rate of silent pauses and vocal hesitations. However, the rate of longer silent pauses (1000-2000 ms and >2000 ms) decreased and the rate of the shortest silent pauses (250-500 ms) increased between the ages 8 and 9. These changes were statistically significant. An explanation for the decrease in longer silent pauses could be the progress in language ability of the children. Another explanation could be that there is a trade-off between longer silent pauses and vocal hesitations.

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