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Detecting Trade-Offs Between Fluency and Language

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Detecting Trade-Offs Between Fluency and Language

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For the last two decades researchers (Colburn & Mysak, 1982; Gaines, Runyan, & Meyers, 1991; Gordon & Luper, 1989; Hill & Gordon, 1995; St. Louis, Murray, & Ashworth, 1991; Wall & Myers, 1982) have examined the link between the language ability of the speaker and stuttering. They found that stuttering occurred more often in novel syntactic structures (Colburn & Mysak, 1982), longer and more complex utterances (Gaines et al., 1991), and sentence generation (rather than imitated sentences) (Gordon & Luper, 1989). In evaluating the speech of children who stutter, most standard assessment protocols include picture description and conversational speech samples. Some of the more thorough ones suggest sampling a variety of speaking situations. However, most do not look at higher language skills and whether or not there is any interaction between language complexity and stuttering. These assessment protocols reflect the ambiguity of our current understanding of connections between fluency and language.

Narrative Language Skills

The language factor, examined here, refers to narrative production. Narratives are descriptions of happenings or events, which can be real or imaginary (Lahey, 1988). A narrative is considered complete if it contains a setting and at least one episode. The setting introduces the characters and describes where the story takes place. An episode must include an initiating event (which causes someone to do something), attempt (made by the character), and consequence (result of the attempt). It also may include an internal response (of the character), plan (of how the problem will be solved), and reaction (to the story). These latter three parts of a narrative are not necessary, but are often included to make the story more interesting. Generally, the narrative

abilities of an individual increase with age and exposure (Nippold, Schwarz, & Jescheniak, 1991; Scott, Healy, & Norris, 1995).

Narrative complexity is analyzed along a continuum, from the simplest to the more sophisticated forms (Lahey, 1988). The least complex is an additive chain. The utterances in this type of narrative have no causal or temporal dependencies and could be arranged in any order. The next type is a temporal chain. The utterances in this level of narrative have no causal relations, however there is a temporal sequence. Next, is a simple causal chain, which contains at least one episode. Finally, the most complex type of narrative is a multiple causal chain, which includes more than one episode. There are two types of multiple causal chains. One is referred to as conjoined; episodes are joined in an additive fashion. The more complex type of multiple causal chain is called embedded; episodes are embedded in one another so that one episode begins before another is completed.

Narrative task refers to generation versus retell of narratives. When a person repeats a narrative that s/he has already heard, that is considered retell. When retelling a narrative, the speaker must remember to include all of the parts of the story, but is not responsible for creating them and making sure that the components of the story flow and follow a rational sequence. In other words, the form may be new to the person, but the content is not because it was already given in the story that the person heard. On the other hand, a generated narrative is one that the speaker creates on his/her own, without being given a plot or story line. When generating a narrative, the speaker is responsible for the form of the story as well as the content. The speaker must handle all of the demands of retelling the story as well as creating the story, maintaining cohesion, and making sure that the story follows a logical progression.

Script knowledge is the knowledge that a speaker has about a familiar event (Mathers-Schmidt & Apel, 1998). A scripted theme involves knowledge of familiar events. For example, a scripted narrative could be about a birthday party. Most children have been to several birthday parties and have an idea about what the format of a "typical" birthday party is. A non-scripted theme involves unfamiliar events. An example of this would be telling a story about a trip through the jungle. Although most children could make up a story about it, very few have first hand experience about trips through the jungle. Scripted themes are thought to be less taxing, and therefore easier, because they involve a new form (the narrative), but old content (knowledge of a familiar event). Script knowledge is also referred to as "cognitive context" because the speaker brings a certain amount of cognitive knowledge about the subject matter to the task, which can influence the speaker's ability to tell the story (Nelson, 1986).

Narratives and Stuttering

Collecting narrative samples from children who stutter may yield several kinds of useful information. First, it may be that the language formation challenges associated with the narrative tasks will tax the capacity of the individual for fluent speech. As a result, the more complex and challenging narratives may trigger disfluencies, even in someone with normal language skills. If this is true, then fluency-language interaction should be appraised along a hierarchy, which includes narrative analysis of gradually increasing demand.

The second reason for collecting and analyzing narrative samples involves the detection of a subtle language disorder. Narratives are of great importance for academic and social success, and any problems identified should be addressed throughout the intervention process (Nippold et al., 1991). If a non-fluent child also has difficulty with narratives, then both problems should be addressed in therapy in order to facilitate adequate communication skills.

Due to the heightened linguistic demands of narrative production, interest has arisen in examining the narratives of children who are fluent and non-fluent (Hill & Gordon, 1995; Nippold et al., 1991; Scott & Healy, 1995; Weiss & Zebrowski, 1994). Researchers often study the differences between stutterers and non-stutterers regarding their narrative skills. Some researchers have considered the trade-offs between fluency and language complexity/narratives (Scott et al., 1995; Weiss & Zebrowski, 1994); however most of the researchers examining narratives and fluency have used limited narrative sampling. Scott, et al., (1995) used only one two episode retell. Nippold, et al., (1991) used two multiple episode retells. Weiss & Zebrowski (1994) utilized one two-episode retell and three similar story generations. With this limited sampling it is not surprising that no compelling evidence was found to support the notion of trade-offs between narrative complexity and stuttering in non-fluent children. Weiss & Zebrowski (1994) and Scott et al. (1995) found that those subjects who stutter did not perform significantly differently from the non-stuttering subjects on most of the narrative measures. That is, the non-fluent subjects were able to complete story-retelling tasks and create original stories that were similar to their fluent peers. The non-fluent subjects also appeared to demonstrate a level of story grammar competence similar to their fluent peers.

However, Weiss & Zebrowski (1994) did note that, in general, children in the stuttering groups produced shorter narratives than children in the non-stuttering group. They suggested that this might be due to a possible avoidance response (Weiss & Zebrowski, 1994). The non-fluent children may have been capable of more sophisticated narratives, but did not show this because of a concern that they would become more disfluent by speaking more.

Scott et al. (1995) also examined the fluency and language trade-off, noting a "very weak" relationship between frequency of stuttering and the level of narrative sophistication. Scott et al. (1995) hypothesized that for non-fluent children with a subtle language impairment, the challenge

of relating information in a coherent, structured manner may demand too much of the child's language system. They also suggested that children who had received intervention for fluency may have used a less complex narrative structure in order to maintain fluency and economize the effort necessary for successful communicative interaction.

These studies (Scott et al., 1995; Weiss & Zebrowski, 1994) indicate that there are no statistically significant differences between children who stutter and control groups when considering narrative-based language skills. There is some mention of trade-offs in these articles; however, the speculations are guarded and have not been tested adequately by direct research in a study.

Hill & Gordon (1995) mentioned the Capacities and Demands Model indicating that trade-offs may be an issue in disfluencies as they relate to language task demands. They found a tendency for disfluencies to increase "as the demand for creating narrative cohesion increased." This was found through a careful analysis of disfluencies in a storytelling task. However, like many studies involving disfluencies and language demands, their findings were based on a single retell task.

In order to examine disfluency and the language conditions under which it emerges, we must systematically elicit sufficient language samples, in order to study where the fluency breakdown might occur. The purpose of this study was to determine how stuttering frequency might vary with narrative complexity, task, and script knowledge (Mathers-Schmidt & Apel, 1998).

METHOD

Subjects:

The subjects were two elementary school-age children. One was a 7 year 5 month male, who had been identified as disfluent by a graduate student clinician. He was somewhat behind in classroom age level performance, and was receiving therapy for a speech and language delay. He had passed a hearing screening. The other subject was a 7-year-old female, who had also been identified as disfluent by a graduate student clinician. She performed at age level in her classroom, and had exceptional language skills, as seen during testing. She was within normal limits on standard language evaluations. She had also passed her hearing screening.

Procedure:

The fluency samples were collected and analyzed by an undergraduate student. The narrative samples were collected by an undergraduate student and analyzed by a graduate student and certified Speech-Language Pathologist. The narrative evaluation protocol included collecting six samples of narrative generation and retelling as follows:

- Generated non-scripted
- Generated scripted
- Retell non-scripted, 1 episode
- Retell non-scripted, 2 episodes
- Retell scripted, 1 episode
- Retell scripted, 2 episodes

The narratives were presented to the two subjects in a different order to account for the influence which test order may have on their responses. The subjects were asked to retell their narratives to a puppet, named Louie, to simulate talking to a naïve listener. Lahey's (1988) narrative analysis

procedure was used to analyze the structure of the subjects' narratives. A five point scale was applied to these narrative structural levels in the following manner: additive = 1 point; temporal = 2 points; simple causal = 3 points; multiple causal-conjoined = 4 points; and multiple causal-embedded = 5 points. Additionally, an extra .5 point was added to any multiple causal narrative, which included more than one episode. The total narrative score (combined scores across all narratives) was compared to the expected scores for children of the subject's age, thereby yielding a percentage expected score.

Intrajudge reliability was taken into account and determined through several methods. Intrajudge reliability was demonstrated by the undergraduate student repeating the stuttering analysis of ten percent of the subjects' narrative samples. There was only one discrepancy between the two data sets. The student researcher noted a silent prolongation on the second analysis, which had been overlooked when analyzing the data for the first time. A graduate student and a certified Speech-Language Pathologist analyzed the narratives. Reliability was found to be good.

RESULTS

Possible relationships between disfluency and narrative production were found at varying levels. The small numbers used in this study precluded doing formal analysis of the relationship between disfluency and narrative skill level. However, the data could be examined to consider indicators of a relationship between disfluency and narrative production scores. The results were also analyzed in terms of how percentage disfluency varied across narrative tasks. Differences in disfluency were found when comparing tasks according to number of episodes and scripted vs.

non-scripted. However, no clear differences were apparent when comparing percentage stuttering in generation vs. retell in narrative tasks.

Relationship between Disfluency and Narrative Production Scores

The data in Table 1a clearly shows that there is no direct relationship between stuttering frequency and narrative production scores. Stuttering frequency scores range from 2.0% to 13.0% while narrative scores vary from 22% to 100%. Likewise, in Table 1b stuttering frequency ranges from 0 to 4.0% and narrative scores vary from 44% to 122%. When examining the data there was no clear relationship between disfluency and narrative production scores.

(Subject One) Table 1a. Percentage Stuttering Frequency and Percentage Expected Narrative Scores [for Retell (R) or Generated (G)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Stuttering Frequency	Narrative Score
R/NS/1	2.0%	33%
R/NS/2	5.6%	66%
G/NS	6.8%	22%
R/S/1	8.6%	100%
G/S	10.0%	22%
R/S/2	13.0%	22%

(Subject Two) Table 1b. Percentage Stuttering Frequency and Percentage Expected Narrative Scores [for Retell (R) or Generated (G)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Stuttering Frequency	Narrative Score
R/NS/1	0	100%
G/S	1.5%	44%
R/S/1	2.2%	100%
R/S/2	2.5%	100%
G/NS	2.8%	44%
R/NS/2	4.0%	122%

Percentage of Disfluency across Different Narrative Tasks

A number of episodes pattern was found when examining percentage disfluency in terms of number of episodes for retell tasks. There was a greater percentage of disfluency during the two episode vs. one episode retell task (both scripted and non-scripted) (See Tables 2a and 2b). Mean stuttering for two episode narratives was 6.3% and for one-episode narratives was 3.2%. This is especially evident in the data for subject one.

(Subject One) Table 2a. Number of Narrative Episodes and Stuttering Frequency [for Retell (R)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Mean Percentage Stuttering
R/NS/2	5.6%
R/NS/1	2.0%
R/S/2	13.0%
R/S/1	8.6%

(Subject Two) Table 2b. Number of Narrative Episodes and Stuttering Frequency [for Retell (R)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Mean Percentage Stuttering
R/NS/2	4.0%
R/NS/1	0%
R/S/2	2.5%
R/S/1	2.2%

Interestingly enough, the pattern of a link between narrative task complexity and percent disfluency was found for Subject Two and was more obvious when she was starting treatment. Access to the results of previous testing was obtained for scripted and non-scripted retell narratives. The data in Table 2c shows that the frequency of her stuttering diminished in all areas, showing that she has responded to treatment. However, she still is most disfluent in the more complex narrative retell type, which is the two episode non-scripted narrative.

(Subject Two) Table 2c. Percentage Stuttering Frequency and Narrative Type [for Retell (R) or Generated (G)/ Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Percent of Syllables Stuttered
R/S/1	5%
R/S/2	4%
R/NS/1	8%
R/NS/2	11%

Scripted vs. Non-Scripted Narratives

Scripted vs. non-scripted narratives revealed a higher frequency of disfluency for Subject Two (See Table 3a). The mean stuttering for non-scripted narratives was 2.3% and scripted narratives was 2.1%. This is including the one episode non-scripted narrative retell during which no stuttering occurred. Without the misleading/confounding episode, the means for non-scripted vs. scripted narratives become 3.4% and 2.1% respectively.

(Subject Two) Table 3a. Non-Scripted vs. Scripted Narratives and Stuttering Frequency [for Retell (R) or Generated (G)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Mean Percentage Stuttering
R/NS/2	4.0%
R/S/2	2.5%
R/NS/1	0%
R/S/1	2.2%
G/NS	2.8%
G/S	1.5%

The data for Subject One actually showed the opposite pattern (See Table 3b). The mean stuttering for non-scripted narratives was 5.3%, while the mean stuttering for scripted narratives was 10.5%. However, this may be accounted for by increasing familiarity with narrative structure as the tasks were presented. The subject had difficulty with producing and retelling narratives. The non-scripted narratives were presented last, so the results may reflect the subjects increased understanding of the narrative format.

(Subject One) Table 3b. Non-Scripted vs. Scripted Narratives and Stuttering Frequency [for Retell (R) or Generated (G)/Non-Scripted (NS) or Scripted (S)/2 or 1 Episodes.]

Narrative Type	Mean Percentage Stuttering
R/NS/2	5.6%
R/S/2	13.0%
R/NS/1	2.0%
R/S/1	8.6%
G/NS	6.8%
G/S	10.0%

Story Generation vs. Retell

For story generation vs. story retell no clear pattern emerged regarding the influence of this task type on stuttering (See Table 4). Mean stuttering for generation was 5% while retell was 4.8%. In agreement with Mathers-Schmidt & Apel (1998), this finding suggests that generation vs. retell may not be a sensitive measure when considering narrative task challenge and fluency breakdown.

Table 4. Stuttering Frequency for Narrative Retell vs. Generation.

Subject Number	Mean Percentage Stuttering	
	Retell	Generation
One	7.3%	7.8%
Two	2.2%	2.2%

DISCUSSION AND CONCLUSIONS

The purpose of this study was to replicate a previous study done by Mathers-Schmidt & Apel (1998) and determine whether the findings of the two studies were similar. Nearly all of the findings were in agreement with the previous study conducted by Mathers-Schmidt & Apel, 1998. These similarities were seen when looking at narrative task complexity (number of episodes), script knowledge (scripted vs. non-scripted) (except for subject one, which was discussed earlier), and task (generated vs. retell). The subjects showed an increase in disfluency during the two vs. one episode retell task for scripted and non-scripted narratives. A higher frequency of disfluency was also observed in scripted narratives vs. non-scripted narratives. Also, the data revealed that there seemed to be no clear pattern for generated vs. retell narratives. The comparisons are only relevant for the younger age group, since both of the subjects were 7-years-old.

Several other findings from this study were in accordance with the previous research (Hill & Gordon, 1995; Scott et al., 1995; Weiss & Zebrowski, 1994). Scott et al. (1995) found a weak correlation between narrative structure and stuttering frequency. The numbers used in this study were too small to allow for calculation of a correlational statistic, but visual examination reveals no relationship between percentage expected narrative score and stuttering. Scott et al. (1995) also discussed the idea that for some children a subtle language impairment may be a component

of their fluency problem. This seems to fit Subject One's pattern of disfluency. While Subject Two's narratives may reflect Scott et al. (1995) idea of trade-offs and Weiss & Zebrowski's (1994) idea of avoidance response. Subject Two had exceptional language skills, but performed lower than expected on some of the narratives. In an attempt on her part to economize effort, in order to avoid stuttering, she may have sacrificed narrative complexity in order to remain more fluent. Gordon & Hill (1995) found a relationship between stuttering frequency and increased narrative cohesion. In this study, no clear relationship was seen between narrative cohesion and stuttering frequency. Subject One's scripted one episode and non-scripted two episode narratives both lacked cohesive devices. However, his stuttering frequency for these narratives was 8.6% and 5.6% respectively, which is in the middle of the stuttering frequency range for Subject One.

The idea of trade-offs, as mentioned in the introduction, seems to be at work here when analyzing the data. Both of the subjects were exceptional in their language abilities. Subject one showed delayed language skills, while subject two showed advanced language skills. This implies that the cognitive resources of the individual are being distributed differently depending on their language skills. For example, subject one's language delay may have accounted for his higher instance of stuttering. More cognitive resources may have been going towards mastery of the language tasks, and therefore were not available for control of stuttering.

Conversely, subject two's exceptional language skills may have also caused her to stutter more. She may be trying to use language skills, which are still difficult for her to produce, even though she is cognitively ready to use them. Since she could be devoting more resources to these higher skills, she may be sacrificing some of her ability to be fluent in order to produce these complex narratives. This is evidenced in the data from this study and from her previous narrative testing. On both occasions she was most disfluent when producing the most complex narrative. The idea of trade-offs indicates that this is what would happen with the language factor playing a role. A

set amount of cognitive resources must be divided amongst different tasks. By using more of these resources for the level of difficulty of language production, fewer would be left for the level of fluency of language production.

Analyzing narrative task performance yields useful implications for treatment. For instance, someone with language delay and fluency problems could be in a treatment program that treated both of these together. This would utilize the sensitivity of narratives for measuring language as well as the affect of narrative demands on the effectiveness of therapy on stuttering. For example, Subject One had difficulty generating and retelling narratives. For narrative generation he required a great deal of prompting and still produced narratives which were only additive chains. When retelling narratives he required prompting for all of them, except the non-scripted two-episode narrative. Also, all of his narratives were below the expected level, except for the scripted one episode narrative retell. Most of his disfluencies were sound/syllable (part-word) repetition without tension. This indicates that his stuttering is mild, since he is effortlessly repeating sounds instead of demonstrating the more severe sound and silence prolongation; while the stuttering is relatively mild, the language delay is quite evident. Although both of these areas should be addressed, it may be better to emphasize language intervention while carefully monitoring stuttering to make sure that the language demands of intervention do not exacerbate the stuttering.

The results of this research could also have practical implications for people who stutter but do not have any accompanying language delay. Narratives are a very sensitive indicator of how one handles language demands. A battery of narratives of varying levels of complexity could reveal where the individual is having the greatest trouble maintaining fluency or any special "tricks" that the person is using to hide their stuttering. For example, Subject Two's disfluency was much more subtle in nature. Her data revealed a low level of stuttering severity and excellent narrative

skills. However, during conversational speech, particularly involving spontaneous "story-telling," her stuttering severity increases. This is consistent with the research which revealed her increased disfluency with more complex narratives. She might benefit from narrative skill intervention, which would ultimately reduce the language demand and facilitate fluency. In addition, the narrative tasks revealed two speech patterns which merit attention.

First, there were several odd pauses in her narratives. The pauses were not very long, so they seemed normal. However, they were relatively frequent and thereby drew attention to themselves. These pauses were most noticeable during the scripted one and two episode narratives. The percentage of pauses (pauses/total words) was 4.3% and 3.1% respectively. Most of these pauses occurred at the beginning of the story. This could be due to the increased mental capacities used for planning the narrative, which would then not be available for producing fluent speech. This may have been an instance of stuttering for her, which was not very noticeable. She had just finished her last session of therapy for Winter Quarter when she was tested.

There were also some questionable instances of throat clearing. She may have had a cold, however, I did not notice a runny nose, cough, sneezing, or any other symptoms of a cold. Sometimes the throat clearing was coupled with a short pause. This led me to wonder whether the throat clearing was a "time filler" to cover up a momentary pause as the result of stuttering. This would indicate that her stuttering had been going on for quite sometime, and she had developed several ways to hide her stuttering. If that were indeed the case, then her treatment should include remediation of these more "tricky," subtle behaviors.

Although the findings, for the most part, were in agreement with those of Mathers-Schmidt & Apel (1998), some factors may reduce the validity. For instance, the sample size of this study was very small (only two subjects). Another replication of this study should be conducted with a

larger sample size, such as one closer to the original study. Also, an undergraduate student in speech-language pathology conducted the study. Lack of experience in conducting studies, analyzing language, and analyzing stuttering may have affected the results. To account for this, later studies should be conducted by someone with more experience in these areas.

While the results of this study are in agreement with those in the study by Mathers-Schmidt & Apel (1998), more research should be conducted in this area before any definite conclusions can be drawn. The idea of using several narratives of varying degrees of complexity has not been studied extensively. This is especially important in light of the implications for evaluating the effectiveness of treatment. A more sensitive measure, such as maintaining fluency across narrative tasks might be used to determine whether treatment has been effective. By eliciting a variety of narratives, the therapist could analyze the clients' stuttering under slight gradations of pressure and better see how the client may perform under the varying conditions that will be faced outside of therapy.

Comparing individuals who stutter and have language delay and those who do not also raises some interesting ideas. Additional research could focus on non-fluent subjects with language delay and non-fluent subjects who do not posses any language problems, or even subjects who demonstrate exceptional language skills.

The more in-depth analysis of this study allowed for a greater degree of sensitivity in measuring the correlation between language and fluency. Unlike previous studies (Hill & Gordon, 1995; Nippold et al., 1991; Scott et al., 1995; Weiss & Zebrowski, 1994), this study focused on several degrees of narrative complexity. The findings indicated that there is no relationship between disfluency and narrative production scores and no significant differences in disfluency when comparing generation vs. retell of narratives. However, differences were found between one vs.

two episode retell narratives and scripted vs. non-scripted narratives. Subjects performed better, i.e., were more fluent, on retell narratives containing one episode and narratives that were scripted. This implies the importance of addressing language measures when assessing and providing intervention for individuals who stutter.

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