Universiteit Utrecht

Opleiding MSc Logopediewetenschap
Clinical Language, Speech and Hearing Sciences

Master's Thesis

Influence of narrative task on linguistic fluency in syntactic cluttering

Esther van Heeswijk
9009833

Supervision:

dr. Y. van Zaalen

prof. dr. Ph. Dejonckere

July 1st, 2011

Abstract

Speech and language pathologists frequently observe that speech of some clients who meet the characteristics of cluttering is less disorganized and contains more fluent complex linguistic structures during retelling a memorized story than in their spontaneous speech. This study explores the effect of these two narrative conditions on linguistic fluency and revision accuracy in speakers with syntactic cluttering and with phonologic cluttering. Speech samples of 12 participants with exclusively characteristics of syntactical cluttering, 13 participants with phonologic cluttering and 16 controls, in both conditions, were analyzed for frequency of non stutter-like disfluencies, morpho-grammatical and semantic errors and percentage of successfully revised errors. Participants with syntactic cluttering and with phonologic cluttering produced less non stutter-like disfluencies during retelling a memorized story. Participants with syntactic cluttering also were more accurate in revising errors in the retelling condition. However, comparison of the effect of the task between the groups yielded no evidence for a different influence of narrative task between groups. Analysis of the effect of the task in each separate group indicates that influence of the task might be stronger for people with cluttering. The findings support the assumption that the imposed topics and story structure of a retelling task facilitate linguistic planning for people who clutter. It is supposed that in a retelling task they are able to allocate more attention to their not fully automatized grammatical encoding process and to monitoring internal and overt speech. This improves their linguistic fluency and accuracy in revising errors on word and sentence level. It remains inconclusive whether this effect is specific for people with syntactic cluttering.

This study also addresses the way the different measures differentiate between the groups. People with syntactic cluttering produced more non stutter-like disfluencies, more errors and were less accurate in revising errors in both conditions. These differences proved to be significant for the frequency of errors in spontaneous speech of people with syntactic cluttering compared to controls.

1. Introduction

Speech therapists who give therapy to PWC, report that linguistic performance of some of their clients is better during retelling a memorized story than when they are asked to tell something about their daily lives; the so called ‘spontaneous speech task’. During

retelling these clients produce language that is less disorganized and contains more fluent complex linguistic structures (Van Zaalen and Winkelman, 2009). This observation is in line with what different leading clinicians in cluttering research report: performance differs depending on the speech task. It improves when the task is less complex and / or when the person who clutters pays more attention to his speech and language (St. Louis, Myers, Faragasso, Townsend and Gallaher, 2004; Daly, 2006; Ward, 2006; Van Zaalen and Dejonckere, 2010). However, the question how the narrative tasks retelling and spontaneous speech could have a different influence on linguistic cluttering symptoms has not been addressed. Therefore this study explores the influence of the narrative tasks retelling a memorized story and spontaneous speech on linguistic fluency in PWC. An attempt is made to explain which psycholinguistic processes are related to this effect and what it implicates for theories on the nature of cluttering.

1.1. Cluttering

The most recent working definition of cluttering is formulated by St. Louis, Bakker, Myers en Raphael (2010): 'Cluttering is a fluency disorder wherein segments of conversation in the speaker's native language typically are perceived as too fast overall, too irregular, or both. The segments of rapid and/or irregular speech rate must further be accompanied by one or more of the following: (a) excessive "normal" disfluencies; (b) excessive collapsing or deletion of syllables; and/or (c) abnormal pauses, syllable stress, or speech rhythm.'

Differences between phonological symptoms and linguistic symptoms in speech of people who clutter, inspired Ward (2006) to suggest a subdivision in motor cluttering and linguistic cluttering. Van Zaalen (2009) narrows the concept of motor cluttering to phonologic cluttering, because she found problems in phonological encoding rather than problems in motor execution. The characteristics of phonologic cluttering according to Van Zaalen are (see also Van Zaalen and Winkelman, 2009): word structure errors (coarticulation, telescoping or syllable sequencing errors) in multi-syllabic words. The predicate 'linguistic cluttering' is narrowed to 'syntactic cluttering' which refers to problems in grammatical encoding and word retrieval. These problems manifest themselves in non stutter-like disfluencies like word and phrase repetitions, interjections, hesitations and revisions. As explained, the subgroup that seems to

perform better during retelling a story seems to be more fluent on linguistic / syntactic level. It is therefore assumed that this subgroup exists of people with obvious characteristics of syntactic cluttering. It seems the characteristics that distinguish retelling from spontaneous speech support grammatical encoding and lexical retrieval, which results in production of less non stutter-like disfluencies.

1.2. Non stutter-like disfluencies

No speaker is completely fluent. Non stutter-like disfluencies are associated with increased conceptual or linguistic planning difficulties (Levelt, 1989; Fromkin, 1973; Goldman-Eisler, 1968). Every speaker has moments when retrieving the right word or constructing the right sentence is not smooth. Common disfluencies all speakers produce include hesitations, revisions, word and phrase repetitions and interjections like 'eh' or 'uhm'. These disfluencies are typical expressions of 'maze behavior' a term introduced by Loban (1976), referring to the image of a speaker trying to find his way to the correct verbal representation of what he intends to express. Loban (1976) defines a maze as a series of words, or parts of words or unattached fragments of speech which are not necessary to the communication unit (an independent sentence with it's modifiers): mazes do not contribute to the communication, they distort it. Maze behaviour is a normal phenomenon in everyday speech, but PWC often show abnormal levels of maze behavior.

1.2.1. Non stutter-like disfluencies in cluttering

The 'normal disfluencies' St Louis et al. (2010) refer to in their definition of cluttering form expressions of maze behavior (Van Zaalen op't Hof, Myers, Ward and Bennett, 2010). The guidelines of the American Speech-Language-Hearing Association on fluency (ASHA, 1999) state that the most commonly regarded normal disfluencies in cluttering are: 'hesitations or long pauses for language formulation; word fillers or non-word fillers (interjections) and phrase repetitions'. They refer to word repetitions as 'ambiguous disfluencies': they are sometimes regarded as normal and sometimes as abnormal (stuttering). The normal disfluencies are distinguished from the 'abnormal' (stutter-like) disfluencies. Revisions are not mentioned.

In their description of cluttering, based on the definitions of St Louis et al. (2010), Van Zaalen and Dejonckere (2010) speak of 'non stutter-like disfluencies' rather than of

normal disfluencies. Non stutter-like disfluencies is the term used in this study as it describes more accurate what it is: disfluencies that are not characteristic for stuttered speech.

Most disfluencies people who clutter produce are non stutter-like disfluencies (St Louis et al., 2010; Van Zaalen and Winkelman, 2009; Ward, 2006; Myers et al., 2003; Myers and Bradley, 1996). However, some PWC produce as much non stutter-like disfluencies as fluent speakers (St. Louis et al., 2007). In speech of people with phonologic cluttering frequencies are found comparable to those in speech of fluent speakers. The frequencies of non stutter-like disfluencies as a percentage of total number of words found in people with syntactic cluttering are much higher (Van Zaalen and Winkelman, 2009). De Oliveira, Bernardes, Broglio and Capellini (2010) found a percentage of 5,6 percent of words spoken for fluent speakers of Brazilian Portuguese and 12,6 percent for speakers who were diagnosed with cluttering. The authors do not distinguish between subtypes. Tree (1995) estimated the percentage of interruptions (pauses not included), repetitions and revisions in everyday speech of fluent speakers around 6 percent of words spoken. This percentage is based on various studies (see for example: Faure, 1980; Lutz et al., 1986; Kasl and Mahl, 1987; Voelker, 1944; all cited by Tree, 1995; see also Bortfeld et al., 2001). A recent study yielded percentages close to 10 percent of words spoken in 75 Dutch fluent adolescent speakers (Derksen, Duizendstra, Hoefnagel,Visser, 2010).

The non stutter-like disfluencies that are explored in this study are those indicated by ASHA guidelines plus revisions as indicated by St. Louis et al. (2010), Myers et al. (2003, as cited by St. Louis et al., 2007), Van Zaalen and Dejonckere (2010) and Ward (2006). These are: part word, whole word and phrase repetitions, interjections and revisions (paraphrases).

1.3. Cluttering and linguistic planning

A closer look at theories on the psycholinguistic explanation of cluttering, will give insight in how task differences could influence frequency of non stutter-like disfluencies in syntactic cluttering.

Various researchers have formulated theories on the psycholinguistic explanation of cluttering. An often cited definition is that of Weiss (1968) who stated that cluttering is caused by a central language imbalance which results in problems with rate, language

formulation and articulation. Referring to this hypothesis and others (see for example: Peters and Starkweather, 1990; St Louis and Hintzman, 1986; Daly, 1986; Mc Donald, 1964; all as cited by Myers, 1996) and the functionalist model of communication of Bates and Mac Whinney (1979) Myers (1996) suggests that speech rate of people who clutter exceeds their linguistic capacities: speech rate, language and articulation are not synchronized. She also points to the observation that people who clutter are not very good in monitoring their speech and language. The idea of cluttering as a problem of synchronizing speech rate, linguistic encoding and monitoring is reflected in the recent theory of Van Zaalen and Dejonckere (2010) who argue that cluttering is a language based fluency disorder with language automation, speech rate and attention as central concepts. They refer to the observation that persons with cluttering produce less non stutter-like disfluencies in less complex speech tasks, like reading and in situations were they pay more attention to their speech.

Van Zaalen and Dejocnkere (2010) and Van Zaalen et al. (2009a; 2009b) use Levelt's model of language production (Levelt, 1989) to give a psycholinguistic explanation of cluttering. This model divides the process of preparing an oral utterance in three components: (1) conceptualisator (creating the preverbal message); (2) formulator (lexical retrieval, constructing syntactic and phonological representation) and (3) articulator (transforming the linguistic representation to a motor program and speech production). During this process a central monitor located in the conceptualisator monitors the speech plan on all three levels: the propositions and pragmatic intentions of the preverbal message are monitored through the conceptual loop; the phonological speech plan is monitored through the inner loop; the speech output through the auditory loop.

Van Zaalen and Dejonckere (2010) and Van Zaalen et al. (2009a; 2009b) suggest that people with cluttering might have 'a "double deficit"': a not fully automated linguistic encoding process (grammatical and phonological) and as a result of that, weak monitoring, because attention is needed to overcome the not fully automated linguistic encoding processes.

Van Zaalen and the Jonckere (2010 hypothesize that in a more complex situation language formulation demands a relatively large part of attention. As a result of this not enough attention is left for monitoring. This may result in unintelligible speech, with excess phonological errors like telescoping and co-articulation. This occurs when

language production is insufficiently automatized on the level of phonological encoding. When grammatical encoding is not automatized, the effect is expressed by linguistic symptoms: excessive production of non stutter-like disfluencies (Van Zaalen 2009).

All authors agree on speech rate as one of the central aspects in cluttering, although overall speech rate often is within normal levels when measured objectively (St. Louis et al., 2010; Van Zaalen et al., 2009). Van Zaalen et al. (2009a) found that non stutter-like disfluencies where more frequent in utterances where people talk at a fast rate. They see this as evidence for the hypothesis that in cluttering speech rate often is to fast for linguistic encoding and monitoring (see also: St. Louis et.al., 2007; Myers, 1996a). This explains why performance of PWC improves, temporarily, when they are instructed to slow down their speech rate. It seems persons with cluttering are not able to adjust their speech rate to language complexity as people without cluttering do (Van Zaalen and Dejonckere, 2010).

The other levels of language production, the articulator and the conceptualisator, are less likely to be affected in cluttering. PWC perform comparable to fluent speakers in simple articulation tasks like repeating nonsense syllables (Van Zaalen et al., 2009b; Hartinger and Mooshammer, 2008). Articulatory problems observed in cluttering are more likely to be a result of problems in phonological encoding.

Different authors mention that in clinic they observed people who clutter who seem to have difficulties in producing clear and cohesive narratives which manifests in pragmatic errors for instance in maintaining a focused topic and accurate referral (Myers and Bradley,1996; Myers, 1996b; Ward, 2006). These findings point to problems at the level of the conceptualisator. Pragmatic performance in cluttering had not been explored in experimental studies until an experiment by Van Zaalen Wijnen and Dejonckere (2009b) in which people had to retell a memorized story. This study did not reveal problems at the level of the conceptualisator: the children with cluttering produced primary and secondary plot elements comparable to controls. As Van Zaalen et al. (2009e) mention, it is quite possible that in a less structured speech task PWC will have problems in organizing their discourse, for instance in spontaneous speech. This question is not addressed in this study, as it focuses on the hypothesis of van Zaalen et al. (2009a; 2009b) that cluttering is related to less automatized language processing at formulator level.

In cluttering attention is regarded a central factor in speech performance (St. Louis et al., 2010; Ward, 2006; Van Zaalen and Winkelman, 2009). Levelt (1989) explains how attention is involved in language production. The conceptual planning of an utterance is an intentional activity: the speaker has a goal and decides what verbal action he will use to realize this goal. In cognitive psychology it is generally acknowledged that intentional activities are under central or 'executive' control (Carroll, 2007). Executive processes rely on attention and working memory resources. During language production (and other cognitive activities) attention determines what information is processed at what moment in working memory: information that is activated in long term memory or that is perceived will be transferred to working memory for further processing only if it is attended to. If it is not attended to, it will lose its activation very fast. (Carroll, 2007). Monitoring the conceptual plan and internal and overt speech, is an intentional activity that demands attention (Levelt, 1986). Levelt (1986) argues that the other components of language processing, lexical retrieval, linguistic encoding and articulation are highly automatic. This means they take place without intention and that they operate largely on their own resources: they do not share attention capacity, with other processes. These processes are fast, which is a prerogative for producing speech at a normal speech rate: speech would be slowed down considerably if a speaker had to think about the different synonyms he could choose or grammatical structures. It is not that he can not attend consciously to these issues, but in normal everyday conversation he does not do it. Studies that explored the processing resources during the different stages of language production lead to a modification of this view. There is empirical evidence that during the stages of lexical retrieval and grammatical encoding attention and working memory resources are demanded: different researchers found that concurrent tasks during language production slow down lexical retrieval and grammatical encoding (Hartsuiker and Barkhuysen, 2010; Ferreira and Pashler, 2002; for more references see Carroll, 2007). This means that these processes are not entirely automatic. These findings mean more of a refinement of the assumptions of Levelt (1989) on the automaticity of the language production process than a rejection. The argument of Levelt that language production would be very slow without any form of automation of grammatical and phonological encoding is very plausible. In this study it is assumed that the grammatical (and phonological) encoding process is in part automated and partially not. How much they depend on attention capacity and working memory is determined by how

automated the language formulation process is: the more automated the less attention and working memory capacity is needed for language formulation.

1.3.1. Non stutter-like disfluencies and linguistic planning

Van Zaalen and Dejonckere (2010) suggest people with syntactic cluttering use non stutter-like disfluencies to gain time for linguistic planning: when the speaker has already articulated part of his message without the following part being ready for articulation, he repeats a part of the message that has already been planned or adds a pause or interjection. They base their hypothesis on the high frequency of word and phrase repetitions found in PWC and the observation that they produce sentence constructions comparable to controls in written discourse and in their speech after removal of revisions, interjections and repetitions (Van Zaalen et al., 2009a). They conclude that this proves that PWC are very well able to construct linguistic structures comparable to fluent speakers but that they often do not have enough time to do it. Howell (2007) proposes a model that describes this situation. This EXPLAN – 'execution and planning' - model explains how asynchrony between planning and execution causes 'stalling' and - less relevant for this study - advancings. With 'stalling' Howell refers to word and sentence part repetitions, filled pauses (interjections) and unfilled pauses. This model assumes that linguistic planning and motor programming and execution are independent processes. Disfluencies are a result of linguistic planning that is not in pace with motor programming and execution: a word or phrase already has been uttered while the linguistic representation of the next word or phrase is not completed. This model suggests that execution takes place when the linguistic plan has reached a critical activation threshold. The activation rate buildup depends on the complexity of the word on the different linguistic levels (semantic, syntactic, lexical, morphological, phonological, phonetic and prosodic). The more complex a word is, the longer and more gradually the activation buildup will be. Howell found evidence for this effect in cases where a relatively easy to process function word precedes a more difficult content word. This situation arises when articulation (execution) of the simpler function word is ready before the next more complex content word has reached its activation threshold for execution. In this situation the speaker keeps on repeating a function word or cluster of function word prefixes until the motor plan for the content word is ready. According to this model a word can reach it's activation threshold before

the linguistic representation is complete. This leads to part word repetitions. As Howell explains, this model points to two possible problems that cause stalling: a language planning process that is to slow, or speech rate that is too fast.

The EXPLAN model explains the appearance of repetitions and interjections, but not revisions. A well known other theory that explains disfluencies, including revisions is the Covert-Repair-Hypothesis of Postma and Kolk (1993) that is based on findings of Levelt (1989; 1983) and Dell (1980), who studied correction of speech errors. According to this hypothesis disfluencies are related to self-corrections during speech production. They distinguish overt repairs where the error and the repair are clear in the speech, for example: 'You made so much noise you worke Cor? – wore? – w?- woke Corky up" (Postma, 1993).' The error is detected after it is articulated. Revisions can be classified as overt repairs. Postma and Kolk (1993) assume that disfluencies in which the utterance is not overtly changed ('this is .. a horizontal line') reflect a covert repair. The error is detected and corrected before it is articulated. Levelt specifically points to interjections and repetitions as markers for covert repairs, for example: 'And at the right side an orange dot, orange dot' (Levelt, 1983). As Levelt states the interjections and repetitions do show that the speakers is monitoring his speech before articulation has taken place, but the exact nature of the repetitions and interjections is uncertain: 'It is almost always impossible to determine what the speaker is monitoring for. It is even impossible to decide whether a covert repair results from a 'false alarm' of the monitor, though this is surely a theoretical possibility.'

The uncertainty about repetitions and interjections as genuine repairs and the consideration that PWC are presumed to have weak monitoring skills and therefore often do not repair errors (Van Zaalen and Dejonckere, 2010; Ward, 2006) make it more likely that repetitions and interjections are related to a time gaining effect than to repairs.

Another way to look at revisions is offered by the results of an experimental study by Engelhardt, Corley, Nigg and Ferreira (2010). They found that people with a combined inattentive and impulsive ADHD profile produced significant more revisions than controls. They found no effect for filled pauses and repetitions. Engelhardt et al. (2010) argue that because ADHD is related to deficits in inhibitory function and response suppression, this supports the assumption that the language production system relies on inhibitory control in order to prevent inappropriate words and word sequences from

being articulated. It seems that when this inhibitory control is not optimal, more non stutter-like disfluencies, especially revisions, are produced. These results lead to the question whether the same mechanism causes PWC to make more revisions than fluent speakers: could it be that they are less efficient in suppressing less relevant lemma's and lexemes that are activated during language planning?
Revisions can be successful and unsuccessful and speakers can omit to revise incorrect utterances. An interesting question is whether people with syntactic cluttering are as accurate in revising errors as people with phonologic cluttering and fluent speakers. Therefore this study explores the relation between successful revisions and errors related to grammatical encoding and lexical retrieval.

1.4. Tasks

Linguistic fluency may differ between narrative tasks and discourse contexts. This has been proven in various experiments within the field of stuttering research (e.g. Weiss, 2004; Trautman, Healey, and Norris, 2001; Au Yeung and Howell, 1998; Weiss and Zebrowski 1997; Goldman Eisler, 1968) and also with normal fluent first and second language speakers (e.g. Trautman, Healey and Norris, 2001; Bortfeld, Leon, Bloom, Schober, Brennan, 2001; Skehan and Foster, 1999; Goldman Eisler, 1968). However, results of these studies are not consistent. Weiss (2004) points to the finding that 'unstructured conversation contexts' exacerbate disfluencies in children who stutter. Weiss and Zebrowski (1997) observed this comparing goal oriented structured conversation (e.g. putting together a Lego figure) and children talking about a topic of their choosing. No indication is given of how the different types of disfluencies differ between conversation tasks. Trautman et al. (2001) found significant differences in frequency of 'mazing' (false starts and revisions) and stutter-like disfluencies between a retelling task and a expository ('how to') task for children who stutter, children with language impairment and controls: mazing and stuttering occurred more often in the retelling task. The non stutter-like disfluencies repetitions and interjections did not differ significantly between tasks. Bortfeld et al. (2001) observed that fluent speakers who give directions or who discuss abstract topics produce more repetitions, restarts and interjections than when receiving and matching directions (on were to place an object) or when discussing photographs of children. Skehan and Foster (1999) observed fluent English speakers who produced less non stutter-like disfluencies during retelling a

predictable well structured story compared to a less predictable and less structured story. Roberts, Meltzer and Wilding found no differences between an expository task ('tell me how you play hockey / tennis') versus two narrative generation tasks ('tell me about your job / your hobby') in 25 English speaking men without a communication disorder. Derksen, Duizendstra, Hoefnagel and Visser (2010) explored non stutter-like disfluencies 75 native fluent Dutch adolescents produced in a retelling task and in spontaneous speech. They also found no significant difference between the tasks.

A study by Schachter, Christenfield, Ravina and Bilous (2009) illustrates how fluency is influenced by the number of options the speaker can choose: they found less interjections in lectures in more formal, structured, factual disciplines than in lecturers in the humanities. This was not a result of a different fluency profile of the lecturers, as was tested with an interview on a common topic.

Despite the great variety in tasks, measures and outcomes, most of the discussed literature points to a relation between task complexity and frequency of non stutter-like disfluencies. It seems that offering a pre structured task will facilitate conceptual planning: the speaker has fewer choices to make.

No study is found that addresses the influence of the narrative tasks retelling a memorized story versus spontaneous speech in cluttering.

An important difference between retelling an auditory presented story and spontaneous speech is that in the first task the topics and the story structure are constrained and that the speaker has perceived the concepts, the words, the sentences and the story structure relative shortly before retelling. The linguistic context that is offered differs between these tasks. The linguistic context comprises the speech material that precedes and follows a particular word or utterance, not only speech material in the direct context, but also words and sentences that are produced much longer before or after or even by an other speaker (Au-Yeung en Howell, 1998). The linguistic context outside the individual words and sentences is formed by the discourse: the conversation the speaker is participating in or the monologue he is constructing. Psycholinguists and philosophers draw a distinction between the meaning of the discourse and the exact wording, or surface form. Research has shown that people recall meaning much better than form (Fletcher, 2001). During discourse processing, the discourse is retained in memory in three ways (Carroll, 2007; Fletcher, 2001):

1. surface representations: the exact linguistic structures of the utterances;

2. propositional representations: an interconnected network of propositions representing the meaning of what has been perceived and the inferences the listener may have drawn on this information;
3. a situational model: that contains causal and temporal situations and that can include sensory motor information.

Exact linguistic structures (surface representations) are only kept in working memory for a short time and transferred to episodic long term memory when pragmatically relevant. Propositional representations are better retained and situational models are the most robust memory representations.

In speech production the speaker generates propositions on the basis of the situational models he has constructed. The propositions are used to construct the preverbal message. The preverbal message is the product of the conceptualisator as described in the model of speech production of Levelt (1989).

A speech task in which the situational model is pre-structured results in a limitation of the propositions that can be selected and the connections that can be made between: this means constructing the pre-verbal message demands less attention. It is therefore assumed that a more structured speech task demands less attention capacity on conceptual level and leaves more capacity for language formulation and monitoring. Because it is assumed that the language formulation of PWC is not automatized optimally, it is expected that they will benefit more from a pre structured task than controls.

Another factor that could have an effect on difference in cluttering symptoms between the two tasks is concentration. Concentration improves speech performance temporarily in cluttering and as a result of this PWC tend be more fluent in a more formal setting when they pay more attention to their speech and language (Ward, 2006; Van Zaalen and Winkelman, 2006; Daly and Burnett, 1996). The question is whether a retelling task is associated with higher concentration than spontaneous speech. Because in this study both tasks are performed in a clinical setting, it is presumed that concentration is relatively high in both situations.

1.5. Hypothesis

The main focus of this study is to test the hypothesis that people with syntactic cluttering perform better on measures of linguistic fluency and revision accuracy in a retelling task versus spontaneous speech. It is assumed that the imposed story structure of the retelling task makes language processing easier on conceptual level. When processing is easier on conceptual level, more attention capacity is available for language formulation and monitoring. This will improve linguistic and speech performance, amongst which linguistic fluency the research objective of this study.

In line with Van Zaalen et al. (2009a; see also Van Zaalen 2009) it is assumed that people with syntactic cluttering have a less automatized grammatical encoding process and as a consequence of that weak monitoring. Facilitating language production on conceptual level will result in more attention capacity for language formulation and for monitoring. Articulation and language formulation will less often be out of synchrony and errors and repairs are detected and repaired more accurate. It is hypothesized that this will be noticeable in outcomes related to grammatical encoding, lexical retrieval and monitoring: they will produce less non stutter-like disfluencies and less morpho-grammatical and semantic errors and they will be more accurate in revising errors during retelling. Because people with phonological cluttering and fluent controls have a more automatized grammatical encoding process, it is assumed that for these groups the influence of the speech task on outcomes of linguistic fluency an revision accuracy is less strong.

Diagnosis of cluttering is based on clinical judgment. Non stutter-like disfluencies are one of the characteristics that are assessed for diagnosis. These are regarded as the main characteristic of syntactic cluttering. It therefore seems obvious to presume that objective measurements of non stutter-like disfluencies will differentiate between people with syntactic cluttering, people with phonologic cluttering and fluent controls. Less is known about the relation between syntactic cluttering and the other two measures of linguistic fluency and maze behavior (morpho-grammatical and semantic errors and successful revisions). A secondary goal of this study is to test the extend to which the different measures differentiate between the group diagnosed with syntactic cluttering, the group diagnosed with phonologic cluttering and controls.

2. Method

To explore the influence of narrative task on linguistic fluency and accuracy of revisions, an experiment was set up with three groups of speakers: people diagnosed with exclusively syntactic cluttering, people with exclusively phonologic cluttering and fluent controls. All participants were tested in the two tasks: spontaneous speech and retelling a memorized story.

2.1. Participants

Participants in this study were 41 adults who were all native Dutch speakers. Twenty-five participants were diagnosed with cluttering at the Centre for Fluency Disorders, Amersfoort, the Netherlands. Diagnosis was based on the assessment as recommended by the International Cluttering Association (see Van Zaalen, Myers, Ward, Bennett, 2010a; Van Zaalen and Winkelman, 2009). This method involves scoring of the stutter and non stutter-like disfluencies, articulation rate and assessment of performance on articulation accuracy, language (word, sentence and story structure). This is performed in different speech tasks amongst which spontaneous speech and retelling a memorized story. Also self awareness of one's speech and the perception of one's communicative behavior are part of the assessment. Twelve participants (1 female, 11 males) had exclusively signs of syntactic cluttering as defined by Van Zaalen (2009) and Van Zaalen and Winkelman (2009). Thirteen participants (4 females, 9 males) were diagnosed with phonologic cluttering, also according to the definition by Van Zaalen (2009) and Van Zaalen and Winkelman (2009).

The 16 other participants (12 females, 4 males) were all university students without any signs of a fluency disorder. They were recruited by a student of speech and language therapy of Fontys University of Applied Sciences. This was done under supervision of a speech and language therapist specialized in fluency disorders.

Participants with a mixed cluttering and stuttering profile are not included because this would lead to results that could also be influenced by the stuttering component of the fluency disorder. In this study only adults are included, to rule out non stutter-like disfluencies related to development of grammatical and morphological abilities, as seen in children.

The number of participants per group are comparable to those in other experimental studies that compared disfluencies in two or more groups and that found significant

differences in the frequency of disfluencies (see for example Van Zaalen, Wijnen and Dejonckere, 2009a; De Oliveira et. al., 2010; Sawyer, 2008; Bakker and Brutten, 1990; St. Louis and Hull, 1985; Yairi and Gintautas, 1981). Thus these numbers seem sufficient to determine significant differences in frequency of non stutter-like disfluencies if they exist in the data sample.

2.2. Speech samples

In this study speech samples of 1 to 3 minutes were used: 41 samples of spontaneous speech of each participant and 41 samples of the participants retelling a memorized story. The samples of PWC were recorded in a clinical setting at the Centre for Fluency Disorders, in Amersfoort. The samples of the controls were recorded by the student of language and speech therapy.

Of each speech sample a fragment with a minimum of 120 and a maximum of 200 words was selected for analysis. With this number of words the sample length is above the 200 syllable samples that are recommended in the latest version of the stuttering severity index (Riley, 1994). The selection of spontaneous speech did not contain the first 20 words of the sample, to exclude the effect of increased attention during the start. Of the 41 retelling fragments 12 contained between 90 and 120 words and two contained 70 words. These were included for analysis.

2.3. Speech tasks

The two speech tasks that are compared are a monologue of spontaneous speech and retelling a memorized story. In the spontaneous speech task the therapists encourages the client to tell something about his daily life with an open question like: ‘What kind of job do you have’, ‘What did you do in your holiday’. For the retelling task the standardized story called the ‘Wallet story’ was used, as is recommended by Van Zaalen and Winkelman (2009) for assessing Dutch speakers on fluency problems. This is a story about a woman who is going out for groceries and loses her wallet. The client is instructed to listen carefully to the therapist and to memorize the story.

2.4. Data collection

All speech fragments were transcribed orthographically. In the transcripts the words that are part of a non stutter-like disfluency were underlined. The following dependent variables were scored:

- Number of non stutter-like disfluencies (NSD) per 100 words: (ratio NSD / total number of words) x 100
- Number of each category of NSD per 100 words: revisions, interjections, repetitions (also divided by total number of words and multiplied by 100)
- Number of incomplete sentences or sentences with morpho-grammatical errors and non successful paraphrases (errors), per 100 words: (ratio errors / total number of words) x 100
- Number of successful revised errors per 100 words: (ratio successful revised errors / total number of errors including successfully revised errors) x 100

Data collection was performed by a student of clinical linguistics and hearing sciences without knowledge of diagnoses of the participants.

2.4.1. Non stutter-like disfluencies

According to the method described by Van Zaalen and Winkelman (2009) which is based on the guidelines of the International Cluttering Association (Van Zaalen et al., 2010a), the following non stutter-like disfluencies were coded and counted: Interjections, revisions (paraphrases of part of the sentence), part word repetitions (produced without stress), word repetitions (produced without stress), sentence part repetitions (produced without stress).

The frequency of non stutter-like disfluencies per 100 words is obtained by counting the instances of disfluency in a sample, dividing it by the total number of words and multiplying it bij 100. As Yaruss (1998) explains it is important to consider the methodological issues of how to code disfluencies that consist of a cluster of words or word parts. He also points to the question of whether to include the words of a disfluency in the total word count. Firstly Yaruss warns for overestimating disfluency which will happen when repetitions of one and the same disfluency are coded as separate instances, for example: 'I-I-I-I-I want that' (Yaruss, 1998). The repetition 'I-I-I-I-I' should be coded as one disfluency. As it comes to word count it is important not to inflate the total number of words, the denominator of the ratio number of disfluencies /

total number of words. This will result in bias caused by the number of words that are implicated in disfluencies: when all words including those that are part of a disfluency are counted, the denominator is larger than when words in disfluencies are excluded. More and longer disfluent clusters will cause the ratio to be lower than in speech with shorter clusters. See the hypothetical examples 1) and 2).

1) I think that I thought I could do this
2) I think thought I could do this

Example 1) and 2) both have one revision, which is counted as one non stutter-like disfluency. But the revision in 1) is a longer cluster of words. As a result of this the total number of words of 1) is higher than of 2). The ratio non stutter-like disfluencies / total number of words for sentence 1) is 1/9 (0,111), for sentence 2) it is 1/6 (0,167). It seems speech in example 1) is more fluent. It therefore seems the speaker performs better in example 1) than in 2). However, one could argue that example 1) is less efficient as the speaker needs more words for the same message. Therefore the speaker does not perform better in 1) and probably even worse. More words included in a revision could make the discourse even more difficult to process for a listener. Yaruss (1998) proposes only to count the words that contribute to the message. Following this method both examples would have a ratio of 1/6 (0.167). This method seems to have face validity. Thus in this study the words that are implicated in non stutter-like disfluencies were not included in the total word count. This is also according to the method of assessing non stutter-like disfluencies in spontaneous speech and retelling a story as recommended by Van Zaalen and Winkelman (2009).

2.4.2. Revisions

Revisions were sub divided in successful and unsuccessful revisions. Successful revisions are revisions that lead to a morpho-grammatical correct sentence with the correct words considering the context of the topic of the discourse. In case there were no revisions and no errors, the ratio successful revised errors / total number of errors (including revisions) was set at the best possible score and that is 1.

2.4.3. Errors

The errors that were scored consisted of incomplete sentences, sentences with incorrect

word order and inaccurate paraphrases. These are errors that people who clutter produce to a greater extend than fluent speakers (Ward, 2006).

3. Results

Table 1 presents the mean results and standard deviations of each group within each speaking task on the three measures: non stutter-like disfluencies per 100 words, number of incomplete sentences or sentences with morpho-grammatical errors and non successful paraphrases per 100 words; successfully revised errors per 100 words. The differences between the tasks within each group are also presented. One extreme outlier (more than 2.5 SD from mean) was removed before hand. This was a score of errors in spontaneous speech in the group phonological cluttering. (N.B. Tests were repeated after removal of all outliers with parametric and non parametric tests. This did not result in different conclusions about significance of effects. Therefore results of the parametric tests are presented with only the extreme outliers excluded). See also the boxplots of the mean differences between the two tasks for each group (figures 1 – 3).

3.1. Influence of the narrative tasks

To compare the influence of the speech task between the three groups, the scores on the three measures were submitted to a mixed two way analysis of variance with task (spontaneous speech, retelling) as within subject factor, and group (people with syntactic cluttering, people with phonologic cluttering and controls) as between subjects factor. An alpha level of 0.05 was adopted. Statistical analysis was performed with SPSS.

Results of the mixed within-between subjects Anova reveal no evidence for a significant interaction between group and task (retelling a memorized story and spontaneous speech) for none of the three measures: non stutter-like disfluencies, $F(2,38) = 0.983$, $p = 0.384$; errors, $F(2,37) = 0.127$, $p = 0.881$; successful revised errors, $F(2,38) = 0.451$, $p = 0.640$. Within subjects Anova shows that task has a significant effect across groups on non stutter-like disfluencies, $F(1,38) = 12.100$, $p = 0.001$ and successful revised errors, $F(1,38) = 9.014$, $p = 0.005$. The participants seem to produce less non stutter-like disfluencies and to revise more errors successfully in the retelling task than in spontaneous speech, but this effect does not differ between the groups. Results point to

a not significant decrease of errors in the retelling task, $F(1,37) = 2.503$, $p = 0.122$.

The observed difference in each separate group was tested with t-tests for paired samples. This was performed for non stutter-like disfluencies and successful revised errors because these two measures differ significantly between the tasks, across the groups. The results are presented per measure in the following and in table 1.

3.1.1. Non stutter-like disfluencies

Paired samples t-tests reveal a significant decrease of number of non stutter-like disfluencies in the retelling task compared to spontaneous speech in the group with syntactic cluttering, $t(11) = -4.21$, $p = 0.001$. On average participants with syntactic cluttering produced 3.17 non stutter-like disfluencies per 100 words less in the retelling task. A significant decrease of non stutter-like disfluencies was also found for the group with phonological cluttering, $t(12) = -2.599$, $p = 0.023$, with a mean difference of 4.36 disfluencies per 100 words. This indicates that task has a significant influence on number of non stutter-like disfluencies the participants with syntactic cluttering and the participants with phonological cluttering produced. For the control group results indicate a non-significant decrease of non stutter-like disfluencies in the retelling task versus spontaneous speech, $t(15) = 0.925$, $p = 0.370$.

3.1.2. Revised errors

Results indicate a significant increase of successful revised errors during retelling versus spontaneous speech in the group of people with syntactic cluttering, $t(11) = 2.182$, $p = 0.052$. A decrease of successful revised errors is observed in the group with phonologic cluttering and the control group for retelling compared to spontaneous speech, but these differences are not significant, phonologic cluttering $t(12) = -1.280$, $p = 0.225$; controls $t(15) = 1.792$, $p = 0.093$.

Table 1 Means and standard deviations of number of non stutter-like disfluencies, errors and revised errors per 100 words.

	PWCsynt (N=12)		PWCphon (N=13)		Controls (N=16)	
	M	SD	**M**	SD	**M**	SD
NSD sp	**12.36**	3.69	**11.58**	4.40	**9.13**	4.04
NSD ret	**9.19**	4.13	**7.22**	5.00	**7.62**	5.89
Difference sp-ret	**3.17***	2.60	**4.36***	6.14	**1.51**	6.51
Errors sp	**1.71**[a]	1.26	**1.35**	0.55	**0,69**[a]	0.66
Errors ret	**1.32**	1.17	**1.06**	1.51	**0,51**	0.70
Difference ret-sp	**0.39**	1.22	**0.29**	1.29	**0.18**	0.93
Revised errors sp	**46.42**	23.27	**50.77**	25.86	**68.79**	28.08
Revised errors ret	**69.92**	24.16	**66.31**	35.48	**79.56**	29.41
Difference ret-sp	**-23.50***	37.30	**-15.54**	45.63	**-10.74**	24.01

* Significant difference between spontaneous speech and retelling within the group at $p \geq 0.05$ (checked with t-test for paired samples)

Group means with the same superscript differ significantly (comparison with one way Anova with post hoc Tukey's b procedure)

- NSD: number of non stutter-like disfluencies / total number of words (ex. Words that are part of NSD), per 100 words
- *errors*: unfinished sentences and sentences with morpho-grammatical errors and not accurate paraphrases / total number of words, per 100 words
- *revised errors*: successfully revised errors as a percentage of total number of errors (including revisions)
- *sp :* spontaneous speech task
- *ret:* retelling task

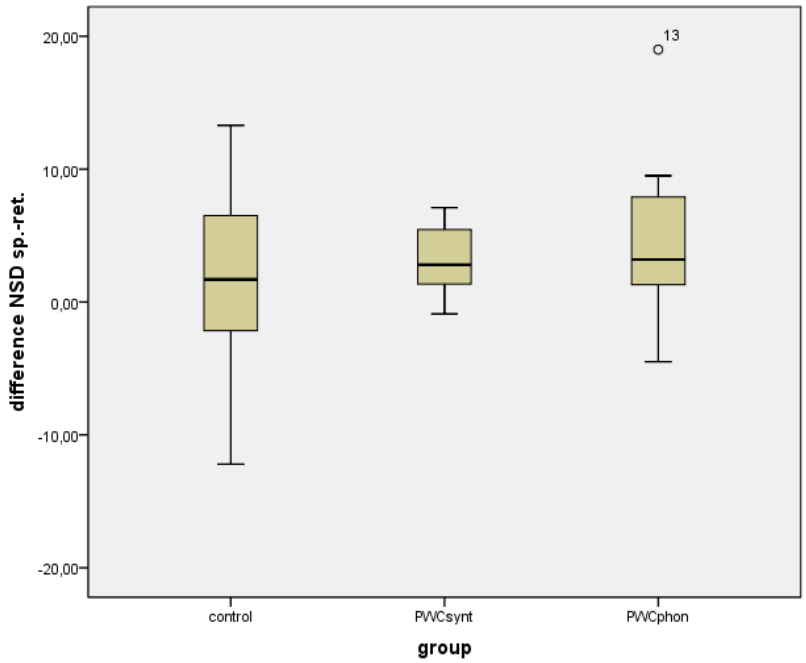

Figure 1: Number of normal disfluencies per 100 words. Differences between spontaneous speech versus retelling for the three groups: controls, people with syntactic cluttering (PWCsynt), people with phonologic cluttering (PWCphon). Median indicated with horizontal line; interquartile range (middle 50% of scores) in the box, lower 25 % and upper 25% of scores indicated with whiskers.

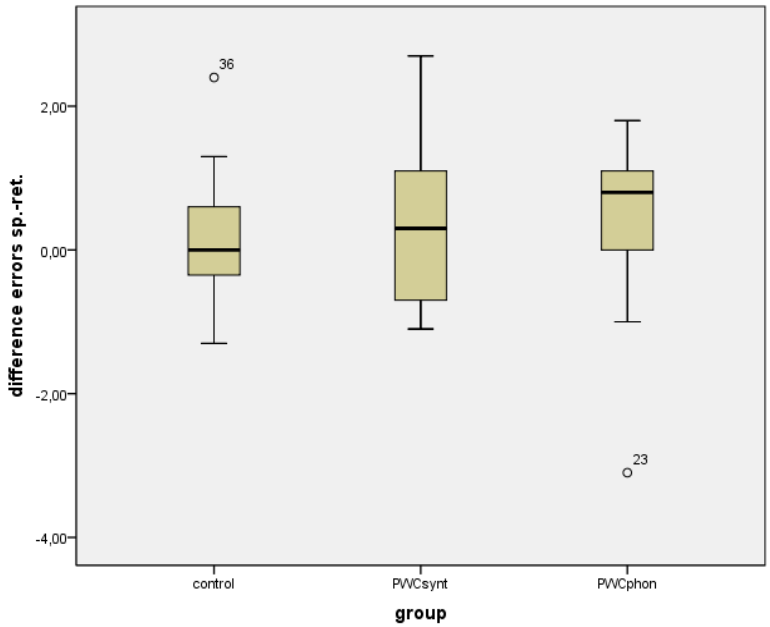

Figure 2: Number of errors per 100 words. Differences between spontaneous speech versus retelling for the three groups: controls, people with syntactic cluttering (PWCsynt), people with phonologic cluttering (PWCphon). Median indicated with horizontal line; interquartile range (middle 50% of scores) in the box, lower 25 % and upper 25% of scores, indicated with whiskers.

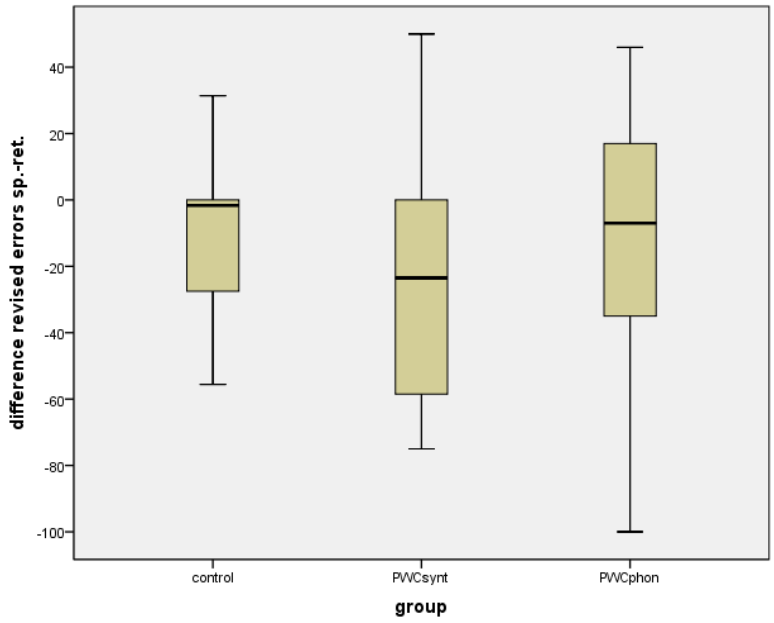

Figure 3: Percentage of successfully revised errors. Differences between spontaneous speech versus retelling for the three groups: controls, people with syntactic cluttering (PWCsynt), people with phonologic cluttering (PWCphon). Median indicated with horizontal line; interquartile range (middle 50% of scores) in the box, lower 25% and upper 25% of scores indicated with whiskers.

3.2. Differentiating between groups

An additional question of this study is to what extend the different measures of linguistic fluency and revision accuracy differentiate between the three groups. In light of this question the separate non stutter-like disfluencies - interjections, repetitions and revisions - are also considered. These are the three disfluencies that were counted in this study and summed up to a total number of disfluencies for each participant in each task. Table 2 presents the means and standard deviations of the separate non stutter-like disfluencies revisions, interjections and repetitions.

One way Anova was applied to compare the groups on all measurements within each condition. If a significant overall difference between the 3 groups was found, pair wise comparisons between groups were performed with Tukey's b procedure to detect which groups differ significantly.

No significant differences between the groups were found for number of non stutter-like disfluencies, in neither of the narrative tasks: spontaneous speech, $F(2,38) = 2.48$, $p = 0.097$; retelling, $F(2,38) = 0.51$, $p = 0.604$.

Results show a significant difference between the groups for number of errors in the spontaneous speech condition, $F(2,32) = 5.14$; $p = 0.011$. Participants with syntactic cluttering made more errors than the controls in spontaneous speech, with a mean difference of 3.23 errors per 100 words.

For the retelling task no significant differences between the groups were found for frequency of errors, $F(2,38) = 2.08$, $p = 0.139$.

Comparison of the groups on successfully revised errors in spontaneous speech showed a not significant difference, $F(2,38) = 2.9$, $p = 0.062$. For the retelling task also no significant differences between the groups were indicated, $F(2,38) = 0.758$, $p = 0.467$.

Results of one way Anova with post hoc Tukey's b indicate significant differences between the groups for number of revisions in the retelling task, $F(2,38) = 3.602$, $p = 0.037$. Participants with syntactic cluttering made more revisions during retelling than participants with phonologic cluttering, with a mean difference of 1.4 revisions per 100 words.

In the spontaneous speech condition no significant differences were found, $F(2,38) = 2.38$, $p = 0.106$.

No significant between group differences were found for the interjections: spontaneous speech, F(2,38) = 0.33, p = 0.72; retelling, F(2,38) = 0.02, p = 0.982.

Comparison of the groups on number of repetitions resulted in a significant difference between the groups in spontaneous speech, F(2,38) = 3.24, p = 0.05. People with syntactic cluttering produced more repetitions than controls, with a mean difference of 1.4 repetitions per 100 words.

Differences between number of repetitions between the groups in the retelling task proved to be not significant, F(2,38) = 0.01, p = 0.991.

Table 2 Means and standard deviations of separate non stutter-like disfluencies per 100 words.

	PWCsynt (N=12)		PWCphon (N=13)		Controls (N=16)	
	M	SD	**M**	SD	**M**	SD
revisions sp	**2.43**	1.48	**2.29**	1.06	**1.53**	1.06
revisions ret	**2.64**[a]	1.33	**1.26**[a]	0.93	**1.78**	1.51
interjections sp	**7.41**	2.88	**7.49**	3.99	**6.59**	2.96
Interjections ret	**5.17**	3.72	**4.86**	4.29	**4.99**	4.12
repetitions sp	**2.41**[b]	1.84	**1.89**	1.19	**1.02**[b]	1.37
repetitions ret	**0.86**	0.46	**0.88**	1.30	**0.83**	1.05

Group means with the same superscript differ significantly. Comparison with one way Anova (alpha level 0.05) with post hoc Tukey's b procedure)

- *sp :* spontaneous speech task
- *ret:* retelling task

4. Conclusion and discussion

4.1. Influence of the narrative tasks

The results of this study show that complexity of the narrative task has an influence on linguistic fluency of people with syntactic and phonologic cluttering. In a retelling task they are more fluent than during spontaneous speech. This effect can be explained with help of the model of speech production of Levelt (1989). Because the retelling task is more structured it is easier on conceptual level - the level of the 'conceptualisator' (Levelt, 1989). As a consequence more attention capacity is available for language formulation at the level of the 'formulator' (Levelt, 1989) and monitoring inner and overt speech. This effect is visible in outcomes related to grammatical encoding: people with syntactic cluttering produce less non stutter-like disfluencies and are more accurate

in revising grammatical and semantic errors. Participants with phonologic cluttering only produced less non stutter-like disfluencies. The number of incomplete sentences or sentences with morpho-grammatical or semantic errors is not affected by speech task. These outcomes confirm the observation by speech and language therapists that linguistic fluency of some PWC is better in a retelling task than during spontaneous speech.

In this study the assumption is that the influence of the narrative task on linguistic fluency and revision accuracy would be stronger for people with syntactic cluttering. This assumption is based on the suggestion by Van Zaalen (2009) that syntactic cluttering is a consequence of an insufficiently automatized grammatical encoding process. This study does not provide direct support for this hypothesis: no significant interaction effect between group and task has been found. Results of this study show that complexity of the task does have an effect, however this effect is also found in the group with phonological cluttering. This implicates that the grammatical encoding process in people with phonologic cluttering also is not fully automatized, although it may be automatized to a higher degree than in people with syntactic cluttering.

In a more indirect way the results implicate that a stronger effect of narrative task for people with syntactic cluttering does exist. This was found when comparing the score pairs within each group. In the group with syntactic cluttering the differences between the two tasks were significant for two of the three measures (non stutter-like disfluencies and successfully revised errors), while in the group with phonologic cluttering a significant difference was found for only one measure (non stutter-like disfluencies). In the group of fluent controls no significant differences were found. This supports the idea that complexity of the narrative task, on conceptual level, has a stronger effect on linguistic fluency of people with syntactic cluttering, although it has not been confirmed by an interaction effect between group and task. Finding stronger evidence for this idea would support the hypothesis of Van Zaalen and Dejonckere (2010) and Van Zaalen (2009) that in syntactic cluttering the grammatical encoding processes is not fully automatized and therefore demands relatively much attention and leaves fewer resources for monitoring and adapting speech rate to the linguistic demands of the moment.

4.2. Differentiating between groups

It is surprising to see that the number of non stutter-like disfluencies did not differ meaningful between groups in this study. Even more since the frequency of non stutter-like disfluencies was one of the characteristics the therapists considered in diagnosis of the participants with cluttering in this study. This is not in line with what is known and hypothesized about cluttering. Excessive production of 'normal' or non stutter-like disfluencies is generally considered as one of the key characteristics of the disorder (St Louis et al., 2010) specifically in syntactic cluttering (Van Zaalen, 2009; Van Zaalen and Winkelman, 2009; Ward, 2006). This does not mean that diagnosis was not accurate: therapists not only consider the number of interjections, revisions and repetitions when assessing speech of people with fluency problems. They also consider the characteristics of phonologic cluttering, stutter-like disfluencies and the speakers awareness of his communicative performance. Probably therapists also regard abnormal pauses, which are also mentioned as non stutter-like disfluencies people who clutter produce excessively (St Louis et al., 2010; Ward, 2006).

In addition it is interesting to notice that the mean frequency of non stutter-like disfluencies found in spontaneous speech of fluent speakers (9,1 per 100 words) is more or less in line with previous research were mean frequencies between 5,6 and 10 per 100 words were found (Derksen et al., 2010; Tree, 1995). The mean frequency of non stutter-like disfluencies in spontaneous speech of PWC (PWCsynt: 12,4 and PWCphon: 11,6) also comes very close to the percentage of 12,6 found with speakers of Brazilian Portuguese with cluttering (De Oliveira et al., 2010), the only other study found that explored the percentage of non stutter-like disfluencies in cluttering. However in this study variances within groups were very large, as is reflected in the not significant differences between the groups for non stutter-like disfluencies. This implies that defining a normative value for non stutter-like disfluencies will lead to a norm that may be sensitive (of the people who score above the norm the majority has speech characteristics of cluttering) but not very specific (a lot of people who clutter will score below the norm). This points to the importance of the other characteristics on basis of which clinicians diagnose someone with cluttering.

For the three separate categories of non stutter-like disfluencies (interjections, revisions and repetitions), significant differences between the groups were only found for revisions in the retelling task and for repetitions in spontaneous speech. This minimal

evidence for significant differences between the groups is no surprise considering the not significant differences found for the frequency of non stutter-like disfluencies overall.

The finding that people with syntactic cluttering produce significant more revisions than fluent controls and that the differences for the other types are not strong enough to reach significance, could indicate that revisions have a stronger differentiating power than repetitions and interjections. As explained in the introduction, it is possible that revisions are a result of a less efficient inhibitory control system (Engelhardt et al., 2010). If difference in production of revisions turns out to be more prominent than the other non stutter-like disfluencies, this implicates that cluttering might be caused by not optimal inhibitory control. A system that is sub served by the frontal cortex - basal ganglia network in the brain (Aron, Durston, Eagle, Logan, Stinear, Stuphorn, 2007).The groups did not differ on frequency of interjections, nor did this measure differ between the tasks. Interjections are considered to be related to a time gaining strategie during linguistic planning (Van Zaalen and Dejonckere, 2010; Howell, 2007). Another way to look at interjections, or fillers, is as a communicative means to coordinate interaction (Shriberg, 2001; Bortfeld et al., 2001; Levelt, 1989). Shriberg (1996) found that frequency of fillers were not correlated with sentence length, and therefore may not be related to planning load in the way that other disfluencies are. A speaker may use fillers like ‘eh’ and ‘uh’ or interjections of words and word clusters (this is a division made by Clark and Fox Tree, 2002) in longer utterances to keep the attention of the listener or to indicate that he is not finished when he hesitates (Clark, 1994; Smith and Clark, 1993). These functions are more of a pragmatic nature. This could explain why the groups did not differ on this measure.

More extensive research into the relation between the separate non stutter-like disfluency types and task complexity could give more insight in the differentiating power of each disfluency type in the assessment of cluttering symptoms.

The number of incomplete sentences or sentences with morpho-grammatical and semantic errors does not seem to differentiate people with syntactic cluttering from controls or people with phonologic cluttering. People with mixed syntactic and phonologic cluttering characteristics were not included in this study. However, it is plausible that the findings of this study apply to this group: the mixed profile is a combination of both sub profiles and does not represent a different disorder.

4.3. Perception of fluency

This study started with the observation of speech and language therapists that some people who clutter seem more fluent during retelling than in spontaneous speech. This study was an attempt to find evidence for this perception and to point to the linguistic phenomena that contribute to it. With this study evidence has been found that during retelling speakers with syntactic and phonologic cluttering are likely to produce less non stutter-like disfluencies and - in case of syntactic cluttering – to revise errors more accurate. This probably contributes to the perception that speech is perceived as more fluent in a retelling task. Nevertheless, other possible objective linguistic and phonetic variables remain to be considered for further research to find confirmation for subjective clinical judgment. Examples of these variables are mean length of utterance, lexical diversity, pause behavior (mean pause time, location of pauses), and production of stressed words. See for instance a study in a different research area - that of second language research - of Kormos and Dénes (2004). Who found correlations between second language teachers' perceptions of fluency of second language students and mean length of utterance, phonation time ratio, speech rate and production of stressed words.

4.4. Pragmatics

As mentioned in the introduction, the prevalence of pragmatic problems in cluttering is inconclusive: Van Zaalen Wijnen and Dejonckere (2009b) did not find evidence for differences in the ability to organize story structure in a retelling task. However as Van Zaalen et al. (2009b) mention, it is quite possible that in a less structured speech task PWC will have problems in organizing their discourse. Comparing story structure in spontaneous speech looks like a natural follow up study to perform if it were not for the problem that spontaneous speech has a very wide variety of possible topics, sub topics etcetera that can be brought up. It seems more sensible to compare the way in which speakers organize speech on micro linguistic level, rather than on the level of content (the topics that are introduced) and macro linguistic level (the order topics are introduced). Micro linguistic level refers to the way narrative cohesion is established by the use of reference devices (pronomalization, anaphora) and temporal and causal connectives ('and, then, while') (Hudson and Shapiro, 1991). Comparing the accurate use of these devices in spontaneous speech of PWC and fluent speakers, could give

more insight into the question whether poor pragmatic skills contribute to the fact that speech of PWC often is perceived as unstructured and difficult to follow.

References

American Speech-Language-Hearing Association (1999). *Terminology Pertaining to Fluency and Fluency Disorders: Guidelines* [Guidelines]. Available from www.asha.org/policy.

Aron, A.R. Durston, S, Eagle, D.M., Logan, G.D., Stinear, C.M., Stuphorn, V. (2007). Converging evidence for a fronto-basal-ganglia network for inhibitory control of action and cognition. The Journal of Neuroscience 27(44), 11860 –11864.

Au-yeung, J. & Howell, P. (1998). Lexical and syntactic context and stuttering. *Clinical Linguistics & Phonetics*, *12*(1), 67-78.

Bakker, K., Brutten, G.J. (1990). Speech-related reaction times of stutterers and non-stutterers: Diagnostic implications. The *Journal of speech and hearing disorders*, *55*(2), 295 -299.

Bortfeld, H., Leon, S.D, Bloom, J.E., Schober, M.F., Brennan, S.E. (2001). Disfluency Rates in Conversation: Effects of Age, Relationship, Topic,Role, and Gender. *Language and speech, 44* (2), 123–147.

Carroll, D.W. (2007). Psychology of language. Chapter 7: *Discourse comprehension and memory*. Wadsworth, Belmont, California.

Clark, H. H., & Fox Tree, J. (2002). Using uh and um in spontaneous speaking. *Cognition 84*, 73–111.

Clark, H. H. (1994). Managing problems in speaking. *Speech Communication 15*, 243–250.

Daly, D.A. (2006). Predictive cluttering inventory. International Cluttering Association. *http://associations.missouristate.edu/ica/*, retrieved, march 2011.

Daly. D.A., Burnett, M.L. (1996). Cluttering: Assesment, treatment planning, and case study illustration. *J. Fluency disorders, 21*, 239-248.

Derksen, A., Duizendstra, C., Hoefnagel, H.J., Visser, M.E. (2010). Normale niet-vloeiendheden bij adolescenten. Een normindicatie voor normale niet-vloeiendheden bij Nederlandstalige adolescenten. *Logopedie en foniatrie* (5), 176-179.

De Oliveira, C.M.C., Bernardes, A.P.L., Broglio, G.A.F., Capellini, S.A.(2010). Speech fluency profile in cluttering individuals. *Pro-Fono, 22* (4), 445-450.

Engelhardt, P.E.E., Corley, M., Nigg, J.T., Ferreira, F. (2010). The role of inhibition in the production of disfluencies. *Mem Cognit, 38,* 617-628.

Fletcher, C. R. (2001) Memory for Meaning and Surface Memory, In: Neil J. Smelser and Paul B. Baltes, Editor(s)-in-Chief, International Encyclopedia of the Social & Behavioral Sciences, Pergamon, Oxford, 2001, Pages 9576-9579

Fromkin, V.A. (1973). *Speech errors as linguistic evidence*. Mouton Publishers, The Hague.

Goldman-Eisler, F. (1968). Psycholinguistics: Experiments in spontaneous speech. London: Academic Press.

Guitar, B. (2006). Stuttering: an integrated approach to its nature and treatment. Lippincott Williams & Wilkins, Baltimore.

Hartinger, M. & Mooshammer, C. (2008). Articulatory variability in cluttering. *Folia Phoniatrica et Logopedica, 60*(2), 64-72.

Hartsuiker, R. J. and Barkhuysen, P.N.(2006). Language production and working memory: The case of subject-verb agreement. *Language and Cognitive Processes, 21,* 1, 181-204.

Howell, P. (2007). A model of serial order problems in fluent, stuttered and agrammatic speech. *Human Movement Science, 26*, 728–741.

Hudson, J.A. and Shapiro, L.R. (1991). From knowing to telling: the development of children's scripts, stories and personal narratives. In: Mc. Cabe A., Peterson, C. *Developing narrative structure*. Lawrence, Erlbaum Asscociates Publishers, Hillsdale, New Yersey.

Kormos, J., Dénes, M. (2004). Exploring measures and perceptions of fluency in the speech of second language learners. *System 32*(2), 145-164.

Levelt, W.J.M. (1989) Speaking: from intention to articulation. Cambridge, MA: MIT Press.

Levelt, W.J.M. (1983). Monitoring and self-repair in speech, *Cognition,* 14(1), 41-104.

Loban, W.D. (1976). Language development. Kindergarten through grade twelve. NCTE committee on research report no. 18. National council of teachers of English, Urbana, Illinois.

Myers, F.L.(1996a). Cluttering a synergistic framework. In: F.L. Myers and K.O. St Louis (eds.). *Cluttering: A clinical perspective*, 71-84. Singular, Sam Diego, CA.

Myers, F.L. (1996b). Cluttering a matter of perspective. *Journal of fluency disorders 21*, 175-186.

Myers, F.L. and Bradley, C.L. (1996). Clinical management of cluttering from a synergistical framework. In: F.L. Myers and K.O. St Louis (eds.). *Cluttering: A clinical perspective,* 71-84. Singular, Sam Diego, CA.

Oliveira C.M.C., Bernardes A.P.L., Broglio G.A.F., Capellini S.A. (2010). Perfil da fluência de indivíduos com taquifemia. *Pró-Fono Revista de Atualização Científica 22*(4), 445-50.

Riley, G. (1994). *Stuttering Severity Instrument for Children and Adults* (3rd ed.). Austin, TX: Pro-Ed.

Postma, A. and Kolk, H.H.J. (1993). The covert repair hypothesis: prearticulatory repair processes in normal and stuttered disfluencies. *Journal of Speech and Hearing Research 36*, pp. 472–487.

Postma, A. (2000). Detection of errors during speech production: A review of speech monitoring models. *Cognition 77*, 97–131.

Schachter, S., Christenfeld, N., Ravina, B., Bilous, F. (1991) Speech Disfluency and the Structure of Knowledge. *Journal of Personality and Social Psychology 60* (3), 362-367.

Shriberg (2001). To 'errrr' is human: ecology and acoustics of speech disfluencies. *Journal of the International Phonetic Association, 31,* 153-169

Skehan, P., Foster, P. (1999). The Influence of Task Structure and Processing Conditions on Narrative Retellings. *Language Learning 49*(1), 93-120.

Smith, V., & Clark, H. H. (1993). On the course of answering questions. *Journal of Memory and Language 32*, 25–38.

St. Louis, K. O. , Bakker, K., Myers, F. L., Raphael, L. J. (2010). Cluttering. *International Encyclopedia of Rehabilitation.* Center for International Rehabilitation Research Information and Exchange, New York.

St. Louis, K.O., Myers, F. L., Bakker, K., Raphael, L. J. (2007). Understanding and treating of cluttering. In: Conture, E.G., Curlee, R.F. (2007). *Stuttering and related disorders of fluency*. Thieme Medical Publishers, New York.

St. Louis, K. O., Myers, F. L., Faragasso, K., Townsend, P. S., & Gallaher, A. J. (2004). Perceptual aspects of cluttered speech. *Journal of Fluency Disorders, 29*(3), 213-235.

St. Louis, K. O. , Raphael, L. J. , Myers, F. L. & Bakker, K. (2003). Cluttering Updated. *The ASHA Leader, 18, 20-22.*

Trautman, L.S. , Healey, E.C., Norris, J.A. (2001). The effects of contextualization on fluency in three groups of children. *Journal of Speech, Language & Hearing Research 44*(3), 564-577.

Van Zaalen - op ´t Hof, Y (2009). *Cluttering identified. Differential diagnostics between cluttering, stuttering and speech impairment related to learning disability*. Dissertation University of Utrecht

Van Zaalen op't Hof, Y., Myers, F., Ward, D., Bennett, E. (2010). Cluttering Assessment. Clinical Issues Committee of the ICA. *http://associations.missouristate.edu/ica/Resources/cluttering_assessment.htm*. Retrieved: august 2010.

Van Zaalen, Y., De Jonckere, P.H. (2010) Cluttering: a language-based fluency disorder. The First Online Conference on Cluttering. *www.mnsu.edu/comdis/ica1/icacon1.html*. Retrieved, november 2010.

Van Zaalen – op ´t Hof, Y., Wijnen, F., De Jonckere, P.H. (2009a). Differential diagnostic characteristics between cluttering and stuttering. *Journal of fluency disorders, 34*, 137-154.

Van Zaalen-Op't Hof, Y., Wijnen, F., Dejonckere, Ph. (2009b). Language planning disturbances in children who clutter or have learning disabilities. *International Journal of Speech-Language Pathology, 11(*6), 496–508

Van Zaalen, Y., and Winkelman, C. (2009). *Broddelen. Een (on)begrepen stoornis.* Coutinho, Bussum.

Ward, D. (2006). *Stuttering and cluttering. Frameworks for understanding and treatment.* East Sussex, Psychology Press.

Weiss, D. (1968). Cluttering. Central language imbalance. *Pediatric clinics of North America 15*(3), 705-720

Weiss, A.L. (2004). Why we should consider pragmatics when planning treatment for children who stutter. *Language, Speech & Hearing Services in Schools 35* (1), 34-45.
Wijnen, F.N.K. (2000). Stotteren als resultaat van in**accurate** spraakmonitoring. *Stem-, spraak- en taalpathologie, 9*(3), 211-230.

Yairi E., Gintautas, J. (1981). Disfluent speech associated with brain damage. *Brain and language, 14*, 49-56.