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The Linguistic Symptoms of Selected Stuttering Children in Nairobi County, Kenya.

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***Abstract*—Developmental stuttering is a speech disorder affecting 5% of the population in the language formative years and whose major features are repetitions of sounds or syllables, words prolongations and speech blocks. The frustration or struggle to produce uninterrupted speech often accompany such behaviours and often identify the Children Who Stutter (CWS) from those who do not stutter (CWNS). The paper investigated the risk factors of the CWS to stutter beyond their preschool years, the different types of stuttering in children based on linguistic symptoms and the secondary stuttering behaviours. This was achieved by examining the stutter in English language also used in the therapy sessions of three CWS aged 4-6. The raw speech data was collected by use of audio recording and the secondary stuttering behaviours were collected via observation checklists. The findings show that two out of the three participants were at risk of stuttering beyond their formative years and all of them had different types of stuttering behaviours based on their linguistic symptoms and secondary stuttering behaviours. The Covert Repair Hypothesis proposes that the symptoms of stuttering occur overtly when the People Who Stutter (PWS) are unable to activate the phoneme selection fast enough as observed in this study.**

Keywords—Assessment, disfluency, linguistic symptoms, stuttering, treatment

I. INTRODUCTION

Stuttering is a speech disorder that is commonly identified as an involuntary interruption in the fluency of speech (Guitar, 2014). The prevalence of this disorder is 5% in preschool children and if it persists in adults, it reduces to 1% (Howell, 2007). This speech disorder affects its sufferers physically, emotionally and psychologically as they go about their daily lives.

It is important to note that there are various types of stuttering. There are two major types of stuttering according to Lavid (2003): developmental stuttering and acquired stuttering. Developmental stuttering is characterised by its childhood onset that interferes with communication and is additionally characterised by overt body tensions in the jaw, lips, chest or muscles that are not related to the speech production process. Acquired stuttering on the other hand is as a result of neurological or psychological trauma (Ward, 2006). Neurological stuttering is caused by trauma to the brain by a tumour, tragic brain injury or a stroke while psychological stuttering is caused by a trauma experienced by a person.

Developmental stuttering can be treated by reducing the moments of stutter but only if early detection and diagnosis of the speech disorder is done and the subsequent introduction of strategies to lessen the moments of stuttering. Most people do not recognize stuttering as a speech problem in Africa. It has been a means for children to ridicule those who stutter. The lack of intervention for children who stutter has led these children to shy away from social conversations and engagements which do not help improve their condition. Currently, there are few documented methods of monitoring language development, assessing and diagnosing a speech or language difficulty as well as intervention strategies to help children who stutter in Kenya. There is very little knowledge on these areas to assist parents in the event a child develops a stuttering problem. If the stuttering persists beyond the language formative years, it is crucial to intervene in order to address the problem early on in life.

Intervention is only as good as the diagnosis. When stuttering is identified and classified, an appropriate approach can be taken to reduce the level of interruption in verbal expression to improve communication. The accuracy of identification and classification of stuttering can be achieved using linguistic theory, specifically, The Covert Repair Hypothesis (CRH) that was put forth by Postma and Kolk (1993).

CRH suggests that disfluency is as a result of internal speech errors that individuals attempt to repair through self-monitoring. In other words, people can detect speech errors before the moment of articulation and correct them before the production of the actual speech (Postma & Kolk, 1993). In the event the covert repair is successful, then the speech error will not appear overtly in the actual speech and according to CRH, this is what normal fluent speakers are able to do. PWS are unable to achieve this and it results in many attempts at repairing the error in the speech plan that manifests as disfluency in speech.

In 2019, the government of Kenya carried out a census and the population was 47.6 million (Kenya National Bureau of Statistics, 2019). As mentioned earlier, 5% of a population is said to experience stuttering in their preschool years (2-6 years) and this would mean that 2.28 million children stutter in their language formative years. 1% of the population would go on to suffer from this speech disorder in their adult years. For Kenya, that would mean 476, 000 individuals have a stutter that persists into adulthood. This is a large number that warrants attention and thus certain measures should be put in place to address this speech disorder. Measures such as early

detection, language developmental assessments, diagnosis and treatment should be considered. This is not to say that the country is completely devoid of diagnosis, assessment and treatment, but this simply means that not enough people have access to such services if the need arises. As a signatory to Millennium Development Goals (MDG) that evolved to Sustainable Development Goals (SDG), Kenya has put forth policies and frameworks to achieve Education for All (EFA). One of the policies that was implemented was inclusive education where normal children and special needs children learn side by side. This policy is still in the early stages of implementation (Williams, 2014).

The questions addressed in the study are: are there children who stutter in Nairobi, Kenya? Are they more at risk than other children? What are the linguistic symptoms of their stutter? Do the CWS exhibit secondary stuttering behaviours? This paper focuses on the risk factors of the CWS who stutter beyond their language formative years, the type of stutter, the linguistic symptoms and finally the secondary stuttering behaviours of CWS aged 4-6 based in Nairobi, Kenya.

II. Literature Review

Developmental stuttering as a speech disorder is multifaceted. According to Yairi and Seery (2014, pp.30-31), developmental stuttering has the following dimensions:

a) Overt speech characteristics: The interruptions in the fluency of speech or the rate of speech that occur at the articulatory, phonatory and respiratory levels. They often manifest themselves as the repetition of speech segments, prolongations or abrupt cessation of sound production.

b) Physical concurrences: The tension of the body not related to the speech production process like the jaw, head, neck, arms among others that co-occur with the stutter. This is also known as secondary stuttering behaviours.

c) Physiological activity: A dimension that cannot be seen by the naked eye but makes use of technology to monitor pupil responses, blood flow and brainwave activity just to mention a few.

d) Affective characteristics: These are the strong emotional reactions that often stem from the difficulty in communication. It results in the avoidance of speech altogether and may even overshadow the stuttering instance.

e) Cognitive processes: Stuttered occurrences may be as a result of the interruption of the speech making process i.e., phonetic selection, planning, preparation and execution or the person's cognitive concepts of the nature of the speech disorder.

f) Social dynamics: As communication is a two-way process, the people who stutter (PWS) may be affected by the listener's focus on the stutter rather than the message. The PWS and the listener may change their communication actions midstream making the PWS mindful of the disorder and further affects the social interaction.

A factor not mentioned by Yairi and Seery (2014) is the genetics and prevalence in gender. Van Beijsterveldt, Felsenfeld, and Boomsma (2010) carried out heritability studies in stuttering on 5-year-old Dutch twins and concluded that genetics play a large role but may not be the major connection to stuttering. McKinnon, McLeod, and Reilly (2007) reported a male to female ratio of 2.85 to 1 respectively in this fluency disorder. This only further proves that developmental stuttering is multi-dimensional and no one reason is the cause for a stuttering incidence.

Stuttering is majorly categorized using a symptom based approach. The following are the types of stutter that are observable using this approach:

i. Sound and syllable repetitions (I-I-I-let's play or pa-pa-pa-party)

ii. Monosyllabic whole word repetitions (I-I-I can't)

iii. Sound prolongations (fffffffamily)

iv. Broken words or pauses within a word (wh [pause] what is it?)

v. Blocking or filled or unfulfilled pauses where a person attempts to speak but little or no sound is emitted.

vi. Circumlocutions in that word substitutions are used to avoid problematic words (wh-wh-wh-[where are you going?] don't go)

vii. Interjections (Just uh ummm sit right there)

(Weiss, 2013; Damico, Müller & Ball, 2010).

Postma and Kolk (1993) suggest that the instances of stuttering can be explained by their theory (CRH). This theory suggested that there are two processes that occur simultaneously to produce fluent, uninterrupted speech. The first process is called phoneme selection. Phoneme selection is selecting the necessary phonemes in order to plan how the organs of speech will be shaped to produce the targeted sound. Phonological encoding on the other hand is a set of instructions given to the motor speech organs to produce the desired sound. Postma and Kolk (1993) suggest that PWS are slow in their ability to activate phoneme selection. It is when they attempt to activate these phonemes at a faster rate than their phonological encoding is capable that there is an increase in selection error. When the PWS detects the error using their internal speech monitor, they attempt to repair it mid-speech resulting to stutter by stalling or repetition. Stuttering, therefore, is the overt disfluency in speech that reflects the covert pre-articulatory repairing of speech before execution.

The Stuttering Foundation of America gives a table of a risk factor chart (table I below) for children who are likely to stutter.

TABLE I. RISK FACTOR CHART

Risk Factor	More likely in beginning stuttering	True for child
Family history of stuttering	A parent, sibling or other family member who still stutters	
Age at onset	Age after 3½	
Time since onset	Stuttering 6-12 months or longer	
Gender	Male	
Other speech-language concerns	Speech sound errors, trouble being understood, difficulty following directions	

III. Methodology and Analysis

This section looks at the methods and tools the researcher used for the data collection and the participants of the study. The demographics and therapy histories of the CWS are included in this section.

A. Methods

To achieve the objectives of this article, a case study research design was used to describe and explore the features and nature of the population. The qualitative research design involved the collection and analysis of data using observation checklists, questionnaires and recordings of the speech data of the CWS by use of narratives and naming pictures. The qualitative data was analysed descriptively and represented by graphical schemes where necessary.

The study was conducted in Nairobi County, where majority of the speech and language therapists (SLTs) are situated and accessible alongside the CWS and their parents. The CWS were chosen through purposive sampling based on the age of the children that the study targeted. The target population (parents and CWS) were then selected.

The target population encompassed children between the ages of 4-6 years who stutter; the nature of their stutter ranging from mild to severe. The parents or guardians of the CWS were also included in the target population as well in order to get more information about the CWS demographics and therapy history.

Three children were observed for this research. The CWS did not have any co-occurring cognitive, developmental or any other speech impairment. The researcher sampled three parents/guardians using the criteria of the parent/guardian who frequents the therapy sessions with their children and are heavily involved in the intervention techniques outside the therapy sessions.

The questionnaires were filled by the parents before the collection of speech data from the CWS. This was done using a 300-word sample that was considered suitable and sufficient while differentiating CWS from CWNS (Throneburg & Yariri, 2001).

Using these tools, the researcher used three types of coding to synthesize the information. One of the methods was open coding. In the audio session recording each line of the sample with the CWS was coded line by line manually and for identification, it was labelled matching all the other sample information essential for study. The data was maintained at a state that could not be edited to create confusion. The Portable Document Format (PDF) was used and kept in a secure zip file. The transcript vignettes provided data that assisted in the forthcoming analysis. In addition to this, the qualitative data was put into categories where inferences can be made in specific linkages to subject matter.

Although done manually for the audio data, the researcher used existing theory about CWS to group the data into thematic allocations and in places where clear and direct relationships could be drawn, identification was made to prepare for the discussion of the results of the study.

The sample population comprised of three children aged 4-6 years that were already receiving speech therapy from two renowned hospitals in Kenya. The respondents had been found through the SLTs offering their services to the respondents therefore, the CWS had already been diagnosed with developmental stuttering by their respective SLTs. The CWS live in the urban setting of Nairobi and were acquiring both the English and Kiswahili languages concurrently. Their dominant language was English and indeed the therapy sessions were carried out in the same language. Questionnaires were handed out to their parents/guardians to capture the demographics and therapy history of the CWS. Voice recordings of the CWS were collected in the form of guided narratives and picture naming exercises.

B. Data Analysis

This section will present and group the data on the CWS by their demographics and risk factors to stuttering. The linguistic symptoms will be analysed by using the Covert Repair Hypothesis postulated by Postma and Kolk (1993).

1) Participant's Risk Factor Chart

CWS 1 was male, aged six years with an onset of three and a half years and no family history of stuttering. CWS 1 was acquiring the English language independent of Kiswahili. CWS 2 was also male, aged four years who was just recently diagnosed and therefore, the onset was noted at the age of four. CWS 2 had no family history of stuttering and was acquiring the English and Kiswahili languages concurrently. CWS 3 was male, aged five years with an onset of three years and no family history of stuttering. CWS 3 was acquiring both Kiswahili and English language

concurrently. Table II below summarises the risk factors of stuttering:

TABLE II. CWS RISK FACTOR CHART

CWS	Age	Gender	Family Stuttering History	Age of Onset
CWS 1	6	Male	No	3.5
CWS 2	4	Male	No	4
CWS 3	5	Male	No	3

All participants had not previously received any kind of intervention or treatment prior to the one they had been receiving at the time of the study.

From the observation checklists, CWS 1 exhibited secondary stuttering behaviours at the head, eyes and legs; CWS 2 at the eyes and arms while CWS 3 rapidly blinked the eyes during the stuttering incidence.

2) Linguistic Symptoms of CWS

Damico, Müller and Ball (2010) classification of stuttering uses the overt breakdowns in speech was used in this research. They are: syllable repetition or whole word repetitions, sound prolongations, broken words, filled or unfulfilled pauses, circumlocution and interjections.

CWS 1 stuttering instances manifested itself majorly in the form of filled and unfulfilled pauses (FP/UFP) taking up 57.58% of the data collected. This type of stutter came about during the picture naming method. The child would fill pauses with humming sounds i.e., hmmm and mmmmh.

Sound prolongations (SP) had 19.35% was observed in the narratives. The SP appeared in vowel sounds / æ/, /ɔ/ and / ʌ/ in the words aaaand, tooongue and tooooy respectively. SP also manifested in consonant sounds /z/, /d/ and /l/ in the words zzzebra and harddlllly.

Syllable or whole word repetitions (SR) had 9.68% that appeared in the narratives. The child stuttered in the word w-w-what suggesting the approximant /w/ was a challenge to produce.

CWS 2 stuttering instances manifested as SR, SP, FP/UFP, circumlocution (C), and interjections (I). CWS use 'on' 2 had no stuttering instances in the picture naming exercises. The SR was the most prevalent type of stutter at 69.41% in the narratives. Words such as: sk-sk-sk-sk-skip, f-fur, th-th-the, s-s-s-s-someth-things, this-this-this, th-th-they, mb-mb-mb-because, by-by-by-by-by-by proved to be a challenge to articulate for CWS 2. SR appeared in sounds /s/, /f/, /θ/, /b/.

The FP/UFP was another area of note. The FP were filled by sounds such as hmmm, ngh and mmh. SP stuttering instances were few and the problematic sound found in this instance was /z/ as in the word zzzzzzzip.

The rare case of C was on the sound /b/. When prompted to begin a sentence with the name of a cat named Boot this was the CWS 2 attempt: CWS 2: Boooot…b-s-s-something is in the sand! CWS 2 clearly avoids repeating the cat's name and focuses on something else.

The CWS 3 had stuttering instances in the form of SR at 85.11%, FP/UFP at 10.64% and SP and C both at 2.13%. The linguistic symptoms of SR were observed in the sounds /m/, /w/, /r/, /b/, /g/, /h/, /s/ both in the picture naming exercises and guided narratives. Some of the words that portrayed these target sounds include: me-meat, w-w-w-washing, wa-wa-watching, when-when-when-when-when-when, ride-riding, b-b-blue, be-be-be-because, gi-gi- a giraffe, gamp-gamp-gameplayer, he-he-heee, a ha-a hat, s-s-s-s-s-s-s-some-someone.

The linguistic symptoms of FP were overtly recognized by the sounds mmh while the UFP was noted by CWS 3 taking in a long deep breath.

The SP of CWS 3 was observed on the sound /n/ as in the word nnnnnnooo. While the one instance of C was to avoid the articulation of sound /h/ as follows: h-h-he-heee- because someone got mad at him.

The following is a generated table of the results in percentages:

TABLE III. CWS DISTRIBUTION OF THE TYPE OF STUTTER

S.D / CWS	SYLLABLE /WHOLE WORD REPETI-TIONS (SR)	SOUND PROLONG-ATIONS (SP)	FILLED OR UNFULFIL-LED PAUSES (FP/UFP)	BROKEN WORDS (BW)	CIRCUM-LOCUTION (C)	INTERJEC-TIONS (I)	INAUDIBLE OR UNCLASSIFI-ABLE SYLLABLES
CWS 1 (6YRS)	9.68	19.35	57.58	0	0	0	12.05
CWS 2 (4 YRS)	69.41	8.24	15.80	0	3.53	1.18	1.21
CWS 3 (5 YRS)	85.11	2.13	10.64	0	2.13	0	0

IV. Results and Discussion

In this section, the results of the moments of stutter will be discussed using CRH. The phonetic elements that the CWS found difficult to phonologically encode will be identified and displayed in summary using

tables. The results and discussion will be analysed in the order of CWS 1 to CWS 3. The discussion will explain the possible reasons for the breakdown in phonological encoding.

A. Results

It is clearly evident that CWS 1, aged six, has a challenge encoding alveolar sounds /z/, /d/, /l/, /t/ and /n/. These are the sounds that are formulated at the back of the teeth at the alveolar ridge. It is clear that the vowel sounds are prolonged due to the preceding alveolar sounds /t/ or proceeding nasal /n/ and palatal approximant /j/ sound as observed in *aaaand, tooongue* and *tooooy*. However, it did not escape the researcher that vowel sounds /æ/, /ɔ/ and / ʌ/ are all open mid vowels.

TABLE IV. DESCRIPTION OF CWS 1 PROBLEMATIC SOUNDS

CWS 1 Problematic sound	IPA description of sound
/æ/	Voiced front open mid vowel
/ɔ/	Voiced back open mid vowel
/ʌ/	Voiced back open mid vowel
/z/	Voiced alveolar fricative
/d/	Voiced alveolar plosive
/l/	Voiced alveolar lateral approximant
/t/	Voiceless alveolar plosive
/n/	Voiced alveolar nasal
/j/	Voiced palatal approximant

CWS 2 being the youngest participant (aged 4) in the study had a varied distribution of types of stuttering although others were more minimal than others i.e., circumlocution, prolongations and interjections. Of interest were the fricatives (sounds that are produced by constricting the air flow from the lungs) /z/ /s/, /f/ and /θ/. The bilabial plosive /b/ (a plosive is a sound produced when the air from the lungs is completely blocked then released suddenly with force) appeared less frequently than any other problematic sound.

TABLE V. DESCRIPTION OF CWS 2 PROBLEMATIC SOUNDS

CWS 2 Problematic sound	IPA description of sound
/z/	Voiced alveolar fricative
/s/	Voiceless alveolar fricative
/f/	Voiceless labiodental fricative
/θ/	Voiceless dental fricative
/b/	Voiced bilabial plosive

CWS 3, aged 5, has an assortment of problematic overt sounds during the stuttering instances. The sounds included /m/, /w/, /r/, /b/, /g/, /h/, /s/ /n/. No clear pattern could be observed, however, the frequency of the stuttered voiced bilabial plosive (/b/) was the highest as compared to any other stuttered sound. From the table below, it is clear that alveolar and bilabial sounds were a major challenge for this child to phonologically encode.

TABLE VI. DESCRIPTION OF CWS 3 PROBLEMATIC SOUNDS

CWS 3 Problematic sound	IPA description of sound
/m/	Voiced bilabial nasal
/n/	Voiced alveolar nasal
/w/	Voices labial-dental approximant
/h/	Voiceless glottal fricative
/r/	Voiced alveolar trill
/b/	Voiced bilabial plosive
/g/	Voiced velar plosive
/s/	Voiceless alveolar fricative

B. Discussion

There are CWS in Nairobi as the researcher found and investigated three such cases of CWS from two renowned Kenyan hospitals. Bloodstein and Ratner (2008) found that overall the ratio of male to female is 3:1 therefore, placing the CWS in this article at a higher risk of stuttering because they are all male. It may also explain why all the participants in this article were male.

According to Guitar (2014), the later a child begins to stutter, especially after 3½ years, the more likely they are to have persistent stuttering beyond the preschool years. This implies that CWS 1 and 2 may likely stutter beyond the age of 6 because the age of their stuttering onset was found to be 3½ and 4 years respectively. They are, therefore, at a higher risk of persistent stuttering. According to Oliveira and Nogueira (2014), associated quality and communication factors, emotional stress and inappropriate family attitudes are important risk factors of developmental stuttering in boys. That is to say that the stutterers themselves may contribute to the severity of their stutter by their own reactions to their difficulty in speaking and the reaction of others to the speech disfluency. This causes PWS to put greater force and effort into their speech attempts. The greater the effort put in alleviating the speech disfluency causes tension in the speech production muscles and overt tension in other parts of the body during the moment of stuttering.

For CWS 1 who was aged 6 the overt stuttering instances were largely found in the FP/UFP and SP. Redford (2015), postulates that the FP/UFP type of stutter often occur alongside the SP type of stutter. This was noted in CWS 1 who had FP/UFP occurring in the picture naming exercises while the SP manifested in the narratives. The SLT in consultation

with the researcher suggested that FP/UFP could be because the child is unable to produce the required utterance as fast as they see the image on the picture despite being asked each and every time "What do you see?"

SP was the type of stutter that CWS 1 exhibited in the alveolar consonants that influenced the articulation of open mid vowels. Alveolar consonants are typically acquired by age three. This could be an indicator of persistent stuttering for CWS 1. Another reason for CWS 1 stuttering persistence on alveolar sounds could be phonotactic probability. Phonotactic probability is when a phonological segment (i.e., /p/) is likely to occur with a subsequent segment in a language (i.e., [pl]). Anderson and Byrd (2008), state that children are sensitive to phonotactic probability that only becomes more sensitive the older they get. At age six most consonant and vowel sounds are fully acquired but consonant blends (in bold) i.e., true, blue, spoilt are still being learnt and could explain the nature of the SP type of stutter in this child.

CWS 2 who was 4 years at the time of the study had the SR, SP, FP/UFP, C and I type of stutter. This can be explained by the rapid expansion of learnt consonant sounds i.e., /b/, /d/, /k/, /g/, /j/ usually between the age of 3.5-4 years. This could explain why the stuttering incidence of /b/ was at a minimum. Due to this rapid expansion of the acquisition of consonant sounds, the phoneme selection process id faster than the phonological encoding therefore causing the fluency disruption.

More complex consonant blends are being developed at this age and could account for the stuttering instances on the fricative consonants. However approximants and fricatives are some of the last sounds in the language formative years to be learnt. This is in tandem with majority of CWS 3, aged 5, problematic sounds trills like /r/, lateral sounds like /l/, fricative /h/ and approximant /w/. Most consonant sounds have been acquired by this age however fricative sounds are acquired between the ages and 4 and 5. The fact that this child still experiences difficulty in phonologically encoding the bilabial plosive could be an indicator of persistent stuttering beyond the language formative years without intervention.

CWS 3 had the highest case of SR at 85.11%. He was aged 5 years at the time of the study. According to Anderson (2007), this type of stuttering is sensitive to word frequency and neighborhood frequency in the production of speech. Word frequency is when a particular word is occurs more frequently than others making them familiar to the person producing the word. This makes it faster for an individual to produce the word accurately and fluently as opposed to the less frequent words from the language. Neighborhood frequency affects phonological encoding because certain words like watch have more as phonetically similar words i.e., patch, latch, catch, starch, match, scratch as compared to other words therefore are easier to phonologically encode and produce than the words that have low neighborhood frequencies.

V. CONCLUSION

It is clear that there are children in Nairobi, Kenya who are currently diagnosed with developmental stuttering and are receiving treatment for this speech disorder. Two out of the three CWS who participated in this study are at a risk of having the stutter persist beyond the age of six partly because they are male and developed their stutter well at or past the age of three and a half years. Other factors such as emotional and physical stress as well as other people's reaction to the stutter of CWS also increase the chances of persistence. Early detection of stuttering is, therefore, highly recommended to reduce the stuttering event before the child reaches adulthood or beyond their speech and language formative years (0-6). With early detection and diagnosis, it is possible for age-appropriate intervention techniques to be used on the CWS to significantly control or reduce the stuttering. Early intervention also guides the caregivers of a CWS to respond appropriately in case of a disfluency occurrence to either manage it, correct it or offer encouragement where necessary.

The syllable or whole word repetitions were the common type of stutter in this population notably on the alveolar, fricative and approximant sounds. Because the population compromised of children in their preschool years, their type of stutter can change over time as they continue to acquire the language over the years. Of note was the rapid acquisition of language between the ages of 3.5-5 years. This can be examined linguistically in accordance with the language acquisition abilities at specific speech and language milestones. Beyond the language formative years however, a linguistic analysis could help the speech language therapist to focus more on specific problematic sounds that greatly affect the fluency of a CWS. Phonotactic probability, word frequency and neighborhood frequency have been found to affect speech fluency in CWS; therefore, suitable therapy sessions to address these underlying causes could assist in the selection of target specific intervention strategies based on linguistic evidence.

The population also exhibited secondary stuttering behaviours notably in the rapid blinking of the eyes during the stuttering incidence. The secondary behaviours are usually more exacerbated by the CWS reaction to their stutter, other people's reaction to the stutter, emotional stress, physical stress and fatigue.

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