ESTUDIOS

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The effect of the percentage of syllables stuttered, attention, and perfectionism on listener's comprehension scores[1]

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Abstract. The primary aim of this study was to compare the listening comprehension levels of four groups of people who listened to recordings that varied in terms of the percentage of syllables stuttered (%SS). The secondary aim was to examine the effects of %SS, attention/hyperactivity, and perfectionism on comprehension. Sixty-four fluent participants between the ages of 18-40 were randomly assigned to four gender-equivalent groups. All participants completed ADHD and perfectionism scales. A clinician read aloud a text, exhibiting different levels (0%, 5%, 10%, and 15%) of %SSs (speech naturalness r>0.800). Each group of participants listened to a recording with a different %SS level. The comprehension performance was evaluated with the Listening Comprehension Assessment Tool developed by the authors. The content validity measures of the tool were sufficient for teachers and clinicians ($\bar{X}$>0.800). The group that listened to the fluent (0%) recording scored significantly higher than the other groups on mean comprehension scores. Covariance analysis indicated that only the %SS level significantly affected the comprehension score.

Keywords: Stuttering; Percentage of syllables stuttered level; Listening comprehension; Attention; Perfectionism.

[es] El efecto del porcentaje de sílabas tartamudeadas, de la atención y del perfeccionismo en las puntuaciones de comprensión auditiva de los oyentes

Resumen. El objetivo principal de este estudio fue comparar los niveles de comprensión auditiva de cuatro grupos de personas que escucharon grabaciones que variaban en términos del porcentaje de sílabas tartamudeadas (%SS). El objetivo secundario fue examinar los efectos del %SS, la atención/hiperactividad y el perfeccionismo en la comprensión auditiva. Sesenta y cuatro participantes con fluidez normal entre los 18 y los 40 años fueron asignados aleatoriamente a cuatro grupos de género equivalente. Todos los participantes completaron escalas de TDAH y perfeccionismo. Un investiagdor leyó en voz alta un texto, exhibiendo diferentes niveles (0%, 5%, 10% y 15%) de %SSs (naturalidad del habla r >.800). Cada grupo de participantes escuchó una grabación con un nivel de %SS diferente. El rendimiento de comprensión se evaluó con la herramienta de evaluación de comprensión auditiva desarrollada por los autores. Las medidas de validez de contenido de la herramienta fueron suficientes para docentes y clínicos ($\bar{X}$ > .800). El grupo que escuchó la grabación con fluidez (0%) obtuvo una puntuación significativamente más alta que los otros grupos en las puntuaciones medias de comprensión. El análisis de covarianza indicó que solo el nivel de %SS afectó significativamente la puntuación de comprensión.

Palabras clave: Tartamudez; Porcentaje de nivel de sílabas tartamudeadas; Comprensión auditiva; Atención; Perfeccionismo.

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Introduction

From a sociological perspective, stuttering is a phenomenon that occurs in the interaction between the "self" and the "other", and it results from the behaviors of the speaker and the listener (Acton & Hird, 2004). In fact, Van Riper (1982) explained that stuttering is both a speech disorder and an interaction disorder and that listeners are as important to the phenomenon of stuttering as people who stutter (PWS) because PWS and listeners affect each other bilaterally during their interaction (Zhang & Kalinowski, 2012). This difficulty is characterised by multifaceted reactions (Koçak & Cangi, 2022). According to the International Classification of Functioning, Disability, and Health (ICF, World Health Organization, WHO, 2001), the listener's experiences and reactions during the interaction with PWS can decrease or increase their participation in daily activities and impact the quality of their lives (Yaruss & Quesal, 2008).

Accordingly, the listener's perception is an important topic in the literature regarding stuttering. Specifically, researchers have focused on examining the effects of disfluency events in speech on the comprehension of the intended message (Sander, 1965; Hulit, 1976; Cyprus et al., 1984; Susca & Healey, 2001; Susca & Haeley, 2002; Panico et al., 2005). According to Traunmüller's Modulation Theory, listeners have expectations or prototypes for the speaker's linguistic and para-extralinguistic characteristics. Speech contains four types of information for the listener: (1) linguistic (vocal effort, speaking rate, pitch dynamics, and voice quality), (2) organic (larynx size and vocal tract length), (3) spatial-perspectival relations (location of the speaker relative to the audience), and (4) spatial-transmittal relations (acoustic and optic factors). It is easier for listeners to follow or understand typical speech, that is, speech unaffected by a communication disorder (Traunmüller, 1994).

Comprehension performances and perspectives of listeners regarding a speech that involves disfluencies

Listeners can respond differently to speech that contains disfluencies (Brennan & Schober, 2001). Considering the Modulation Theory (Traunmüller, 1994), whether the listener is accustomed to the disfluencies of the speaker may be an important factor. Stuttering-like disfluencies (SLD) include syllable repetitions, prolongation, blocks, and other disfluencies (OD), such as pausing, revision, and hesitation (Ambrose & Yairi, 1999). Studies indicate that pausing and hesitation are ODs that positively contribute to listeners' linguistic comprehension (understanding of the content) and recall performance (Bloomfield et al., 2010; Bosker et al., 2015). Speech signals that involve stuttering can be unusual for the typical listener and may disrupt the listener's perception of the intended message (Susca & Healey, 2002). In addition, considering Traunmüller's categories, SLDs refer to different articulations, prosodies, speeds, pitch qualities, and vocal efforts that may impact the listener's perception.

Similar to the studies conducted to examine listening comprehension related to dysarthria (Hustad & Beukelman, 2002; Hustad, 2008) or voice disorders (Evitts et al., 2016), studies have also been conducted to examine listening comprehension performance for speech that contains stuttering. For instance, Sander divided (1965) 120 participants into two groups that listened to a text dubbed with voluntary stuttering. Before listening to the recording, the first group was instructed to focus on "what is being said," and the second group was asked to concentrate on "how it is said." After both groups listened to the recording, the participants completed an eight-question test to measure their comprehension of the text. The results indicated that the group that was instructed to focus on what the speaker in the recording said tested significantly higher compared to the group that was instructed to concentrate on how the speaker said the text.

The literature contains few studies that quantitatively and qualitatively examine the effect of stuttering on listening comprehension or listener reactions (Cyprus et al., 1984; Hulit, 1976; Panico et al., 2005; Susca & Healey, 2001, 2002). In studies comparing the performance of group comprehension when listening directly to fluent and non-fluent recordings (Cyprus et al., 1984; Hulit, 1976), evaluation questions to listening comprehension performance about the read-aloud text were used. In both Cyprus et al. (1984) and Hulit (1976), the effect of disfluencies on comprehension was examined using keywords containing more information about the text. In both studies, it was observed that the fluent recording was better comprehended than the stuttering recordings.

In other studies, listener perceptions and/or comfort were examined (Panico et al., 2005; Susca & Healey, 2001, Susca & Healey, 2002). Susca and Healy (2001) took a reading sample with a 10% stuttering frequency taken from a person who stuttered, altered it on a digital platform, and obtained different samples with fluency and 5% and 15% frequency. Using a mixed method (quantitative–qualitative research), the listeners were asked six questions about the recording. In another study that qualitatively examined the effect of fluency in speech on understanding, four different examples were formed, again with fluency, stuttering frequencies of 5%, 10%, and 15%, and the participants were asked five open-ended questions (Susca & Healey, 2002).

In both Susca and Healey's studies (2001, 2002), increasing the frequency of stuttering negatively affected listener comfort and perception. In a similar study, Panico et al. (2005) examined listener perceptions of fluent

and non-fluent reading samples using data obtained through mixed-methods. In a study that implemented video recordings in addition to audio recordings with different stuttering frequencies (0%, 5%, 10%, and 15%), as the percentage of stuttered syllables increased in both presentation types, negative comments from the audience increased (Panico et al., 2005). When all these studies are considered together, the increasing frequency of stuttering clearly affects listening comprehension performance, listener comfort, and listener perception, regardless of platform type or presentation style.

Effects of personality and attention on listening comprehension and experiences

When examining the language learning literature in particular, listening comprehension performance and perceptions may be affected by listeners' characteristics, such as their personalities, attitudes, emotions, and cognitive features (Araghi et al., 2012; Call, 1995; Karakus Taysi, 2019). For example, Zare-Behtash et al. (2017) examined the relationships between personality and tests for listening for gist and minimal pairs, and significant relationships were found between many personality dimensions using these two tests. However, some studies find no relationship between listening comprehension and these variables. For example, Bommelje et al. (2003) found no relationship between Watson-Barker Listening Test (WBLT) scores and personality in adults.

Perfectionism is another personality trait or attitude that might affect listening comprehension because listeners with this aspect have an excessive interest in mistakes (Tozzi et al., 2004). Perfectionism, which refers to an excessive interest in mistakes and high standards, can be internal (i.e., oriented toward the person himself or herself) or external (i.e., oriented toward other individuals) (Siegle & Schuler, 2000). In Hewitt and Flett's (1991) model, perfectionism covers three dimensions: self-oriented, other-oriented, and socially prescribed perfectionism. Perfectionism may affect language learning and listening comprehension, according to some studies (e.g., Flett et al., 2016; Pishghadam & Akhondpoor, 2011; Amini & Shamlou, 2014). When listening to a speech containing disfluencies, listeners who are other-oriented perfectionists may display an excessive interest in speech disfluencies and focus on how the individual speaks rather than on the content of the speech. Thus, these other-oriented perfectionists may not understand the intended message of the speech.

Attention and other cognitive skills are variables that affect the comprehension of linguistic structures. This subject has mainly been studied within the context of attention-deficit/hyperactivity disorder (ADHD), particularly in children (Kim, 2016; Lorch et al., 1999; McInnes et al., 2003). Individuals with ADHD have more difficulty maintaining attention and catching external stimuli than typically developing individuals. It also shows itself in this listening skill (McInnes et al., 2003). Attention is closely related to the process of actively selecting information among the environmental sounds heard (Kiessling et al., 2003). At the same time, it enables the person to focus on the information necessary for understanding and makes an efficient choice (Stoltzfus et al., 1993) and modulates the relevance of this choice (Eckert et al., 2016). In this way, attention affects the cognitive stages of listening comprehension, inhibiting ability (Kim & Phillips, 2014), working and long-term memory (Strauss & Francis, 2017). Therefore attention alone is not an impactful variable, but it interacts with other factors, such as demographics, self-efficacy, verbal short-term memory, and verbal working memory, to affect comprehension (de Bree & Zee, 2021).

Purpose of the Study

Similar to the studies previously discussed, the study's main aim was to compare the listening comprehension levels of four groups who listened to recordings that differed in terms of the percentage of syllables stuttered (i.e., 0%, 5%, 10%, and 15%). In this study, because of the personal characteristics of listeners, such as their personalities, attitudes, and attention characteristics affect their listening performance, the secondary aim of the study was to examine the combined effect of the percentage of SS in audio recordings, attention/hyperactivity, and perfectionism on listening comprehension.

Method

Participants

Sixty-four participants in total, 32 females and 32 males, who met the inclusion criteria participated in the study (Table 1). The mean age of the participants was 22.6 years (SD=6.99), with a minimum age of 18.51 and maximum age of 40. The inclusion criteria for the participants are as follows:

a) Speaking Turkish as a native language,
b) Not having a hearing damage and/or loss,
c) Not having recently experienced a middle ear problem,

d) Not being diagnosed with attention-deficit/hyperactivity disorder (ADHD),
e) Having marked no more than 5 choices of "frequently" and/or "very frequently" on the Attention Deficit subscale of the Adult Attention-Deficit/Hyperactivity Disorder Scale.

Sociodemographic information about the 64 participants who met the inclusion criteria is presented in Table 1.

Table 1. Demographic Characteristics of Participants

		n	*%*	*M*
Gender	Female	32	50	24.8
	Male	32	50	24.0
Age	18-20	6	25	18.5
	21-25	43	65	22
	26-40	15	10	27.5
Education Level	Undergraduate	57	89.06	
	Graduate	7	10.9	

All participants were students or graduates of undergraduate or postgraduate departments of various universities. Care was taken to select all participants (undergraduate or graduate) from different departments and to ensure that the distribution was heterogeneous. The main inclusion criterion of the study was the absence of any speech and language disorders (e.g., fluency disorders). The absence of any communication disorder among the participants was determined by the statement of the participants and by an in-person conversation with the second and third authors. To exclude familiarity with stuttering, speech and language therapy/pathology undergraduates and graduates, and participants in close contact with individuals with stuttering were not included in the study. Moreover, in order to eliminate the effect of the participants' knowledge level of the text used in the LCAT on their listening comprehension score, not having read the relevant text was included in the inclusion criteria. Equal numbers of males and females were assigned to each of the four groups, yielding four groups of 16 participants.

Ethical approval for the study was obtained from the Ethics Committee of Üsküdar University with the decision dated 27/05/2020 and numbered 61351342.

Data Collection Tools

In this study, two scales were used to control for some possible confounding variables (A-ADHDS for ADHD and MPS for perfectionism) and to balance the groups in terms of these variables. The LCAT was developed and used to examine the listening performances of the participants.

Adult Attention-Deficit/Hyperactivity Disorder Scale (A-ADHDS)

The original scale was developed by Turgay (1995) in Canada with the name of Adult ADD/ADHA DSM IV-Based Diagnostic Screening and Rating Scale. The transliteral equivalence, validity, and reliability study of the scale in Turkish was performed by Gunay, Savran, and Aksoy (2005). In this context, for the reliability of the scale, the consistency coefficient of the scale was calculated through Cronbach's alpha (0.9566), Spearman-Brown (0.9072), and Guttman (0.9072) techniques. In the norm study conducted, those who scored lower than three were placed in the group with low symptoms of AD (Attention-Deficit), those between 3.01 and 10.99 were in the group with moderate level of symptoms, and those who scored 11 and above were classified as the group with a high level of AD symptoms.

Multidimensional Perfectionism Scale (MPS)

The Turkish adaptation of the scale, which was developed by Hewitt and Flett (1991), was performed by Oral (1999) on university students. The MPS consists of the three subscales of self-oriented perfectionism, other-oriented perfectionism, and socially prescribed perfectionism. In the 7-point Likert-type scale, each subscale is made up of 15 items; thus the total scale consists of 45 items. In the Turkish adaptation study, Cronbach's alpha coefficient was calculated as 0.91 for the self-oriented perfectionism (SOP) subscale, 0.73 for the other-oriented perfectionism (OOP) subscale, and 0.80 for the socially prescribed perfectionism (SPP) subscale. Although the scale lacks cut-off points for clinical diagnosis or perfectionism levels, such as high, medium, and low, it can compare the perfectionism levels of individuals or groups.

Listening Comprehension Assessment Tool (LCAT)

A new assessment tool was developed because the tools used in earlier studies (e.g., Cyprus et al., 1984; Hulit, 1976; Sander, 1965) had not been adapted to Turkish **(Appendix-1).** This tool consists of four voice recordings—containing the dubbing of a text with different fluency percentages—and a questionnaire consisting of 10 multiple-choice items related to the content of the voice recording. Each question in this test is evaluated as 1 point; the maximum test score is 10, and the minimum score is 0. The development process of LCAT was carried out in a series of steps.

Text Selection

To determine the effect of stuttering on listening comprehension, the first step at this stage of the tool development process was to select a text for an experienced SLT to read aloud with disfluencies at various levels. In the text selection, three novels with narrative discourse were preferred. These selected novels were *Araba Sevdası, pages 10-11* (Recaizade Mahmud Ekrem), *The Last Day of a Condemned Man, pages 72-73* (Victor Hugo) and *The Alchemist, pages 74-75* (Paulo Coelho). An expert opinion form was prepared to examine a text from each novel, and this form was presented to three Turkish teachers. The opinions of the Turkish teachers were taken in terms of the adequacy of the factors in the three texts in measuring word variety, word count, style, and listening comprehension skills, and they were requested to score the texts as "Yes", "Partially", and "No" in terms of appropriateness of the texts for undergraduate and graduate students. As a result of the independent evaluations made by the teachers, the text which was scored with the most number of "Yes" choice was selected to be used in the study. The text that was chosen has a narrative discourse and includes 186 words and 494 syllables, and of these 186 words, 70 are nouns, 48 are adjectives, 18 are verbs, 10 are adverbs, 10 are conjunctions, 5 are prepositions, and 1 is an interjection.

Preparation of test items regarding the text

In line with the opinions taken from the experts in order to assess listening comprehension skills, ten multiple-choice questions regarding the text were prepared, and eight Turkish teachers and two SLTs were asked to choose among "Essential", "Useful but not neccesary", and "Not necessary" In cases where they chose "Useful but not neccesary" and "Not necessary." They were requested to propose another question instead of the relevant question. Based on the qualitative data obtained from opinions and feedback, Content Validity Ratio (CVR) and Content Validity Index (CVI) were calculated for each question. In order to calculate content validity, a method, which was developed by Lawshe (1975), the validity criterion values of which were revised by Wilson et al. (2012) and Ayre and Scally (2014), and named as "Modified Lawshe Method" by Yesilyurt and Capraz (2018), was used. In this context, questions marked as "Essential" were scored as 3, questions marked as "Useful but not neccesary" were scored as 2, and questions marked as "Not necessary" were scored as 1. The maximum test score is 30, and the minimum score is 10. The qualitative data obtained were converted into quantitative data by calculating CVR and CVI.

Content Validity Ratio (CVR)

Calculating content validity is an essential procedure for determining whether an assessment instrument (e.g., scale, checklist, or questionnaire) measures the content it is expected to measure (Frank-Stromberg & Olsen, 2004). One way to ensure content validity is to seek expert opinions on the subject to indicate the importance of each item in a tool (Ayre & Scally, 2014). The Lawshe method is a content validity calculation method that determines which items in the assessment tool are necessary by calculating the content validity ratio (CVR) and content validity index (CVI) values after receiving expert opinions. It is used as a reliable method in calculating the content validity of assessment tools in many fields (George et al., 2015; Gupta et al., 2019; Kennedy et al., 2019; Smith et al., 2016). According to Lawshe method, the CVR is a statistical procedure that is useful in the rejection or retention of specific items. The number of raters who mark an item as essential is calculated using the CVR. CVR has a guiding role in determining whether the items should be included in the scale. CVR is calculated with the formula of $CVR=NE/(N/2)-1$. Here, NE represents the number of experts who found the relevant item as "Essential", while N stands for the total number of experts who gave their opinions. CVR takes a value of ±1, and if the ratio is 0 or a negative (-) value, it is assumed that the relevant item does not have content validity and is removed from the scale (Lawshe, 1975).

Content Validity Index (CVI)

CVI represents the dimensions of the overlapping detected between the functioning capacity of determined work performance and observed performance in the test examined (Lawshe, 1975). CVI is obtained by taking the average of CVR values determined for each item that was decided to be included in the scale. Within the

scope of calculating the content validity of the LCAT, the average of content validity ratios calculated for each item in the previous step was taken, and it was determined to be 0.925. When the Minimum/Critical Values (MCV) of CVRs are examined at α=0.05 significance level, it is seen that content validity criterion in which the number of experts is 10 is 0.800. As the content validity ratio average of the present study was 0.925>0.800, the questions prepared were found to be valid at α=0.05 significance level (Lawshe, 1975).

Preparation of the Audio Recordings

The text, which consisted of 186 words and 494 syllables, was dubbed in four different versions as 0%, 5%, 10%, and 15% stuttered syllables. In order to prevent the effect of potential differences in adult stuttering behaviors on the study findings, the words to be pronounced disfluently were determined by equal distribution according to word types and through random assignment. However, the placement of disfluencies within words was always in the initial position. The duration of the audio recordings varied, but the average was 2 minutes and 45 seconds (0%: 1 minute 56 seconds; 5%: 2 minutes 38 seconds; 10%: 2 minutes 53 seconds; 15%: 3 minutes 36 seconds). The disfluencies in question include voluntary syllable repetitions and prolongations determined by the SLT in line with the literature (e.g., Guitar, 2013; Riley & Bakker, 2009). The reason for preferring syllable repetitions and prolongation is to prevent the listeners from being confused that the sound was cut during the block. Two-syllable repetitions were consistently included (e.g., b-b-book), and prolongations were coherently about 0.5 seconds (e.g., aaaaple). In addition, no sample included a secondary behavior that could be heard because it might affect the listener's perceptions. The dubbing was made by a 36-year-old female PWNS SLT with an MSc degree and continuing Ph.D. studies who had been practicing stuttering therapy for nine years.

Determining the Naturalness of Speech in the Audio Recordings

In order to measure representative adequacy of the audio recordings created regarding a real stuttering sample, the 9-degree stuttering naturalness measurement tool developed by Martin et al. (1984) was used.

Interrater reliability for speech naturalness

As in many studies (e.g., Edge, 2012) that used the scale developed by Martin et al. (1984) in their research on speech naturalness regarding stuttering, a reliability analysis was performed. Intraclass correlation coefficient, which is commonly used for this purpose, shows the consistency between scorings provided by more than one raters (Lahey et al., 1983).

While calculating intraclass coefficient, one of the ways of avoiding potential error problems is to divide a speech sample into two and create two rating samples instead of raters' rating speech samples twice (Tinsley & Weiss, 1975). In this context, each of the audio recordings with 5%, 10%, and 15% stuttered syllables was divided into two equal durations. Then, 10 SLTs residing in Istanbul, with at least two years of SLT experience and providing regular services in stuttering assessment and treatment, listened to the first halves of the audio recordings, and following the listening process, each recording was rated according to the scope of naturalness. Perfect interrater harmony was obtained in all three recordings that included 5%, 10%, and 15% SS (r = .856, r = .816, r = .830).

Procedures

Similar to previous studies (Sander, 1965; Panico et al., 2005; Susca & Healey, 2001, 2002), in the application phase, each participant was made to listen to only one audio recording in order to eliminate the effect of learning, experience or perceptive prejudices regarding audio recordings, and they were assigned randomly to only one recording. In other words, the participants were assigned to one audio recording listening task considering the gender quota.

Applications were performed with each participant one-on-one in a quiet environment. First of all, the participants were informed about the purpose and content of the study, and their consent was taken. Then, the participants were asked to fill in a sociodemographic information form. Each participant was made to listen to one of the four audio recordings by random assignment in order to eliminate bias with the help of an Apple EarPods MNHF2TU/A model earphone. After each use, the earphone was disinfected to ensure a hygienic environment. All data collection tools were applied as paper–pencil tests in an in-person environment. The LCAT was administered to the participants by instructing them. The participants were asked to respond to all questions, and after they marked their choices, A-ADHDS and MPS were administered to them.

Statistical Analysis

In line with the purpose of the study, in order to determine the difference between the groups according to %SSs, variance analysis was performed, and in order to examine the effect of all scale scores on listening comprehension, covariance analysis was used.

Results

The difference between the groups in terms of scale scores according to the %SS in the audio recordings was examined using variance analysis in Table 2. Accordingly, when A-ADHDS total and MPS's subscale scores were examined, there was no statistically significant difference between the groups.

Table 2. Listening comprehension scores of participants based on exposed %SS

	%SS	*n*	*M*	*SD*	*p*
ADHD scale total score	0%	16	5.00	2.449	0.089
	5%	16	6.19	2.257	
	10%	16	4.63	2.778	
	15%	16	6.81	3.229	
Self-oriented perfectionism	0%	16	66.69	10.922	0.927
	5%	16	69.75	14.374	
	10%	16	67.38	13.952	
	15%	16	68.25	14.276	
Other-oriented perfectionism	0%	16	59.94	7.979	0.896
	5%	16	59.94	12.948	
	10%	16	61.44	11.764	
	15%	16	62.69	14.022	
Socially prescribed perfectionism	0%	16	55.44	13.510	0.949
	5%	16	53.56	12.506	
	10%	16	53.38	6.323	
	15%	16	54.56	10.321	
Perfectionism total score	0%	16	182.06	18.738	0.984
	5%	16	183.25	30.023	
	10%	16	182.06	26.415	
	15%	16	185.50	34.100	

*p<0,05.

Variance analysis findings related to the participants' listening comprehension performances regarding four different recordings in terms of stuttered syllable percentages are presented in Table 3 and Figure 1. According to these results, the participants displayed different performances at a significant level in understanding four different audio recording samples in terms of stuttered syllable percentages. Moreover, Sheffe's post hoc analysis showed that the difference between 0% and 15% significantly affected listening comprehension. The participants obtained the highest comprehension mean score of 6.81 related to the speech sample with 0% of stuttered syllables, that is, the speech which was totally fluent.

Table 3. Participants' listening comprehension scores based on exposed percentage of stuttered syllables

	%SS	*n*	*M*	*SD*	*p*
Listening comprehension score	0%	16	6.81**	1.377	0.021*
	5%	16	5.50	1.414	
	10%	16	5.50	1.713	
	15%	16	5.13**	1.784	

* Significant at .05 level at ANOVA.

** Significant at .05 level at Sheffe posthoc test.

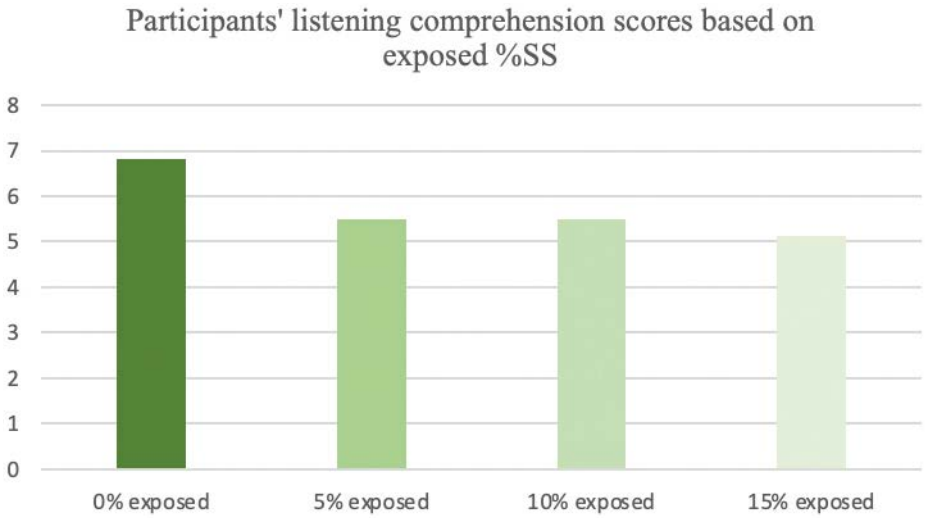

Figure 1. Visual representation of participants' listening comprehension scores based on exposed percentage of stuttered syllables

The effects of the participants' MPS's subscale scores, A-ADHDS total score, and the %SSs they listened to on their LCAT scores were examined together by using covariance analysis (Table 4). According to these results, it was determined that the %SS they listened to had a significant effect on LCAT score, and that A-ADHDS total score, SOP scores, OOP scores, and SPP scores did not have a relatively significant effect.

Table 4. Covariance results on the effect of %SS, ADHD and perfectionism scores on listening comprehension

Dependent Variable: Listening Comprehension Assessment Tool (LCAT) scores					
Source	***Tip III sum of squares***	***Degrees of freedom***	***Mean square***	***F***	***p***
Corrected model	44.575	7	6.368	2.703	0.017
Intercept	6.347	1	6.347	2.695	0.106
ADHS total score	0.264	1	0.264	0.112	0.739
Self-oriented perfectionism	1.402	1	1.402	0.595	0.444
Other-oriented perfectionism	0.570	1	0.570	0.242	0.625
Socially prescribed perfectionism	8.216	1	8.216	3.488	0.067
Exposed percentage of stuttered syllables	24.082	3	8.027	3.408	0.024
Error	131.909	56	2.356		
Total	2281.000	64			
Corrected Total	176.484	63			

Discussion

This study mainly examined how %SS level affected the participants' listening comprehension scores. The study also investigated the roles of hyperactivity/attention and perfectionism in listening comprehension, which is used to equate listening groups and exclude individuals with ADHD from the study. The most significant finding of the study indicated that the participants' listening comprehension performances differed among the groups according to the %SS to which they were exposed. The participants who listened to the completely fluent speech recording exhibited a more successful performance (a mean score of 6.81 for 0% SS) in comparison to the other groups (a mean score of 5.50, 5.50, and 5.13 for 5%, 10%, and 15% SS, respectively).

The findings of this study can be discussed first in the context of the features of our main measurement tool, the LCAT. In this study, the measurement tools used in similar previous studies (Cyprus et al., 1984; Hulit, 1976; Panico et al., 2005; Sander, 1965) were unusable because they lacked Turkish adaptations. Although the measuring power of the instrument was analyzed quantitatively and qualitatively by Turkish teachers and SLTs, further procedures such as validity and reliability analysis could have been applied. Moreover, the addition of a male voiceover would have given us an opportunity to examine the effect of the gender factor. If the

LCAT had qualitative questions (e.g., How much do you think the presenter stuttered? How did you feel while listening to them?), extremely flexible data on participant perspectives could have been collected.

The result that better listening comprehension performances correlated with fluent speech was consistent with previous studies. For example, Hulit's (1976) study concluded that stuttering generally affected listening comprehension. Moreover, Panico et al. (2005) and Panico and Healey (2009) conducted studies involving audio recordings with different %SSs, and their studies demonstrated that increased %SS directly resulted in a low level of listening comprehension.

The present study, to control some possible variables in listening comprehension, included participants' perfectionism and attention scores, but it was determined that these variables did not significantly affect the listening comprehension scores. After all, if %SS was the only factor that affected listening comprehension, then the group that listened to the fluent audio recording should have earned a perfect score on the LCAT. Since this did not occur, the results indicate that various factors related to the listener and the speaker affect listening comprehension. Similar to the study that Susca and Healey conducted in 2002, the listeners made negative comments regarding the recordings that included both fluency and stuttering. Hence, the listeners focused not only on the fluency of speech but also on other aspects (Hegstrom, 1979). The results of the present study showed that the attention and perfectionism scores of the participant groups did not overshadow the %SS of the speech and resulted in a better listening comprehension performance. Thus, the findings of the study align with the literature that explained that other factors related to listeners affect their listening comprehension (Susca & Healey, 2001; 2002), and these factors did not include listeners' perfectionism and attention scores. The present study indicated that listeners are as important as PWS in interactions involving stuttering (Van Riper, 1982).

Again, when the participants were grouped according to different stuttering frequencies, no regular decrease was observed in the mean. The frequency of stuttering exposure affects listening comprehension. It is possible that the frequency of stuttering is not the only factor affecting listening comprehension. Numerous factors, including participant demographics, LCAT validity (sensitivity-specificity), confounding variables, and participant demographics, may affect this relationship.

Previous studies have partially documented that in addition to the effect of speech fluency on the listener's perception, the features of the text are also important to listening comprehension. Cyprus et al. (1984) found in their study that %SS or the information value of the stuttered word alone did not affect listening comprehension. This study also determined that the recall problems of the listeners appeared when they heard severe stuttering of words that had high information value. In other words, dealing with form rather than content negatively affected comprehension.

Hulit conducted a study in 1976 to examine the effect of the stuttering of keywords and other words on the ability to recall information. Hulit explained that the disfluencies experienced with keywords directed the attention of the listeners more toward the story, thereby leading to a better ability to recall the information.

The present study tried to distribute evenly the words in which disfluency was experienced in the audio recordings, although few studies in the national literature have attempted to do this. The present study was unable to fully control word repetitions, fillers, revisions, voice tone changes, and secondary behaviors that potentially occur in moments of real disfluency. This was one of the most significant limitations of the present study. As Panico et al. explained in their study in 2005, these features could affect the listener's ability to engage with the message and understand it.

Because the environment of the present study did not reflect a natural speech context, listeners may display lower comprehension performance in daily communication, and the level of communicational disconnection shown in this study may be more severe. In addition, listeners' comprehension problems and the efforts they make can affect their facial expressions (Panico & Healey, 2009) and the feedback they provide to the speaker, who may interpret this behavior as a negative reaction from the listeners to the stuttering. Also, disfluencies in speech can affect listeners' perceptions of the speech signal and its prosodic features and may cause listeners to perceive the speech as disfluent and less natural even during moments of limited stuttering (Traunmüller, 1994). Increased stuttering severity may cause the listener to develop a negative attitude toward the speaker and decrease the listener's comfort as he or she is forced to exert more effort (Turnbaugh et al., 1979; Gabel, 2006; Panico et al., 2005; Susca & Healey, 2001; 2002), and go beyond the listener's attitude to affect listening comprehension, as the present study demonstrated (Hulit, 1976; Cyprus et al., 1984; Susca & Healey, 2001; 2002; Panico et al., 2005; Panico & Healey, 2009).

The effect of stuttering on listening comprehension may manifest itself in listeners' negative perceptions of the speaker in terms of his or her features, linguistic competence, context, and speech production. This situation causes stuttering to become a bilateral problem, and thus, stuttering is arguably both a speech disorder and a communication disorder.

Conclusions and Clinical Inferences

When a traditional approach is used for stuttering therapy, the most important goal is to reduce the severity of the disfluency. The present study showed that this is important for the comfort of the listeners. However, when

intervention procedures for stuttering are addressed holistically and every aspect of the phenomenon is considered in managing the issue, it becomes evident that permanently maintaining disfluency at 0% stuttering-like disfluency is not a plausible target. This is because stuttering is a bilateral problem that involves interaction between individuals and the environment. Determining therapy targets within the framework of the ICF model facilitates the management of all aspects of stuttering and establishes a focus for therapy (Yaruss, 2010). The importance of developing knowledge, experience, and awareness in society of stuttering is currently an issue at the forefront of speech therapy. If each individual in society listens to samples that include some stuttering and understands how to exhibit the appropriate reaction, a stutter-friendly environment can be created for PWS. Although these findings provide some important evidence for chronic stuttering, they do not yield inferences about early stuttering.

Because %SS affects comprehension, PWS cannot successfully relay their intended messages to listeners. In such cases, PWS should use communication strategies that facilitate communication in their daily lives (Healey, 2010). These strategies may include developing storytelling skills, using brief information, and obtaining presentation support through various visuals (Panico & Healey, 2009). Thus, listeners will more easily understand PWS.

The finding that listeners' attention and perfectionism did not affect listening comprehension performance makes it impossible to reach a clear conclusion that includes a clear cause-effect relationship. Numerous confounding variables related to the examination of the interaction between PWS and the environment. Future studies that specifically address listeners' attitudes toward communication, skills, and other variables will provide better clarification of this issue.

Limitations

The most important limitation of the study was the rhythmic presentation of stuttering behaviors in the audio recordings. In a natural stuttering sample, disfluency behaviors, abnormal pauses, and nonrhythmic phonations can be observed and affect the study findings. However, increasing the representability of the stuttering phenomenon and exhibiting disfluencies at a certain standard while demonstrating fluency as naturally as possible were considered essential.

It was important to control for other variables in addition to the listeners' ADHD and perfectionism. For example, it was imperative to control for psychological variables, such as previous communications with PWS, attitudes toward the disability, empathy, and acceptance of others. Thus, including these variables and new variables in this direction in the designs of future studies will increase the strength of the studies. In addition, in the study, having each listener only listen to one sound recording makes it difficult to control variables associated with the listeners. To control for listener characteristics in future studies, it is suggested that each participant listens to all audio recordings.

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