

An Investigation into the Difference in Word Class and the Function of Repetition in Stuttering Persian Speaking Children

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Received date: December 01, 2016; Accepted date: January 27, 2017; Published date: January 31, 2017

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Abstract

Various studies have explored developmental stuttering in children. However, not many investigations have been conducted to examine repetition types produced by these children. That said, the purpose of this study was to examine repetition types produced by the children who stutter and those who do not, observing for differences in word classes, including content and function words. To that end, six children who stutter and eight children who do not participated in this study. The participants were Iranian and they were monolingual Persian speakers. The language productions of these children were recorded. A situation has been created for them in which they produced natural data. The results of the study indicated that both groups of children produced more number of part-word repetition than whole-word repetition. Moreover, the results indicated that there was a statistically significant difference between the two groups with regard to the repetition types of different word classes. The findings also revealed that children who stutter produced significantly more part-word repetition in both content and function words. This was also observed for the content words produced by the children who do not stutter. However, no significant difference was observed in the repetition types of function words in the production of the children who do not stutter. The study has proposed some arguments for the obtained results.

Keywords: Stuttering; Content words; Part-word repetition; Persian speakers

Introduction

The increasing number of studies conducted within the realm of childhood stuttering show the importance of the topic for several different reasons. First, as Hall, Wagovich, and Bernstein Ratner [1] state, the importance of effective human communication in life which is done through the medium of language is undeniably important. Second, the parallel development of language growth and the emergence of stuttering which happens between the age of 2 and 7 contributes to the significance of the topic [2]. Consequently, if childhood stuttering is not paid the due attention, it may disguise the communication competence of children in future. Thus, one can say that doing studies within the realm of stuttering holds significance in that researchers of the field are searching for the reasons which lead to and influence stuttering in children.

In the search for the reasons and the factors associated with stuttering in children, the researchers have reached different outcomes. For instance, some of them [3-5] have found that fluency breakdowns are more often observed when the children fail to encode and decode the syntactic, lexical, and phonetic of speech production. Others such as Bernstein Ratner [6], suggest that the stuttering which we observe in the children may be due to the higher level of sentence planning such as the combination of higher number of syntactic constituents. Later on, however, Howell [4] proposed a mixed model in which he showed the overlap between planning and execution of utterance. Howell's model which is called EXPLAN (EXecutuin and PLANning) suggests that "this overlap is thought to provide opportunity for dyssynchronies between the planning (linguistic) and execution (motor) of utterance constituents, which might contribute to stuttering" [7].

In contrast, psycholinguistic models view stuttering in different perspectives. These models, such as "fault-line" [5] and "convert repair" [8], associate fluency breakdowns with phonological difficulties rather than syntactic/lexical encoding/decoding processes. In addition to that, the psychological perspective toward children who stutter suggests that supersegmental aspects of language can be another reason for the difficulty in language planning and production [9]. Moreover, other researchers [10,11] believe that the combination of suprasegmental aspects of language with lexical and segmental aspects of utterance, and dyssynchronous aspects of segmental information may lead to stuttering.

The important point regarding the psycholinguistic perspective is that the theories and empirical results obtained from the conducted studies show the important role which the linguistic factors play in the distribution and loci of the language production of the children who stutter [7]. Given that, the different repetition types are associated with different levels of linguistic encoding [12]. One type of repetition is part-word repetition in which children who stutter repeat a specific part of the words when they have problems in their language production. This type of repetition is thought to result from the errors at the level of language encoding processes [13]. However, the whole-word repetition, as another type of language related repetition in which the children who stutter repeat the entire of the problematic words, is associated with the errors at the level of lexical planning [8].

One more aspect of stuttering which has drawn the attention of researchers working on children who stutter is the word class. Categorically the linguists mention two types of word class including content words and function words. Content words include main verbs, adverbs, nouns, and adjectives [14] which are thought to be phonologically more complex than function words [15]. Function words are those words which are phonologically simple [15] including conjunctions, propositions, pronouns, and auxiliary verbs [14].

The different perspectives mentioned earlier propose that linguistic planning is associated with lexical process in which the selection of a word specifies the phonological and syntactic element of a sentence [12]. We should also know that speech errors are related to content words [16]. During linguistic planning time, one may observe the speech errors in the content words which “assigned to their relevant slots within a syntactic structure” [13]. Dell [17] states that during the process of content word inferences, the anticipation, preservation, and exchange of errors may be observed. However, as Buhr et al. [13] and Garrett [18] declare, function words are not considered to trace in phonological errors.

However, as Buhr et al. [13] raise the question, “empirical studies regarding the tendency for children to stutter on function words presents a novel means to investigate a potential phonological factor in developmental stuttering.” Studies [19] show that although through the comparison of traditional models we may predict that the phonological problems are manifested through content words, children have the tendency to stutter on the function words. Moreover, Buhr and Zebrowski [20] believe that children stutter on the beginning position of function words. When addressing function words and content words with the type of repetition including whole-word repetitions and part-word repetitions, the case will be more intriguing.

Literature Review

Theoretical underpinnings

The studies which have been conducted with regard to children who stutter used various theoretical and empirical models. In this section we summarize the recent theoretical models along with the empirical findings of the studies.

The covert repair hypothesis proposed by Kolk and Postma [21] suggests that all of the difficulties in the speech fluency are due to the “covert repairs” of phonological encoding which may happen in the speech of a person before he/she expresses the error overtly. To put it in another way, the covert repair hypothesis postulates that the speech errors might be detected before the utterance of the errors. The covert repair leads to the correction of the error internally rather than externally.

The covert repair hypothesis also specifies its tenets for the stuttering children with care. Given that, the covert repair hypothesis states that the recovered children from stuttering can be as fluent as the normal fluent speakers [15]. This hypothesis proposes that the true stuttering people are those whose phonological processes are slower than the normal fluent people. Applying the tenets of the covert repair hypothesis to the stuttering children, Yaruss and Conture [22] pointed that if the disfluencies in the speech show the correction of the errors covertly, then, the same process of correction should be observed in overt repairs. Moreover, since the covert repairs are not the only explanation for the data obtained from the children who stutter at 3-6, the results need to be interpreted with caution.

Another theory in association with stuttering is EXPLAN model proposed by Howell [4]. In the words of Savage and Howell [15], in this model “language planning and execution are parallel independent processes with neither process being monitored for errors.” (pp. 461). The proponents of this model questioned the notion of covert repair and mentioned the mismatches existing between the time of planning and execution as the reason for disfluent speech [23]. That said, since when a speaker is executing one language segment he/she is planning

the upcoming segments simultaneously, the disfluency might happen due to the speakers’ inability in planning the next segments owing to fast speech and incomplete execution segments [24].

Some similarities and differences can be detected between the covert repair hypothesis and EXPLAN model. In a similar way both the covert repair hypothesis and EXPLAN explain the disfluencies which may be observed in the normal fluent speakers and the people who stutter. However, different from the covert repair hypothesis, EXPLAN proposes that the processing mechanism of people who stutter and the normal fluent speakers start in the same patterns. EXPLAN suggests that since in the childhood the planning system is not that much mature to plan the upcoming words, disfluency in the production of children can happen.

It is important to note that EXPLAN does not see any differences between the young children who stutter and the normal fluent speakers, except that the children who stutter are slow representers of the speech planning [25]. However, EXPLAN is different from the covert repair hypothesis in that it suggests that the planning difference is global and not phonological. In this regard, most of the children who stutter recover as their planning system will mature [26]. The proponents of EXPLAN model posit that the persistence of the stuttering features in the adulthood of the children who stutter is because “they shift from making stalling disfluencies to advancing disfluencies” [15] which may be due to different factors such as environmental ones.

One fascinating feature of EXPLAN over the covert repair hypothesis is that it is well supported by the naturalistic data. According to Bloodstein and Grossman [27], the problems in the fluency of children often happen in function words. Howell [28] mention whole-word repetition as a type of disfluency in the speech of the children who stutter. For instance, the children who stutter may utter the on the table as on on on the the the table. Moreover, one more type of repetition as stated earlier is part-word repetition. According to Howell and AuYeung [29], this type of repetition happens more in content words due to being less frequent and less easy to generate compared with function words. Children who stutter may utter on the ttttable instead of on the table. The tenets of EXPLAN model suggest that the problem in the production of content words is due to the fact that they are more difficult to be planned. In other words, children find it harder to plan the content words for execution, leading to part-word repetition.

That all said, both EXPLAN and the covert repair hypothesis have some explanations for stuttering in children with regard to different aspects such as word classes and type of repetitions. The focus of both theories is on the naturalistic data. Consequently, these theories do not pay the fare attention to test experimentally [15]. This may lead to the debate between the naturalistic and experimental paradigms. Bosshardt [30] postulates that the naturalistic data leads researchers to investigate language in its context; however, makes it difficult for the researchers to determine the processes. Nonetheless, the experimental data leads researchers to investigate the language related processes in a non-circular fashion.

Experimental studies

Different research studies have used various methodologies to address stuttering in children. Bajaj, Hodson, and Schommer-Aikins [31] conducted a study to examine the performance of 23 children who stutter and 23 children who do not stutter on three metalinguistic tasks

including two phonological awareness assessment tasks and one modified grammar judgment. The results of their study showed that there was a significant difference between the students who do not stutter and those who stutter on the modified grammar judgments tasks in which the children who do not stutter outperformed those who do. However, the results of their study indicated that there were no significant differences between the two groups regarding their performance on the two phonological awareness assessment tasks.

In another study, Sawyer, Chon, and Ambrose [32] investigated the impacts of rates, length, and complexity on the problems of speech production in children who stutter. They examined the mentioned criteria of speech production of eight boys and six girls who stutter through the use of mean length utterance. The findings from examining the clausal constituents per utterance and articulation rate indicated no significant differences between the two sections under investigation in this study. However, the mean length utterance significantly increased in the second section in which the ending syllabuses were under investigation.

In 2008, Savage and Howell conducted a study to investigate the underlying mechanism of stuttering by investigating the fluency of priming of short sentences. The information obtained from their study indicated three findings. First, the findings showed that the children who stutter and those who do not would be more fluent after function word priming rather than content word priming. Second, the results revealed that there was a significant difference between children who stutter and those who do not with regard to the fluency after function word priming in which children who stutter were more fluent. Finally, children who stutter produced longer content words after the production of function words compared with children who do not stutter.

More recently, Buhr et al. [13] conducted a research study with the aim of investigating different types of repetitions, including part-word repetition and whole-word repetition associated with monosyllabic words in children who stutter and those who do not. They hypothesized that the repetition types might be different when different word classes were uttered. Collecting data from 13 children who stutter and 15 who did not stutter, Buhr et al. [13] also coded the words for their word classes. The results of this study indicated that children who stutter and those who do not had higher tendency to produce part-word repetition on the content words; however, there were no significant differences between the two groups. The findings also revealed that children who stutter produced significantly higher number of repetitions in the function words compared to children who do not stutter.

Rationale for this study

Through reviewing the literature theoretically and empirically, one can understand that there are some discrepancies among the results and the findings of different studies. More often than not, most of the studies have been conducted in English. Consequently, in this study, we aimed to investigate the repetition types, part-word repetition and whole-word repetition, regarding different word classes, including content words and function words in Persian, of the children who do stutter and those who do not. Combining the tenets of both theories of EXPLAN and covert repair hypothesis, we strengthen the methodology of the study. Once again it should be stated that in this study we investigated the repetition types of the children who do not stutter, meaning that they were fluent speakers; however, due to the reasons explained earlier in the study they repeated some words in

their utterances. The current study was an attempt to address the following questions:

1. How do children who stutter and those who do not produce part-word repetition and whole-word repetition with regard to content and function words?
2. Is there any statistically significant difference between children who stutter and those who do not with regard to repetition types and word classes?
3. Is there any statistically significant difference between the repetition types of children who stutter when different word classes are of concern?
4. Is there any statistically significant difference between the repetition types of children who do not stutter when different word classes are of concern?

Methodology

Participants and setting

Six children (three boys and three girls) who stutter with the age range of 5-7 years ($M=5.8$) old and 8 children (four boys and four girls) who do not stutter with age range of 4-7 ($M=5.4$) years old participated in this study. For the purpose of this study, the lead researcher visited a speech therapy center in Shiraz, Iran to collect the data. The participants were selected through different criteria. First, the researchers selected the participants who had not been treated for their speech disfluencies. Moreover, the participants who had low quality and meaningless productions were discarded from the study. These two criteria led us to have six children who stutter.

Data collection

To collect the data the researchers used a positioning theory. The mentioned theory as Tirado and Gálvez [33] state "is an interactionist approach which has the peculiarity of having been composed within the field of Social Psychology." Although the tenets of positioning theory are induced from marketing communication, they are now used to explain the positions of a person with his/her interaction types. In another words, positioning theory is used in research to make one's actions intelligible for others. The lead researcher created conversations in such a way that the children became involved in it; consequently, they saw themselves in a real conversation. The fact that the children saw themselves in a real context of conversation had two advantages. First, we could obtain naturalistic data and, second, we could investigate stuttering experimentally, leading to the fulfilment of both naturalistic and experimental approaches to data collection.

The children were asked to speak about their future career and what they would do in those careers. This kind of topic required the children to think, plan, and execute their production. This way we considered the effect of planning on execution which was addressed in the previous studies. The utterances produced by the children were tape-recorded. Then, the transcriptions of the recorded materials were prepared for further analysis.

Data analysis

After transcribing the data for analysis, we categorized different aspects to obtain the required information. With regard to the repetition types we had four categories including part-word repetition,

whole-word repetition, repetition of both part-word and whole-word, and phrase repetition. However, of the four types we were interested in just two of them: part-word repetition, and whole-word repetition. Moreover, with regard to word classes, as it was stated earlier, we categorized content words and function words.

For the matter of reliability measurement of part-word repetition and whole-word repetition, another examiner examined 50% of the transcribed data and the degree agreement between the two examiners was about 94%. In what follows some extractions from several transcriptions are provided:

“do do doctor besham” → “I wanted to be a physician”

do do doctor=content word.

“sar sar sarbaz o o o po po polis mikh mikh besham” → “I wanted to be a soldier and a police”

sar sar sarbaz=content word

po po polis=content word

o o o=function word

“do do dostam Reza mikhad ke ke ke moa moalem beshe” → “my FRIEND Reza wants to be a TEACHER”

do do dostam=content word

ke ke ke=function word

moa moalem=content word

The information obtained from the children who stutter (CHS) and children who do not stutter (CHNS) appear in Table 1 below:

	Group	N	Mean	Std. Deviation	Std. Error Mean
PWR	CWS	6	13.000	2.89828	1.18322
	CWNS	8	3.3750	1.06066	0.37500
WWR	CWS	6	3.6667	1.36626	0.55777
	CWNS	8	1.2500	0.46291	0.16366
PHR	CWS	6	2.8333	1.47196	0.60093
	CWNS	8	1.0000	0.75593	0.26726

NOTE: PWR (Part-Word Repetition); WWR (Whole-Word Repetition); PHR (Phrase Repetition)

Table 1: Descriptive statistics of the information about different types of repetitions.

Results

The first research question of this study addressed how children who stutter and those who do not produce part-word repetition and whole-word repetition when the content and function words are at focus. (Figure 1) shows the information we obtained in this regard.

As can be seen in Figure 1 the highest mean score is for part-word repetition of the content words for both groups (Figure 1). Also indicates that the mean score for repetition of content and function words is the same (2.5) for children who stutter.

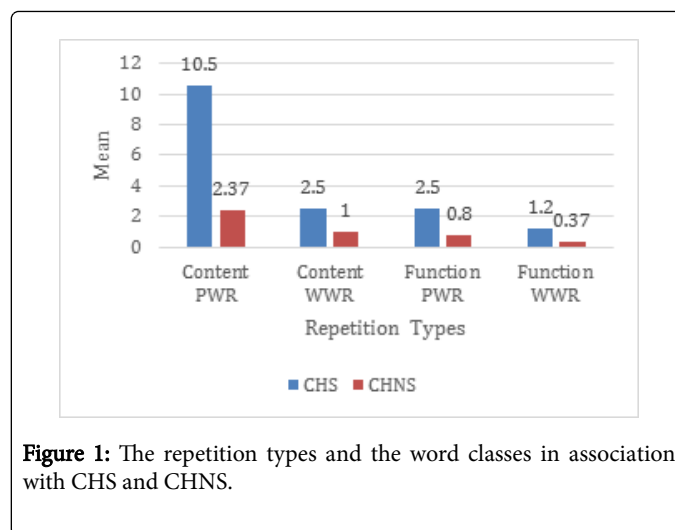


Figure 1: The repetition types and the word classes in association with CHS and CHNS.

To address the second research question which was posed to investigate the language production of children who stutter and those who do not regarding the repetition types and word classes, a series of non-parametric tests were run. First of all, a Mann-Whitney U Test was run to investigate the difference between part-word repetition and whole-word repetition in the children who stutter and those who do not. Table 2 shows the results of this analysis.

	Group	N	Mean Rank	Sum of Ranks
Content PWR	CWS	6	11.50	69.00
	CWNS	8	4.50	36.00
	Total	14		
Function WWR	CWS	6	11.00	66.00
	CWNS	8	4.88	39.00
	Total	14		
Content PWR	CWS	6	10.75	64.50
	CWNS	8	5.06	40.50
	Total	14		
Function WWR	CWS	6	10.25	61.50
	CWNS	8	5.44	43.50
	Total	14		

Table 2: Difference between part-word repetition and whole-word repetition in both groups.

Table 2 is very useful because by using it one can indicate which group can be considered to have the higher repetition types with regard to different word classes. As can be seen in Table 2, the children who stuttered had higher ranks in different repetition types associated with word classes. To see whether or not the difference was statistically significant, test statistics was run. Table 3 indicates the results.

Table 3 shows that there are statistically significant differences between children who stutter and those who do not with regard to both repetition types associated with word classes. Given this, it can be

understood from Table 3 that children who stutter produced higher number of part-word repetitions in content words compared with the children who do not stutter.

	Content PWR	Function PWR	Content PWR	Function PWR
Mann-Whitney U	0.0	3.0	4.5	7.5
Wilcoxon W	36.0	39.0	40.500	43.500
Z	-3.154	-2.822	-2.639	-2.425
Asymp. Sig. (2-tailed)	0.002	0.005	0.008	0.015
Exact Sig. [2*(1-tailed Sig.)]	0.001 ^b	0.005 ^b	0.008 ^b	0.029 ^b

a: Grouping Variable: Group; b: Not corrected for ties.

Table 3: Inferential statistics regarding the difference between part-word repetition and whole-word repetition in both groups.

The third research question of this study was posed to address the children who stutter while they produced part-word repetition and whole-word repetition in association with content and function words. To that end, we conducted Wilcoxon signed-rank test. Table 4 shows the results of this test.

	Content PWR	WWR-Content	Function PWR	WWR-Function
Z	-2.207 ^b		-2.070 ^b	
Asymp. Sig. (2-tailed)	0.027		0.038	

a: Wilcoxon Signed Ranks Test; b: Based on positive ranks.

Table 4: The production of different repetition types in the children who stutter.

Table 4 indicates that there is a statistically significant difference between the repetitions types associated word classes of children who stutter. As can be seen, children who stutter produced a higher number of part-word repetition in both content and function words.

	Content PWR	WWR-Content	Function PWR	WWR-Function
Z	-2.232 ^b		-1.265 ^b	
Asymp. Sig. (2-tailed)	0.026		0.206	

a: Wilcoxon Signed Ranks Test; b: Based on positive ranks.

Table 5: The production of different repetition types in the children who do not stutter.

Finally, the fourth research question of this study was an attempt to investigate whether one can observe any statistically significant differences between the repetition types of the children who do not stutter when different word classes were of major concern. To this end, another Wilcoxon signed-rank test was run to address this question. Table 5 shows the results.

As can be seen in Table 5, there is a statistically significant difference between the repetition types of content words in the children who do not stutter ($p < 0.05$). However, this statistically significant difference cannot be observed in the repetition types of the function words in these children ($p > 0.05$).

Summary of the results

The results of the current study can be categorized into four main categories. First, the results indicated that both children who stutter and those who do not stutter used part-word repetitions more than whole-word repetitions. Moreover, the results revealed that there is a significant difference between the children who stutter and those who do not in the repetition types of different word classes. These results indicated that children who stutter used all repetition types for different word classes more than the children who do not stutter. Moreover, the results also showed that there were statistically significant differences between the repetition types in content words and function words produced by the children who stutter. The results of this section of the study showed that the children who stutter produced more part-word repetition on content and function words. Finally, the results indicated that there was a statistically significant difference between the repetition types of content words in children who do not stutter, showing that these children used part-word repetition for content words more than whole-word repetitions. However, there was no statistically significant difference between repetition types of function words for these children.

Discussion

Some explanations can be given with regard to the first research question. The previously conducted research showed that children who stutter and those who do not, tended to produce repetitions at the beginning of their speech productions [13,20]. That said, we can argue that the higher tendency of both groups in producing part-word repetition might be due to the position of the words. To put it another way, one can support the claim that the position of the words in an utterance is a leading factor causing part-word repetitions.

The production of fewer number of whole-word repetitions in both groups with regard to content words and function words might be due to language skill production [34]. We suggest that when children do not possess a threshold level of language production, they produce more whole-word repetitions. We can argue that the whole-word repetitions need more ability in planning and execution by children. Using these arguments we can say that the more the ability of children will be in producing the language, the less they will produce whole-word repetition. Consequently, children have more tendencies to produce part-word repetitions in both content and function words.

With regard to the second research question addressing the repetition types produced by children who stutter in content and function words, the results indicated that both in content and function words the children who stutter used more part-word repetitions in their utterances. These findings taps upon the role of phonological factors in developmental stuttering [13]. Based on these factors, part-word repetition is easier for the children who stutter. Unlike the study conducted by Buhr et al. [13] the results of this study revealed that children who stutter used statistically significant part-word repetitions.

Moreover, previously conducted studies have shown that producing content words reduce the planning time [15]. One may argue that since children who stutter see themselves in a situation that needs to convey

the meaning, they understand that they have to plan and execute content words immediately. They produced more part-word repetitions. Given that, the children who stutter produced more content words which needed less time to produce and at the same time used more part-word repetitions to even produce content words more easily and faster.

Finally, we run a “between-subject testing” to see the repetition types of the children who do not stutter when producing content and function words. The results we obtained in this regard can be divided into two categories. First, like children who stutter, children who do not stutter showed that they used statistically significant more part-word repetitions than whole-word repetitions in the content words. Owing to this, the explanation which has already been provided for the children who stutter can be relevant for the children who do not. One of these explanations is less time of planning and execution which can be obtained through producing content words with part-word repetition.

On the second part, the results of the study showed that no statistically significant difference was observed between the part-word repetition and whole-word repetitions in the production of function words. One explanation for these finding might be the fact that uttering the function words for the children who do not stutter is equal either by using part-word repetitions ore whole-word repetitions. Moreover, as Savage and Howell [15] stated, maybe different word classes including content and function words require different timing and competency to be produced. Furthermore, we can add to this point the fact that children who stutter and those who do not may be different with regard to the ability they need to produce content and function words. Owing to this, the results of the study lead us to argue that children who do not stutter may be competent enough to produce function words without any difference in repetition types.

Conclusion

This study was an attempt to investigate the repetition types produced by the children who stutter and those who do not while they produce content and function words. The results of the study have shown that both children who stutter and those who do not produced more part-word repetitions more than whole-word repetitions. That said, the results of the study are inconsistent with that of Bhur et al. [13] in which children who stuttered and those who do not produced more whole-word repetition for both content and function words. The results of the study also suggested that there is a significant difference in the part-word repetitions used by children who stutter while they uttered content and function words. The same results have been obtained with regard to the production of content words in the children who do not stutter. The results we obtained in these regards can be traced in the one by Savage and Howell [15]; however, causation should be taken since the purpose of their study was on priming.

Through the courses of analysis, we proposed different arguments for the obtained results. First of all, we think that since as the previously conducted studies showed, children who stuttered and those who do not tended to produce their repetitions at the very beginning of their utterances [20]. Moreover, we also proposed that since the development of language skills are a dynamic process, the participants of this study might produce a higher number of part-word repetitions due to the increment of their language production skill. One more explanation we provided on the obtained results is the phonological factors which might be involved in the more production of part-word

repetition in the both group. According to the principles of phonological factors, one might produce a higher number of part-word repetitions compared with whole-word repetitions due to the easiness of production [13]. Nonetheless, there was no statistically significant difference in the production of content and function words with regard to the repetition types. We proposed the reason might be that children who do not stutter have reached a threshold level based on which there is no difference which repetition types they used.

The results of this study have implications for clinical speech therapy and pedagogical ones. First of all, the Persian speech therapists might make use of the findings of this study to develop materials for the children who stutter. Through the results obtained in this study we know that children who stutter produced more content words and at the same time more part-word repetitions. Consequently, this might trigger the Persian speech therapists to reconsider the materials for them. Furthermore, the results of this study might be used for pedagogical purposes in kindergartens for the children who stutter (pre-school children). Given that, the teachers and people in charge might use the results to create specific types of materials for stuttering children.

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