JSLHD 2026. Vol. 35, No. 2. 063-069
ISSN 1226-587X / eISSN 2671-7158
Journal of Speech-Language & Hearing Disorders 언어치료연구

ORIGINAL ARTICLE
https://doi.org/10.15724/jslhd.2026.35.2.063
http://jslhd.org/

A Study on Disfluency Characteristics in Non-Stuttering Children for the Development of a Stuttering Prediction Test

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Purpose : This study systematically analyzes the types and frequency of disfluencies in the natural speech of typically developing children. It aims to identify developmental patterns by age, providing foundational data to distinguish normal disfluency from pathological stuttering and to support the development of early screening tools.

Methods : Participants included 21 typically developing children (ages 4, 5, and 6) in the Gyeongnam region. Speech samples were collected through free-play and book-reading interactions. One-hundred utterances were obtained from each child and classified into normal disfluency (ND) and abnormal disfluency (AD) types for statistical analysis.

Results : The total disfluency ratio was highest at age 4 and decreased with age, though differences across groups were not statistically significant. Within each age group, the ND ratio was significantly higher than the AD ratio, particularly for 4- and 5-year-olds. Regarding specific types, part-word repetitions increased with age, peaking at age 6, while interjections and incomplete phrases were most frequent at age 4 and decreased thereafter. Word and phrase repetitions were highest at age 4, dipped at age 5, and slightly increased at age 6. Revisions and hesitations remained infrequent across all ages. Notably, no prolongations or blocks were observed in any group.

Conclusions : Typically developing children exhibit significantly higher rates of normal disfluency compared to abnormal disfluency. While total disfluency showed a descriptive decline with age, specific types demonstrated distinct qualitative shifts. These findings provide essential baseline evidence for understanding normal speech development and creating assessment tools for the early prediction of stuttering.

Keywords : Stuttering prediction test, normal disfluency, abnormal disfluency

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Received : March 15, 2026
Revision revised : April 15, 2026
Accepted : April 30, 2026

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2022S1A5A2A01046610).

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Ⅰ. Introduction

Speech is the most fundamental means of human communication, and fluency refers to the ability to produce intended messages at an appropriate rate and rhythm without disruptions to the flow of speech (Guitar, 1998). Fluency serves as the foundation for effective communication, and disruptions in fluency may negatively affect not only children's everyday interactions but also their emotional well-being and social relationships. In particular, stuttering is a representative fluency disorder that typically begins in early childhood and, in some cases, persists into adulthood. When early intervention is delayed, stuttering may lead to long-term difficulties across multiple domains, including academic performance, self-esteem, and interpersonal relationships (Guitar, 2014; Yairi & Ambrose, 2005).

Stuttering is defined as a disruption in the smooth flow of speech characterized by repetitions, prolongations, and blocks (Wingate, 1964), and it most commonly emerges between the ages of 2 and 5, a period of rapid language development. In developmental disorders, including stuttering, early identification and intervention are considered the most effective strategies for preventing symptom chronicity and long-term persistence (Curlee, 1999). Although many preschool-age children recover spontaneously within one to two years after onset without professional intervention, approximately 20~25% continue to stutter (Yairi, 1997). Thus, childhood stuttering may represent either a transient developmental phenomenon or an early indicator of persistent stuttering extending into adulthood. Even though 75~80% of preschool children

recover spontaneously, appropriate caregiver responses and accurate clinical judgment remain critical regardless of recovery outcomes. In particular, children who do not recover spontaneously are at high risk for chronic stuttering, and longer duration of stuttering is associated with prolonged treatment and poorer prognosis. Therefore, deciding whether to monitor preschool children's disfluency as a normal developmental phenomenon or to initiate early intervention because of elevated risk for persistence constitutes a critical clinical decision. Such decisions must be grounded in sufficient empirical evidence regarding the characteristics of childhood stuttering and the processes of onset and recovery (Curlee, 1999).

A fundamental issue that must be addressed prior to such diagnostic decisions concerns the definition of early stuttering itself. The concept of early stuttering includes two key factors: the child's age and the duration since stuttering onset. However, many previous studies have inferred the characteristics of childhood stuttering from data on adults who stutter or have failed to adequately control for children's age and time since onset during participant selection (Yairi et al., 1993). As a result, information specific to early stuttering has remained limited, and the substantial overlap between disfluencies observed in children who stutter and those in typically developing children has made it difficult to clearly distinguish early stuttering from normal developmental disfluency.

Disfluencies observed in typically developing children are considered a natural part of language development and frequently occur during the preschool years, a period marked by rapid expansion of the language system. During this stage, children experience rapid vocabulary growth, increased mean length of utterance, and the production of increasingly complex sentence structures, all of which place temporary demands on speech planning and language organization processes. Consequently, developmental disfluencies in typically developing children often take the form of interjections, revisions, incomplete phrases, phrase repetitions, and pauses, and are generally produced with minimal speech tension or articulatory effort (Conture, 2001; Guitar, 2014; Yairi & Ambrose, 2005). Although the frequency of disfluency varies across individuals, it typically decreases or stabilizes with age, reflecting developmental improvements in speech organization and fluency during the later preschool years (Byun et al., 2004; Kim et al., 2012). In contrast, pathological disfluencies such as blocks, prolongations, and part-word repetitions are rarely observed in typically developing children and are considered core behaviors more prominently exhibited by children who stutter (Byun et al., 2004; Conture, 2001; Wingate, 1964).

Because typically developing children also experience various disfluencies as part of the language acquisition process, these behaviors may superficially resemble early stuttering. However, early stuttering and normal developmental disfluency substantially overlap in both type and frequency, making it difficult for clinicians to clearly differentiate the two phenomena in clinical settings (Conture, 2001). In particular, typically developing children tend to exhibit higher frequencies of normal disfluencies, whereas children who stutter demonstrate more prominent pathological disfluencies, including sound- or syllable-level repetitions, prolongations, and blocks, indicating a qualitative distinction between the two groups (Byun et al., 2004; Seong & Jeon, 2019).

Against this backdrop, there has been increasing demand for the development of assessment tools for the early identification and prediction of stuttering. To achieve this goal, it is essential to clearly delineate the differences between pathological stuttering and normal developmental disfluency. In particular, it is important to establish foundational data through systematic analyses of age-related and context-specific disfluency characteristics in typically developing children. However, much of the existing domestic and international literature has focused primarily on characterizing children who stutter, resulting in a relative lack of quantitative and qualitative data on natural disfluency patterns in typically developing children. Furthermore, many studies have been limited to simple frequency-based analyses or have failed to adequately consider the relationships among age, speaking context, and disfluency characteristics, thereby limiting their practical applicability as indicators for stuttering prediction in clinical settings.

Recent research on fluency screening and assessment has rapidly expanded beyond the simple measurement of disfluency frequency toward multidimensional screening frameworks that simultaneously consider persistence risk factors, language abilities, communication attitudes, caregiver reports, and co-occurring issues. For example, Walsh et al. (2021) suggested that the prediction of persistence in early stuttering requires examination of the relationships among multiple risk factors rather than reliance on a single indicator. Singer et al. (2022) further reported that a cumulative risk approach is useful in predicting the risk of persistent stuttering in young

children. Winters and Byrd (2024) showed that caregiver ratings provide important information for understanding children's communication attitudes. Most recently, Koenraads et al. (2025) reported associations between early language ability and the onset and persistence of stuttering, emphasizing the need for early screening approaches that incorporate language ability from the initial stage of stuttering emergence.

Similar trends are becoming increasingly evident in Korea. Kim et al. (2025) proposed a parent-response-based screening module embedded within a telepractice platform model for childhood stuttering, including case history, communication attitude, disfluency, and parental perception items. In addition, Choi et al. (2025) standardized the Korean version of the Stuttering Behavior Inhibition Scale (SBIS) for children, demonstrating that the assessment of childhood stuttering is expanding beyond speech behaviors alone to include temperament and emotional characteristics. Considering these recent domestic and international research trends, foundational data on the natural disfluency characteristics of typically developing children can serve as a critical benchmark for multidimensional early screening systems. In other words, clearly identifying the developmental characteristics of normal disfluency represents the starting point for constructing assessment systems that enable early detection of persistence risk and linkage to individualized intervention, underscoring the strong academic and clinical timeliness of the present study.

Accordingly, the present study aims to provide foundational data for the development of a stuttering prediction measure by conducting an in-depth analysis of disfluency characteristics in typically developing children according to age and speaking context.

II. Methods

1. Participants

The participants in this study consisted of 21 preschool children residing in the Gyeongnam region, including seven 4-year-olds (five boys and two girls), seven 5-year-olds (four boys and three girls), and seven 6-year-olds (five boys and two girls). All participants were selected based on initial screening reports indicating age-appropriate cognitive, physical, and language development, with no identified visual, auditory, neurological, or speech sound production problems.

Among these children, only those who scored within one standard deviation below the mean or higher (≥ -1*SD*) on both the receptive and expressive language domains of the Preschool Receptive-Expressive Language Scale (Kim et al., 2003) were included. In addition, children who were not diagnosed with stuttering according to the Paradise Fluency Assessment (Shim et al., 2004) were selected as the final participants.

2. Materials and data collection

Spontaneous speech samples were collected through interactions between the examiner and the child using free-play and picture-book reading activities, which are among the most commonly used procedures for collecting language samples in young children (Yim et al., 2015). To minimize the influence of activity type and contextual factors, standardized materials from the CSBS-DP Behavior Sample (Lee et al., 2018), including a pretend-play toy set and three picture books, were used, and a total of 100 utterances were collected from each child.

During the language sampling process, when a child lost interest in the activity or showed low engagement with the examiner-provided materials, the use of the child's preferred toys was permitted to maintain natural interaction.

3. Research procedures

Speech samples were collected by the researcher at each child's childcare center to ensure a familiar and naturalistic environment. All collection sessions were video-recorded and were subsequently used for transcription and disfluency analysis.

4. Coding and analysis criteria

1) Speech transcription

All collected speech samples were video-recorded. During transcription, the children's utterances were recorded as closely as possible to their original forms, and stuttered words and disfluent utterances were also transcribed in their original spoken forms without modification.

2) Types of disfluency

Disfluency types were classified into abnormal

disfluency (AD) and normal disfluency (ND) according to the classification criteria used in previous studies (Byun et al., 2004; Conture, 2001).

Abnormal disfluency included repetitions, prolongations, and blocks occurring at linguistic units smaller than the word level. Specifically, repetitions were defined as part-word repetitions, syllable repetitions, and phoneme repetitions, all of which occurred below the whole-word level.

In contrast, normal disfluency included whole-word repetitions, phrase repetitions, interjections, revisions, hesitation, and incomplete phrases. In particular, whole-word repetitions were defined as repetitions in which a multisyllabic word or a single word was repeated in its entirety and were considered part of the normal disfluency category that naturally occurred during speech planning.

3) Calculation of disfluency ratio

The disfluency ratio was calculated as a syllable-based disfluency ratio, obtained by dividing the number of disfluent syllables by the total number of syllables produced and multiplying by 100. The present study analyzed speech at the syllable level according to the utterance analysis criteria of the Paradise Fluency Assessment (P-FA, Shim et al., 2004). The P-FA is a standardized assessment widely used in the evaluation of childhood fluency in Korea.

4) Reliability analysis

To verify the reliability of disfluency analysis, intra-rater and inter-rater reliability were calculated using 10% of the total speech samples. The reliability samples were selected to ensure balanced representation of age groups (4, 5, and 6 years) and speaking contexts, and to include a variety of disfluency types.

The second evaluator who participated in the inter-rater reliability analysis was a certified Level 1 speech-language pathologist who independently analyzed the samples after receiving sufficient prior training on the disfluency coding criteria. Discrepant cases were reexamined based on the coding manual and were resolved through final agreement. The results indicated high reliability, with 98% intra-rater reliability and 95% inter-rater reliability.

5. Statistical analysis

Given the small sample size in each age group, the assumption of normality was examined using the Shapiro-Wilk test prior to inferential statistical analyses. The results indicated that the total disfluency ratio satisfied the normality assumption (W=.925, p=.111), and therefore parametric analyses were retained.

First, Welch's one-way ANOVA was conducted to examine differences in the total disfluency ratio across age groups (4, 5, and 6 years). Second, paired samples t-tests were conducted to compare the ratios of normal disfluency (ND) and abnormal disfluency (AD) within each age group. Third, descriptive statistics were used to examine age-related differences in disfluency forms.

Ⅲ. Results

1. Age-related differences in total disfluency ratios

To examine age-related differences in the total disfluency ratio, Welch's one-way ANOVA was conducted. Descriptive statistics indicated that the mean total disfluency ratio was highest in the 4-year-old group (M=4.21, SD=2.37), followed by the 5-year-old group (M=2.03, SD=1.18) and the 6-year-old group (M=1.95, SD=1.30). However, the differences among age groups were not statistically significant, $F_{(2, 11.4)}$=2.16, p=.160 (Table 1).

Table 1. Descriptive statistics for total disfluency ratios across age groups

Group	*n*	*M*	*SD*
4 years	7	4.21	2.37
5 years	7	2.03	1.18
6 years	7	1.95	1.30

2. Comparisons between ND and AD ratios within age groups

Paired samples t-tests were conducted to compare the ratios of normal disfluency (ND) and abnormal disfluency (AD) within each age group.

The results showed that, in the 4-year-old group, the ND ratio (M=4.06, SD=2.41) was significantly higher than the AD ratio (M=0.15, SD=0.16), $t(6)$=-4.21, p=.006. Similarly, in the 5-year-old group, the ND ratio (M=2.03, SD=1.18) was significantly higher than the AD ratio (M=0.12, SD=0.17), $t(6)$=-4.15, p=.006.

In contrast, in the 6-year-old group, the difference between the ND ratio (M=3.28, SD=3.81) and the AD

ratio (M=0.56, SD=0.86) was not statistically significant, $t(6)$=-2.12, p=.078 (Table 2).

Table 2. Comparisons between ND and AD ratios within age groups

	ND	AD	t	p-value
4 years	4.06 (2.41)	0.15 (0.15)	-4.21	.006**
5 years	2.02 (1.17)	0.11 (0.16)	-4.15	.006**
6 years	3.28 (3.81)	0.56 (0.86)	-2.12	.078

Note. ND=normal disfluency; AD=abnormal disfluency.
**p<.01

3. Differences among disfluency type

Comparisons of disfluency forms across age groups showed distinct developmental changes for each type. First, part-word repetitions gradually increased with age and were highest in the 6-year-old group. In contrast, interjections occurred most frequently in the 4-year-old group and gradually decreased in the 5- and 6-year-old groups.

Revisions and hesitations generally remained at low frequencies across all age groups, although both increased slightly in the 5-year-old group. Incomplete phrases occurred at a very high frequency in the 4-year-old group, but decreased markedly after age 5 and then remained relatively stable. Finally, word and phrase repetitions were highest in the 4-year-old group, decreased sharply in the 5-year-old group, and then increased slightly again in the 6-year-old group. In contrast, no prolongations or blocks were observed in any age group (Table 3).

Table 3. Age-related differences in disfluency forms

Disfluency type	4 years M (SD)	5 years M (SD)	6 years M (SD)
Part-word repetition	0.86 (0.90)	1.14 (1.68)	2.50 (5.17)
Prolongation	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Block	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Interjection	7.75 (4.47)	6.14 (6.67)	4.67 (5.54)
Revision	0.14 (0.38)	0.86 (1.21)	0.17 (0.41)
Hesitation	0.14 (0.38)	0.86 (1.21)	0.17 (0.41)
Incomplete phrase	9.43 (4.43)	5.86 (4.30)	5.67 (2.50)
Word & phrase repetitions	2.29 (2.63)	0.43 (0.79)	0.67 (1.03)

Ⅳ. Discussion and Conclusion

The present study examined disfluency in preschool children from multiple perspectives, including age-related changes in total disfluency ratios, differences between normal disfluency (ND) and abnormal disfluency (AD), and variations across disfluency forms. This multidimensional approach reflects the understanding that fluency development in children is a complex process that cannot be adequately explained by a single index alone. In particular, the preschool years are characterized by rapid changes in linguistic, cognitive, and speech-planning abilities, during which both the frequency and forms of disfluency serve as important indicators of developmental change. Accordingly, the present discussion interprets the findings with a focus on the characteristics of fluency development and their developmental implications.

First, age-related differences in total disfluency ratios were examined among 4-, 5-, and 6-year-old children, and no statistically significant differences were found across age groups. However, descriptive statistics indicated that the 4-year-old group showed relatively higher disfluency levels than the 5- and 6-year-old groups. This finding suggests that disfluency may occur more frequently during the earlier stages of preschool development and is consistent with previous domestic findings on developmental characteristics of normal disfluency in early childhood (Byun et al., 2004). Nevertheless, because the sample size in each age group was small and the 4-year-old group showed relatively greater variability, this descriptive difference should be interpreted with caution. In other words, the present finding may reflect the individual variability commonly observed in normal disfluency rather than a stable developmental group difference. In addition, previous studies with preschool children have reported that disfluency increases as discourse demands or task complexity increase (Kim et al., 2012). In this context, the relatively higher disfluency levels descriptively observed in the 4-year-old group may reflect differences in language processing demands associated with developmental stage. Future studies using larger samples and longitudinal designs are needed to examine developmental changes in preschool disfluency more precisely.

Second, comparisons of ND and AD ratios within each age group revealed statistically significant differences in

the 4- and 5-year-old groups, whereas no significant difference was found in the 6-year-old group. These findings indicate that ND and AD are qualitatively distinguishable phenomena throughout much of the preschool period. Specifically, ND levels were significantly higher than AD levels in the younger age groups, reflecting the fact that normal disfluencies such as repetitions, revisions, and interjections commonly emerge during speech adjustment processes, whereas AD consists of core disfluency behaviors that directly disrupt speech flow. These findings are consistent with previous domestic research showing that normal and pathological disfluencies differ not only in frequency but also in qualitative composition (Byun et al., 2004). In contrast, the absence of a statistically significant difference in the 6-year-old group may be related to the relatively large within-group variability at this age, suggesting that individual fluency characteristics become more diverse in later preschool years. Previous studies have emphasized that analyses of disfluency types may serve as more sensitive indicators for early stuttering identification than simple frequency measures alone. Typically developing children and children who stutter have been reported to differ qualitatively in repetition type, utterance position, and duration (Kim et al., 2012). These findings further support the importance of the ND-AD distinction confirmed in the present study.

Third, the analysis of disfluency forms across age groups revealed clear developmental changes in both the composition and frequency of disfluency types. This finding suggests that preschool disfluency is not a unitary phenomenon but varies according to developmental stage. Interjections and incomplete phrases occurred at relatively high frequencies in younger children but gradually decreased with age. The particularly high occurrence of these forms in the 4-year-old group may reflect immaturity in speech planning and sentence formulation abilities. In contrast, part-word repetitions increased with age and were highest in the 6-year-old group. This may suggest that as utterance length and overall linguistic output increase with age, repetition is more frequently used as a speech adjustment strategy. In particular, the large standard deviation observed in part-word repetitions among 6-year-olds suggests that within-group variability increased substantially, possibly influenced by one or two children who produced markedly high repetition frequencies. This result indicates that repetitions may reflect not only developmental changes but also individual characteristics. Revisions and hesitations remained relatively infrequent across ages, and no clear age-related trend was observed. This suggests that these forms may be influenced more by individual speaking style or task characteristics than by developmental factors alone. Word and phrase repetitions were highest in the 4-year-old group, decreased in the 5-year-old group, and then showed a slight increase again in the 6-year-old group. This may reflect a developmental shift from reliance on short-unit repetitions toward more organized speech strategies. In contrast, no prolongations or blocks were observed in any age group, indicating that these core disfluency behaviors are rarely found in typically developing preschool children.

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