A Prosodic Focus Study on the Differentiation of Syntactic Structural Ambiguity from the Perspective of Experimental Phonetics: A Case Study of "The Mother of Three Children"

Xingwen Xu[1,a,*]

[1]*School of Liberal Arts, Heilongjiang University, Xuefu Road, Harbin, Heilongjiang Province, China*

a. cynthia_xingwen@163.com

*corresponding author

Abstract: With the deepening research on syntactic structural ambiguity and prosodic phonetics, the role of prosodic focus in the resolution of syntactic ambiguity has become a key topic in phonetic studies. Using "The Mother of Three Children" as an example, this study analyzes the relationship between prosodic focus and syntactic ambiguity through acoustic and perceptual experiments. The research aims to bridge the gap in understanding how prosodic focus functions in the differentiation of syntactic ambiguity and to explore its influence on ambiguity interpretation in real-world contexts. The experimental results indicate that variations in prosodic focus can, to some extent, facilitate the resolution of syntactic ambiguity. In the syntactic structure of "The Mother of Three Children," different prosodic foci significantly affect ambiguity interpretation. This study not only enriches the theoretical understanding of syntactic ambiguity and prosodic focus but also provides empirical evidence for ambiguity resolution in language processing. By examining the interaction between prosody and syntax, this research offers new perspectives and insights for studies in phonetics, syntax, and language comprehension.

Keywords: syntactic ambiguity, prosodic focus, experimental phonetics

1. Introduction

The study of ambiguous sentence structures has garnered widespread attention in academia. However, how different phonetic cues and contextual factors influence the comprehension of structural ambiguity, particularly through experimental phonetics, remains an area requiring further investigation. Therefore, this study employs experimental phonetics to explore how prosodic focus contributes to the resolution of syntactic ambiguity in the sentence structure of The Mother of Three Children, thereby revealing the specific mechanisms by which phonetic cues affect sentence interpretation. This research aims to address gaps in experimental design and theoretical analysis, provide new insights into the syntactic ambiguity of Mandarin Chinese, and contribute to the further development of research on the cognitive mechanisms underlying language processing.

2.   Literature Review

Scholars have primarily adopted three approaches to analyzing ambiguous sentence structures. The first is hierarchical analysis, which offers an intuitive structural representation of sentences, aiding in the comprehension of complex sentence constructions [1]. The second is transformational analysis, which demonstrates the possible interpretations of ambiguous sentences through structural transformations [2]. The third is semantic-oriented analysis, which focuses on the semantic relationships between sentence components and is particularly useful for analyzing how adverbial elements with clear semantic tendencies influence overall sentence interpretation [3]. Most existing studies on ambiguity have focused on grammatical, semantic, and pragmatic aspects, requiring advanced linguistic analysis skills and a deep understanding of sentence structures. However, these analytical methods are often complex, time-consuming, and lack phonetic-based analyses and descriptions.

In recent years, research on ambiguous sentence structures has deepened, with an increasing number of studies adopting multi-perspective and multi-method approaches, among which experimental phonetics is one prominent method [4]. Within experimental phonetics, considerable attention has been given to investigating how prosodic focus influences the semantic interpretation of ambiguous sentences. As a high-level manifestation of speech dynamics, prosody involves the coordinated variation of various prosodic elements following specific patterns at the acoustic level. Since Yuen Ren Chao laid the foundation for Chinese prosody research, nearly a century of scholarly efforts has driven the field from predominantly descriptive analyses toward practical applications, marking a shift from qualitative to quantitative research [5]. Prosodic cues primarily include duration, fundamental frequency, and intensity [6]. Lehiste's study found that duration is the most reliable cue in resolving syntactic segmentation ambiguities. Focus represents the central meaning of a sentence as expressed by the speaker and highlights the intended emphasis [7]. Halliday was the first to propose that "focus" corresponds to the most prosodically prominent part of a sentence and serves to convey new information [8]. Huang Caiyu applied the aforementioned prosodic cues in a study on the ambiguous "V double + N double" structure, conducting acoustic experiments and statistical analyses [9], thereby confirming the validity of using duration, fundamental frequency, and intensity to interpret ambiguous sentence structures. Wen Baoying and Dong Weiyan analyzed prosodic focus in the "lian" construction "lian NP dou VP" [10], while Hao Cuixue and Lü Ming examined prosodic focus in the ambiguous "V de A" structure [11]. Both studies found that focus leads to an expansion of the pitch range, while also compressing the pitch range of post-focus elements. This compression effect extends to the end of the sentence, whereas its influence on pre-focus pitch is relatively minimal. These experimental approaches not only provide empirical evidence for understanding linguistic ambiguity but also demonstrate the value of experimental phonetics in exploring complex linguistic phenomena.

The application of experimental phonetics in the study of ambiguous sentence structures holds significant value, as it not only reveals the impact of phonetics on sentence interpretation but also advances the understanding of cognitive mechanisms in language processing. In speech, focus manifests as a synchronic prosodic pattern, yet the role of prosodic cues in cognitive processing remains insufficiently understood in linguistic research [10].

This study aims to bridge this gap by investigating the prosodic focus in syntactic ambiguity resolution from an experimental phonetics perspective, using the ambiguous phrase "sān gè háizi de māma" ("the mother of three children") as a case study. This ambiguous structure has two possible interpretations: (1) "one mother has three children" and (2) "three mothers who have children." The selection of this sentence structure is primarily based on its clear syntactic ambiguity and the potential influence of prosodic focus on syntactic parsing. While previous studies have explored the

relationship between prosody and syntactic structure, most have focused on individual factors, lacking empirical research that integrates actual phonetic data.

3. Acoustic Experiment Design for the Ambiguous Structure "The Mother of Three Children"

3.1. Speakers

This experiment involved 12 speakers, consisting of 6 males and 6 females, all aged 20 and from northern Mandarin-speaking regions. Their Mandarin proficiency was at Level 2-A or above. All participants were in good health, had normal articulatory organs, and were fully capable of completing the experimental tasks. They actively engaged throughout the experiment.

3.2. Experimental Corpus Design

The ambiguous phrase "sān gè háizi de māma" ("the mother of three children") was placed in contextual sentences designed to differentiate its ambiguity. To minimize the influence of other intra-sentential factors on the ambiguous structure and ensure control over a single variable, structurally similar sentences with an equal number of syllables were selected as contextual sentences. This approach aimed to highlight the prosodic characteristics of the ambiguous structure in a predictable and controlled manner, reflecting the features adopted by speakers to resolve ambiguity. The experimental sentences were as follows:

Group 1: Tā jiùshì sān gè háizi de māma. ("She is the mother of three children.")

Group 2: Tāmen shì sān gè háizi de māma. ("They are mothers of three children.")

In the naturally focused base sentences, the phrase includes three prosodic words—"sān gè" ("three"), "háizi" ("children"), and "māma" ("mother")—with a total of six syllables. According to Shi Feng, prosodic words refer to common syllabic combinations that exhibit close phonetic cohesion and can be perceptually identified. In the acoustic analysis, the experiment examined differences in duration, pitch, and intensity within individual syllables and across the entire phrase "sān gè háizi de māma." This analysis aimed to determine the prosodic focus and further validate the internal prosodic segmentation pattern of the ambiguous structure from a phonetic perspective.

3.3. Collection of Recording Samples

In this study, the Praat software was used for recording, with a mono-channel format and a sampling rate of 44,100 Hz. Praat offers functions for recording, playback, and speech synthesis, allowing for the editing and analysis of selected speech data. The final results can be displayed in various types of spectrograms. The study conducted statistical analyses of the values provided by the software for three fundamental phonetic parameters—pitch, intensity, and duration—while also utilizing spectrograms to analyze the ambiguous structure.

The recordings were conducted in a quiet classroom within the School of Literature at Heilongjiang University. Before recording, speakers were given 1 to 2 minutes to familiarize themselves with the corpus. During the recording process, they were instructed to read the sentences naturally and steadily. Each speaker read each experimental sentence three times, with a 5-second interval between repetitions. The pronunciation quality was assessed by the author of this study, who is also a native speaker from a northern Mandarin-speaking region with a Level 1-B Mandarin proficiency. Data with obvious misinterpretations of ambiguous sentences were excluded, resulting in a total of $10 \times 2 \times 3 = 60$ valid recordings.

3.4. Data Measurement and Statistical Visualization

The recorded speech data were subjected to an acoustic analysis using Praat, measuring key parameters such as pitch (in Hz), duration (in milliseconds), and intensity (amplitude sum). After normalization, three parameters—pitch fluctuation, pause rate, and volume ratio—were used for quantitative analysis. The statistical analysis and visualization of the results were completed using Excel.

For pitch data, this study employed the pitch fluctuation formula for calculation and analysis [12]:

$Q_x = (K_x - K_{min})/(K_{max} - K_{min})$

where Q_x represents the pitch fluctuation of a given syllable, K_{max} is the maximum value of the pitch range in the sentence, K_{min} is the minimum value, and K_x represents the measured upper and lower pitch limits of each syllable within this range.

Following this formula, the extracted fundamental frequency (F0) data were first converted into semitone values, and the highest and lowest values were identified as the two extremes of the sentence's pitch range. To account for physiological differences between male and female speakers, the pitch range for each gender was measured separately. Pitch fluctuation graphs were then created for both groups. In these graphs, values within the thin-lined boxes represent the percentage range of syllabic pitch fluctuation, while values within the thick-lined boxes indicate the percentage range of word-level or phrase-level pitch fluctuation.

For duration data, this study employs the pause rate formula [13] for calculation and analysis. The pause rate formula is as follows:

$D_x = S_x/S$

Where D_x represents the duration ratio of a given syllable, S_x is the duration of the syllable, and S is the average syllable duration in the sentence.

Since the subsequent analysis requires calculating the pause rate at the phrase level, a reasonable derivation of the word-level pause rate formula is:

$D_x' = S_x'/S'$

where D_x' represents the duration ratio of a given word, S_x' is the duration of the word, and S' is the average syllable duration in the sentence multiplied by the number of syllables in the word.

In speech, duration serves as a concrete manifestation of different boundary levels, and in prosodic research, it is primarily represented through pause rate. Pauses refer to breaks and lengthening within natural speech flow, mainly involving pauses after boundaries and lengthening before and after boundaries. Liang Lei and Shi Feng point out that prominence in speech is a characteristic determined by multiple complex factors. It is associated with all four phonetic parameters and should be considered a result of the combined effects of multiple parameters rather than being solely linked to any single acoustic parameter [13]. "Light" refers to unstressed or weak parts of speech, typically exhibiting relatively weaker intonation and lower intensity, especially when in non-focal positions within a sentence. Light syllables tend to have shorter durations, faster speech rates, receive less emphasis, and contribute minimally to sentence meaning, primarily serving as connectors. In contrast, "heavy" refers to stressed parts of speech, usually emphasized words or syllables with greater intensity, clearer and stronger articulation, and longer duration. These features make them more noticeable, allowing them to convey critical information effectively. Stressed syllables generally correspond to the informational focus of a sentence or discourse, representing its most crucial elements. Further, the relationship between light and heavy syllables manifests as relative prominence, which can be quantitatively represented by the volume ratio. The volume ratio is a key parameter in stress research, particularly useful in distinguishing between light and heavy syllables, and holds significant reference value in prosodic studies. The intensity data of the speech samples were obtained

by extracting and measuring each syllable from the waveform. According to the volume ratio formula [13], if the volume ratio value exceeds 1, it indicates an increase in intensity.

The volume ratio formula is as follows:

Ex=Gx/Gmean

Where Ex represents the volume ratio of a given word, Gx is the amplitude sum of the word, and Gmean is the average amplitude sum of syllables in the sentence.

Each speaker's absolute values for pitch, duration, and other parameters may vary due to factors such as gender and speech rate, leading to some differences in the measured experimental data. However, each speaker follows a systematic pattern in their own speech, maintaining relative consistency in prosodic performance within their native phonetic framework. Moreover, there should be a consistent correspondence between individual speakers of the same language or dialect. The phonetic patterns in ambiguous structures are considered to represent an overall trend, with limited influence from absolute individual differences. Therefore, except in cases where specific considerations are necessary, the impact of individual differences caused by factors such as gender and age is minimized. Instead, common patterns are extracted by using the average values of each acoustic parameter for analysis and discussion.

## 4. Acoustic Experimental Analysis of the Ambiguous Structure "The Mother of Three Children"

4.1. Pitch Performance of the Ambiguous Structure "The Mother of Three Children" Under Two Semantic Interpretations

This study analyzes pitch data using the measure of pitch fluctuation. Speakers are categorized into male and female groups, and the corresponding calculations are performed based on the pitch fluctuation formula [12]. The pitch fluctuation patterns of ambiguous sentence 1 and ambiguous sentence 2, grouped by gender, are shown in Figure 1:
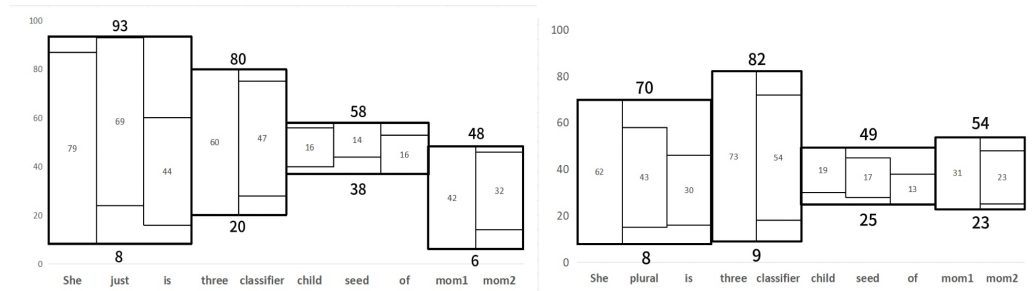
1a. Male Speakers – Ambiguous Sentence 1 (Left)
1b. Male Speakers – Ambiguous Sentence 2 (Right)
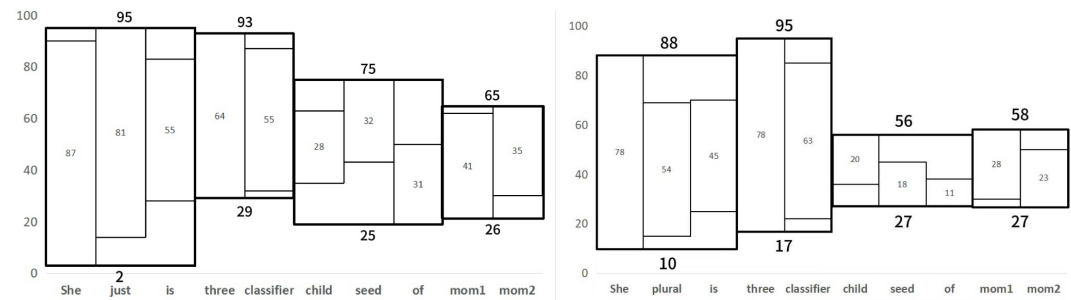
1c. Female Speakers – Ambiguous Sentence 1 (Left)
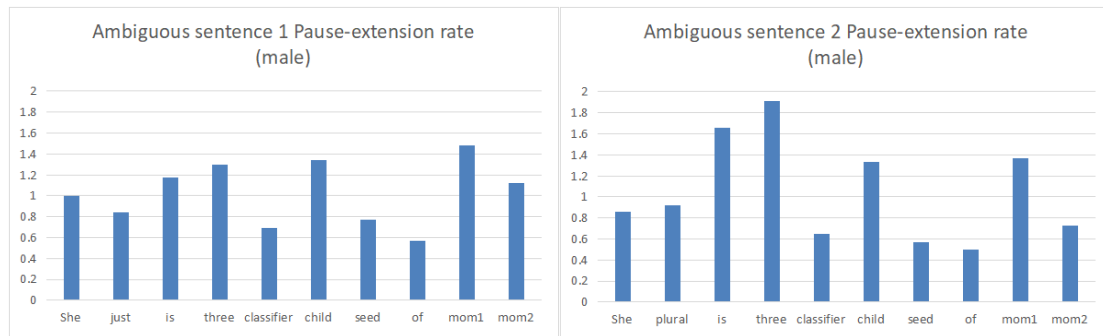1d. Female Speakers – Ambiguous Sentence 2 (Right)

Figure 1: Pitch Fluctuation Patterns by Gender

As shown in Figures 1b and 1d, in ambiguous sentence 2, both male and female speakers exhibit a similar pitch trend, with "three" displaying a more pronounced pitch fluctuation compared to "mother." "Three" demonstrates the largest tonal range in the entire sentence, making it more acoustically prominent. In terms of auditory perception, the greater pitch fluctuation of "three" in ambiguous sentence 2 enhances its perceptual distinctiveness, thus emphasizing this information. A comparison between Figures 1a and 1b, as well as Figures 1c and 1d, reveals that in ambiguous sentence 1, "three" has a smaller pitch fluctuation than in ambiguous sentence 2, whereas "mother" exhibits a larger pitch fluctuation than in ambiguous sentence 2. In this ambiguous sentence, "mother" is relatively more prominent as the key piece of information. These findings suggest that the pitch fluctuation in ambiguous sentences 1 and 2 aligns with their respective semantic interpretations.

The tonal range characteristics reflected in these pitch fluctuation data, both at the syllable and word levels, are closely related to syntactic structure. The similar pitch performance observed across genders in both ambiguous sentences supports the feasibility of using experimental phonetics to investigate the prosodic focus in syntactic ambiguity resolution. This approach contributes to a deeper understanding of how prosodic focus functions in resolving syntactic ambiguities like "the mother of three children."

4.2. Duration Performance of the Ambiguous Structure "The Mother of Three Children" Under Two Semantic Interpretations

In Praat, duration data can be obtained by segmenting and measuring each syllable's length from the waveform. The measurement includes the closure and release phases of stops and affricates. The syllable lengthening ratio is calculated using the lengthening rate formula [12]. If the computed value exceeds 1, it indicates segment lengthening; otherwise, it suggests that no lengthening has occurred. The lengthening rate values for ambiguous sentences 1 and 2, grouped by gender, are shown in Figure 2 and Table 2:

2a. Male Speakers – Ambiguous Sentence 1 (Left)
2b. Male Speakers – Ambiguous Sentence 2 (Right)
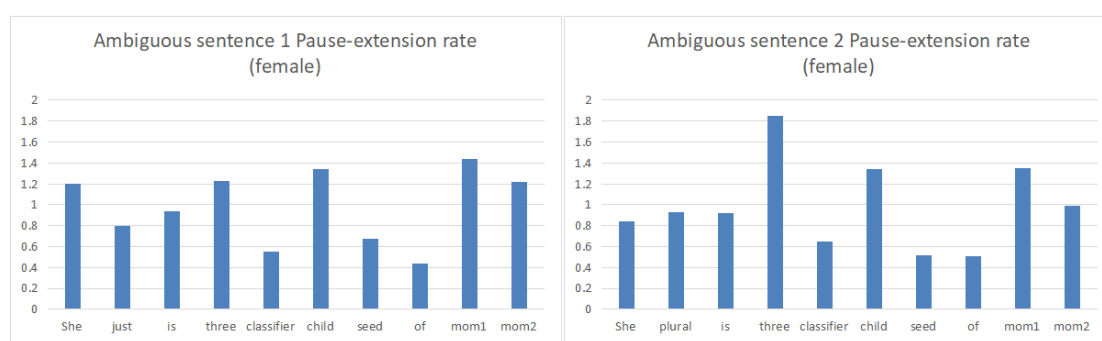
2c. Female Speakers – Ambiguous Sentence 1 (Left)
2d. Female Speakers – Ambiguous Sentence 2 (Right)

Figure 2: Lengthening Rate Patterns by Gender (Syllables)

From Figure 2, it can be seen that the trends for the male and female groups' sentence structures are generally consistent. Both Ambiguous Sentence 1 and Ambiguous Sentence 2 show pronounced peaks at "three," "child," and "mother." However, there is no significant variation in the dwell time of "child" across the different ambiguous sentences. Therefore, the dwell times for the words "three classifiers" and "mother" in Ambiguous Sentence 1 and Ambiguous Sentence 2 were further calculated for each gender group, with the values presented in Tables 1 and 2 below:

Table 1: Female Dwell Time (Words)

	"Three classifiers"	"mother"
She is the mother of three children. (Ambiguous sentence 1)	0.89	1.33
They are mothers of three children. (Ambiguous sentence 2)	1.25	1.07

Table 2: Male Dwell Time (Words)

	"Three classifiers"	"mother"
She is the mother of three children. (Ambiguous sentence 1)	0.99	1.17
They are mothers of three children. (Ambiguous sentence 2)	1.28	1.05

From Tables 1 and 2, it can be observed that in Ambiguous Sentence 1, the dwell time for "mother" is greater than for "three classifiers," and it has the longest dwell time in the entire sentence. In Ambiguous Sentence 2, the dwell time for "three classifiers" exceeds that of "mother," making it the word with the longest dwell time in that sentence. Words with higher dwell times have longer sound durations and are more prominent. Thus, it can be inferred that in terms of sound duration, "mother" in Ambiguous Sentence 1 has a longer sound duration, while "three classifiers" in Ambiguous Sentence 2 has a longer sound duration. Therefore, in these two ambiguous sentences, "mother" is emphasized in Ambiguous Sentence 1, and "three classifiers" is emphasized in Ambiguous Sentence 2. No significant anomalies were observed in the data. In Ambiguous Sentence 1, "mother" has a higher dwell time in both gender groups, indicating a more significant elongation of its sound segment, and thus it is more prominent. In Ambiguous Sentence 2, "three classifiers" has a higher dwell time, with its sound segment elongated more noticeably, making it more attention-grabbing, consistent with the general correlation between sound duration and prominence.

4.3. Acoustic Intensity Representation of the Ambiguous Structure "The Mother of Three Children" in Two Different Meanings

In addition to pitch and duration, sound intensity also plays a crucial role in observing fluctuations and stress patterns in sentences, making it an important aspect of prosodic research. To examine the distribution of sound intensity for individual words with different meanings, the formula for calculating volume ratio was used, and normalization was applied. The volume ratio values for the gender groupings in Ambiguous Sentence 1 and Ambiguous Sentence 2 are shown in Figure 3:

3a. Male Ambiguous Sentence 1 (Left)
3b. Male Ambiguous Sentence 2 (Right)

3c. Female Ambiguous Sentence 1 (Left)
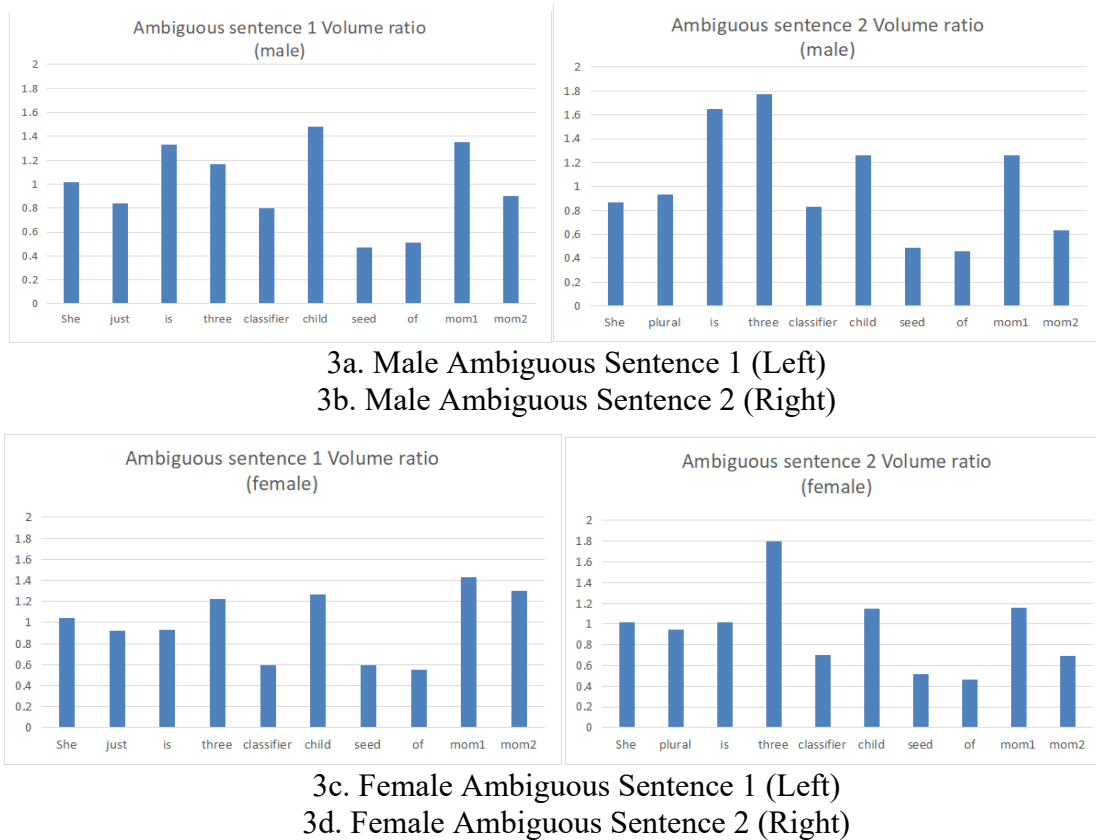3d. Female Ambiguous Sentence 2 (Right)

Figure 3: Volume Ratio by Gender (Word)

From Figure 3, it can be seen that the trends for the male and female groups' sentence structures are generally consistent. Both Ambiguous Sentence 1 and Ambiguous Sentence 2 show pronounced peaks at "three," "child," and "mother," but the volume ratio for "child" does not change significantly across the different ambiguous sentences, meaning it does not affect our understanding of the two ambiguous sentences. The volume ratios for the words "three classifiers" and "mother" in Ambiguous Sentence 1 and Ambiguous Sentence 2 were further calculated for each gender group, with the values presented in Tables 3 and 4 below:

Table 3: Female Volume Ratio (Words)

	"Three classifiers"	"mother"
She is the mother of three children. (Ambiguous sentence 1)	1.8	2.7
They are mothers of three children. (Ambiguous sentence 2)	2.5	1.85

Table 4: Male Volume Ratio (Words)

	"Three classifiers"	"mother"
She is the mother of three children. (Ambiguous sentence 1)	2.1	2.3
They are mothers of three children. (Ambiguous sentence 2)	2.6	1.9

According to Tables 3 and 4, in these two ambiguous sentences, the words "three classifiers" and "mother" have higher volume ratios and are emphasized. Overall, there is a consistent pattern: these two words generally have higher volume ratios in sentences with different gender and meanings. However, there are special cases. In Ambiguous Sentence 2, the volume ratio for "mother" in the male group is 2.3, lower than the female group's 2.7, which contradicts the usual assumption that males generally have louder volumes. This could be because, in actual pronunciation, the influence of semantic understanding and expression habits on volume exceeds that of gender factors. In this case, the main role of the volume ratio is to emphasize key semantic information through volume contrast, while the absolute volume size does not play a decisive role in prominence.

4.4. Prosodic Focus

Through the above analysis, the experimental results for the male and female groups were averaged, and the data for Ambiguous Sentence 1 and Ambiguous Sentence 2 were summarized in terms of pitch, duration, and intensity. In Ambiguous Sentence 1, "mother" has a higher pitch variation than "mother" in Ambiguous Sentence 2, and in terms of both duration and intensity, it is longer than other prosodic words in the sentence, such as "three classifiers" and "child," both in dwell time and volume ratio. Therefore, "mother" can be considered the prosodic focus of this ambiguous sentence, which is understood as "a mother has three children."

In Ambiguous Sentence 2, in terms of pitch, duration, and intensity, "three classifiers" exhibits higher variation, longer dwell time, and a larger volume ratio compared to other prosodic words in the sentence. Thus, "three classifiers" can be regarded as the prosodic focus of this ambiguous sentence. This prosodic focus aligns with the semantic meaning of the sentence, "three mothers with children." It can be observed that the analysis and interpretation of the ambiguous sentences using prosodic focus align with the conclusions drawn through hierarchical analysis, semantic pointing analysis, and variation analysis. This demonstrates the feasibility and accuracy of using experimental phonetics to determine the semantic direction of ambiguous sentences.

5. Perception and Discrimination Experiment on the Ambiguous Structure of "The Mother of Three Children" under Different Meanings

To further verify the differences between the various parameters reflected in the above acoustic experiments of the ambiguous structure of "the mother of three children," and to explore whether these differences—such as pitch, pauses, and stress patterns—can be accurately perceived and received by listeners in practical spoken language, a perception and discrimination experiment is designed to study the two different meanings derived from this ambiguous structure.

5.1. Experiment Design

5.1.1. Participants

This study surveyed 10 undergraduate students, 5 males and 5 females, all aged 20, from a northern dialect region, with normal hearing.

5.1.2. Experiment Corpus

Four audio files were selected based on the most accurate understanding of the two meanings from the acoustic experiment, with the pronunciation closest to the experimental data.

5.1.3. Methodology

The 4 collected audio files were randomly ordered. According to the acoustic experiment results, the perceptual focus of ambiguous sentence 1 should be "mother," and the perceptual focus of ambiguous sentence 2 should be "three classifiers." Listeners were asked to report their understanding based on what they heard and to restore it to the different semantic contexts. The results were then statistically analyzed and graphed.

5.2. Discussion of Experiment Results

The statistical analysis of the listeners' perception results under the two meanings is summarized in the following table. See Table 5:

Table 5: Perception Experiment Restoration Results

Investigate the number of sentence restoration times	"mother"	"Three classifiers"	Correct restoration rate
She is the mother of three children. (Ambiguous sentence 1)	10	0	100%
They are mothers of three children. (Ambiguous sentence 2)	0	10	100%

From the data in Table 5, it can be seen that when the prosodic focus of "the mother of three children" is on "mother," all 10 listeners correctly restored it, achieving a 100% restoration rate. Similarly, when the prosodic focus was on "three classifiers," the restoration rate was also 100%. This indicates that listeners can accurately perceive the acoustic emphasis in each semantic context, effectively capturing the intrinsic differences in stress characteristics exhibited by the ambiguous structure "the mother of three children" under different meanings. Thus, listeners can use speech information to decode the meaning and restore the correct interpretation.

6. Conclusion

Through the analysis of the prosodic focus performance of the ambiguous structure "the mother of three children" and the investigation of the prosodic distribution patterns in terms of pitch, duration, and intensity, the following conclusions are drawn:

Acoustic Experiment Findings:

Based on the acoustic experiment, the prosodic focus of the ambiguous structure "the mother of three children" was analyzed, with a focus on the distribution patterns of pitch, duration, and intensity. The results show that under different meanings, the pitch peak of the prosodic focus significantly rises, the duration clearly extends, and the intensity also exhibits an increasing trend. Thus, the prosodic focus plays a crucial role in the semantic interpretation of this ambiguous structure, and its acoustic characteristics serve as effective markers for distinguishing the ambiguity. The study further validates the role of prosodic features in syntactic ambiguity differentiation and provides experimental phonetic evidence for the study of Chinese prosodic focus and ambiguity resolution.

Perception Experiment Results:

The differences in the acoustic performance of the ambiguous sentence formed by "the mother of three children" can be effectively perceived by listeners. The acoustic differences align with the listeners' perceptual tendencies, further confirming that this ambiguous structure can be distinguished through significant acoustic features. This grammatical structure can thus undergo ambiguity differentiation through phonetic means.

Interdependence of Prosodic Elements:

The three prosodic elements—pitch, duration, and intensity—are interdependent and compensatory, although their performances are not entirely the same. Among them, duration and intensity tend to exhibit relatively consistent patterns, with the emphasized parts generally corresponding to the focus. Pitch is more distinctive, and different ambiguous sentences require comparative analysis to identify the relatively prominent part and determine the focus location.

It is hoped that the phonetic experimental analysis of prosodic pattern features will contribute to the study of focus issues in Chinese. In the future, further experimental analyses and exploration of other ambiguous sentence structures will be conducted.

References

[1] Feng, X. M. (2007). Analysis methods of ambiguous sentence patterns in modern Chinese. Hebei Self - study Examinations, (4), 6.

[2] Ma, C. Y. (2013). The gradual emergence of semantic factors in structural analysis - from the sentence - component analysis method to the sentence - pattern transformation analysis method. Journal of Xingyi Normal University for Nationalities, (6), 50-53.

[3] Zhou, G. (1998). A tentative discussion on semantic orientation analysis. Linguistic Research, (3), 27-34.

[4] Zhu, X. N. (2024). The four - stage development of phonetics. Journal of Changshu Institute of Technology, 38(1), 24-46. DOI: 10.16101/j.cnki.cn32 - 1749/z.2024.01.010

[5] Luo, L. (2022). An acquisition study on the prosodic - related interfaces of Chinese ambiguous structures by Uyghur students. [Doctoral dissertation, Sichuan International Studies University]. DOI: 10.27348/d.c nki.gscwc.2022.000022

[6] Xue, L. Y. (2015). The use of prosodic cues in second - language spoken language processing. [Doctoral dissertation, Zhejiang University].

[7] Lehiste, I. (1973). Phonetic disambiguation of syntactic ambiguity. The Journal of the Acoustical Society of America, 53(1_Supplement), 380.

[8] Halliday, M. A. K. (1967). Notes on transitivity and theme in English: Part 2. Journal of Linguistics, 3(2), 199-244.

[9] Huang, C. Y. (2012). An experimental phonetic analysis of the "V_dual + N_dual" ambiguous structure. Language Teaching and Linguistic Studies, (3), 98-104.

[10] Wen, B. Y., & Dong, W. Y. (2019). Analysis of the prosodic focus of the "lian NP dou VP" sentence pattern. Chinese Language Learning, (5), 26-36.

[11] Hao, C. X., & Lü, M. (2023). Research on the prosodic focus of disambiguating the "V - de - A" structure from the perspective of experimental phonetics. In School of Chinese as a Second Language, Peking University (Eds.), Proceedings of the 2023 Doctoral Forum on Teaching Chinese as a Foreign Language and the 16th Academic Forum for Postgraduate Students in Teaching Chinese as a Foreign Language (pp. 12). [Publisher not specified]. DOI: 10.26914/c.cnkihy.2023.022038

[12] Shi, F., Wang, P., & Liang, L. (2009). The pitch range of declarative intonation in Mandarin Chinese. Nankai Linguistics Journal, (2), 4-13, 178.

[13] Liang, L., & Shi, F. (2010). Analysis of the volume ratio of two - character groups in Mandarin. Nankai Linguistics Journal, (2), 35-41, 186.