

Relationship between pauses and prosodic constituents in the speech of children with typical language development

Relações entre pausas e constituintes prosódicos na fala de crianças com desenvolvimento típico de linguagem

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ABSTRACT

Purpose: (1) To verify distribution of non-hesitation and hesitation pauses during interviews with children who presented typical language development; (2) To verify, in non-hesitation pauses, its relation with phonological utterance and intonational phrase boundaries; (3) To verify, in hesitation pauses, its distribution along the beginning and ending of utterances. **Methods:** Pauses have been extracted from speech samples of four children with typical language development, aged between four and five years old, who attended Preschool at a Municipal Preschool in Marília, in 2011. Speech samples covered topics developed within ten pedagogical proposals carried out in the classroom. Subsequently, hearing inspection of every file was performed by the researcher (complemented by auditory-perceptual judgment from a group of five judges) to identify pause points. **Results:** Statistical differences weren't found in distribution between hesitation and non-hesitation pauses; marginal tendency for higher rate of pauses in intonational phrases boundaries than in phonological utterance boundaries was detected; there wasn't statistical difference in distribution between hesitation pauses in the beginning and in the middle of utterances. **Conclusion:** Instability in pause distribution is an important linguistic resource for observing prosodic domains, which are more or less mastered by children during language acquisition.

Keywords: Language; Child development; Child language; Child rearing; Linguistics

RESUMO

Objetivo: (1) Verificar a distribuição de pausas não hesitativas e hesitativas em entrevistas com crianças em desenvolvimento típico de linguagem; (2) verificar, nas pausas não hesitativas, sua relação com limites de enunciados fonológicos e de frases entonacionais; (3) verificar, nas pausas hesitativas, sua distribuição entre início e interior de enunciados. **Métodos:** As pausas foram extraídas de amostras de fala de quatro crianças com desenvolvimento típico de linguagem e idades entre quatro e cinco anos que, em 2011, frequentavam o nível Infantil II de uma Escola Municipal de Educação Infantil de Marília. As amostras de fala versavam sobre temas trabalhados em dez propostas pedagógicas desenvolvidas na sala de aula das crianças. Posteriormente, foi realizada, pela pesquisadora, uma inspeção de ouvira (complementada pelo julgamento perceptual-auditivo de um grupo de cinco juízes) de cada um dos arquivos, a fim de se identificar os pontos de pausas. **Resultados:** Não foi verificada diferença estatística na distribuição entre pausas hesitativas e não hesitativas; foi verificada tendência marginal de maior ocorrência de pausas em limites de frases entonacionais, do que em limites de enunciados fonológicos; não houve diferença estatística na distribuição entre pausas hesitativas em início e em interior de enunciados. **Conclusão:** A instabilidade na distribuição das pausas é um importante recurso linguístico de observação dos domínios prosódicos que se mostram como mais, ou menos, dominados pelas crianças na aquisição da linguagem.

Descritores: Linguagem; Desenvolvimento infantil; Linguagem infantil; Educação infantil; Linguística

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INTRODUCTION

In speech pathology literature, there are few studies correlating pauses and prosodic components in language acquisition. In its majority, studies on pauses (in hesitation circumstances) in children speech relate them to pathological conditions (such as stuttering), or to comparisons between what is considered typical and what is considered pathological in language acquisition⁽¹⁻¹⁰⁾.

Other studies that approach pauses in children speech highlight subjective aspects in speech’s fluency/disfluency relationship. Although analyzing pathology, these studies question the origin of stuttering from the normality. These studies represent a critical stance towards the negative approach to speech disfluency, since, according to its authors, disfluency is inherent to the language acquisition and its development, not to the person him or herself, but rather to the relationship between men and culture/society and to the “good-speaker ideology”⁽¹¹⁻¹⁴⁾.

There are a few studies that connect hesitation (including hesitation pauses) and prosody⁽¹⁵⁾. Hesitation pauses also appear in another study, that explored the relationship between fluency/disfluency and subjectivity in oral narratives produced by children between two years and two months old and four years and four months old⁽¹⁶⁾.

Studies on prosody have tried to demonstrate its role in language development. From a linguistic perspective, prosody concerns utterance volume levels, intensity, duration, pauses and speed⁽¹⁷⁾, as well as natural languages’ tone, stress and rhythm⁽¹⁸⁾. Yet from this perspective, prosody is the initial bridge between formal speech organization and the language’s discursive and meaning potential during the early years of life. It represents the first chance of elaboration, connecting a sound to a meaning⁽¹⁹⁾.

Pause is an important element to define prosodic structures. Pauses are expected in drawing the boundaries of prosodic components, such as phonological utterance and intonational phrases⁽²⁰⁾ – elements which assimilate phonological, syntactical, semantic and pragmatic information that can be seen in clauses and in its parts (in intonational phrases), as well as in phrases or sentences (in phonological utterance). The predictability of the relationship between pause points and prosodic components allows us to define which of these pauses would or would not have a hesitation nature – since we would not expect any pause outside the boundaries (initial and final) of both components, in an utterance regarded as fluent.

This type of pause distribution has been suggested and diffused in some studies⁽²¹⁻²³⁾. However, these studies focused in pauses extracted from speech produced by patients suffering from Parkinson’s disease. The question arises as to how would be the pause distribution, regarding prosodic components, in speech produced by children during language acquisition?

Being language acquisition characterized mainly by

language instability in children speech, the present study had as central reason verify how much the presence of pauses in the speech of children in the age group of five to six years old would demonstrate such instability. The first hypothesis that drove the development of this study was that, in this age group, pauses in children speech would indicate, at the same time, their sensibility to prosodic components boundaries, in which its presence is expected – contexts where non-hesitation pauses are, therefore, expected –, as well as difficulty in speech production, outlined by the presence of hesitation pauses. Given the typical instability of language acquisition, the second hypothesis was that the presence of both types of pauses would be inconstant in the studied children speech.

The present investigation intends to contribute to the Speech-Language and Hearing Sciences in characterizing and determining fluency development, not only in pathological cases, but also in what is regarded as normal speech, by analyzing how pauses are distributed in children speech. It has also intended to contribute to the understanding of constitutive formulation and reformulation of children speech, fomenting, theoretically, knowledge production that favor the progress in understanding instabilities in language acquisition.

The development of the present study has been guided by the following objectives:

- (1) to verify distribution of non-hesitation and hesitation pauses during interviews with children who presented typical language development;
- (2) to verify, in non-hesitation pauses, its relationship with phonological utterance and intonational phrase boundaries;
- (3) to verify, in hesitation pauses, its distribution along the beginning and ending of utterances.

METHODS

The present study was submitted to the Ethics Committee in Research of *Universidade Estadual Paulista “Júlio de Mesquita Filho”* (UNESP), under the protocol number 0138/2010.

As unit of analysis, we selected recordings of four male children who attended public preschool during 2011 in Marília, São Paulo. Specific information on age group of the children are described below, in Chart 1.

The following criteria were considered to select four recordings from the participant children: (a) to have been

Chart 1. Children’s age in the first and the last interview collection

Subject	Date of birth	Age in the 1 st interview	Age in the 10 th interview
S01	06/21/2006	4:10	5:4
S02	06/17/2006	4:10	5:4
S03	10/04/2005	5:6	6:0
S04	08/14/2005	5:8	6:2

present in all recordings; (b) absence of language disorders – confirmed after speech and language assessment, as well as hearing screening; (c) to have signed an Informed Term of Consent by the parents or legal guardians, authorizing the child's participation in the research. In 2011, the children participated in ten recorded sessions of speech activity, resulting in a *corpus* of 40 recordings (4 children x 10 sessions). The recordings summoned children's knowledge on topics covered in class, such as narrative aspects from children's stories, growing stages of Moringa Tree, musical instrument's features, among others.

Each child was recorded singly, inside an acoustic hood installed in the university campus, using high-fidelity equipment: a Marantz® digital recorder (PMD 670) attached to a SHURE® dynamic cardioid microphone (8800).

All recordings were kept in separate files, identified by child's name. Subsequently, six Speech-Language and Hearing Sciences students/researchers, specially trained to perform this task, transcribed the recordings.

The recordings were assigned randomly to each of the six researchers to perform the transcription. It was given priority to video files, in order to observe and transcribe not only conversational aspects, but also children's gesture and expressions.

Two groups, formed by the six researchers, revised the transcriptions to ensure accordance between video and text material. During this process, a first researcher transcribed the file and, subsequently, the text file was submitted to the other two researchers in the group, who assessed the material together, taking notes of possible disagreements. After this, the transcription was submitted one more time to the first researcher – who produced it. In case of disagreement between the first transcriber and the two reviewers, an agreement criterion was adopted, favoring two of three researchers, in order to reduce significantly the subjectivity inherent to data interpretation. After revising all transcriptions, the two groups of judges reviewed the material one last time. In the transcriptions, judges marked pause points with the adding symbol (+).

Pause points' identification made it possible to answer the first object of the present study (to verify distribution of non-hesitation and hesitation pauses during interviews with children who presented typical language development). As to the second and third objectives (to verify, in non-hesitation pauses, its relation with phonological utterance and intonational phrase boundaries; and to verify, in hesitation pauses, its distribution along the beginning and ending of utterances), pauses were divided in two groups, for analysis purposes: (1) pauses which enclose prosodic components, such as phonological utterance (U) and intonational phrases (I) – group of non-hesitation pauses; (2) pauses which break intonational phrases structure – group of hesitation pauses.

In the following phrase, non-hesitation pauses can be observed (the symbol + indicates pause points):

“Look + the hare was mocking the turtle + and it run really fast”.

Regarding prosody, the phrase, as a whole, corresponds to the component phonological utterance, since its enunciation assumes intonational contours, which syntactically enclose a complete sentence. Therefore, phonological information (intonational contours), syntactical information (sentence structure), semantic information (relationship of meaning between different parts of the sentence) and pragmatic information (marked by the structure “look” and by the position of the enunciation's subject regarding the interlocutor) are present in this phonological utterance. Still on prosody, it is expected that, not only the intonational contours' ending characteristics, but also a pause, would enclose the phonological utterance.

Within the phonological utterance, three prosodic sub-contours, followed by pauses, would enclose three intonational phrases, namely: (1) *look*; (2) *the hare was mocking the turtle*; and (3) *and it run really fast*. Once again, relation between phonological information (intonation and pauses), syntactical information, semantic information and pragmatic information can be seen in the three sub-contours. In fact, the first pause point matches the boundary of a phatic expression (which marks the emphasis in the contact with interlocutor), and the second one matches the ending of a clause within a sentence.

Hereafter, occurrences of hesitation pauses in the beginning and in the middle of an utterance:

+ *Oh:: i/it isn't how it starts*

In this case, pause occurs in the beginning of a phonological utterance. Its hesitation character may be confirmed by the fact that it's part of a complex mark, which is accompanied by a filled pause (*oh::*) and by the repetition of a part of the word *it* (*i/it*) that follows it in the utterance.

*there was + a mushroom
with + a polka dot blouse*

In both occurrences, hesitation pauses showed a different nature: breaking the intonational phrases formulation, that is, breaks within structures in which language doesn't foresee a pause. In the first case, break happened between a verb (“there to be”) and its clausal complement (direct object “mushroom”); in the second case, break occurred between a preposition (“with”) and the structure that it introduces (“a polka dot blouse”). Once that pauses occurred, in both situations, in non-predictable syntactical and prosodic points, they are characterized as hesitation pauses.

It was performed statistical processing of data using the software Statistica (version 7.0) and descriptive and inferential analysis from non-parametric Wilcoxon Matched Pairs Test for dependent variables. It was determined a confidence level of $\alpha \leq 0,05$ and 95% confidence interval.

RESULTS

Results related to the first objective of this study – distribution of hesitation and non-hesitation pauses in the subject of the study – are described in Table 1.

Table 1. Comparison of hesitation and non-hesitation pauses

Type of pause	Mean	Standard deviation	Z	p-value
Hesitation	172.5	57.1	0.73	0.46
Non-hesitation	193	94.8		

Non-parametric statistical test Wilcoxon Matched Pairs for dependent variables ($p \leq 0.05$)

From 1462 pauses, few disparities were identified between the amount of hesitation pauses – 690 (47%) – and non-hesitation pauses – 772 (53%). P-value (0.46) confirms this tendency, to the extent that it demonstrated a non-significant distribution between hesitation and non-hesitation pauses in sample’s total amount. However, values of standard deviation in occurrence of both types of pauses call our attention. Although central tendency was kept, these values might indicate a variation in distribution in this sample.

Results related to the second objective – comparing detected pauses in prosodic components, intonational phrases and phonological utterance boundaries – are exposed in Table 2.

Table 2. Comparison of pauses in I and U boundaries

Type of pause	Mean	Standard deviation	Z	p-value
I boundary	154.7	84.4	1.82	0.068
U boundary	38.2	19.6		

Non-parametric statistical test Wilcoxon Matched Pairs for dependent variables ($p \leq 0.05$)

From 772 non-hesitation pauses, 619 (80%) occurred in intonational phrases boundaries and 153 (20%) occurred in phonological utterance boundaries. Despite having a considerable percentage difference, distribution between different prosodic boundaries did not appear to be significant. Nonetheless, marginal aspect of this result (0.068) favoring the enclosure of the intonational phrase component should be noted. We should also highlight the dispersion pointed by standard deviation values in distribution of both types of pauses. This fact, once again, indicates a variation in distribution within the sample.

Finally, results related to the third objective of this study – comparing pauses in the beginning and in the middle of utterances – are displayed in Table 3.

From 690 hesitation pauses, 320 (46%) occurred in the beginning of utterances and 370 (54%) occurred in the middle of utterances. The distribution of these types of hesitation pauses did not appear to be significant, as attested by p-value (0.58). However, the difference of standard deviation in distribution of

Table 3. Comparison of pauses in the beginning and in the middle of utterances

Type of pause	Mean	Standard deviation	Z	p-value
Beginning of utterance	80	11.4	0.55	0.58
Middle of utterance	92.5	61.6		

Non-parametric statistical test Wilcoxon Matched Pairs for dependent variables ($p \leq 0.05$)

both types of pauses calls our attention, especially because it was verified less dispersion in its occurrence in the beginning of the utterance than in the middle of the utterance, which indicates greater homogenization in the first type of occurrence, when compared to the second type.

DISCUSSION

Regarding the first objective, absence of significance indicates two tendencies. On the one hand, occurrence of hesitation pauses is supported by studies that say that children during language acquisition present speech fluency interrupting elements, called speech breaks. According to these studies, fluency breaks, that is, disfluencies, are inherent and natural to development process⁽¹¹⁾. Yet, this disfluency period (marked by hesitation pauses, among other elements) is expected and it changes during development, with major breaks in younger children, tending to stability⁽¹¹⁾. Therefore, presence of hesitation pauses not only confirms these studies (since such pauses would indicate that children are found in normal process of language acquisition), but also shows the strength and the necessity of hesitation as a constitutive element of language acquisition. It also shows that children negotiate with language’s prosodic structures – in this case, intonational phrases and phonological utterance – whose internal development is sufficiently mastered by them.

Conversely, occurrence of non-hesitation pauses suggests a certain regularity (in non-controlled speech productions) in enclosing big prosodic structures that predicate, in its final boundaries, presence of pauses. These data confirm prosodic premises, which point that pauses are expected in enclosing components of intonational phrases and phonological utterance (the highest two in prosodic hierarchy)^(20,24).

If, on the one hand, absence of significance in distribution between hesitation and non-hesitation pauses suggests an expected oscillation between internal structure formulation of the two components and setting its boundaries, on the other hand, the values of standard deviation suggest that oscillation is also determined by factors that are not easily identified, recovered or measured (although constitutive) in children speech. Among these factors, we may think of a possible greater/lower mastering of discursive object, or a possible greater/lower engagement

between children and the object during the speech production. In other words, standard deviation values may suggest the effect of subjectivity in prosodic structuring in children speech, which has been gaining prominence in literature focused in observing more and less fluent moments of this type of speech^(11-16,24,25).

As to the results found in the second objective, marginal p-value (0.068) suggests tendency, somewhat expected, once phonological utterance – the highest components in prosodic hierarchy – use to be constituted of more than one intonational phrase⁽²⁰⁾, which increases the probability of occurrence of the second component (and, consequently, of pauses in its boundaries) and in speech production. Presence of pauses enclosing both components highlights, therefore, the action of language's prosodic regularities in children speech, particularly the ones that characterize intonational phrases and phonological utterance components.

Yet, one notes great fluctuation compared to mean values of break pauses distribution of the two components. Once again, issues like subjectivity in language practice appear to be important to clear up the differences in children speech's prosodic organization.

Regarding discussions on results of the second objective of investigation, it was not found, in literature, studies focused and/or results that could be compared to the ones here exposed. Finally, with regard to the third objective, absence of significance in hesitation pauses distribution in utterance production – in the beginning and in the middle of an utterance – drives our attentions to two facts. On the one hand, pauses in the beginning of utterances suggest difficulty in starting, as far as they indicate a reaction time to the interlocutor's demand, and/or time to formulate utterances that would respond to that demand.

Conversely, hesitation pauses in the middle of utterances show barriers to the direction that the utterance would take in its progression. Therefore, these pauses may work as resources that children make use in order to maintain the utterance flow, according to the demand created by the interlocutor. In the referred moments, hesitation pauses would be one of the manners by which children try to control the utterance dispersion, relying on the demand of meaning to which they were exposed in dialogical activity with their interlocutor⁽²⁴⁾.

However, we should highlight the fluctuation (expressed by standard deviation) in distribution of the two types of hesitation – greater regularity in the beginning of utterances; greater dispersion in the middle. Fluctuation suggests that it is more predictable to act responsively to the interlocutor than to organize the continuity of saying (when it comes to prosody), especially because, in the continuity, the complex relation between prosody's phonological information and syntactic-semantic or pragmatic-discursive aspects of language^(18,20) strongly demonstrates its action, moments in which children speech allows to detect subjective aspects in its production^(11-16,25).

The set of results here exposed and discussed confirms the hypothesis that led the development of the present investigation.

Indeed, the results found indicate the complexity of the role of pauses in enclosing prosodic structures (that is, identifying its boundaries) and in their internal formulation (namely, in hesitation moments during its development). This complexity is owned, fundamentally, to the fact that, in language, the prosody's phonological information interacts with information from other nature, such as the ones derived from syntax, semantic and pragmatic of speech flow. Connecting them through components, such as phonological utterance and intonational phrase, demonstrates to be a complex task to the children studied in the present investigation. As can be seen, children were more inconstant than stable in pursuing this endeavor. In what concerns to enclosing these prosodic components, there is a strong tendency to stabilization, since pauses occurred more frequently in its boundaries.

Other studies should be performed, with similar theme and methodology, so that it could be possible to confirm, or question, the results found. These studies could analyze, for instance, a higher quantity of subjects in the same age group; subjects in different age groups (so the changes from one age group to another in language acquisition and prosodic structure organizations could be known); children with and without language difficulties; or subjects during language acquisition, compared to adults.

Although the results of this study have been extracted from speech samples of children with normal fluency, we believe that they could provide parameters for Speech Therapy in cases of language pathology, in what concerns to fluency analysis of dialogic interaction. In our opinion, this contribution showed possible mainly by the privileged methodology, based in data collected during less controlled speech circumstances, closer to the ones verified in real situations of language use.

CONCLUSION

Data point to the importance of pause as an index of more and less fluent moments of children speech, moments that could be detected by distribution of non-hesitation and hesitation pauses in speech samples. Furthermore, they point to the relation between these moments (more and less fluent) and enclosing and formulating prosodic components, which is demonstrated by the relation between non-hesitation pauses and phonological utterance and intonational phrases boundaries, as well as by the presence of hesitation pauses in the beginning and in the middle (therefore, outside these boundaries) of utterances.

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