

Unveiling the Power of Hesitation: Exploring Vocalizations in the Speech of Introverts and Extroverts

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Abstract. This study investigates vocalized hesitations, specifically filled pauses, in the spontaneous speech of individuals with varying levels of introversion and extroversion.

The primary objective is to examine the potential correlation between psychotype and the frequency of vocalized hesitations, thereby elucidating distinct speech patterns associated with introversion and extroversion. Through a rigorous analysis of statistical data and correlation measures, this study aims to contribute to our understanding of the intricate interplay between personality traits and verbal communication. Research suggests that introverts tend to exhibit a higher rate of vocalized hesitations, possibly serving as cognitive processing strategies during speech production. In contrast, extroverts are hypothesized to display fewer vocalizations and prioritize more fluid speech output, reflecting their inclination for externalized thought processes. By uncovering the underlying mechanisms of vocalized hesitations and their relationship to introversion and extroversion, this research enhances our knowledge of how psychotypes manifest in spontaneous speech. The findings have implications for psycholinguistic theories and provide valuable insights for researchers and practitioners working in the fields of psychology, communication sciences, and psycholinguistics.

Keywords: Vocalized Hesitations, Introverts, Extroverts, Psychotype, Personality Traits, Speech Patterns, Spontaneous Speech, Psycholinguistics.

1 Introduction

For human speech activities, there are phenomena that indicate various difficulties faced by speakers during the process of spontaneous speech generation. The reason for such difficulties is elementary: the conditions of temporal deficit while speech generation takes place. For example: ‘in real communication conditions, during natural spontaneous dialogue, the production of a text (utterance) essentially occurs in “extreme conditions” – with a time deficit and the absence of the possibility to carefully plan a strategy’ (Levitsky 2011: 162); ‘the process of speech generation is closely intertwined with the process of thought generation, forming a unified speech-thought process implemented by mechanisms of speech thinking’ (Katsnelson 1972: 110). Wilhelm von Humboldt described the speech act as a spontaneous struggle, a dramatic

conflict between thought and its verbal embodiment: 'For even the most everyday feeling and the deepest thought, language turns out to be insufficient, and people regard this invisible world as a distant country to which only language leads them, never reaching the destination. Every speech, in the truest sense of the word, is a struggle with thought, in which one feels both strength and weakness' (Humboldt 1984: 378); 'The gap between thoughts and language... is observed in speech fluctuations, false starts, and reformulations that abound in everyday speech. Interestingly, both introspection and speech failures show that people constantly compare their thoughts with their verbal expression and other possible variations of this expression. Clearly, people engage in mental monitoring of verbal variants that can be used to organize and express their thoughts, weighing different possibilities' (Chafe 2015: 64).

In "extreme conditions," human speech cannot be smooth and "polished"; it inevitably contains various signs of spontaneity known as hesitation phenomena (HP). These phenomena manifest in different ways and, in some manner, slow down the speech. Previously, these phenomena were studied in disciplines unrelated to linguistics, as they were considered external speech defects. However, in recent decades, they have become the foundation of an interesting and promising field that emerged at the intersection of linguistics, psychology, medicine, and the theory of probabilistic processes (Nikolaeva 1970). The linguistic study of these phenomena falls under the domain of colloquialistics (Devkin 1979; Skrebnev 1985).

Hesitation phenomena have been widely investigated in linguistics in recent years (Lounsbury 1954; Maclay & Osgood 1959; Clark & Fox Tree 2002; Aleksandrova & Ivanitsky 2003; Kibrik & Podlesskaya 2005; O'Connell & Kowal 2005; Aleksandrova 2004; Fehringer 2007; Corley & Stewart 2008; Cenoz 2013; and others; see also Yakovleva 2016 for a comprehensive review). The concept of hesitation phenomena is broader than that of hesitation pauses (HPa). In a narrow sense, HPa refers only to physical pauses, which occur when the speaker selects a word to fill a specific position within the syntactic structure of the utterance (Phonetics of Spontaneous Speech 1988: 147). In a broader sense, hesitation phenomena include both filled and unfilled pauses, as well as other forms of hesitation such as vocalizations, sound elongations, self-repairs, repetitions, and more.

Vocalizations are considered the most universal way of filling hesitation pauses in any language. They are non-speech or speech-like sounds that serve as a form of speech disruption, causing a break in the smooth unfolding of the speech flow. Vocalizations provide the speaker with a pause to prepare for the next portion of speech and, in combination with correction, contemplate possible ways to correct the preceding portion (Podlesskaya & Kibrik 2005).

Taking into account the universality of vocalizations discussed in this article, we will focus on a specific psychological dimension, extraversion-introversion. The main psychological groups studied are introverts and extraverts.

An introvert is understood as a person prone to introspection, calm, restrained, introjective and somewhat pessimistic, appreciating order, in need of a clear plan of action.

An extravert is understood as an impulsive, aggressive, optimistic and cheerful, outward-oriented personality, devoid of deep control of emotions.

Our objective is to demonstrate the inseparable connection between extraversion and vocalized hesitations. Previous research has indicated that introverts tend to exhibit a higher frequency of hesitations in their spontaneous speech (Gorbunova 2022), albeit without a detailed examination of specific hesitation types. By investigating the relationship between vocalizations and extraversion/introversion, we aim to gain valuable insights into how personality influences speech production and communication styles.

2 **Vocalized Hesitations and Their Classifications**

The task of studying hesitation pauses was first initiated by English and American researchers in the 1950s, with the main objective of understanding the causes of their occurrence. The investigations were conducted based on audio recordings of spontaneous English speech and reading. Researchers such as Maclay and Osgood (Maclay & Osgood 1959), as well as Goldman-Eisler (Goldman-Eisler 1972), discovered a connection between hesitation pauses and the process of lexical selection in the English language. By examining the overall proportions of pauses in spontaneous speech and reading, they noticed that pauses are more related to content rather than the structure of the utterance: ‘In fluent speech, the speaker keeps pauses under control, integrating them fairly well into the syntactic structure, and they primarily serve communicative functions rather than indicating internal processes’ (Goldman-Eisler 1968: 83). Conversely, in disfluent speech, pauses are less controlled and reflect internal planning processes.

All types of hesitation pauses in spontaneous speech (including vocalizations, but not limited to) can arise due to a variety of factors that operate collectively and interrelatedly:

1. **Physiological:** such as interruptions in breathing or health-related difficulties like asthma.
2. **Linguistic:** including the selection or search for an appropriate pronunciation, word choice, and consideration of morphological and syntactic relationships.
3. **Psycholinguistic:** such as temperament type, habitual speech rate, anxiety levels, vocabulary knowledge, and depth of understanding of the topic.
4. **Sociolinguistic:** including the level of speech competence, language proficiency, speech culture, professional background, educational level, and age.
5. **Extralinguistic:** such as communicative conditions and the degree of speech preparedness.

Maclay and Osgood also extensively examine vocalized hesitations, devoting significant attention to the role of anxiety as a prominent factor in the process of pause filling: ‘If anxiety is a tension-producing phenomenon, vocalization is likely to be tension-reducing. This implies that a subject in an anxiety state as he begins to talk will show an initially high rate of hesitations followed by a decreasing rate as speech continues. The level of hesitations may increase again as a result of external factors or as a consequence of the content of his own utterances’ (Maclay & Osgood 1959).

According to O.A. Aleksandrova (Aleksandrova 2004), hesitation in spontaneous speech can be a cause of communication failures as they hinder the understanding of the intended meaning and negatively affect the emotional state of the interlocutor. Therefore, in effective communication, all elements of hesitation should be reduced to unfulfilled pauses. A simple experiment conducted by researchers in St. Petersburg provided grounds to disagree with this statement: the removal of hesitations filled with non-speech sounds from spontaneous monologues led to a decrease in expert evaluations of these texts, sometimes by two points on a 7-point scale (see: Bogdanova 2010). Analyzing a large corpus of spontaneous monologues recorded from speakers of the Russian language allowed to conclude that vocalizations as a type of fillers in hesitations generally indicate a high level of speaker proficiency, while lexical or verbal fillers indicate a low level (Bogdanova 1993: 99).

In a comprehensive examination of the factors contributing to hesitations, Bortfeld et al. (2001) conducted an analysis of recorded task-oriented dialogs. Their findings revealed that the roles played by participants, specifically whether they were describing images or attempting to find matching images, had a significant impact on the frequency of hesitations, particularly fillers. This effect was observed irrespective of the length or complexity of the utterances.

Although the argumentation below seems to emphasize the significance of vocalizations, it is important to distinguish between fillers and vocalized hesitations in terms of terminology. Both fillers and vocalized hesitations indicate moments of hesitation or uncertainty in speech, but vocalization appears to be a specific type within the category of fillers. While vocalized hesitations refer to audible sounds produced during speech, fillers encompass units that may have their lexical meaning “bleached,” undergo processes of grammaticalization and pragmaticalization, and serve specific functions in speech, cf.:

- (1) *ya vot segodnya (e-e)¹ / mne predlozhili (e-e) / ya vot seychas ochen' (**m-m**) zanyat² (S125, m., 52, extr.)³ — vocalization, hesitation pauses filled with audible sounds;*
- (2) *(**m**) vot / oni stoili voobshche iznachal'no (e) vot yesli priti v obychnyy magazin / dve dve s polovinoj tsysachi (S121, w., 28, intr.) — short vocalized hesitations extended with filler *vot*.*

The functions of vocalizations largely coincide with the functions of other hesitational phenomena in spontaneous speech. They serve to demonstrate speech hesitation, buy time for considering the next word or continuation of speech, make corrections if something said is unsatisfactory to the speaker, and can be considered a form of speech manipulation.

¹ Vocalizations and fillers are marked in all examples as follows: vocalizations are underlined and bold, filler is bold.

² The transcribing texts from the corpus “One Day of Speech” include special symbols of discourse transcription: / — short physical pause; // — long physical pause; () — short hesitation pause; (...) — long hesitation pause; (e-e) — vocalized pause; - — prolongation of sounds; ... — break, etc (on the rules of transcription, see: Russian Language of Everyday Communication 2016: 242-243).

³ In the brackets after the example, we write the speaker’s code, gender, age, and psychological group (extravert or introvert).

Hesitation pauses, as well as vocalizations, could even assist in the ongoing process of understanding. For example, Howell and Young (1991) found that utterances with self-repairs were rated as more comprehensible when preceded by pauses. In an online task where participants had to select one of three geometric shapes, Brennan and Schober (2001) observed that the fastest identifications occurred when the interruption included a filler or a silent pause of the same duration. With the help of vocalizations, the speaker not only fills the pause of hesitation and gives themselves time to find the right word, but also can maintain the listener's attention and prevent their intervention in the dialogue until their own utterance is complete (Bogdanova-Beglarian 2023). Moreover, some of them – notably, vocalizations – may be a part of the speaker's expressive armory, which can be further categorized according to psychotype.

3 Data and Processing Procedure

The research material was sourced from the “One Day of Speech” corpus, which was created with the purpose of studying the speech behavior of Russian language speakers throughout a day using the 24-hour recording method.

To collect data for the “One Speech Day” corpus, the principle of “casting a wide net” was utilized, involving the collection of a wide range of language speaker data, which then became the subject of multidimensional analysis (Sound Corpus... 2013: 68). The corpus comprises over 1 million word occurrences in transcriptions, recording speech from 128 speakers and over 1000 of their interlocutors in various communicative situations.

The data for the study consists of speech produced by 50 Russian speakers, where vocalizations were annotated. Gender differences analysis was obtained before the psychological analysis, so all 50 informants were considered valid (see Table 1).

Table 1. Quantitative characteristics of the subcorpus by gender

Gender	People	Words	Number of Contexts
Male	30	106547	277
Female	20	69821	227

The psychological basis for the study relies on the results of two psychological tests – FPI and EPI – using only the extraversion/introversion scale to explore correlations between the poles. Ambiverts, by definition, alternate between both levels of arousal or may remain at an optimal level, which can be considered average and lacking specific characteristics, making their interpretation challenging.

A further comparison of the results from the two tests on the ‘introversion/extraversion’ scale revealed a coincidence rate of 64.6%. Informants whose test results did not align between the two questionnaires were excluded from the final sample. The most representative data for further analysis came from only 26 speakers. In total, the final psychological sample for further analysis consisted of 16 extraverts and 10 introverts. Exclusions were not only made due to a lack of psychological data; several speakers were also excluded due to poor recording quality or inadequate transcription, as well as very short speech episodes. The distribution of speakers by psychotype was found to be insufficiently uniform to claim

psycholinguistic balance. The higher number of extraverts, as indicated by the test results, can be attributed to the fact that psychological testing took place after the recordings and was not a determining factor in selecting or inviting specific speakers to participate in the experiment.

After obtaining all the necessary information about the speakers' psychological type, there was a need for cleaning, normalization, and quantitative assessment of the textual data in the corpus. To qualitatively evaluate the correlations between psychological types and vocalizations, as well as to calculate basic statistics, it is necessary to know the exact word count in the "speech day" of each informant represented in the final psychological sample. Since the transcriptions contain not only the words of the speakers but also the utterances of all interlocutors they interacted with during the "speech day," one of the stages of normalization involved the automatic recognition and removal of words spoken by all interlocutors.

Thus, the final user subcorpus consisted of 433 contexts with vocalizations extracted from the speech of 26 informants. Out of these, 10 were introverts and 16 were extraverts. The total volume of the material analyzed reached 95543 words, with introvert informants contributing 29380 words and extravert informants contributing 66163 words (see Table 2).

Table 2. The final quantitative characteristics of the pilot subcorpus

Psychological group	People	Words	Number of Contexts
Introverts	10	29380	191
Extraverts	16	66163	242

4 Vocalizations in the Speech of Introverts and Extraverts

The current research has been carried out with the integration of all the criteria required for the successful application of quantitative linguistic methods in both practical and theoretical domains. Although quantitative linguistic methods are typically associated with practical applications, their utilization in this study allows for a substantial expansion and modification of our scientific understanding of the entire language system and its functional capacities (Baranov 2001: 39).

As the original dataset contained more than 100,000 words, traditional manual methods with standard text editors were inadequate for processing such a large volume of data. Consequently, all further analysis was performed using computer methods, specifically leveraging the Python programming language and libraries such as NumPy and Pandas⁴, which are designed for analyzing extensive data arrays.

Upon reviewing Table 1, it becomes clear that women use more vocalizations than men, despite the overall corpus data indicating that women hesitate less. This suggests that the frequency of vocalizations cannot be solely attributed to hesitations or pauses in speech. Other factors, such as communication style, expressiveness, cultural norms, or social expectations, may contribute to the observed difference. Further analysis and investigation are required to gain a comprehensive understanding of the underlying factors influencing the higher occurrence of vocalization.

As can be seen from Table 2, there are nearly twice as many vocalizations in the speech of introverts compared to extraverts, despite the higher number of the latter. This disparity in the frequency can be attributed to inherent differences in communication styles and cognitive processing. Introverts tend to engage in more introspective thinking, carefully considering their words before speaking. On the other hand, extraverts typically exhibit more spontaneous and outgoing speech. Extraverts tend to use vocalizations in conjunction with other hesitation units and fillers, demonstrating prolonged and thorough hesitation when they choose to do so. In contrast, introverts use vocalizations less frequently in chains, but insert single hesitations frequently, after nearly every word.

These results are highly consistent with the findings of the Dewaele and Furnham (Dewaele, Furnham 2000) experiment, in which 25 Flemish students were presented with speech tasks under stressful (formal) and relaxed (informal) conditions. The results revealed a negative correlation between the proportion of vocalization *er* and the level of extraversion in formal situations. The researchers put forward the hypothesis that introverts, being more anxious and less stress-tolerant, are expected to exhibit a higher frequency of hesitations compared to extraverts, cf.:

- (3) *vot (e-e) ya tol'ko chto slyshal (m-m) (...) chto u Poltavchenko / syn* (S122, m., 33, extr.);

- (4) **(e-m)** **(e)** **(m)** *prenzii byli takie / vo-pervykh znachit yey nuzhno bylo chtoby *V za nikh ne tsep'yalas' yeyo Stesha% ne drala ikh* (S125, m., 52, extr.);
- (5) **(e-e)** *to est' na samom dele v nashe predstavenii / nu / skazhem tak / bol'shinstva /* **(eh-m)** *mnenie o tom chto svad'ba dolzhna byt' v belykh tonakh / eto* **(e-e)** **(n-n)** *nu vot traditsionnost' takaya nekaya / da* (S121, w., 28, intr.);
- (6) *chto / nu konechno* **(e-e)** *eto oche... eto provokatsiya ochen' legko* **(e-e)** *znachit* **(e)** *otdavt' tekh kto ne osobenno znachit tsennen / ponimaesh' da ?* (S130, w., 74, intr.)

The findings regarding the usage of single vocalizations and vocalization chains are further supported by frequency list (see Table 3). Interestingly, while for introverts the short single vocalization *(e)* places the first rank in frequency list, for extraverts rank is as low as fourth.

Table 3. Top 5 most frequent vocalizations in the speech of speakers with different psychotypes

Psychotype	Vocalization	Number of contexts
Introverts	e	60
	e-e	60
	m-m	28
	m	15
	e-m	11
Extraverts	m-m	99
	e-e	79
	a-a	29
	e	26
	m	2

⁴ All software used in this study is free and distributed as open source: <https://pandas.pydata.org/>, <https://numpy.org/>

5 Conclusion

The analysis of transcriptions, quantitative data, and comparative observations revealed an uneven distribution of vocalizations among different psychotypes. Specifically, it was found that introverts tend to use vocalizations twice as frequently as extraverts, both as isolated instances and within chains. This indicates inherent differences in how introverts and extraverts incorporate vocalizations into their speech patterns. Furthermore, a closer examination of vocalizations within speech contexts highlighted distinct behaviors exhibited by introverts and extraverts. Introverts showed a tendency to insert single hesitations more frequently throughout their speech, while extraverts had a higher likelihood of using vocalizations in chains with other hesitation units. Additionally, when comparing vocalization frequencies based on gender, intriguing findings emerged. Despite women having fewer overall hesitations in the corpus, they tended to utilize more vocalizations compared to men. This suggests that gender may play a role in the frequency and usage of vocalizations within speech. These findings emphasize the importance of considering individual differences, such as psychotype and gender, when studying language use and communication patterns. To gain a deeper understanding of the observed variations in vocalization patterns, further research could explore the underlying psychological and sociolinguistic factors driving these differences. Moreover, investigating the impact of cultural and contextual variables on vocalization usage would contribute to a more comprehensive understanding of this phenomenon.

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