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**First language attrition in voice onset times of Czech expatriates residing in
Anglophone areas compared with Czech students of English.**

**Atrice mateřského jazyka zkoumaná na době nástupu hlasivkového tónu
rodilých mluvčích češtiny přebývajících v anglofonním prostředí ve srovnání se
studenty anglického jazyka**

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Abstract

The present thesis investigates first language attrition on the level of phonetics, specifically the voice onset times of Czech expatriates living in Anglophone countries and advanced Czech students of English residing in the Czech Republic. First, it is questioned whether first language attrition occurs only in a migration context or whether it is possible for it to occur to advanced language learners still residing in their native environment. The results show non-monolingual like behaviour in both groups, however, of a different kind. Students drifted further from the English paradigm in the VOT of their L1 while expatriates drew closer to it. The results replicate what some other researchers found and suggests that L2 immersion environment determines the kind of crosslinguistic influence but is not conditional to L1 attrition, defined as diversion from the monolingual standard. The thesis also questions whether more frequent and variable L1 use decreases first language attrition, suggesting that it does, however, only partially and only in lenis plosives and not in fortis plosives.

Keywords: first language attrition, voice onset time, crosslinguistic transfer, language mode, phonetic category assimilation, phonetic category dissimilation, equivalence classification

Abstrakt

Tato práce se zabývá atricí, neboli nepatologickou změnou jazykových schopností, prvního jazyka na fonetické jazykové úrovni. Zejména se zaměřuje na nástup hlasivkového tónu Českých emigrantů žijících v anglicky mluvící zemi a pokročilých studentů angličtiny stále pobývajících v České republice. Nejprve se práce zaměřuje na otázku, zda li atrice prvního jazyka zasahuje pouze jedince žijící v emigraci, anebo jestli je možné ji pozorovat i u pokročilých studentů druhého jazyka stále žijících ve svém rodilém prostředí. Výsledky ukazují formy odlišné od monolingvního standardu u obou skupin, avšak pro každou skupinu odlišné jiným způsobem. Studenti se ve svých českých plozích oddělili realizacím typickým pro angličtinu, zatímco emigranti se jim přiblížili. Závěry replikují výsledky jiných dále zmíněných studií a naznačují, že pobyt v prostředí užívajícím primárně druhý jazyk mluvčího určují, jaký typ změny v rodilé řeči dojde, ale nejsou pro atrici, definované jako oddálení od monolingvního standardu, podmínkou. Práce také bere ohled na to, zda li více časté a variabilní užívání prvního jazyka i v emigračním kontextu snižuje úroveň atrice. Experimentální výsledky naznačují že ano, avšak jen částečně a jen co se týče znělých plozích a nikoliv co se týče těch neznělých.

Klíčová slova: atrice prvního jazyka, doba nástupu hlasivkového tónu, mezi jazykový transfer, jazykový mód, asimilace fonetických kategorií, disimilace fonetických kategorií, ekvivalentní klasifikace

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List of abbreviations

L1	<i>First language</i>
L2	<i>Second language</i>
SLM	<i>Speech Learning Model (Flege, 1995)</i>
ATH	<i>Activation Threshold Hypothesis (Paradis, 2004)</i>
SLA	<i>Second Language Acquisition</i>
VOT	<i>Voice Onset Time</i>
CLI	<i>Crosslinguistic Influence (Jarvis and Pavlenko (2008))</i>

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1. Introduction

“To lose your own language was like forgetting your mother, and as sad, in a way.” That is what one of the characters in Alexander McCall Smith’s (2005) book, *The Full Cupboard of Life*, has to say on the subject of “losing” one’s own native tongue. It is not an extremely rare occurrence that a person who has been residing abroad, not using their first language very much, starts to observe some changes in their native speech or perhaps even getting comments from prior acquaintances that they “sound different”. This might, in turn, shift one’s own attitude toward their mother tongue, cause shame and reluctance in using it or eventually disparage them from speaking it at all. But does this pertain only to speakers who migrate or is it a possibility for advanced learners of other languages? Does seeking out and maintaining frequent contact with other expatriates prevent this? Both questions are probed by linguistic research concentrating on non-pathological language changes, referred to as language attrition and this thesis tackles them as well (Schmid, 2011).

In the first chapter, I will discuss previous research concerning attrition, specifically I will first define the concept, then concentrate on cognitive theories that attempt to present a comprehensive framework for explaining the psychological basis of attrition, specifically the Language Mode Theory, Activation Threshold Hypothesis, Speech Learning Model, and the theory of Multicompetence. Subsequently, factors that can possibly influence first language attrition will be discussed those are namely age, first language use and linguistic priming. In the following chapter, I will first define the phonetic concept of voice onset time and then introduce its characteristics for Czech and English. The next two chapters will deal with the practical parts of this work. The methodological chapter will introduce the thesis experiment, its participants and resulting material. The results and discussion chapters will then present the results of the experiment and connect them with the postulations of previous research.

2. First Language Attrition

2.1 Defining Attrition

Language attrition was suitably defined by Bergmann et al. (2016, p. 72) as follows: “changes (usually a decline) in an individual's abilities in a language, induced by decreased use and input in this language”. Although research is done both on first and second language attrition, the present thesis concentrates on *first language attrition*, i.e., the language user's native language, and therefore all future postulations pertain primarily to it. Although linguists (e.g., Mathesius 1935) have pointed out the plasticity of speakers first language (hereafter referred to as L1), language attrition as a concept is relatively new (Sučková, 2020a). The beginnings of systematic attrition research date to the 1980s and Freed and Lambert's conference volume *Loss Language Skills* which attempted to define the phenomenon and managed to establish much of the methodological and theoretical standards for future research (Köpke & Schmid, 2004). Further work that provided systematic guidelines for hypothesis formulation and experimental design was Anderson's (1982) article *Determining the linguistic attributes of language attrition*. Lambert and Freed's (1982) definition of attrition as “language loss” is no longer considered as precise (Schmid, 2011). Its problem lies in that it implies a binary process and refers to cases of pathological language loss and implies, which could lead to terminological confusion (Schmid, 2011). Current research implies that attrition is rather a gradual process that is present to a degree in every bilingual speaker (Schmid, 2011). Consequently, the attitudes towards L1 attrition have also shifted. While Cook (2003, p. 11) proposes that L1 attrition can have *Positive effects*, *Negative effects*, and *Neutral effects*, he stresses that in most cases, beside extreme losses of L1 capabilities, the effects of attrition are neutral and classifying them as negative or positive would include certain value judgements on the part of the researcher.

Attrition can influence the speaker's L1 on many linguistic levels (Sučková, 2020a), therefore it is useful to delineate specific occurrences by the means of the 10-dimensional scheme of *crosslinguistic influence* (hereafter referred to as CLI) developed by Jarvis and Pavlenko (2008). The scheme is shown in *Table 1*.

Table 1 Classification of crosslinguistic influence according to Jarvis and Pavlenko (2008)

Dimension	Type
Area of language knowledge/use	phonological, orthographic, morphological, lexical, semantic, syntactic, discursive, sociolinguistic, pragmatic
Directionality	forward, reverse, lateral, bi-or multi-directional
Cognitive level	linguistic, conceptual
Type of knowledge	implicit, explicit
Intentionality	intentional, unintentional
Mode	productive, receptive
Channel	aural, visual
Form	verbal, nonverbal
Manifestation	overt, covert
Outcome	positive, negative

Note. The exact format of this table was adapted from Sučková (2020a, p. 17)

First, a brief overview of each of the aspects of CLI is in order. The category of *Area of language knowledge/use* defines the linguistic domain in which influence occurs (Jarvis & Pavlenko, 2008, p. 21). *Directionality* describes which languages in the multilingual speaker influences which, for example, whether L1 influences L2, L2 influences L1 etc. (Jarvis & Pavlenko, 2008, p. 22). *Forward* transfer refers to influence of L1 on a post-L1 language and *reverse* of post-L1 on L1 language (Jarvis & Pavlenko, 2008, p. 22). Transfer between languages on the “same level is termed *lateral transfer* and in the case that both of the user’s languages function synchronously as the source and recipient languages the process is labelled *bidirectional transfer* (Jarvis & Pavlenko, 2008, p. 22). The category of *cognitive level* distinguishes between transfer on the *conceptual level*, meaning in the mental representations and transfer on the *linguistic level* which pertains to the linguistic forms as such (Jarvis & Pavlenko, 2008, p. 23). The category of *types of knowledge* distinguishes between the unconscious *implicit knowledge* of a language and the more conscious metalinguistic *explicit knowledge* (Jarvis & Pavlenko, 2008, p. 24).

Intentionality allows a distinction between *intentional CLI*, meaning CLI used as a communicative strategy, and *unintentional CLI*, which is CLI as the result of formed mental associations between elements of two languages (Jarvis & Pavlenko, 2008, p. 24). *Mode* distinguishes between *productive* uses of language, such as speech and *receptive* uses, such as listening (Jarvis & Pavlenko, 2008, p. 24). *Form* is applied to make the general distinction between the *verbal* form of communication (i.e., speech) and *non-verbal* forms (i.e., all others) (Jarvis & Pavlenko, 2008, p. 24). *Channel* then lays out a finer differentiation because it provides not only the *oral/aural* category but also further differentiates the *non-verbal* forms, for example, the *visual, manual, or written channels*. *Manifestation* further specifies the nature of the interlingual connections made between multilinguals’ languages; *overt manifestations* are links made between structures existing in both languages and *covert manifestations* occur when transfer happens between a structure present in one language and missing in the other (Jarvis & Pavlenko, 2008, p. 25). In terms of *outcome*, Jarvis, and Pavlenko (2008, p.25) agree with the proposition that the terms *negative* and *positive* are not ideal but, nonetheless, are categorically the most straightforward. *Negative* outcome is said to occur when the CLI somehow interferes with the intelligibility of communication or

violates the norm of the monolingual speakers and *positive* outcome is when none of the above occur (Jarvis & Pavlenko, 2008, p. 25).

The type of CLI discussed in this thesis is categorized as a *phonetic* change, occurring in a *reverse* direction, taking place *unintentionally* on the part of the speakers and targeting their *implicit* knowledge of the language. The changes later described in the thesis occur in the *productive* mode, *verbal* form, and *oral* channel, with *overt* manifestations. Lastly, though it conflicts with Cook's (2003) previously posited proposition, the *outcome*, in the context of this scheme, would be *negative* as it would be a shift from the monolingual norm.

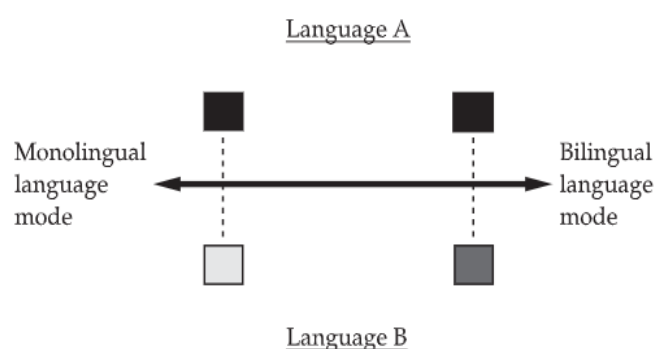
Having put forward concepts important for defining language attrition, I will now present cognitive factors that can influence the occurrence of attrition and theories on the cognitive basis of the process.

2.2 Cognitive basis of attrition

2.2.1 Language Mode Theory and Activation Threshold Hypothesis

The Theory of Language Modes centres around the concept that bilinguals (here referring both to early and late bilinguals) communicate in different *language modes*, i.e., different states of activation of the users' languages and language processing mechanisms, when they are with monolinguals and when they are with bilinguals sharing their languages (Grosjean, 2012, p. 1). Grosjean (2012, p. 2) presents *language modes* as a continuum of activation, as is demonstrated in *Figure 1*.

Figure 1 Language mode continuum (Grosjean, 2012, p.2)



The individual languages of the user are depicted on the vertical axis, the level of their activation is represented by the degree of darkness, black being the completely activated and white deactivated states (Grosjean, 2012, p. 2). The horizontal axis represents the specific language modes, ranging from the border modes, the *monolingual mode*, where one language is active and the other completely deactivated, to the *bilingual mode* where both languages are active, although not to the same degree, because in every communicative situation, there will always be only one *base language*, which possesses the largest degree of activation (Grosjean, 2012, p. 2). In most situations, operate in varying degrees of intermediate modes (Grosjean, 2012, p. 2). Grosjean (2012, p. 2) also stresses the importance of the *comparative level of activation* or the activation levels of the languages in relation to one another. And that both languages' activation levels are often interdependent. (Grosjean, 2012, p. 2). Subsequently, the specific language modes of a speaker is hypothesized to determine their linguistic behaviour, for example, one close to the monolingual mode will show very little language switching and react more slowly to it. (Cheng & Howard, 2008).

The levels of activation and the speaker's specific mode at any moment are factors decided unconsciously and influenced by a plethora of social and idiosyncratic factors (Grosjean, 2012). Those include the participants of the communicative situation, their mutual relationships, language proficiencies and their language mixing capabilities and attitudes (Grosjean, 2012, p. 2). Furthermore, situational circumstances, such as the location of the communication, the presence of other potential monolingual communicators or the formality of the situation, might also influence the speakers' language mode. (Grosjean, 2012). Grosjean (2012) mentions other minor influencing factors such as the topic of conversation or the communicative function of an interaction.

Experimental support for the theory is shown in studies by Lanza (1992) and Genesee, Boivin, and Nicoladis (1996), which examined bilingual children in situations where their interlocutors interacted with them either in one language exclusively or admitted language mixing. They found that the presence of *bilingual mode* behaviour (language mixing etc.) in the children was dependant on the presence or absence of such behaviour in their interlocutors (Grosjean, 2012, p. 4). This goes to show that whether

the linguistic structures of one of the bilingual's or L2 learner's languages are activated or inhibited is highly context dependant.

Although the theory primarily works with situational predictions and frequency of use research, its preoccupation with cognitive activation of a language allows it to be connected with a neurolinguistic theory, specifically Michel Paradis' (2004) Activation Threshold Hypothesis (hereafter referred to as ATH), and together provide a holistic view of what occurs, neurologically, during L1 attrition of a migrant speaker (Sučková, 2020a).

ATH posits that a linguistic item "is activated when a sufficient amount of positive neural impulses has reached its neural substrate" (Paradis, 2004, p. 28). The subsequent number of neural impulses necessary to activate the item constitutes its *activation threshold*, each time an item is activated, its threshold is lowered, and fewer impulses are necessary to activate it (Paradis, 2004, p. 28). The activation threshold of an item that is not stimulated for longer periods of time rises and the item becomes more difficult to retrieve (Paradis, 2004, p. 28). This is so because, on one hand an item's activation threshold rises over time, but also because the retrieval of a particular item requires the inhibition of any possible alternative, so as to prevent interference (Paradis, 2004, p. 28). This inhibition is achieved by the raising of their activation threshold, resulting in them requiring more neural impulses, making some items more available because of the relative ease of activation (Paradis, 2004, p. 28). Furthermore, the more active the non-target item is the stronger the inhibition must be, which suggests that the inhibition of the speaker's L1 is stronger in case of L2 output.

In a migration context, L1 attrition can be explained as a result of long-term lack of stimulation and inhibition of L1 items so that items in the L2, in which the bulk of the communication takes place, can be activated more easily. An expatriate would primarily be in an L2 monolingual mode with their L1 is getting little to no activation and becoming more inhibited. Use of L1 items would require an increasingly higher number of impulses for activation and this relative difficulty could result in the L1 items being replaced by their competing L2 alternatives, which have much lower activation thresholds, because of the higher frequency and recency of their activations (Paradis,

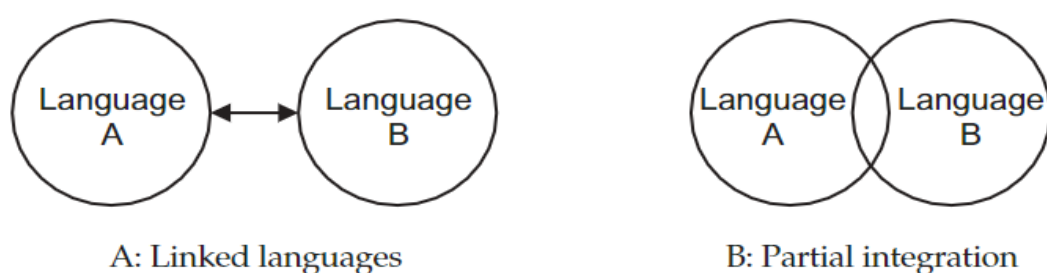
2004, p. 28). This is hypothesized to possibly affect all linguistic levels (Sučková, 2020a, p. 22)

The hypotheses also suggest that it is prolonged periods of L1 inhibition in the L2 monolingual mode that are at the core of attrition which would make it very unlikely that L1 attrition would occur with highly proficient language learners, still residing in their native-speaking environment.

2.2.2 Speech learning model and Multicompetence

The theory of *Multicompetence* (Cook, 2003) differs from ATH in that it does not conceptualize a bilingual's languages as separate entities but supposes that since they reside in the same mind, they "must form a language super-system at some level rather than be completely isolated systems" and in this it challenges the notion that an L2 learner should strive to match a monolingual standard (Cook, 2003, p. 2). On the other hand, the theory does not assume a total integration of all the multilinguals' languages into a single supersystem (Cook, 2003, p. 7). Cook (2003, p. 8) rather hypothesizes an integration spectrum with the actual state of integration of the multilinguals' languages being somewhere in between the two models presented in *Figure 2* (Cook, 2003, p. 8).

Figure 2 The interconnection models (Cook, 2003, p.8)



In model A, i.e., the *linked languages model*, both languages are separate structures which display some influence on one another (Cook, 2003, p. 8). This concept underlies much of the present second language acquisition (hereafter referred to as SLA) research and is also implicitly supposed by the Language Mode Theory (Cook, 2003, p. 8,10). Model B, the *partial integration model* theorizes an area of overlap

between the still to a degree separate linguistic systems in which bi-directional movement occurs (Cook, 2003, p. 8).

Within this model, attrition should not be referred to as transfer, rather as a changing of the fundamental structure of both languages by the presence of the other (Cook, 2003, p. 10). This would suggest a larger variability in the possible influences that the L2 could have on the L1, not just a preference for the more activated items, as presented by ATH. A theory of precisely how this influence would manifest itself can be found in Flege's (1995, p. 237) *Speech Learning Model* (hereafter referred to as SLM) which proposes a comprehensive theoretical framework for the interaction of the phonological systems of multilinguals' languages.

In accordance with the integration model, it suggests that elements making up the L1 and L2 phonetic subsystems of the multilingual exist in a *common phonological space* and naturally exert bidirectional influence on one another (Flege et al. 2003, p. 469). It further proposes that the human capacity for speech learning remains intact throughout life and that the lessened ability of native-like L2 phoneme reproduction is caused by the engagement with established L1 categories, which attract the learner's L2 similar vowels or consonants and have a high possibility of subsuming and assimilating them (Flege et al., 2003, p. 469). The more acoustically similar an L2 sound is the more likely it is to be subsumed under an L1 sound (Flege et al., 2003, p. 469). However, by the logic of the theory, *phonetic category assimilation* is only one possible interaction between the elements of a phonetic system and SLM distinguishes another possible interaction, specifically, *phonetic category dissimilation* (Flege et al., 2003, p. 469).

As suggested, *assimilation* occurs when a new L2 sound is not assigned to a separate phonetic category but is misidentified with the closest existing L1 phoneme (Flege et al., 2003, p. 469). Flege (2003, p. 469) also hypothesizes that as the speaker becomes more familiar with the L2, the L1 category, previously identical with familiarity the L1 category which assimilated the L2 sound shifts from the monolingual norm and becomes an amalgamation of both the L1 and the L2 sound (Flege et al., 2003, p. 470). Flege (2003, p. 470) substantiates this in the results of one of his studies on French-English late bilinguals. Assimilation adjacent is *equivalence classification*, a process of categorizing two distinct but similar sounds as variants of a single category (Flege,

1995). In such a case, complete assimilation is unlikely, rather a bidirectional or a unidirectional influence between the forms will occur. *Dissimilation* occurs when the similar L1 and L2 speech sounds are categorized as different phonemes and to maintain sufficient phonetic contrast between them, the bilinguals' newly formed L2 category and the established L1 category drift apart into more extreme positions of the phonetic space (Flege et al., 2003, p. 470). Flege and Effing (1987) found dissimilation in the case of proficient English language learners, for whom their L1 phonemes moved further away from the L2 variants as L2 proficiency increased. Since it has been shown that the phonetic space of an individual is malleable even beyond a sensitive period for acquisition (see 2.3.1), this pertains not only to L2 acquisition but also L1 attrition (Fowler et al., 2006).

An experimental case of both assimilation and dissimilation was found by Watson (1991), whose research focused on French-English subsequent bilingual children (ages six to ten) and their contrasts in plosive voicing. The results suggested that the voicing strategies in their French were more English-like and those in English were more extreme than of a speaker monolingual English (Watson, 1991, p. 40). Because these differences were imperceptible, Watson (1991, p. 40) suggests that they were a compromise on the part of the bilinguals, of making their phonetic realizations more similar to conserve cognitive energy, but only to the degree that it does not impede their communication and still appeases the monolingual community's standard (Watson, 1991, p. 41). The framework of ATH does not provide a conceptual explanation for the drifting away in the speakers' English, only for their movement towards the dominant language, however, in terms of the SLM the speakers assimilated in their French and to keep sufficient contrast, dissimilated in the dominant English.

2.3 Variables influential with regards to attrition

A crucial, yet difficult to measure factor influencing attrition is language attitude, a positive attitudes to one's L1 and a desire to retain the identity connected to it does, to a degree, tend to prevent L1 attrition (Schmid, 2011, p. 105). However, since its difficulty in measurement and its tendency to fluctuate over the lifetime, L1 attitude will not be taken into account as a variable (Schmid, 2011, p. 101).

2.3.1 Age

A crucial developmental factor for language attrition and acquisition is age, specifically how the age of relocation influences L1 attrition (Schmid, 2011). The question is connected with Lenneberg's (1967) hypothesis of the *Critical*, later renamed *Sensitive Period* (Ruben, 1997). It proposes that during language acquisition there is a period of extreme efficiency on the part of the learner, which rapidly decreases at the age of around ten to twelve years and then remains equally low for the rest of the speaker's life (Lenneberg, 1967; Pallier, 2007,). Its importance for attrition research lies in the fact that it conceptualizes that and potentially how the pliability of a speaker's linguistic system changes over time (Pallier, 2007). It would suggest that for attrition age of relocation in a migration context is a crucial determiner of the process (Schmid, 2011). A study done by Bylund (2008) found that the period around the twelfth year of age is critical, if relocation occurs prior, attrition is likely to occur to a much higher degree, while if it occurs afterwards, attrition is much less extensive, and age of relocation becomes much more irrelevant. In a sense the situation with attrition is a reversal of the Sensitive period in acquisition and Schmid (2011, p. 73), therefore, suggests that the pre-pubertal migration does not cause L1 attrition but incomplete acquisition, therefore, age of relocation should be considered to distinguish between the pre-pubertal incomplete acquirers and post-pubertal attriters.

In terms of length of residence in a non-native context, attrition is often imagined as a gradual process, but it has been shown that its onset is relatively quick (Schmid, 2011, p. 78). Some studies suggest that most changes to an expatriate's L1 occur in the first five to seven years abroad (e.g., Mägiste 1979). Further, I will present two different theories on the cognitive basis of attrition.

2.3.2 L1 input and output

Although frequency of language use is certainly a determining factor for L1 attrition degree (e.g., Paradis, 2004), Schmid (2011, p. 82) proposes that research should not only distinguish between "frequent" and "infrequent" use, but also that it should take into consideration in which situations and with whom this use occurs (Schmid, 2011, p. 83). She proposes to distinguish three possible types of use: *interactive use*, *non-interactive use*, and *inner use* (Schmid, 2011, p. 83).

Interactive use of language is that in spoken or written communication with interlocutors and entails both *input* and *output* and mediates information, emotion, attitude, or identity expression (Schmid, 2011, p. 83). Because of this linguistic expressiveness it is used in diverse speech situations where different linguistic behaviours, for example different degrees of bilingual language use, are required, in informal situations, bilinguals are more likely to freely code-switch (switching between stylistically or otherwise different linguistic variants or languages) between their L1 and L2 and need to pay less attention to potential cross-linguistic influences, while in formal use, speakers might take more care to avoid such phenomena (Schmid, 2011, p. 84). Attriters using their L1 only in informal settings then might be more likely to exhibit forms of attrition because they can freely code-switch between their languages, while those who use it in formal settings and strive to sound the most native-like, might be more aware of the potential influences of their L2 and strive to avoid it as much as possible (Schmid, 2011, p. 84). A further assessment of the situations in which speakers employ their L1 could be afforded by an analysis of their social networks, a concept first introduced by (Moreno, 1934), however such detailed analysis is outside the scope of this thesis, which will concentrate only on L1 use frequency in a limited number of situations.

Other forms of language use do not entail both *input* and *output* but are oriented towards one or the other. A strictly *input* oriented exposure is that of books and other media (Schmid, 2011, p. 89). These forms provide a way for users to be in contact with their L1 even without an L1 communication partner and theoretically could be a means of maintaining L1 proficiency (Schmid, 2011, p. 89). Whether *input* only is enough to maintain or build proficiency was primarily discussed in SLA research, which suggests that with the increase of language proficiency, learners' profit from comprehensible input learning more (Cummins, 1979). Accordingly, potential L1 attriters have should be, therefore, able to profit from this process more than for example second language learners (Schmid, 2011, p. 90). However, because of the difficulty in measuring the amount of this exposure in the age of internet information accessibility, not much of L1 attrition research focuses on passive linguistic input as a determining factor (Schmid, 2011, p. 90).

What Schmid (2011, p. 91) calls *inner language* (i.e., the language of inner thought, counting and expression of emotions) is on the other hand purely expressive. Without an interlocutor, bilinguals' choice of language in these contexts is relatively free and therefore can be expressive of the state of their linguistic system (Schmid, 2011, p. 9). Many factors influence language choice in this context, e.g., emotional immediacy (L1 reactions are said to be more immediate), or the language of learning a particular skill, like, for example, counting (Schmid, 2011, p. 92). But what is crucial is that internal functions of language are not invariably associated with one language only, but themselves change based on the linguistic situation of the speaker (Schmid, 2011, p. 94). We can therefore expect the reduction of L1 *inner* use to accompany attrition, but we cannot consider it a predictor factor (Schmid, 2011, p. 94).

2.3.3 Linguistic Priming

As Schacter et al. (2004, p. 853) define it, priming is “a nonconscious form of memory that involves a change in a person’s ability to identify, produce or classify an item as a result of a previous encounter with that item or a related item”. In linguistic terms, it is a phenomenon in which prior exposure to specific language forms or meanings either facilitates or interferes with a speaker’s subsequent language comprehension or production of said or related linguistic forms (Trofimovich & McDonough, 2011, p. 3). The initial form which facilitates further use is called the *prime*. This is the form that is presented prior to production or recognition. The following form which is or is supposed to be somehow influenced by the prime is called the *target* (Trofimovich & McDonough, 2011).

Priming is believed to be an implicit process which is a part of a larger implicit memory system and linguistic priming is interpreted as a form of implicit learning, which suggest that language users’ previous linguistic contact shapes their subsequent language use without much conscious awareness of it (Trofimovich & McDonough, 2011, p. 4). Experimental evidence has been found for the support of priming being an implicit cognitive process, for example, Tulving and Schacter (1990, p. 302) found that in subjects suffering from dense amnesia priming is still possible. Though most research on linguistic priming is done in monolingual settings, evidence for cross-linguistic priming exists as well (e.g., Kootstra, Van Hell, & Dijkstra, 2012).

The typology of priming phenomena used in psycholinguistic research is double, the first distinction is made between *perceptual* and *conceptual priming* and the second is based on the linguistic level on which priming occurs, i.e., *semantic*, *syntactic*, and *auditory* priming (Schacter & Buckner, 1998). Conceptual priming requires semantic encoding and is not modality-specific, i.e., dependant on the equality of the modus of the prime and the target, for example, a visual prime corresponding to a visual target (Schacter & Buckner, 1998). On the other hand, perceptual priming is modality-specific, meaning the priming effect is reduced on cross-modality tasks, and does not require semantic encoding (Schacter & Buckner, 1998). Semantic priming describes a tendency for “speakers to process a word more quickly and/or more accurately when they have been previously exposed to a word related in meaning” (Trofimovich & McDonough, 2011, p. 4). Syntactic priming refers to the “tendency to produce a syntactic structure that appeared in the recent discourse, as opposed to an equally acceptable alternative” (Trofimovich & McDonough, 2011, p. 5) and auditory priming “to the tendency for people to process or produce a spoken word, combination of words or a speech sound more quickly and more accurately or to be more likely to produce a specific phoneme when they have had previous exposure to them in speech” (Trofimovich & McDonough, 2011, p. 5). Seeing the propensity of previous contact influencing linguistic production or perception, experimental tasks measuring the influence of one of the speaker’s languages on another should consider the language of the experiment instructions as a possible variable, be they verbal or written.

3. Voice onset time

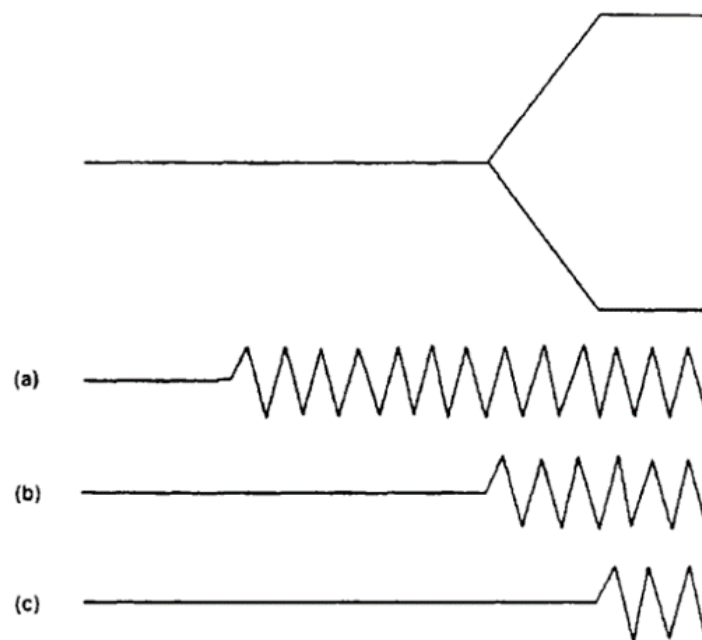
3.1 Definition and typology

Lisker and Abramson (1964) first developed the concept of voice onset time (hereafter referred to as VOT) in their seminal paper as a “simple and quite robust measure of acoustic differences among stop consonants of different voicing categories” (Sučková, 2020a, p. 79) and defined it as “the temporal relation between the moment of the release of the stop (i.e. plosive) and the onset of glottal pulsing” (Abramson & Whalen, 2017, p. 2). Of course, distinction of voicing is very common in many of the world's

languages some researchers noted the differences in the timing of voice onset in plosives in different languages (e.g., Panconcelli-Calzia, 1924) even prior to the coining of VOT, however, the important temporal dimensions and acoustic realizations of such differences remained unobserved until the developments in VOT research (Abramson & Whalen, 2017, p. 2). For clarification, plosives are consonants created by two articulatory organs moving towards each other and forming a total stricture, which, after enough air pressure is built behind it, is released, making an audible sound, i.e., plosion (Roach, 2009, p. 30). Furthermore, VOT has become a standardly utilized measure in bilingualism research because of its interlanguage variability, proneness to cross-linguistic influence, and relative straightforwardness in measurement (Thomas, 2010).

Lisker and Abramson then devised a double distinction based on whether voicing began prior or after the moment of release of the intraoral pressure, which was set as a reference point at 0 msec (Abramson & Whalen, 2017). If glottal pulsing, i.e., voicing started prior to stop release it was termed as *voicing lead*, also referred to as *prevoicing*, which would have negative values and if voicing began after the release, it was considered *voicing lag* which would have positive values (Abramson & Whalen, 2017; Sučková, 2020a). Voicing lag can also be subdivided into *short-lag* VOT, i.e., cases of voicing beginning at or around the moment of release, lasting less than 30 msec and *long-lag* VOT, that is, instances when after the stop release air escapes through the vocal folds, producing a sound resembling /h/ which is termed aspiration (Sučková, 2020a; Roach, 2009, p. 32). Long lag VOTs are supposed to be longer than 30 msec in duration (Skarnitzl 2011). *Figure 3* shows the parametric representation of all three types of VOT taken from Docherty (1992, p. 22) of a word initial plosive. Though current research focuses not only on word initial VOT, but the present thesis does also, therefore, the other possible positions will not be discussed any further. The representation shows first the approximation of the articulatory organs and subsequently, the presence or absence of voicing, represented by the periodic waveform, where (a) corresponds to prevoicing, (b) to short-lag VOT and (c) to long-lag VOT. (Docherty, 1992, p. 20)

Figure 3 A parametric representation of word-initial voicing timing (Docherty, 1992, p. 22)



Note. (a) represents periodic voicing waveform in prevoicing, (b) in short-lag VOT, (c) in long-lag VOT

From a physiological point of view, voicing lag is a result of an integrated opening-and-closing action of the glottis momentarily interrupting vocal fold vibration or in other words the glottis being somewhat open (Abramson & Whalen, 2017; Docherty, 1992). However, Roach (2009) points out that even same as most voiceless speech sounds, for example /h/, even aspiration requires slight narrowing of the vocal folds, therefore, voicing lag is a result of a very minute and precise articulatory process. The complexity of the process is attested even by the activity behind voicing lead, where cessation of voicing due to equalization of the sub- and supraglottal pressures caused by the building up of pressure behind the occlusion is avoided by means of complicated articulatory strategies like lowering of the larynx or expanding of the pharyngeal cavity (Docherty, 1992) Based on the patterns of VOT types acquisition, it has also been inferred that each of the VOT realizations, entails different kinds and

difficulty levels of velopharyngeal activity, specifically that short-lag VOT are easiest, as they are acquired first and prevoicing the most difficult, as it is acquired only in early school years in an adult-like manner (Kewley-Port & Preston, 1974; Stoehr et al., 2017).

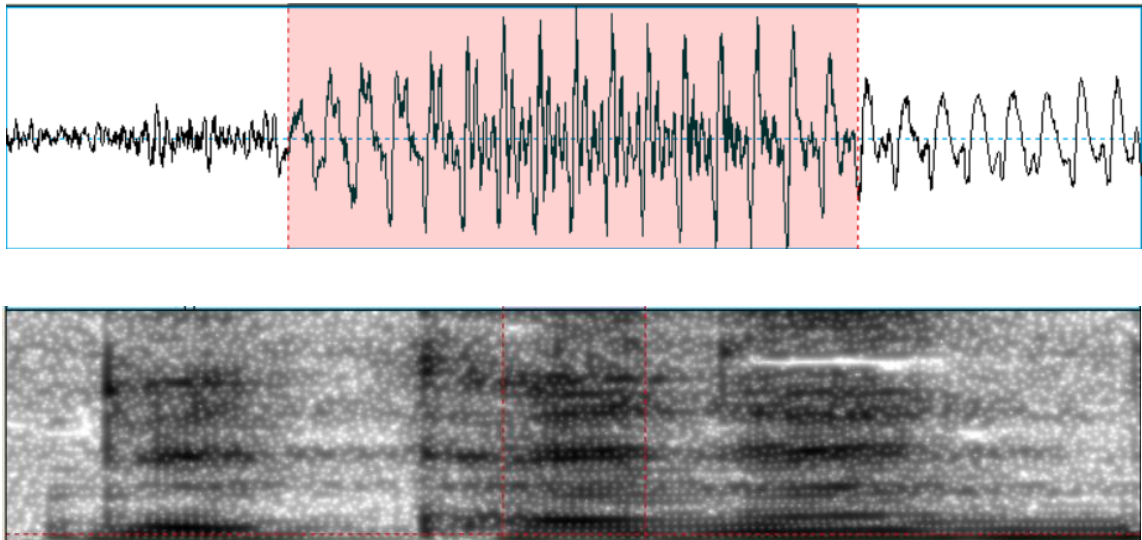
Although this threefold VOT distinction presents only majority trends and is not expressive of all possible variations that languages can use to distinguish between phonological voicing in plosives, for example, Hindi has not only voiced unaspirated and voiceless aspirated, but also voiceless unaspirated and voiced aspirated (Abramson & Whalen, 2017), it nonetheless provides another important dimension in voicing division besides the mere presence or absence of glottal pulsing. However, the variability in plosive pairs distinctions which it introduces also raises the issue of discrepancy between the phonological distinctive category of “voicing”, and the actual acoustic differences of sounds differentiated in said category (Skarnitzl, 2011). For example, the difference between the “voiceless” and “voiced” phoneme groups /p t k/ and /b d g/ can be in one group having voicing present during its closure and the other not (as it is in Czech), however, it can just as well be the case that neither are “voiced” in their acoustic realization and the distinction between them rests in the “voiceless” variant having a longer period of aspiration at its culmination (Skarnitzl, 2011). Because of these discrepancies a different terminology, relying on the concept of articulatory force, was introduced (Skarnitzl, 2011). The “voiceless” plosives were presumed to be produced with a higher degree of respiratory energy and muscular effort and therefore were termed *tense* or *fortis*, on the other hand, “voiced” plosives were proposed to be produced with less articulatory force and were termed *lax* or *lenis* (Skarnitzl, 2011). Although the concept of articulatory force as distinguishing between “voiced” and “voiceless” plosives has been disproved, the terminology of fortis and lenis plosives will be used in the next sections of this thesis because of its relative distinctiveness and its frequent use (Skarnitzl, 2011).

What subsequent VOT research focused on was characterizing what further variables influence the length of speakers’ VOTs besides the language of speech (Skarnitzl, 2011). Variation in the position and surroundings of the plosive, like bordering sounds or stress of the word in question, psychological aspects such as age and sex or sociological variables such as gender or sociolect have all been found to somewhat influence VOT length (Skarnitzl, 2011). Furthermore, a substantial body of

research was dedicated to discovering how articulatory position of a plosive influences VOT duration and the results seem to suggest that VOT is prolonged when the place of articulation is further back in the oral cavity (Abramson & Whalen, 2017; Docherty, 1992). Cho and Ladefoged (1999), specifically, conclude that though across all the languages they studied there was a universal tendency for bilabial plosives to have shortest VOTs and velar (or uvular) plosives to have the longest VOTs, a direct correlation between higher VOT values and a farther place of articulation cannot be assumed (Cho & Ladefoged, 1999). The issue was taken with the specific supposition that VOT values increase linearly with a farther place of articulation, however, this was not what their research suggested, it showed that the most significant differences were revealed between bilabial and alveolar plosives and between velar and uvular ones, no such difference was found between alveolar and velar ones (Cho & Ladefoged, 1999). The reasons behind this tendency can be the relatively smaller size of the cavity behind the place of occlusion in farther plosives, which causes higher air pressure build-up and therefore a longer release, or the slower movement speed of the part of the articulatory organ, i.e., the back of the tongue (Cho & Ladefoged, 1999).

VOT measurement relies on both the waveform and the spectrogram. The waveform is “a graphic representation of the shape of a wave” (Merriam-Webster & Inc., 2016), that shows the changes of pressure, or amplitude, in time and to a relative point designated as 0, and also the frequency of a sound wave, that is the number of oscillations in a second, measured in (Hz) (Skarnitzl et al., 2016, p. 31). For more precise distinctions spectrograms are used beside waveforms, they are based on the fact that most sounds are composites of multiple sound waves with different frequencies and amplitudes and displays the intensity on individual frequency components of the composite sound (Skarnitzl et al., 2016, p. 33). A waveform and a spectrogram of the phoneme /e/ are in *Figure 4*.

Figure 4 A waveform and a spectrogram with /e/ highlighted.



Note. The exemplary waveform and spectrogram were taken from a recording elicited for the purposes of this thesis, by the experimenter.

The display and comparison of both is mediated by Praat (Boersma & Weenink, 2014, 2018) and therefore it is the most commonly used software in VOT research (Abramson & Whalen, 2017, p. 11).

3.2 English voice onset time

The English language has six plosive consonants, three fortis: bilabial /p/, alveolar /t/ and velar/k/ and three lenis bilabial /b/, alveolar /d/ and velar /g/, there is also the glottal plosive /ʔ/, but it is less important as it usually occurs only as an alternative pronunciation of /p/,/t/ or /k/ (Roach, 2009, p. 31).

English fortis plosives are generally characterised as long-lag (VOT > 30 msec); i.e., aspiration follows stop release, creating an audible delay between the plosion and the beginning of voicing (Roach, 2009). Roach (2009, p. 33) also stresses that when /p/,/t/ or /k/ are preceded by /s/, as in “spin” (John C. Wells, 1982, p. 322), there is no aspiration present after the plosive. English lenis plosives have been reported to be realized both as prevoiced and as having short-lag VOT, Roach (2009), however, suggests that prevoicing is present only in slow, deliberate speech and that short-lag

VOT is more common, this is supported by other research on the topic (e.g., Lisker & Abramson, 1964; Docherty, 1992) Docherty (1992) also suggests that which of these realizations is used is also based on the place of articulation, with bilabial plosives being more prone to prevoicing. No matter which of the realizations is implemented, the distinction from the long period of aspiration following the fortis plosives is retained (Sučková, 2020a).

A contended point with varying results is the question whether English VOT differs based on dialectal variety. Since the number of English dialects is so vast (Upton & Widdowson, 2013) an analysis of VOT of all dialectal varieties of the language would be extremely extensive, the present section will concentrate only on three dialects which are of import to the present thesis, General American English, Southern British English, and General Australian English. Some research, as that of Sučková (2020b) or Wells (1982), does not suggest any major differences in VOT for the mentioned varieties, Sučková (2020b) only suggests a slight preference for prevoicing in the American participants of her experiment, a feature often associated with Southern American English (e.g., Hunnicutt & Morris, 2016). Nonetheless, there is also a significant body of research which does suggest significant differences; Docherty (1992) presents a table of mean VOT durations of fortis plosives proposed in a number of different studies, two of which pertained to British English, those coloured red, and ten to American English, those coloured black, see *Table 2* (Docherty, 1992, p. 26). Added to this table are the mean values for fortis plosives of Australian English (coloured blue) of adult speakers presented by Millasseau et al. (2021). What must be mentioned that some values presented in *Table 2* come from research concerning not only word initial plosives a factor which would influence the measured VOT durations (Docherty, 1992).

Table 2 Mean VOT values in British (red) American(black) and Australian English (blue) from a selection of previous studies (Docherty, 1992, p. 26), with a single mean value calculated from the data.

/p/	/t/	/k/	Author
40	56	56	(Suomi 1980)
47	68	72	(Hawkins 1979)
43,5	62	64	British English Mean
34	60	64	(Menyuk & Klatt 1975)
47	65	70	(Klatt 1975)
40	43	51	(Baran et al. 1977)
48	62	78	(Westbury, 1979)
53	66	70	(Weismer, 1979)
58	69	75	(Peterson & Lehiste 1960)
58	70	80	(Lisker & Abramson 1964)
58	71	74	(Zue 1976)
68	78	84	(Port & Rotunno 1979)
83	87	90	(Zlatin 1974)
54.7	67.1	72.5	American English Mean
66	77	77	Australian English Mean (Millasseau et al., 2021)

The values in *Table 2* seem to suggest consistent differences in duration by dialect specifically that Southern British English has the shortest VOTs, General American longer and Australian the longest. These are further supported by research of Berry & Moyle (2011) who report a mean VOT range for fortis plosives of American English ranging from 65 to 120 msec (M = 92.5) or of Sonderegger (2015) who shows

that in Southern British English VOT values for fortis plosives range between 35 and 75 msec (M= 55). Clothier et al. (2018) show Australian English a mean value of fortis VOTs in Australian English to be 68.7 msec. A consistent feature seems to be the relatively shortest values for British English. Both Clothier et al. (2018) or Docherty (1992) also mention that in Southern British English and Australian English the differences between the VOTs of alveolar and velar plosives seem to be minute or null, this coincides with the research of Cho and Ladefoged (1999).

3.3 Czech voice onset time

Based on a place of articulation, there are four types of Czech plosives the bilabial /p/ and /b/, alveolar /t d/ and velar /k g/, with Czech /t/ also possibly labeled as denti-alveolar as it is articulated with the tip of the tongue more forward than /d/ (Machač, 2006). Rather uncommon are the palatal /c, ɟ/ plosives produced by creating occlusion on the hard palate (behind the alveolar ridge and preceding the velum) with the tongue tip resting on the bottom front teeth (Machač, 2006, p. 4). However this thesis is directed towards comparisons of realizations of plosives shared by English and Czech, therefore /c, ɟ/ will not be discussed any further.

Unlike in English or German, where the category of voicing is not expressed by presence of voice, but primarily by the presence and duration of aspiration, in Czech the phonological category of voicing corresponds with its phonetic realization, i.e., the presence or absence of glottal pulsing during the closure phase (Machač, 2006). In other words, Czech fortis plosives have a short-lag VOT with vocal folds vibration beginning at the moment or shortly after the release and Czech lenis plosives are prevoiced (Sučková, 2020a; Podlipský and Šimáčková, 2018) In terms of mean durations of Czech VOTs no source listing specifically the mean durations of VOTs typical in Czech was found. Machač (2006), however, does list the duration of the explosion phase of all Czech plosives in msec, which will be used as a reference point for the purposes of this thesis and can be found in *Table 3*. In accordance with previous postulations, VOT duration increases with farther places of articulation, however contrary to Cho & Ladefoged (1999), differences between alveolars and velars are greater than those between bilabials and alveolars

Table 3 Mean durations of the explosion phase of Czech fortis plosives /p t k/ (Machač, 2006, p. 42).

Plosive	Mean duration of explosion phase
p	16,5
t	20
k	32

3.4 Attrition and voice onset time

VOT is a feature standardly utilized in bilingualism and L1 attrition research because of its interlanguage variability, proneness to cross-linguistic influence, straightforwardness in measurement and its contribution to perceived foreign accent in L1 attriters (Sučková, 2020b, Stoehr et al., 2017).

First two studies with results important to the topic of this thesis are Sancier and Fowler (1997) who found VOT attrition not to be an irreversible condition, but a behaviour that shifted based on the dominant language of the environment, and Flege and Effing (1987) who discovered change in L1 VOTs in L2 language students, however, the change was a movement in the L1 away from the L2 VOT. The study by Stoehr et al. (2017) is significant in that it also investigated the impact of L2 on L1 lenis plosives (previous research concentrated mostly on fortis plosives) and in that it investigated whether L1 attrition occurs not only in speakers residing in an L2 context, but whether it occurs in speakers frequently using their L2 but residing in their L1 environment (Stoehr et al., 2017). Stoehr et al. (2017) investigated VOT production in Dutch- German bilingual couples residing in the Netherlands, where German was the L1 of one speaker and L2 of the other and vice versa. The study found that only the speakers who did not reside in their L1 environment showed signs of L1 attrition and that attrition occurred only in fortis and in lenis plosives only marginally (Stoehr et al., 2017). The authors draw the conclusion that only L2 immersion context lead to L1 attrition which was also supported by a movement or retainment of a VOT variant which was easier from an articulatory point of view (Stoehr et al., 2017). Furthermore,

they conclude that lenis plosives are much more resistant to L1 attrition, a claim supported by the findings of Mayr et al. (2012)

Lastly, a study done by Sučková (2020b) concerned British and American expatriates, residing in the Czech Republic, and the influence of Czech and Czech-accented English on their native English. Her results showed that the both the participants' fortis and lenis plosives drifted closer to the L2 paradigm, suggesting that lenis plosives are as likely to be affected by attrition (Sučková, 2020b) Furthermore she showed that even in a context where the speaker's L1 is of high prestige in the L2 environment, attrition nevertheless occurs (Sučková, 2020b). Another interpretation of the results could be that the speakers were speaking deliberately and slowly, which Roach (2009) suggests is more conducive to prevoicing, nonetheless, a L2 influence was clear.

3.5 Hypotheses

Based on the information introduced in chapters 2 and 3 two research questions, each with a hypothesis, will be established. The first pertains to the conditioning of L1 attrition by an L2 immersion context, with the hypothesis being that "first language attrition occurs only in a migration, non-L1 speaking context". The second question pertains to whether more extensive and varied L1 use influences L1 attrition, for this question, hypothesis is that "more frequent and varied L1 use does influence L1 attrition".

4. Method and Material

4.1. Experimental task

The experimental task, administered either via e-mail or personally, consisted of a short instructional paragraph, which can be found in *Appendix Table A1*, a set of 100 sentences, 50 in Czech and 50 in English, to be read and recorded by the participants and a questionnaire. The instructions were written in Czech for the purposes of making the speaker's produced Czech as authentic as possible and to prevent any possible priming influences of an English instructional text, however, as this priming would be considered cross-modality, it is unlikely that it would have been effective. Nonetheless,

to further offset any priming influence two versions of the experiment were created, one which started with the English set of sentences and one with the Czech set, half of the participants were given one version and the other half the other. The speakers were then tasked with familiarizing themselves with the text of the sentences and subsequently record their readings of them. Of the 50 sentences, 30 were target sentences and 20 were masking sentences, with the structure of the target sentences being that of either an article in English or an adjective ending with a vowel in Czech, followed by a target word beginning with a lenis or a fortis plosive followed by the rest of the sentence. For each plosive, five target words were selected and put into sentences, jointly making up the 30 target sentences. Making the preceding word end with a vowel was done to achieve more precise measurements of the beginning or presence of the closure phase of the plosives. A list of the English and Czech target sentences can be found in *Appendix Table A2*. The masking sentences were a selection of random sentences based on the discretion of the experimenter, some had the same structure as the target sentences, and some had a different one.

The target words were limited only to those beginning with the plosive in question, those that have primary stress on the first syllable and have their word-initial plosive in a pre-vocalic position. The words matching the following regex: “(p¹)(a|e|i|o|u).*” were extracted from two corpora, British National Corpus for English and SYN2020 corpus for Czech. To keep as much variability in the pool of possible target words, even low-frequency words were included in the list, however, to avoid completely obscure terms which could flummox the speakers, a minimum i.p.m, i.e., items per million (Kovaříková, 2021) was set at 1 i.p.m. A random selection of five target words for each plosive was made from the resultant set of found items. The chosen words were then manually inspected to ensure that they matched all criteria. An earlier version of the experiment, which was given to three participants, included sentences that were removed from the final version of the experiment because of not corresponding to the mentioned criteria and were replaced by sentences that did correspond. The subsequent readings of the replacements were possible to elicit from two out of the three speakers presented with the previous experiment version.

¹ The value within the brackets was the plosive in question.

Following the experimental set of sentences was a questionnaire with questions differing for the expatriates and the students residing in the Czech Republic. Both questionnaires elicited general demographic information like sex, age, and vocation/subject of study. The expatriate survey further concentrated on country of origin, country of relocation, time spent in the country of migration, recording device, self-reported L1 use frequency ranging from only passive use to daily use of at least three hours, a set of questions on what languages the expatriates used at their place of work/study, home, with friends, the language of thought and media consumption and finally an approximate number of Czech speakers with whom they interact regularly. The questionnaire for Czechs had specific questions intended to gauge the speakers' use of their English and to determine whether they live with a native English speaker or have resided in an Anglophone country in last years. The exact form of both questionnaires can be found in *Appendix Table A3* and *Appendix Table A4*.

4.2 Participants

The expatriate group consisted of 10 speakers contacted through acquaintances of the experimenter. Apart from one pair of speakers (speakers 9 and 10) none of the participants had any relationship with one another. The final sample of speakers consisted of seven female and three male participants (Age of relocation: $M= 24.4$, $SD= 6.07$, Age: $M= 36.3$, $SD= 12.94$). Any control over the plausible sex differences was not possible because of the difficulty in eliciting any speakers from this specific group. Six participants resided, at the time of the experiment, in the United Kingdom, two in the United States and two in Australia. The reported ages of relocation also suggest that if, in fact, changes to the participants L1 would be found, they would not be results of incomplete acquisition, but would be cases of attrition. *Table 4* shows the elicited demographic information for all 10 speakers.

Table 4 Expatriates' demographic information.

Speaker ID	Country of residence	Age of relocation	Age	Sex	Occupation or subject of study
1	United Kingdom	19	20	F	Popular Music Performance & Song writing
2	United Kingdom	19	20	F	Spanish Language and Translation
3	United Kingdom	19	21	F	Psychology
4	United Kingdom	25	40	F	Housewife
5	United Kingdom	26	49	F	Teacher
6	United Kingdom	23	31	M	Economic consultant
7	Australia	28	40	M	Bike mechanic
8	Australia	19	37	F	Fitness manager
9	USA	38	52	M	Public Boarding
10	USA	28	53	F	Entrepreneur

The students group consisted of 10 BA students of English and American studies at the Faculty of Arts at Charles University recorded by the experimenter in the recording studio of the Phonetics Department. Afterwards, they were given the introduced questionnaire which can be found in *Appendix Table A4*. In terms of English proficiency all students were at least in their 3rd year of the BA programme, out of which, according to the website of the Department of the English Language and ELT Methodology, they should graduate with a C1 language proficiency level of the Common European Framework of Reference for Languages (Anglistika – amerikanistika, 2021). Age of the participants ($M = 22.2$, $SD = 1.31$) ranged from 21 to

24, 7 females and 3 males took part in the experiment. None of the speakers reported to be living with a native speaker of English or to have resided for extended periods of time in an Anglophone country within the span of 3 years prior to the experiment.

4.3 Material and procedure

In total, 20 recordings were elicited in Czech, out of which 10 were made by the expatriates and 10 by the students, and another twenty in English, in the same proportions by the two groups, however only the Czech ones will be used in the experiment. They were recorded in a sound-proof recording studio at the Phonetics Department of the Faculty of Arts Charles University on a condensation microphone AKG C4500 B-BC with a sampling frequency of 22050 Hz and the expatriates recorded themselves on either their mobile device or an external microphone connected to a computer. In the instructions they were asked to find a quiet place for recording.

Out of the recordings the masking sentences were edited out of each recording in the programme Audacity and with those being deleted the total number of target sentences was 581. The edited recordings were then annotated in Praat (Boersma & Weenink, 2014, 2018) and VOT segmentation and measurements was based on Skarnitzl (2011) and Abramson & Whalen (2017). The start of the VOT will be set at the moment of release of closure and burst of the stop, which is represented as a sudden onset of aperiodic noise in the waveform and as a dark vertical strip in the spectrogram (Skarnitzl, 2011). In case of multiple bursts, the first should be considered as the zero point (Skarnitzl, 2011). The end of the VOT was marked at the onset of vocal folds vibration, i.e., voicing, realized in the waveform as the start of periodicity and denoted by the pitch line created by the pitch function in Praat, which was used to counter the possible human errors on the part of the annotator, at the cost of accepting the software errors of Praat (Sučková, 2020, p. 87). The period between the two boundaries is then set as the VOT. Prevoicing was annotated in the case that pitch was detected throughout the closure phase, because the quality of the expatriate recordings made it difficult to establish a precise point where the pre-release voicing began, further analysis will work only with the presence or absence of prevoicing in lenis plosives. For the pitch function, method of analysis was autocorrelation, and the pitch range was 100Hz to 600Hz for females and 75Hz to 300Hz for males (Vogel et al., 2009) Besides VOT duration, word

duration (beginning with the closure of the first plosive and ending, with the end of cycling of final sound of the word) and closure phase were also annotated for ease of further analysis. An VOT annotation is demonstrated in *Figure 9* and prevoicing annotation in *Figure 10*. Tier one was named Word and contained word annotations and tier two was named VOT and contained VOT and prevoicing annotations. A Praat script was employed to measure the duration of VOT annotations and elicit corresponding labels on both tiers.

Figure 5 Positive VOT annotation.

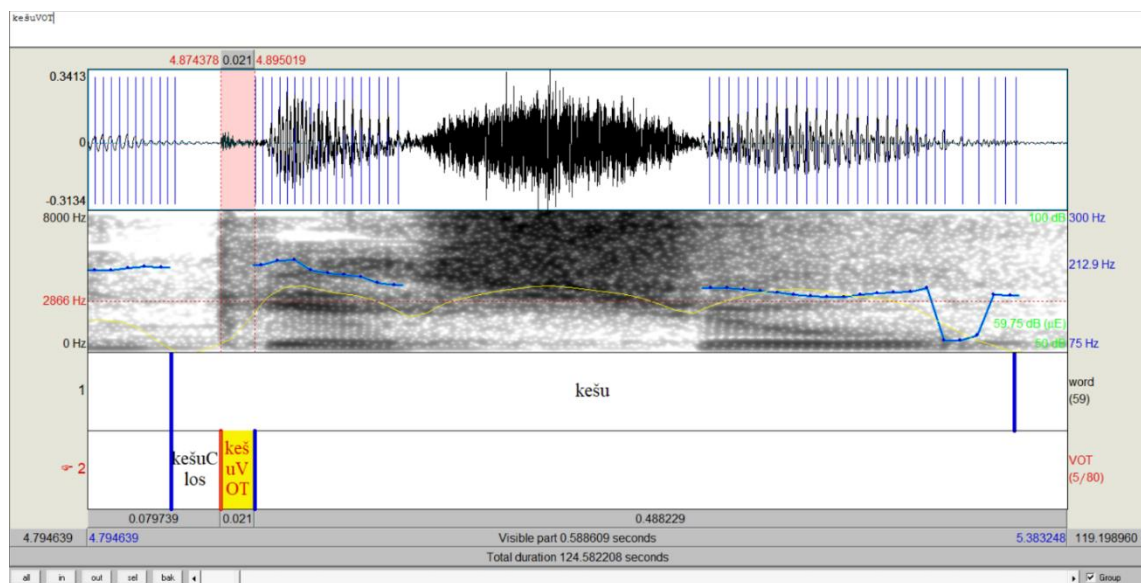
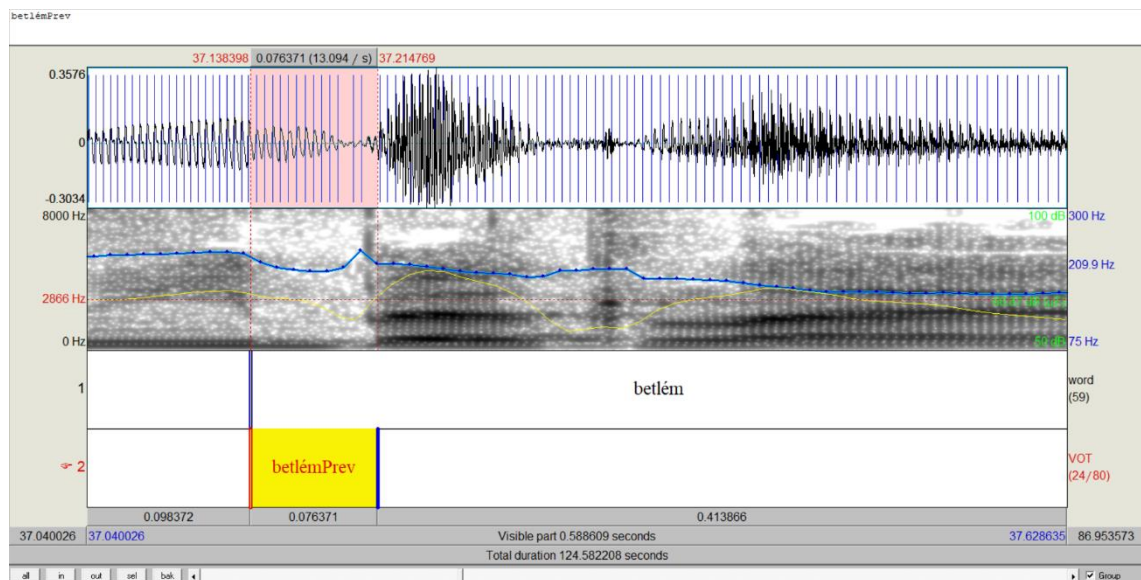


Figure 6 Negative VOT annotation.



4.3.1 Reliability of measurements

A reliability check was performed on ten randomly chosen target words from ten different speakers by an MA student of English language at the Faculty of Arts, Charles University and experienced in acoustic analysis in Praat. Based on the resulting and the original annotations the presence or absence of prevoicing and the durations of annotated VOTs and words were used for statistical consistency check. A test used to measure the consistency of quantitative measurements made by different observers measuring the same quantity is the Intraclass Correlation Coefficient (further ICC), which evaluates how much data entries sorted into groups resemble each other (Glen, 2016). ICC can range from 0 to 1, the closer to one the coefficient is the higher the similarity of the data. In the case of the present annotations, the ICC revealed high similarity of the data both in VOT duration measurements (ICC= 0.97) and word duration measurements (ICC= 0.90). On binary data, Cohen's Kappa Statistic is used to measure the inter-rater reliability is (Glen, 2014). Cohen's Kappa was used on the annotations of presence or absence of prevoicing and revealed that $k = 0.60$, which can be interpreted as moderate agreement (Glen, 2014). All reliability calculations were done in R (R Core Team, 2021) via the "irr" package.

5. Results

5.1 Expatriates and students general comparison

Prior to acoustic analysis of the participants recordings, I will address the survey results of both groups. Regarding the expatriates' answers, *Table 5* shows information regarding the L1 and L2 use of 9 out of 10 participants, as it was self-reported in the questionnaire. The information for one participant is not available. The length of residence in the Anglophone country ($M= 12.98$, $SD= 8.60$) ranges from seven months (0.84 years) to 25 years. The L1 use frequency numbers correspond to one of five possible answers presented to the participants in the questionnaire, with each number being associated with a certain degree of L1 use: 1- only passive use of L1 (media etc.), 2- use of L1 to communicate with another native speaker at least once a month, 3- use of L1 to communicate with another native speaker at least once a week for at least 30 minutes, 4- daily use of L1 for at least an hour, 5- daily use of L1 for at least 3 hours.

The distribution of answers can be found in *Figure 5*. The largest number of speakers, four, stated that they use their language at least once a week and no speaker claimed to use their L1 only passively.

Table 5 Expatriates' self-reported L1 and L2 use information.

Speaker ID	Length of residence (years)	L1 use frequency	Job /school Lang.	Home Lang.	Friend Lang.	Media Lang.	Thought Lang.	Regular com. partners	Score	Group
1	0,84	4	En	Cz	En/Cz	En	En/Cz	7	15	3
2	1	3	En	En/Cz	En/Cz	En	En	5	10	2
4	15	2	En	En	En	En/Cz	En	2	5	1
5	23	3	En	En	En	En	En	3	6	2
6	8	3	En	En/Cz	En/Cz	En	En	3	8	2
7	12	3	En	En	En	En	En	3	6	2
8	18	2	En	En	En	En	En	1	3	1
9	14	5	En	Cz	En/Cz	En	Cz	4	14	3
10	25	5	En	En/Cz	En/Cz	En	En	3	10	2

Figure 7 Pie chart of L1 use.

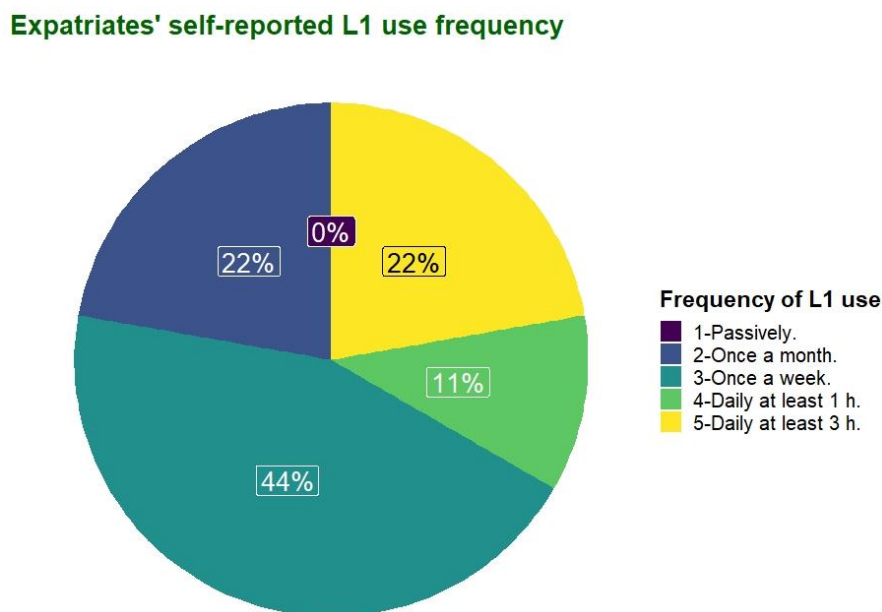
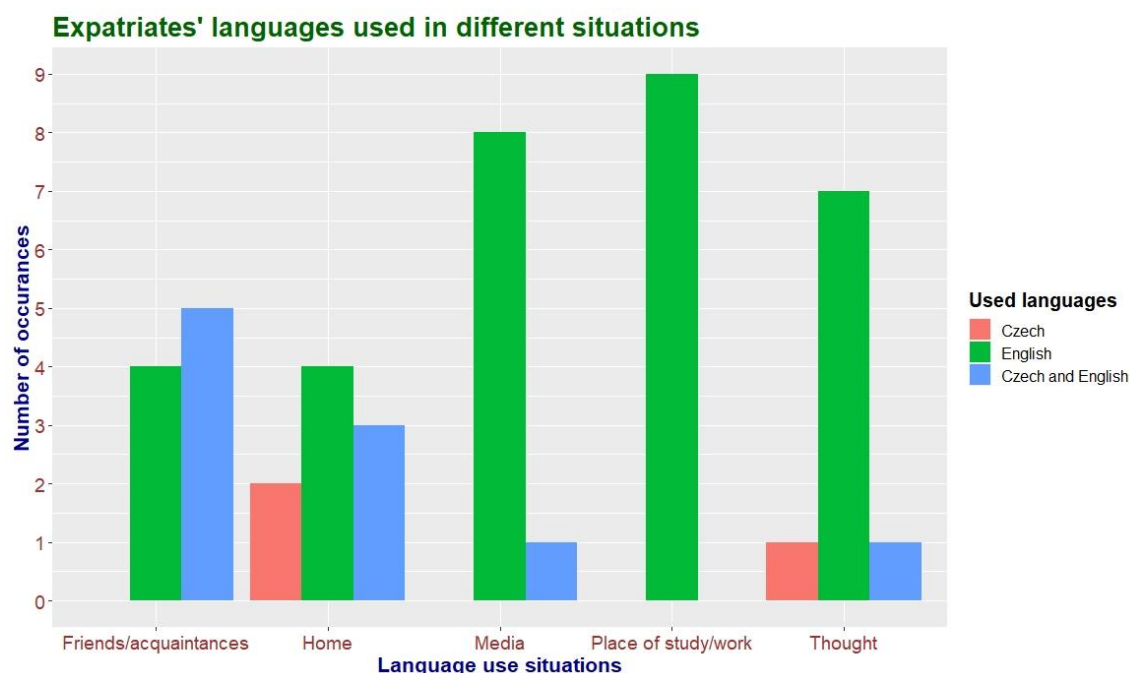


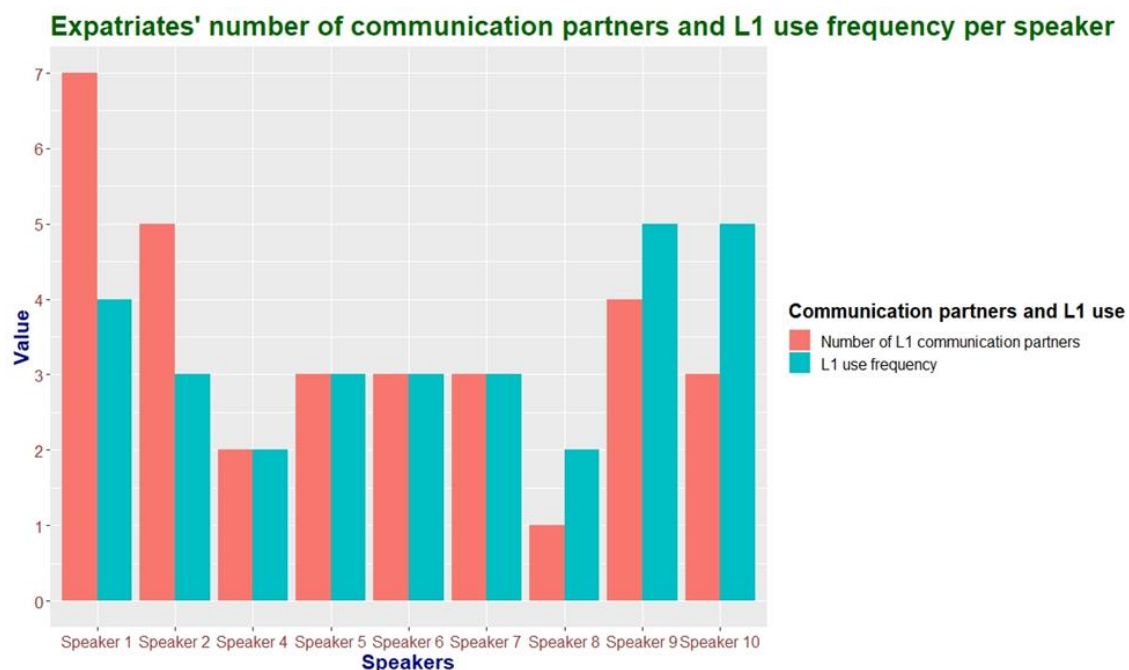
Table 5 also shows the languages that the participants primarily used in different situations, where answers ranged from English, Czech to both languages equally. *Figure 6* depicts the distribution of the three answers based on the situation. The most reported language of thought was English, suggesting, based on research presented in 2.3.2, a large degree of L2 to L1 influence. Czech was reported minorly in this case as well and along with language of home use these are the only situations where Czech was reported at all. Unsurprisingly, English was the only variant chosen in the context of the place of work or study meaning that participants used only English in the most formal environment and reserved Czech or a combination of Czech and English to informal situations, based on previous research this situation should be much more conducive to L1 attrition. Combination of Czech and English was reported most in communication with acquaintances, suggesting speakers maintained some L1 informal relationships even in the migration context. Furthermore, the fact that only English was the majority choice for language of media consumption suggest that not much input oriented L1 contact, which could potentially counteract attrition was retained.

Figure 8 Distribution of expatriates' language use in different situations.



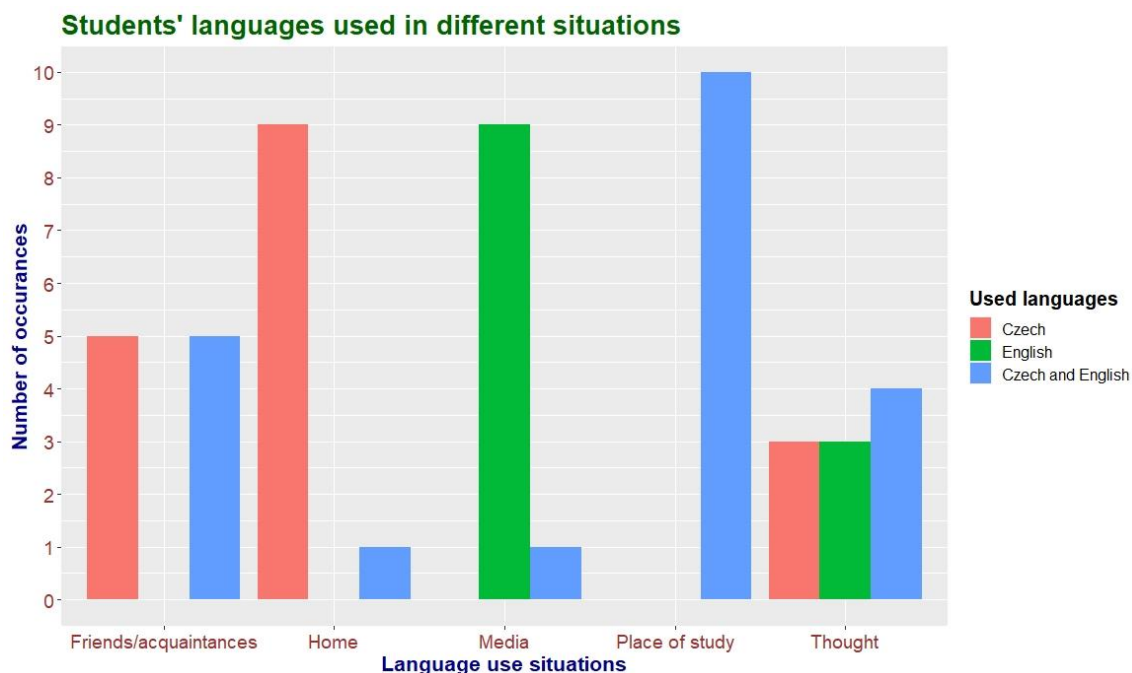
Lastly, speakers were questioned on the approximate number of native Czech speakers they communicate with regularly ($M= 3.44$, $SD= 1.74$). *Figure 7* shows the self-reported L1 use frequency and the number of regular Czech communication partners per speaker. Based on the answers, an L1 use score was calculated, with an amount of points being attributed first equal to the L1 frequency answer, i.e., answer garnering points, then 0 to 2 points were attributed for the language used in different situations answers (English only = 0 points and Czech only = 2 points), and lastly an amount of points equal to the number of L1 regular communication partners was also assigned. Based on the resulting scores the speakers were divided into three groups, with group 1 having the least variable and frequent L1 contact and group 3 the most variable and frequent L1 contact.

Figure 9 Self-reported L1 use frequency and the number of regular Czech communication partners per speaker.



The participants in the student group were questioned on their L2 use and as *Figure 8* suggest, participants preferred usage of a combination of English and Czech in majority of situations, with Czech being preferred only at home and English only as a medium of content consumption. The language of thought as emblematic of the speakers' linguistic situations supports this much more equal distribution of both participants' languages. This suggests that unlike the expatriates, the students seem to have a more equal contact with both their L1 and their L2. Each participant also disclosed at least one regular L2 communication partner ($M= 6.5$, $SD= 6.65$). Excel was used to collect the data about the participants into tables and R (R Core Team, 2021) along with the "ggplot2" (Wickham, 2016) package were used for creating visualizations.

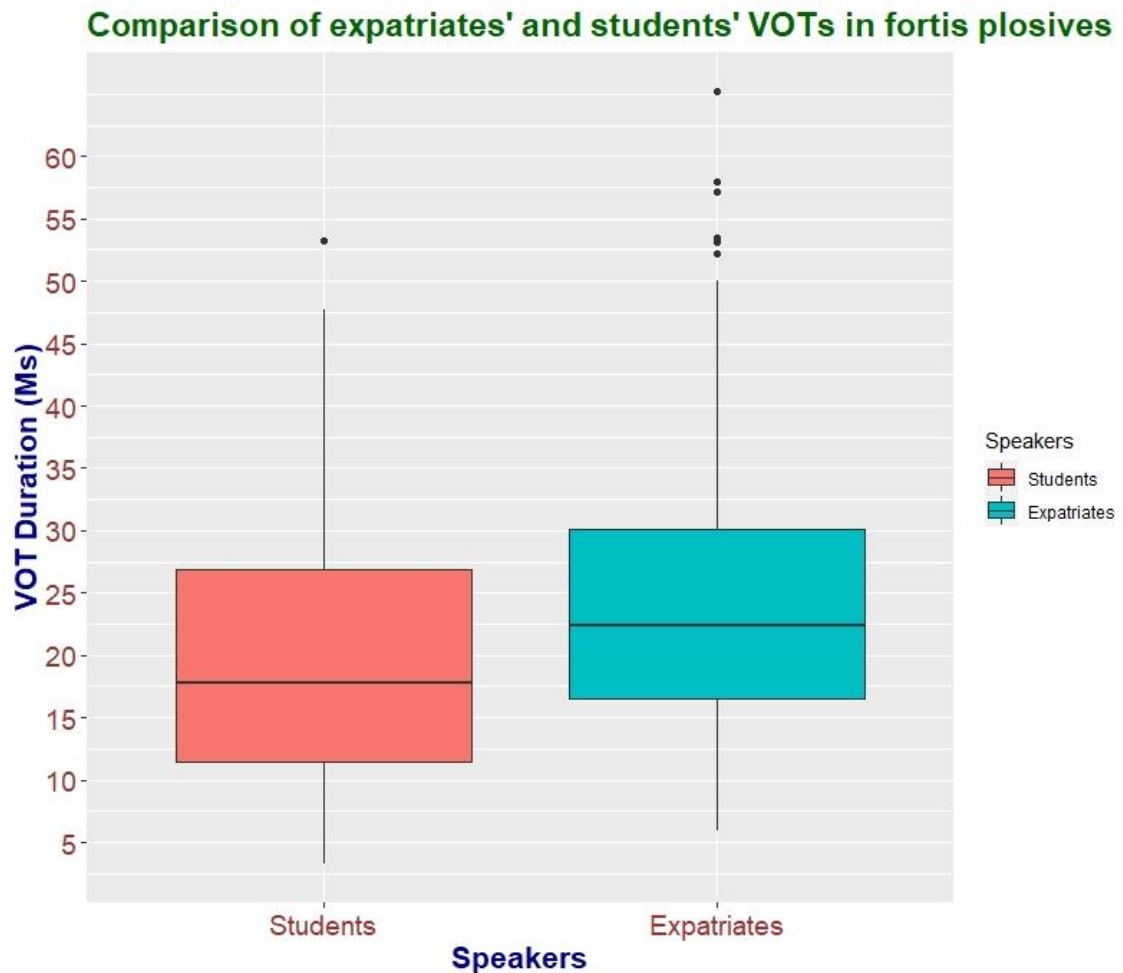
Figure 10 The frequency of the language options based on the situation.



Following the survey analysis, based on the recordings, the VOTs of both groups were also acoustically analysed. A Shapiro-Wilkins test, a test commonly used to test the normality of data distribution (Volín, 2007), with $\alpha = 0.05$ was used to test the normality of the VOT durations of fortis plosives for the data elicited both from the expatriates ($W = 0.93$, $p < 0.001$)² and the students ($W = 0.94$, $p < 0.001$) and revealed that the data is not normally distributed. Therefore, a non-parametric test was chosen for the comparison of the means of the data samples. Furthermore, the data consists of two samples and is not correlated, therefore the Mann-Whitney U test was ideal for the comparison. The test is a non-parametric variant of the t-test, and its null hypothesis claims that both samples come from the same population and the alternative hypothesis supposes that the difference between the two samples is significant, with the possibility of adding the parameter of one of the groups values being significantly lower or greater (Volín, 2007). For two groups in question the test revealed that the VOT values for the students' group are significantly lower than those of the expatriates group. A visualization of the VOT durations for the two samples can be seen in *Figure 11*.

² "p<0.001" is used when the calculated p value is extremely small, for example, in this case, $1.74 \cdot 10^{-7}$

Figure 11 Comparison of expatriates' and students' VOT durations in fortis plosives.

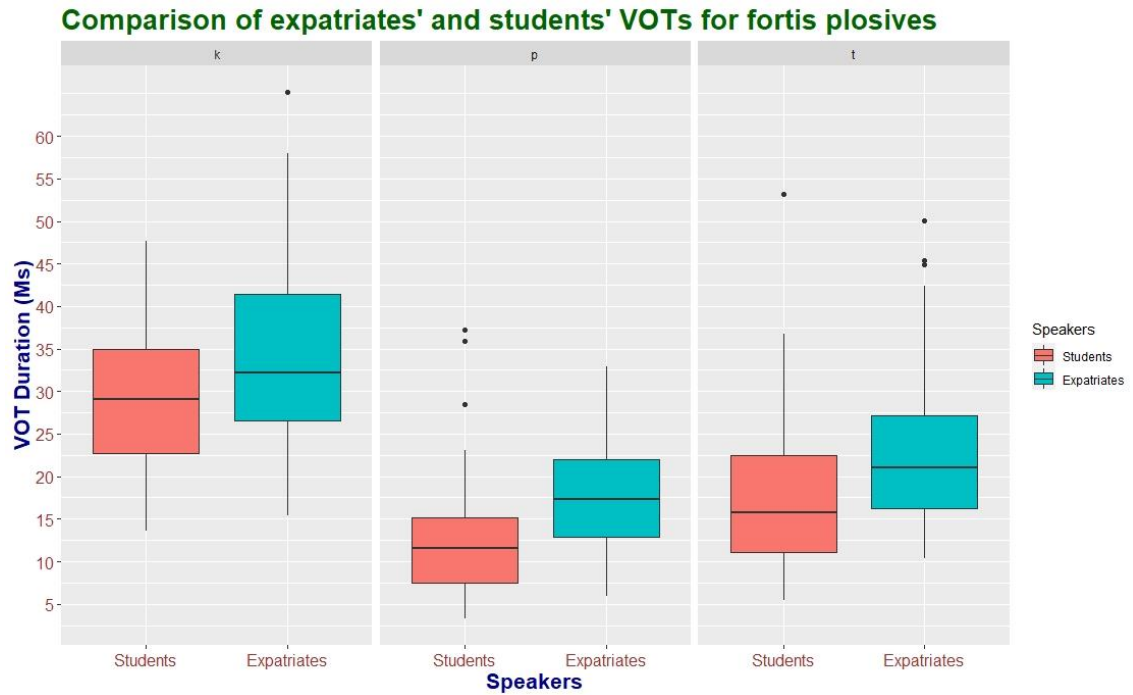


*The median values – Students = 17.75, Expatriates = 22.4

The same comparison was then done for each fortis plosive individually using the Mann-Whitney U test ($\alpha= 0.05$) which found that the durations of the students were significantly different, again lower, than those of the expatriates for each plosive (/p/ - $W= 608$, $p< 0.001$; /t/ - $W= 7709$, $p< 0.05$; /k/ - $W= 863$, $p= 0.008$). VOT durations of the /k/ plosive were normally distributed for both the expatriates ($W= 0.96$, $p= 0.14$) and the students ($W= 0.97$, $p= 0.52$) and therefore the t-test ($t= 863$, $p= 0.002$) was used as well and confirmed the previous result. *Figure 12* presents the visualization of the data for each plosive separately and *Table 6* shows the calculated means and standard deviations of VOT durations for all the participants' fortis plosives combined and then

for each plosive separately. For comparison, the “canonical” monolingual VOT values, introduced in sections 3.1 and 3.2 are also added.

Figure 12 Comparison of expatriates’ and students’ VOTs for fortis plosives.



***The median values** – students /k/ = 29.04, exp. /k/ = 32.17, students /p/ = 11.65, exp. /p/ = 17.26, students /t/ = 15.71, exp. /t/ = 21.01

Table 6 VOT duration means for expatriates, students and monolinguals.

	Expatriates - mean	Students - mean	British English	American English	Australian English	Czech
All plosives	25,38 (11,84)	19,94 (10,77)	55 (Sonderegger, 2015)	92.5 (Berry & Moyle, 2011)	68,7 (Clothier et al., 2018)	22,83 (Machač, 2006)
p	17,9 (6,73)	12,74 (7,14)	43,5 (Docherty, 1992)	54.7 (Docherty, 1992)	66 (Millasseau et al., 2021)	16,5 (Machač, 2006)
t	22,73 (9,03)	17,74 (9,21)	62 (Docherty, 1992)	67.1 (Docherty, 1992)	77 (Millasseau et al., 2021)	20 (Machač, 2006)
k	35,16 (11,63)	29,21 (8,37)	64 (Docherty, 1992)	72.5 (Docherty, 1992)	77 (Millasseau et al., 2021)	32 (Machač, 2006)

*Note. All durations are in msec. Following the **mean values**, which are in bold, is the standard deviation in the expatriates' and students' data and the sources for the monolingual data.*

The differences between the expatriates' and the students' mean values were regularly approximately 5 – 6 msec for all the plosives. The expatriates' plosive with the largest variation of VOT values was /k/, which is supported by it having the largest standard deviation (SD= 11.63), however for the students the most variable plosive was /t/ with SD = 9.21. In both cases, /p/ has the least variation in its VOT durations. Compared with monolingual values, the students produced VOTs consistently shorter than those reported by Machač (2006), and the expatriates produced VOTs consistently higher. One way in which the expatriates' VOTs remain Czech-like are the differences in duration based on the place of articulation. Unlike in English, where the VOT

durations of the alveolar and velar plosives are similar or identical, in the data based on Machač (2006) and in both the participant groups, the difference between VOT durations of the alveolar and velar plosives are consistently higher than that between bilabial and alveolar plosives.

Similarly, I compared the occurrences of prevoicing in lenis plosives between the two groups. The percentage of prevoiced lenis plosives for each group is visible in *Figure 13* and *Table 7* shows the sums of prevoicing manifestations and a percentage of prevoicing use for all lenis plosive combined and for each lenis plosive individually. The percentages were always calculated as the sum of occurrences divided by the total number of target words including the given plosive, so, for example, the percentage of prevoicing of /b/ was calculated as the number of prevoiced /b/ target words divided by the total number of /b/ target words.

Figure 13 Percentage of prevoicing in lenis plosives of students and expatriates.

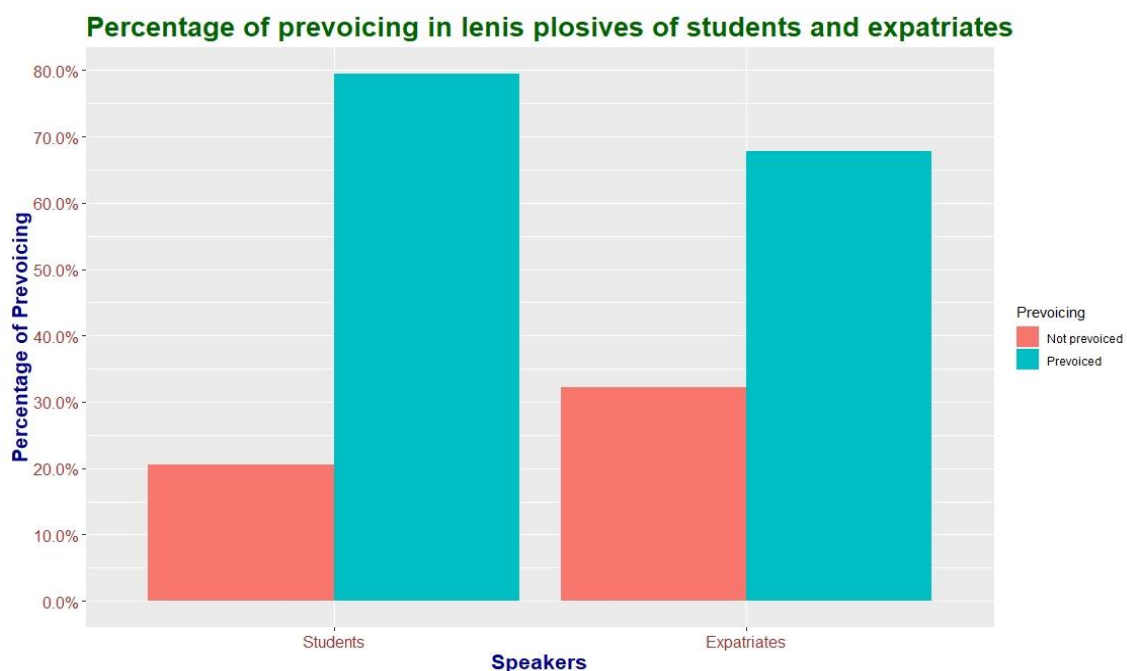
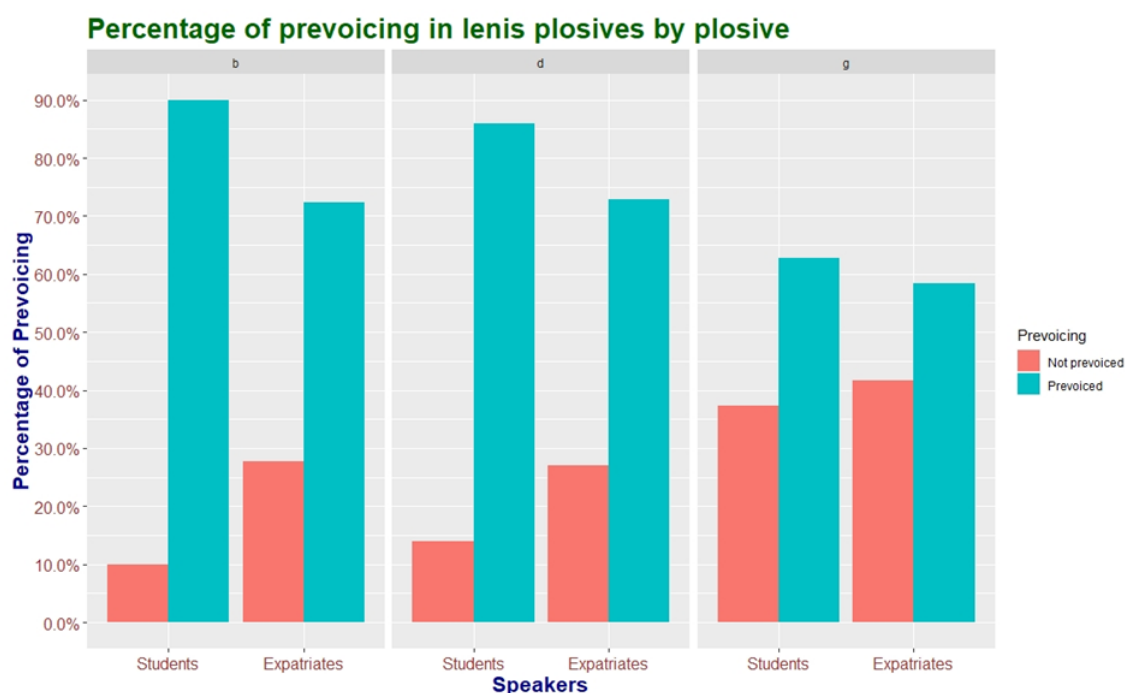


Table 7 Sums and percentages of prevoicing in lenis plosives.

	Expatriates sum of prevoicing occurrences	Students sum of prevoicing occurrences	Expatriates prevoicing percentage	Students prevoicing percentage
All lenis plosives	97	120	67%	79%
b	34	45	72%	90%
d	35	43	72%	86%
g	28	32	58%	62%

Expatriate participants seemed to prevoice their plosives in a smaller number of cases than the students did, specifically, expatriates prevoiced 67% of all lenis plosives, while students prevoiced 79%. A statistical analysis of the significance of this difference was in order. Firstly, Shapiro-Wilkins test ($\alpha = 0.05$) showed that neither the values of the expatriates ($W = 0.58, p < 0.001$) nor those of the students ($W = 0.49, p < 0.001$) are normally distributed. Subsequently, a Mann-Whitney U test found that the expatriates used prevoicing to a significantly smaller degree than the students did ($W = 9540, p = 0.01$). The percentages for each lenis plosive separately are visualized in *Figure 14*.

Figure 14 Percentage of prevoicing in lenis plosives by plosive.



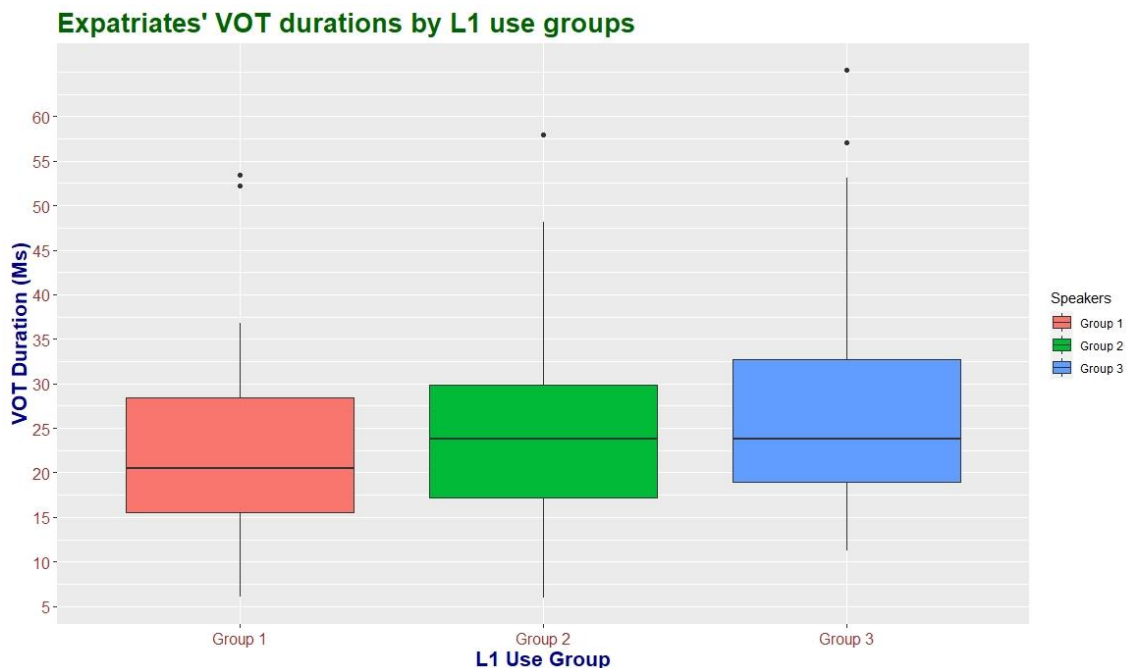
Regarding the data for each lenis plosive separately, the smallest percentage of prevoicing for both groups occurred in the velar plosive /g/ (students - 62%, expatriates - 58 %) which also shows the smallest difference between the groups, with the students exhibiting cases of prevoicing only by 4% more. In the alveolar and bilabial plosives, prevoicing was preferred much more and intergroup differences were also much higher. The students used prevoicing in 86% of times in /d/ and in 90% of times in /b/ and the expatriates prevoiced both their /d/ and /b/ in 72% of occurrences. The students used prevoicing in /d/ more by 14% and in /b/ by 18%. A Mann-Whitney U test was therefore done to compare these intergroup differences statistically by each lenis plosive. However, neither for /d/ ($W = 1043, p = 0.055$) or /g/ ($W = 1170, p = 0.32$) any significant difference was found. For /b/, on the other hand, the test showed a statistically significant difference between the groups, with the expatriates group having less occurrences than the students group ($W = 967, p = 0.01$).

5.2 Analysis of L1 use effect on L1 attrition

First, a correlation, or joint change of two variables in quantifiable steps (Volín, 2007), of L1 use frequency and number of regular L1 communication partners was calculated.

A Shapiro-Wilks test for normality distribution with $\alpha = 0.05$ of L1 use frequency ($W = 0.86$, $p = 0.10$) and for the number of Czech communication partners ($W = 0.91$, $p = 0.33$) revealed that the data is normally distributed. Therefore, the Pearson correlation coefficient, a parametric test most often used in phonetics (Volín, 2007) was used to assess the correlation of the variables and revealed a moderate/satisfactory (e.g., Volín, 2007, p. 190) positive correlation ($r = 0.49$). Another investigated correlation was between the period spent in the country of immigration and the L1 use scores. A Shapiro-Wilks test for normal distribution with $\alpha = 0.05$ for time spent abroad ($W = 0.94$, $p = 0.61$) and for the scores ($W = 0.94$, $p = 0.59$) revealed that the data is normally distributed and therefore a Pearson correlation coefficient was used to test the correlation of the two variables and revealed a moderate negative correlation ($r = -0.45$). Furthermore, a comparison of VOT values based on L1 use groups was done, with the visualization of the data for the three groups in *Figure 15* and the mean values, standard deviations and medians for each group and all expatriates collected in *Table 8*.

Figure 15 VOT durations based on L1 use groups.



Note. The three groups refer to the established L1 use groups, with Group 1 having least variable and frequent L1 contact and group 3 the most variable and frequent L1 contact.

Table 8 L1 use groups' VOT values.

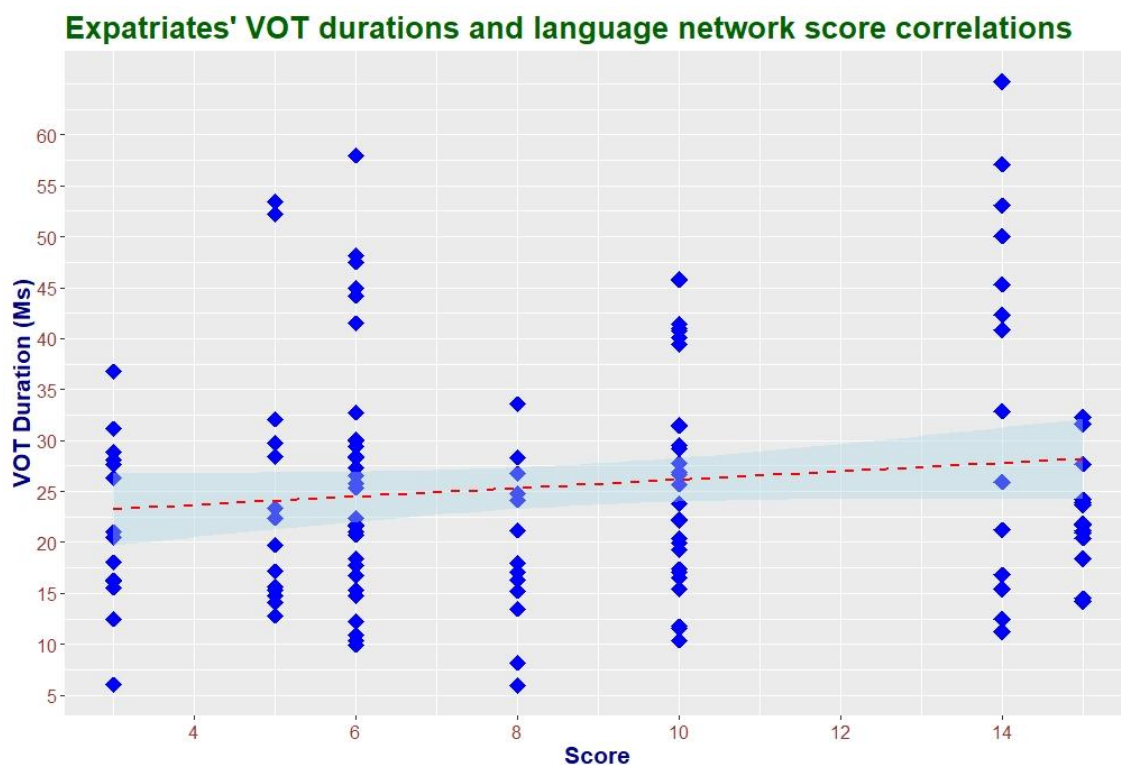
	Mean	Standard Deviation	Median
All expatriates	25,38	11,84	22,4
Group 1	23,12	10,93	18,75
Group 2	25,3	11,04	23,81
Group 3	28,47	14,19	23,81

Note. All values are in msec.

A comparison of the mean values for each group's fortis VOTs suggests a steady grow of about 2-3 msec. with each group, however, what must also be considered is that Group 3 has the most variable data (SD = 14.19) and therefore a comparison of the median values, which shows that the median values for groups 2 and 3 are the same, but that the median for group 1 is still lower, might be more telling. Group 1 median is even lower than the median of the VOTs of all expatriate participants.

A statistical analysis of the significance of the difference between the three groups was then carried out using the ANOVA test, used to measure the statistical significance of intergroup differences with more than two groups, with the H0 being that they are not significant and H1 that they are (Glenn, 2022). In the case of the present data ($\alpha = 0.05$) the ANOVA did not evaluate the intergroup differences as significant (F-value = 1.54, $p = 0.21$). This was supported by an individual comparison of each group with each group that did not reveal any significant differences. Regression line, a graphical visualization of the relationship between an independent (in this case the scores) and a dependent (VOT durations) variable, was also done to visualize the relationship between L1 use group and VOT duration (Volín, 2006, p. 208). The regression line for the mentioned variables can be seen in *Figure 16*. It shows a slight rise in VOT values with the increasing of the scores.

Figure 16 Linear regression of the L1 use score and VOT durations.

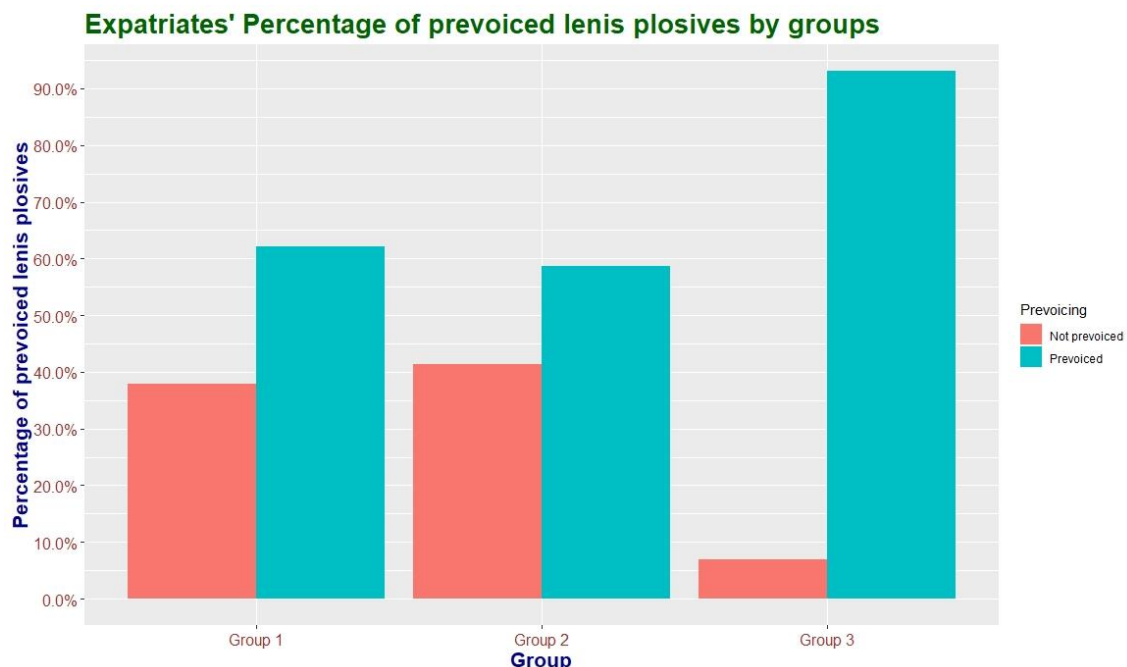


An analysis of the relationship between L1 use and the percentages of prevoiced lenis plosives can also be conducted. *Table 9* shows the total sums of occurrences and percentages of targets prevoiced and not prevoiced for all three groups and for all expatriate participants. A visual comparison of the data can also be seen in *Figure 17*.

Table 9– Comparison of totals and percentages for L1 use groups.

	Total of prevoiced targets	Percentage of prevoiced targets	Percentage of not prevoiced targets
All expatriate speakers	97	67%	33%
Group 1	18	62%	38%
Group 2	44	58%	42%
Group 3	27	93%	7%

Figure 17 Expatriates' percentages of prevoiced lenis plosives by L1 use groups.



The percentage of prevoiced lenis plosives seems to be quite similar between group 1 and group two, with the difference between the two being 4%. The first two groups also seem quite similar to the compiled data. Speakers from the second group exhibited the lowest amount of prevoicing. However, participants from group 3 appear to have prevoiced the majority of their lenis plosives, 93% specifically. This is a much greater percentage not only than that the two other groups but also of the compiled data of all expatriates.

As in the previous section, an ANOVA test was used to examine the significance of the differences between the three groups and showed a significant difference (F-value = 6.20, $p = 0.002$). A Shapiro-Wilkins test was conducted to gauge the distribution of the prevoicing data and found that it is not normal for all groups (g1 - $W = 0.61$, $p < 0.001$; g2 - $W = 0.62$, $p < 0.001$; g3 - $W = 0.28$, $p < 0.001$). Further analysis, by the means of the Mann-Whitney U test, was done to compare the data of the third group with the remaining groups respectively and revealed that the number of prevoiced targets in group 3 is significantly greater than that of both group 1 ($W = 290$, $p = 0.002$) and group 2 ($W = 713$, $p = 0.0003$). Unsurprisingly, no such difference was found between group 1 and group 2 ($W = 1050.5$, $p = 0.75$). R (R Core Team, 2021)

along with the “ggplot2” (Wickham, 2016) package were used for creating visualizations and for the statistical analysis.

6. Discussion

6.1 Students and expatriates, general comparison

The first research question of this thesis pertained to whether L2 immersion environment conditions L1 attrition and as with many linguistic phenomena, the experimental results suggest an answer all but straightforward. Firstly, it must be reiterated that language attrition was defined as “changes in an individual's abilities in a language” (Bergmann et al., 2016, p. 72) and although the authors suggest that it is mostly a “decline” in abilities, it has been shown that attrition has such a wide spectrum of possible results that any change to the speaker should be regarded in connection with attrition. In view of this, the results of the experiment do not confirm the alternative hypothesis and in fact suggest that attrition occurred both in the expatriates and in the students group.

However, the specific changes that were observed are perhaps even more notable. In the terms introduced by Flege’s (1995) SLM, the expatriates’ respective fortis plosive realizations seemed to go through equivalence classification. They were not assimilated into a singular new plosive form, as attested, for example, by the keeping of the Czech relative place of articulation-based differences, a finding going against the propositions made by Cho and Ladefoged (1999) but seemed to possibly be classified as variants of a superior category, with the Czech variant moving more towards the dominant L2 form. The Czech students on the other hand, showed durations lower than those reported by Machač (2006) for monolingual values. This occurrence can have two interpretations, one is that Machač (2006), in fact, did not measure VOT precisely, he himself terms his values as the durations of the plosion phases of plosives, rather than VOTs. The other interpretation is that the students showed signs of category dissimilation in their fortis plosives, where as a result of their English proficiency their Czech plosives drifted further away from the English paradigm. This finding coincides with what Flege and Effing (1987) found in advanced L2 learners, who, as their proficiency increased differentiated the VOTs in their two languages more drastically.

This seems to suggest that SLM provides the various possible effects that L1 attrition can have, regardless of L2 immersion, however, to predict which of these effects occurs ATH (Paradis, 2004) can be of aid. The present study, along with that of Effing and Flege (1987) seems to suggest that which effect occurs is dependent on the levels of L1 activation. In the case, when a speaker resides in an L2 immersion context with little to no L1 activation, the different fortis plosives seem to be classified into a singular category and the dominant L2 form seems to draw the minority L1 form. However, in the case that both languages are plentifully activated and proficiency in the L2 is high enough, separate categories are established for each of the variants and the L1 form drifts into a more extreme position from the L2 form, so as to retain sufficient distinctiveness. The comparisons of each plosive separately seem to suggest that all fortis plosives are equally liable to attrition change in their VOT.

The analysis of prevoicing in lenis targets does not go counter to the previously presented results, it suggests that the lenis plosives of the expatriates drifted closer to the dominant realizations of English, while the Czech ones did not. As no specific monolingual percentages for prevoicing could be found, no further conclusions can be made about the student's prevoicing percentages compared to a monolingual standard. However, the fact that lenis plosives seemed to be affected by L1 attrition as much as the fortis plosives conflicts with the findings of Stoehr et al. (2017). This could perhaps be accounted for by the fact that the expatriates of this experiments moved from the more difficult prevoicing to the simpler short-lag VOT, whereas those of Stoehr et al. (2017) would be drifting in the other direction. However, Sučková (2020b) found attrition in the direction from short-lag VOT to prevoicing in English and American expatriates, therefore the articulatory difficulty might not be as important. An individual comparison of every lenis plosive revealed only significant inter-group difference in the bilabial /b/ which also showed the largest percentage of prevoicing, in accordance with what Docherty (1992) proposed. This suggests that /b/ is most susceptible to crosslinguistic transfer, with velar /g/ appearing to be the least.

6.2 L1 social network comparison

Of note are the correlations found between the number of L1 communicative partners and L1 frequency use and between L1 use scores and time spent abroad. Though the correlations were only intermediary, which means that no significant conclusions can be

made based on them, they seem to point to a trend of L1 use frequency and variability dropping with the length of the speakers' residence abroad.

The analysis of prevoicing percentage in relationship to L1 use groups suggest a result in accordance with Schmid's (2011) claims, which is that with the increase of frequency and variability of L1 use, attrition seems to be, at least partially counteracted. Although the differences between the first two groups were not confirmed to be significant, the third group appeared to show a significantly larger percentages of prevoicing than any of the other two groups. However, these results were not confirmed by the analysis of the inter-group differences in VOT durations. However, a tendency was seen in the VOT durations to get unexpectedly longer with each group. This could very well be a result of chance; however, it could also point to a different underlying tendency, unaccounted for in the present analysis. Although the L1 use frequency and variation scores attempted to reflect not only L1 use frequency but also the variation in the situations in which it was used, they were, nonetheless, not extremely detailed and therefore it is possible that they did not properly capture all of the aspects of the speakers' L1 use which could have potentially influenced L1 attrition.

7. Conclusion

In summary, the present thesis found experimental evidence for a form of L1 attrition occurring both for expatriates and for advanced students residing in their L1 environment. It also suggests that the specific effect that L1 attrition takes is dependent on the levels of activation afforded to the speakers in their L1, with lack of activation resulting in equivalence classification (Flege, 1995) and a drifting of the L1 form towards the L2 paradigm and sufficient activation in both languages resulting in a separation of the two forms into distinct categories and drifting apart of those categories. It also suggests that in the case of equivalence classification, some VOT features, specifically, relative place of articulation VOT differences do not change to resemble more those of the L2. The thesis also concluded that lenis plosives are as prone to L1 attrition as are the fortis ones, with bilabial plosive /b/ seeming most disposed to changes resulting from L2 influence. This presents further questions that could be addressed in subsequent research. Attention should specifically be given to

how the degrees of ease of articulation of the competing forms influence L1 attrition, with Stoehr et al.'s (2017) results suggesting that it does and Sučková's (2020b) that it does not.

The second research question, which is whether an increase in frequency and variability in L1 use would result in more resistance to L1 attrition was answered only partially. The results of lenis plosive analysis seem to confirm the postulations made by Schmid (2011) that is, that more frequent and varied L1 use would result in lesser degrees of attrition, however, the analysis of fortis VOTs did not come to any such conclusions and in fact suggested a slightly opposite trend.

As for future research, focus should also be given to whether certain of the lenis plosives are, in fact, more prone to attrition, as suggest the present results. The effects of L1 attrition in advanced learners of a second language is also a topic, as this thesis partially shows, that also garners further investigation. For future research pertaining to the topic of L1 use and L1 attrition, a much more detailed analysis of speakers L1 use would be afforded by the measurement of their social networks, in accordance with the social network theory (see Moreno, 1934). As Schmid (2011) herself suggests a through social network analysis of each speaker might reveal closer details about the social background factors that influence the degree of L1 attrition. However, as such analyses are very complex and extensive, they were outside of the scope of this thesis.

Some limitations of the present study should also be mentioned. Firstly, a larger number of participants would most probably result in much more generalizable and reliable results. Another possible adverse influence on the results of the presented experiment was the fact three speakers had to record a part of their target sentences with a delay from their initial readings. L1 attrition is a very flexible and fluid process and therefore it is possible that the delay may have changed the VOT values slightly, however, as the number of the replacement sentences was relatively small, the changes were hopefully not as significant. Other speech elicitation tasks should also be considered further and, for example, a picture naming tasks or a reading of a continuous text, instead of separated sets of sentences, might result in data more resembling continuous speech. Further variables should also be controlled and accounted for in

future experiments, for example, gender or age differences were not monitored and could be potentially influential factors.

Notwithstanding the inadvertent drawbacks of the experiment, the thesis showed significant results in accordance with some studies and in opposition to others. It outlined a number of further tendencies of first language attrition, specifically the possible interactions of activation and crosslinguistic influence in advanced L2 students and the influence of L1 usage frequency and variation. It, with at least partial success, attempted to add to the growing body of literature on the cognitive and social processes underlying the process of language change and attrition.

8. Bibliography

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9. Resumé

Tato práce si dala za cíl prozkoumat dva aspekty atrice mateřského jazyka, a to konkrétně, zdali je atrice podmíněna pobytem v zemi s jiným majoritním jazykem, než je mateřský jazyk mluvčího, nebo zdali se může od monolingvního standardu odklonit i pokročilý student druhého jazyka, který stále pobývá ve svém rodilém prostředí. Kromě toho se práce také zabývá otázkou, zdali časté a variabilní užívání mateřského jazyka v kontextu emigrace snižuje pravděpodobnost či charakter změn v mateřském jazyce vlivem druhého jazyka.

První kapitola teoretické části se zaměřuje na atrici jako koncept a následně podává dvě teorie o kognitivní bázi tohoto jevu. V neposlední řadě se také soustředí na faktory, jako je věk, používání mateřského jazyka nebo priming a jejich potenciál atrici ovlivnit. Základní problém v definování atrice jazyka je obecně tendence vymezovat děj jakožto ztrátu jazyka. Avšak pojmenovat tento jev jako „ztrátu“ může způsobit potenciální terminologické problémy, konkrétně zaměnění konceptu atrice s patologickými ztrátami jazykové schopnosti jako je například afázie. Další komplikace spočívá v tom, že termín „jazyková ztráta“ spíše vykresluje atrici jako binární děj, kdy mluvčí jazykové schopnosti buď mají nebo nemají, avšak valná většina výzkumů naznačuje, že se jedná o velice variabilní děj, který je do určité míry přítomen v každém bilingvním mluvčím. Proto je preferováno děj definovat jako změny a odlišnosti od monolingvního standardu v jazyce mluvčího, nikoliv jako kompletní ztrátu schopností.

Jak již bylo zmíněno, atrice je děj značně proměnlivý a může se týkat všech jazykových úrovní, proto je v kapitole také nastíněn desetidimenzionální teoretický rámec vytvořen Jarvisem a Pavlenkem (2008) nazvaný mezi-jazykový transfer, pomocí kterého je možno definovat konkrétní případy atrice. Jev zkoumaný v této práci je příklad fonetické změny v opačném směru, která se děje mimovolně na implicitní úrovni v produktivním módu, verbální formě a orálním kanálu. Změny popsány v této práci mají také zjevnou manifestaci a dle schématu jsou negativní, neboť způsobují oddálení od monolingvního standardu.

Po definování atrice kapitola popisuje čtveřici psycholingvistických teorií přímo či nepřímo se zaměřujících na kognitivní bázi fenoménu atrice jazyka. První dvojici

tvoří Grosjeanova (2012) Teorie jazykových módů a Paradisova (2004) Hypotéza aktivačního prahu. Grosjean (2012) navrhuje, že každý bilingvní mluvčí se v každé jednotlivé komunikační situaci vyskytuje v určitému jazykovém módu. V různých módech dochází k rozdílným poměrům aktivace jejich jednotlivých jazyků a za krajní módy jsou považovány bilingvní a monolingvní mód. V případě, že se mluvčí nachází v monolingvním módu, jen jeden z jeho dvou jazyků je aktivován, na druhou stranu, pokud se mluvčí vyskytuje v bilingvním módu, oba jeho jazyky mají podobnou míru aktivace, avšak jeden vždy lehce vyšší. Většina mluvčích se nachází na určitém spektru mezi těmito dvěma extrémy. To, v jakém módu se mluvčí nachází je určeno komunikační situací, např. její formálností či jazykovými schopnostmi konverzačních partnerů, určování zároveň probíhá podvědomě.

Hypotéza aktivačního prahu říká, že když je určitá jazyková forma užívána častěji, namísto odpovídající formy v druhém jazyce mluvčího, klesá její aktivační práh, tj. počet neurálních impulzů potřebných k její aktivaci. Na druhou stranu, jelikož všechny soupeřící formy z dalších jazyků mluvčího musejí být inhibovány, aby nedocházelo k narušování formy právě užívané, aktivační práh těchto soupeřících forem stoupá a je náročnější je aktivovat. Co se týče atrice prvního jazyka, tyto dvě teorie by naznačovaly, že základ atrice je nedostatek aktivace v mateřském jazyce způsobený neustálou nutností emigranta mluvit svým druhým jazykem, tudíž být neustále v monolingvním módu pouze ve svém druhém jazyce. To by znamenalo, že formy mateřského jazyka by měly velice málo aktivace, ba naopak by byly často inhibovány, což by mohlo vést k užívání nestandardních forem v mateřském jazyce. To by byl následek relativně jednodušší aktivace soupeřících forem z druhého jazyka, ke kterým by se formy začaly přibližovat i v jazyce prvním.

Teorie multikompetence (Cook, 2003) a Flegeho (1995) Model učení řeči definují atrici odlišným způsobem. V rámci multikompetence není atrice transfer mezi dvěma separátními jazyky, ale vzájemné ovlivňování a přetváření překrývajících se jazykových systémů v mysli mluvčího. Jelikož existují oba jazyky jakéhokoliv uživatele v rámci jedné mysli, Cook (2003) navrhuje, že je nutný určitý překryv mezi oběma jejich systémy, který může vyústit v množství rozdílných vlivů na oba jazyky mluvčího. Model učení řeči pak popisuje, jaké tyto vlivy mohou být.

První možný výsledek interakce jazykových systémů je asimilace, proces, ve kterém dochází k zařazení jedné hlásky z jednoho z jazyků do kategorie hlásky jiné, často podobné, existující v druhém jazyce. Prakticky tak dochází ke splynutí obou hlásek do jedné. U disimilace jsou obě hlásky klasifikovány jako odlišné kategorie a k zachování dostatečné distinktivnosti mezi oběma hláskami se v artikulačním prostoru ještě více oddálí. Méně extrémní variantou asimilace je ekvivalentní klasifikace, ve které dva fonémy nesplynou do jednoho, ale jsou zařazeny jako dvě varianty jedné nadřazené fonémické kategorie. V tomto případě se fonémy svými realizacemi k sobě často přiblíží, avšak nestanou se totožnými. Jelikož tyto teorie nejsou závislé na aktivaci, dalo by se z nich soudit, že atrice prvního jazyka se netýká pouze emigrantů, ale také pokročilých mluvčích cizího jazyka, neboť mají definitivně vyvinuty dva překrývající se a ovlivňující se jazykové systémy.

V neposlední řadě se kapitola zabývá konkrétními proměnnými, které mají potenciál atrici ovlivnit. Jednou z nich je věk mluvčího, přesněji věk, kdy se přestěhoval do prostředí, které neužívá jeho rodnou řeč. Věk je zásadní kritériem zejména v teorii Senzitivního období (Lenneberg, 1967), která říká, že přibližně do 10 až 12 roku života jsou lidé v určitém stavu plasticity, ve kterém je schopnost učit se jazyk extrémně vysoká a jazykové systémy extrémně proměnlivé. Toto období končí při nástupu puberty, po němž mluvčí zůstávají na poměrně nízké úrovni plasticity jazykového systému. V rámci atrice prvního jazyka to znamená, že mluvčí, kteří emigrovali před zakončením tohoto období nemohou být klasifikováni jako jedinci, kteří si prošli atrici prvního jazyka, ale musí být považováni za ty, u kterých nedošlo k dokončení osvojování prvního jazyka. Krom toho bylo také poukázáno na to, že doba v emigraci nemusí být nijak vysoká, aby se atrice začala projevovat.

Další významnou proměnnou je vystavení emigrantů jejich mateřské řeči. Frekventovaný kontakt v mnoha variabilních situacích vede, dle některých výzkumníků (například Schmid, 2011), ke snížení stupně, kterého atrice dosáhne. Pasivní kontakt, například sledování médií, je také prezentován jako možnost snížení pravděpodobnosti a stupně atrice u pokročilých mluvčích. Jazyk, ve kterém mluvčí přemýšlejí, by také měl indikovat stupeň integrace druhého jazyka v myslí mluvčího. Lingvistický priming, tedy změny produkce či recepce určité jazykové formy vlivem předchozího kontaktu

s identickou či podobnou formou, byl vyzdvižen jako proměnná, která by měla být kontrolována specificky při zadávání práce.

Druhá teoretická kapitola se týkala doby nástupu hlasivkového tónu a definovala jej jako časový úsek mezi momentem exploze plozivy a nástupem periodického kmitání hlasivek v rámci další hlásky (Abramson & Whalen, 2017). Dále pak představila trojí dělení VOT, a to na takzvaný *prevoicing*, kdy hlasivky kmitají i během závěrové části hlásky, *short-lag* VOT, což je krátká doba nástupu hlasivkového tónu (<30 ms) a nakonec *long-lag* VOT, také často zvaný aspirace či přidech, ve kterém je doba mezi momentem exploze a nástupem kmitání hlasivek delší než 30 ms a podobá se hlásce /h/. Krom toho také představila výzkum naznačující, že VOT má tendenci se prodlužovat se zadnější artikulací (Cho & Ladefoged, 1999).

Dále představila typologii VOT typickou pro angličtinu a češtinu. Pro angličtinu jsou typické long-lag aspirované neznělé plozivy a short-lag znělé plozivy (s občasnou realizací s prevoicingem), a pro češtinu je pro neznělé plozivy typické short-lag VOT a pro znělé prevoicing. Nakonec byly představeny studie, které zkoumaly atrici prvního jazyka na době nástupu hlasivkového tónu. Zejména důležitá je studie provedena Flegem and Effingem (1987), kteří našli odchýlení od monolingvní normy i u pokročilých studentů, avšak odchýlení dál od tendencí jejich druhého jazyka, tudíž proces disimilace. Výzkum Stoehr et al. (2017) je význačný tím, že pozornost zaměřil nejen na neznělé plozivy, ale i na ty znělé, u kterých však nebyly nalezeny žádné změny vlivem atrice prvního jazyka. Krom toho jejich experiment potvrdil atrici jen u mluvčích žijících mimo svou rodnou zemi. Sučková (2020b) se také zaměřila jak na znělé tak neznělé plozivy a našla vliv majoritního jazyka v zemi emigrace u obou druhů plozív.

Experimentální část zkoumala nahrávky 20 mluvčích, z nichž 10 byli emigranti žijící v anglofonních zemích a 10 studenti oboru Anglistika-amerikanistika na Univerzitě Karlově. Záznam byl pořízen buďto samotným autorem výzkumu, nebo záznam pořídili samotní účastníci, jejichž úkolem bylo přečíst 50 českých vět, z nichž bylo 30 následně analyzováno. Analyzované věty vždy začínaly přídatným jménem končícím na samohlásku, po kterém následovalo slovo začínající plozivou. Pro každou

plozivu bylo takto konstruováno 5 vět. U každého z těchto sledovaných slov byla poté akusticky analyzována přítomnost a délka VOT plozív.

Kromě nahrávek byl také analyzován dotazník týkající se demografických údajů o účastnících a také specifik užívání prvního jazyka v případě emigrantů a užívání druhého jazyka v případě studentů. Výsledky dotazníku naznačují, že emigranti ve většině situací používají primárně angličtinu a češtinu používají jen minoritně, a to v neformálních kontextech, což je situace ideální pro atrici jejich prvního jazyka. Emigranti také dle svých odpovědí primárně přemýšleli v angličtině. Studenti ve většině situací užívali kombinaci češtiny a angličtiny.

Analýza se poté zaměřila nejprve na rozdíly trvání VOT mezi studenty a emigranty. Ve srovnání s monolingvními standardními hodnotami českých plozív (22,83 ms – Machač, 2006) našla práce pravidelné prodloužení VOT u plozív emigrantů (25,38 ms) a pravidelné zkrácení VOT u plozív studentů (19,94 ms). Toto naznačuje, že atrice se do určité míry týká obou skupin, avšak u každé skupiny se realizovala jinak. V rámci Modelu učení řeči došlo u emigrantů k ekvivalentní klasifikaci, pravděpodobně z důvodu malého množství aktivace, a u studentů k disimilaci obou kategorií s cílem je lépe diferencovat. Dá se tudíž říct, že atrice prvního jazyka nebyla podmíněna pobytem v místě s majoritním jazykem jiným, než je mateřský jazyk mluvčího, avšak nedostatek aktivace v prvním jazyce s tímto pobytem spojený způsobí to, že česká ploziva bude zařazena jako varianta nadřazené kategorie a přiblíží se ve své realizaci majoritní anglické formě. Na druhou stranu pokročilí studenti, kteří mají stále dostatečně častou aktivaci ve svém prvním jazyce, si i pro českou formu plozivy i pro tu anglickou vytvořili odlišné kategorie, které poté disimulovali s cílem udržet mezi nimi dostatečný rozdíl. Tyto závěry byly potvrzeny i při analýze znělých plozív, která zjistila, že emigranti (67 %) užívali prevoicing typický pro češtinu méně než studenti (79 %). Toto také naznačuje, že i neznělé plozivy mohou být ovlivněné atricí.

Experiment také zkoumal, zdali časté a variabilní užívání mateřského jazyka zmenší stupeň či pravděpodobnost atrice. Analýza neznělých plozív naznačuje, že ano, neboť skupina mluvčích s nejčastějším a nejvariabilnějším kontaktem s češtinou vykázala největší procento prevoicingu, 93 % oproti 62 % pro skupinu s nejmenším kontaktem a 58 % pro skupinu se středním kontaktem. Tato zjištění však nebyla

potvrzena analýzou VOT, kde nebyl statisticky potvrzen žádný rozdíl mezi skupinami, ba co víc byl nalezen mírný trend stoupaní trvání VOT s narůstající frekvencí a variabilitou užívání mateřského jazyka. Hlubší a detailnější analýza vlivu užívání prvního jazyka na atrici by tedy byla nutná.

10. Appendix

Table A1 – Instructions for the experimental task

Nejprve veliké díky za Vaše rozhodnutí zúčastnit se tohoto experimentu. V žádném případě se nejedná o test, který by Vás měl jakkoliv hodnotit a zároveň je experiment naprosto anonymní. Celý experiment by neměl trvat více než 10–15 minut. Vaším úkolem bude se nahrát při čtení série vět anglicky a série vět česky, ty najdete dále v tomto dokumentu, a poté vyplnit dotazník, který se nachází na konci dokumentu. Věty byste měli číst tempem, které Vám je příjemné a přirozené, není nutné v četbě spěchat. Věty si před začátkem nahrávání pročtete a seznámte se s nimi. Jakmile se jednou začnete nahrávat, je důležité abyste nahrávku nijak neupravovali, nic z ní nevystřihávali, ani s ní nezačínali od začátku. V případě přeroknutí, jednoduše větu přečtete znovu a pokračujte ve čtení. Pro nahrávání si prosím najděte klidnou místnost s, pokud možno, žádnými rušivými zvuky z venku a žádným tikáním či bzučením. K nahrání můžete využít funkci diktafonu v počítači (pokud vlastníte externí mikrofon, je doporučeno ať použijete ten), popřípadě diktafon v mobilním zařízení. Vaše nahrávky společně s vyplněným dotazníkem v tomto dokumentu poté zašlete na e-mailovou adresu: vojtaripl@gmail.com. Vaše nahrávky nebudou nikde zveřejňovány, budou využity pouze pro analýzu dat a akademické účely jako experimentátorovu práci nebo vědecký článek. V sekci **Dotazník**, jsou dvě otázky, na které je předem daný a vypsán počet odpovědí, u těchto otázek prosím nějakým Vámi zvoleným způsobem zvýrazněte odpověď, kterou byste chtěli vybrat, nebo smažte všechny odpovědi, které vybrat nechcete. Znovu musí být zdůrazněno, že se nejedná o test, takže se uvolněte a věty čtete naprosto přirozeně. Děkuji za Vaši účast a za Váš čas.

Table A2 – Czech target sentences

Zakázaný doping se našel u slavného atleta. Malý kešu, který mu zaskočil, ho neustále nutil ke kašli. Ztracené bednění je ve stavebninách dnes ve slevě. Mé dispozice nejsou ideální. Velký barel stál přímo uprostřed cesty. Ztracený pytel už se nikdy nenašel.

Vzniklá puklina by mohla ohrozit strukturu dálnice. Skotský golf je neustále na vzestupu. Krásný betlém stál před městským úřadem. Školní geografie je na dobré úrovni. Toto pojmenování bylo velice urážlivé. Jeho gesce je poměrně široká. Řídící komise se konečně rozhodla. Takový podraz od něj nečekal. Její gauč skončil na skládce. Velké teplo někomu nedělá dobře. Známa básnička vydala novou sbírku. Stará teologie se dnes už nevyučuje. Špinavá teniska ležela na silnici. Nová tapeta na zdi vůbec nedržela. Naše pohoda závisí na tvém chování. První dávka nestačí.

Jarní tání způsobilo velké potopy. Dnešní datum je v něčem velice významné. Rostoucí bezdomovství je problém. Prázdná kasa byla velice nápadná. Minulý guvernér provedl mnohé změny. Vlakové k olejiště bylo nově přestavěno. Těsný korzet býval součástí šatníku téměř každé ženy. Tato definice již není přesná.

Table A3 – Expatriates questionnaire

Z jaké země pocházíte? _____

V jaké zemi přebýváte nyní? _____

Jak dlouho žijete v cizí zemi, kde nyní přebýváte? _____

V kolika letech jste se přestěhovali do cizí země, kde nyní přebýváte? _____

Věk: _____

Pohlaví (podtrhněte vybrané nebo smažte vše nevyhovující):

Muž Žena Jiné

Jaké je vaše povolání, popřípadě obor studia? _____

Na jaké zařízení se nahráváte? (telefon/laptop + značka, model...) _____

Jak často užíváte svůj mateřský jazyk?

1. Se svým mateřským jazykem přicházím do kontaktu jen pasivně. (sledování televizoru, poslech rádia atd.)

2. Svým mateřským jazykem mluvím s rodilým mluvčím alespoň jednou za měsíc.

3.Svým mateřským jazykem mluvím s rodilým mluvčím alespoň jednou týdně déle než 30 minut.

4.Svým mateřským jazykem mluvím každý den alespoň hodinu.

5.Svým mateřským jazykem mluvím každý den alespoň tři hodiny.

Jakým jazykem komunikujete ve Vašem zaměstnání/místě studia? _____

Jakým jazykem komunikujete ve vašem současném domově a s rodinou? _____

Jakým jazykem komunikujete se známými a přáteli? _____

V jakém jazyce sledujete média a další formy zábavy (knihy, videa, filmy atd.) nejvíce?

V jakém jazyce přemýšlíte (počítání, sny, přemýšlení atd.) nejvíce?

Přibližně s kolika česky mluvícími lidmi komunikujete regulérně?

Table A4 – Students questionnaire

Questionnaire for Czechs residing in Czech Republic

Jaký je Váš věk? _____

Jaké je Vaše pohlaví? Žena Muž Jiné

Jaký je Váš studijní obor? _____

Máte v rodině, popřípadě žijete s rodilým mluvčím angličtiny?- Ano Ne

Pobývali jste v posledních 3 letech po delší dobu v anglicky mluvící zemi?- Ano Ne

Jakým jazykem komunikujete ve Vašem zaměstnání/místě studia? _____

Jakým jazykem komunikujete ve vašem současném domově a s rodinou? _____

Jakým jazykem komunikujete se známými a přáteli? _____

V jakém jazyce sledujete média a další formy zábavy (knihy, videa, filmy atd.) nejvíce?

V jakém jazyce přemýšlíte (počítání, sny, přemýšlení atd.) nejvíce? _____

Přibližně s kolika anglicky mluvícími lidmi komunikujete regulérně? _____

Jak často mluvíte anglicky ?

1 Každý den alespoň hodinu.

2 Alespoň hodinu za dva dny.

3 Alespoň hodinu za týden.

4 Alespoň hodinu za dva týdny

5 Hodinu za měsíc a méně.