THE ROLE OF PSYCHOTYPOLOGY IN THE ACQUISITION OF RHOTIC CONSONANTS BY ADOLESCENT EMERGENT MULTILINGUALS

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ABSTRACT

Psychotypology has been postulated as one of the factors shaping multilingual acquisition and affecting cross-linguistic influence across various domains of language, including phonetics and phonology. Despite its explanatory potential, psychotypology was rarely quantified [1], [2], [3] and correlated with phonological data. To investigate the relationship between psychotypology and multilingual acquisition of speech, this exploratory study assessed the perception of language distance by 20 adolescent emergent sequential multilinguals (L1 Polish, L2 English, L3 German) through the ViLDiM measure [4]. The results were correlated with the L2 and L3 speech production scores obtained in a delayed repetition task focused on rhotic consonants. Although there was no statistically significant relationship between the L2 and L3 rhotic realisations and perceived language distance, possibly meaningful interactions were observed on an individual case basis.

Keywords: multilingual phonology, multilingual acquisition, psychotypology.

1. INTRODUCTION

Psychotypology is a term proposed by Kellerman [5], [6] describing individual perception of distances between languages. Psychotypology focuses on the perceived differences and similarities determining language proximity and, unlike typology, it is considerably more fluid, subjective and prone to change throughout language learning [7]. Psychotypology has been positioned as a significant factor in the process of bilingual and multilingual acquisition. Kellerman [5], [6] recognised the potential relationship between the perceived language distance in the likelihood of cross-linguistic influence (CLI) from L1 to L2. Odlin [8] suggested that individual perception of relations between linguistic structures may affect the probability of CLI. De Angelis [9] acknowledged the influence of psychotypology on CLI patterns in multilingualism. In the Typological Primacy Model, Rothman [10], [11], [12] postulated that typology and psychotypology influence the perception of language

proximity by the parser, which in turn affects the characteristics of CLI in the process of multilingual acquisition.

Despite the assumptions concerning the role of psychotypology in language acquisition, a considerable number of previous studies did not quantify it as a variable (e.g. [5] [6] [7], [13], [14]). Other studies measured psychotypology through questionnaires, think-aloud protocols or magnitude estimations (e.g. [1], [2], [3]), relaying predominantly on a binary understanding of the relationship between the languages. This issue was addressed by Nelson et al. [4], who devised a measure of language distance by representing all languages in the repertoire within the same visual space.

The relationship between psychotypology and multilingual phonology has rarely been explored. In their case studies of phonological development, Williams and Hammarberg [15] and Hammarberg [16] indicated that speakers who detect similarities and parallels between the languages experience some facilitative influence. Wrembel [2] investigated the cognitive processes behind metalinguistic awareness related to phonological performance in a third language. The results indicated that typology and psychotypology had a particularly strong presence in the cross-linguistic awareness comments of the participants and might have a substantial influence on their performance.

Psychotypology might be positioned as one of the crucial factors associated with multilingual development. However, the studies of its role are in an early, exploratory phase. The current study aims to quantify psychotypology and examine its role in the acquisition of rhotics in multilingual speech production data. Moreover, through the application of an innovative visual measure of language distance, it intends to account for the dynamic perception of the relationships between the languages in the multilingual mind.

2. METHOD

2.1. Aims

The present study intends to examine the relationship between psychotypology and the acquisition of

multilingual speech, with the former operationalised as ViLDiM scores and the latter as a target or non-target-like renditions of rhotic consonants in the L2 English and L3 German of the participants. Consequently, the research question posed in the study is as follows: what is the relationship between psychotypology and speech production of adolescent multilinguals?

It is postulated that the participants who perceive a given pair of languages as closer, might display related cross-linguistic influence (CLI) in the production of rhotic consonants. For instance, the participants who see L1 Polish and L3 German as closer might exhibit more L1-like realisations in L3 German, whereas the ones who perceive L2 English and L3 German as closer might have more L2-like realisations in L3. However, it should be noted that long exposure to a given language may affect psychotypology; in more experienced learners the distance between the languages might decrease due to the increasing language familiarity.

The focal features in this study include rhotic consonants in L2 and L3; their diversity might be particularly interesting in the context of studying CLI in multilingual speech acquisition and its potential interaction with psychotypology. The realisations of rhotic consonants differ across the three languages tested in the present study In Polish, it is predominantly realised as an alveolar trill [17] with possible realisations as an alveolar flap [18]. In L2 English (General British), a rhotic consonant is realised as a post-alveolar approximant [19]. In L3 German (Standard German), the realisations are quite diverse including uvular trill, uvular fricative or a vocoid in the syllable-final position [20] [21].

2.2. Participants

The participants were 20 adolescent emergent multilinguals (mean age=12.65, *SD*=0.48, male to female ratio – 10:10) with L1 Polish, learning L2 English (age of language learning onset=7) and L3 German (age of language learning context=12) in the context of formal instruction in a Polish public primary school. The participants had the same amount of language classes and were taught by the same L2 and L3 teachers. They had also the same order of L2 and L3 acquisition and had no additional languages in their repertoire. The participants were tested individually in a quiet room in a school library. The administered tasks are described in the following sections.

2.3. Psychotypology task

Psychotypology was assessed through the Visual Language Distance Measure (ViLDiM) [4]. The

measure employs a visual paradigm to illustrate the perception of distances between the languages. ViLDiM utilises a dotted sheet of A3 paper and transparent circles marked with the names of the languages. Such a framing of language distances accounts for the multidimensional and dynamic nature of the relationships between the languages in the multilingual repertoire. The participants are requested to arrange the circles on the sheet of paper to indicate the perception of distance between the languages. In the current study, the participants were specifically instructed to pay attention to the way the languages in their repertoire sound. The raw distances between the circles were measured and normalised following the formula outlined by Nelson [4].

$$(1) \qquad NV_{L1-L2} = \frac{RV_{L1-L2}}{RV_{L1-L2} + RV_{L1-L3} + RV_{L2-L3}}$$

Figure 1: Score normalisation formula for psychotypology task (ViLDiM). NV- normalised distance, RV – raw distance (in cm).

2.4. Speech production task

The production of rhotic consonants was tested through a delayed repetition task, administered separately for L2 and L3. Before completing the task, the experimenter attempted to induce a given language mode [22] through a short conversation in L2 or L3 respectively.

Both language versions of the delayed repetition task included a sequence of dialogues, consisting of two sentences. The first sentence featured the target word with the embedded target feature (a rhotic consonant). The second sentence was an intervening material, intended to minimise the short-term recall and imitation to possibly access the actual representations of the features. To resemble a conversational pace, the interval between the sentences in each dialogue was 400 ms. The participants were requested to listen to the dialogues and recall the first sentence after the presentation of each sequence. The pace of the task was adjusted for each participant; after the reproduction of the first sentence, the experimenter moved to the next one.

Each language version included 6 target words with an embedded rhotic consonant (in the initial or medial position). The responses of the participants were recorded through a dynamic microphone plugged to a laptop via an external audio interface (16bit, 44.1 kHz).. To control for rhotacism, the L1 Polish production was recorded and analysed by the experimenter.

3. RESULTS

3.1. Psychotypology – perception of language distances

The normalised measurements of language distance indicated that the participants perceived the L2 English-L3 German pair as the closest in their repertoire (*M*=0.28, *SD*=0.09), followed by L1 Polish-L2 English (*M*=0.34, *SD*=0.08) and L1 Polish-L3 German (*M*=0.38, *SD*=0.08) as the most distant. Table 1 presents the normalised measures of language distance.

Lg pair	N	95% CI	M	SD	min	max
L1-L2	20	0.306-0.381	0.34	0.08	0.20	0.50
L1-L3	20	0.339-0.418	0.38	0.08	0.21	0.49
L2-L3	20	0.234-0.320	0.28	0.09	0.15	0.50

Table 1: The normalised measurements of language distance.

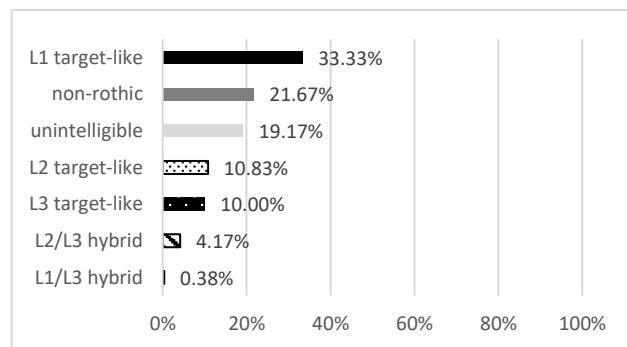### 3.2. Delayed repetition task in L2 and L3

The recordings of rhotics production obtained through L2 and L3 delayed repetition tasks were rated by three independent raters per language, near-native speakers of either English or German with L1 Polish who completed phonetics and phonology courses during their BA studies. The raters received detailed instructions concerning the characteristics of rhotic consonants in the three languages of the participants and a list of rating categories. The production of the participants was rated according to the following categories specified in the rating instructions: (1) target-like realisation, (2) L1 realisation, (3) L2/L3 realisation, (4) a hybrid realisation, (5) realisation as a non-rhotic sound, (6) unintelligible pronunciation. Each rater analysed a total of 120 items per language. Inter-rater reliability (IRR) was computed according to a solution suggested for nominal datasets where each participant is rated by the same raters (more than 2) [23]. Cohen's Kappa was computed for each rater pair (rater 1 - rater 2, rater 1 – 3, rater 2 – rater 3) and subsequently averaged to produce an overall estimate of IRR for each language. The resulting kappa for the L2 English rating indicated a moderate agreement (approaching the benchmark for substantial), *k*=.609. The kappa for L3 German indicated a substantial agreement, *k*=.692 between the raters.

The rating of L2 production indicated that L2 target-like realisations were dominant (67.50%), with the presence of L1 Polish CLI in L1/L2 hybrid realisations (22.50%). L1-like realisations were rather infrequent (6.67%), followed by unintelligible realisations (3.33%), see Fig. 1.
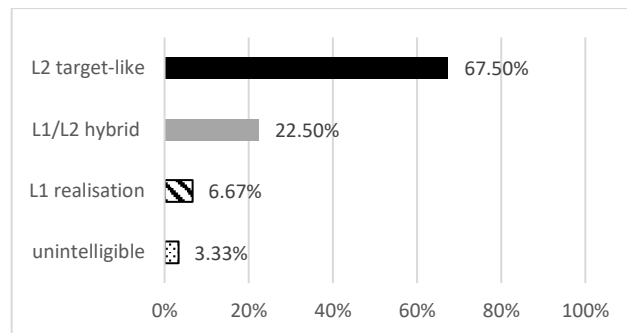
Figure 1: The realisations of L2 rhotic consonants.

L3 production was dominated by L1 realisations of rhotic consonants (33.33%), with frequent replacements of the rhotic consonants with non-rhotic ones (/v/ and /x/ in particular) (21.67%) as well as unintelligible renditions (19.17%). 10.83% of realisations were characterised by L2 target-like production and 10.00% by L3 target-like. Occasional L2/L3 and L1/L3 hybrid realisations were observed (4.17% and 0.38% respectively), see Fig. 2.

Figure 2: The realisations of L3 rhotic consonants.

3.3. Delayed repetition task in L2 and L3

The decisions about correlations between the particular scores of speech production and psychotypology were based on the tendencies observed in speech production. As for L2, the L2 target realisations were correlated with L1-L2 distance to see the directionality of the relationship between these variables. Pearson correlation coefficient indicated no relationship between the two variables (*r*=-0.53, *N*=20, *p*=0.82). Moreover, the hybrid L1/2 realisations were correlated with L1/L2 distance to investigate if the participants with higher number of hybrids perceived the two languages as closer. Pearson correlation coefficient indicated no relationship between the two variables (*r*=0.83, *N*=20, *p*=0.73). As for L3, the high number of L1-like realisations was correlated with the L1-L3 distance to investigate whether the participants with closer L1-L3 proximity produced more L1-like rhotics in L3.

Further, Pearson correlation coefficient indicated no relationship between the two variables (r=-0.93, N=20, p=0.69).

Despite the lack of significant relationships on a global level, some interesting relations between psychotypology and rhotic production were observed for individual cases. For instance, the two participants with the greatest distance between L1 and L2 (NV=0.500) demonstrated high L2 target-like production, which might suggest that for some speakers the perception of proximity might increase with proficiency. Conversely, the participant with the closest L1-L2 proximity exhibited a high percentage of hybrid realizations and errors (66.66%). In L3, the participant with the second closest L2-L3 proximity (NV=0.164) was characterized by a high percentage of L2/L3 hybrids and L2 realizations in L3 (66.66%). Such findings may indicate a relationship between CLI and L2-L3 perception. The participant with the third closest L1-L3 proximity produced L3 rhotics with strong L1 CLI and /v/ or /x/ replacements (0% of target-like realisations).

4. DISCUSSION

The study investigated the relationship between psychotypology and the acquisition of multilingual speech. Sequential adolescent multilinguals completed a ViLDiM task [4] to measure their perception of language distance as well as a delayed repetition task in their L2/L3 rhotics production. The results indicated that the participants perceived their L2 English and L3 German as the closest, followed by L1 Polish and L2 English and the most distant L1 Polish and L3 English. Despite different characteristics of rhotics, the L2 and L3 were perceived as more similar than L1-L2 and L1-L3 language pairs. Such results may be driven by the overall typology, genetic relatedness and the perception of both sounds as belonging to the domain of foreign language.

As far as multilingual speech production is concerned, the participants produced more target-like rhotics in the more proficient L2 than in the early-stages L3. The L2 rhotics were predominantly realised as postalveolar approximants and L1/L2 hybrids. The L3 realisations were substantially influenced by L1. Moreover, the high percentage of non-rhotic substitutions and unintelligible realisations indicates that L3 rhotics posed a challenge in perception and production.

The overall look at the relationship between psychotypology and multilingual acquisition revealed that the more proficient L2 was not considerably closer to L1 compared to the newly acquired L3. Consequently, the perception of language distance may not be affected by the length of the language learning experience. Additionally, the perceived closeness of L2 and L3 (despite a short period of L3 learning) supports the assumptions that phonological features of L2 and L3 are either perceived from a more typological perspective or classified as foreign and therefore assessed as close.

The correlations between psychotypology and rhotic production in L2 and L3 did not indicate any significant relationships. However, the individual cases revealed some links between CLI and multilingual speech production. Such findings correspond with the predictions concerning psychotypology by Bardel and Lindqvist [24]. They suggest that it is best observed and explored on an individual case basis rather than at a group level. However, it still would be worthwhile to extend the scope of the current study to a larger pool of participants and more tokens and tested features as well as perception tests to increase the possibility of revealing significant group tendencies. Additionally, different language repertoires and acquisition contexts could contribute to further understanding of these relationships.

5. CONCLUSION

The current study constituted one of the first attempts to investigate the relationship between quantified psychotypology and multilingual speech production. There were no significant correlations between psychotypology and rhotics production, however, there were some meaningful interactions between CLI and language distance on an individual level. Additionally, the findings indicate that psychotypology might be informed by typology and language status (native vs. foreign). Further research is needed to explore the relationship between psychotypology and multilingual acquisition of phonology from an individual and group perspective.

6. ETHICS STATEMENT AND ACKNOWLEDGEMENTS

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