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Aspects of the relation between the production and perception of a second language

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Abstract
Production and perception tests were administered to 24 L2 users. Relationships between language experience, self assessment and perception and production test results are presented. Results indicate possible support for test methods by showing expected results in these comparisons.

Introduction
The relation between production and perception of both a first (L1) and second (L2) language has been of considerable interest in recent linguistic and phonetic research (Strange, 1995). This paper is concerned with this problem with respect to L2 and approaches it from the point of view of "perceptual foreign accent" (McAllister, 1995). What is foreign accent? In Crystal's A Dictionary of Linguistics and Phonetics "accent" is defined as "... The cumulative auditory effect of those features of pronunciation which identify where a person is from, regionally or socially." Foreign accent can thus "...relate to...national groups speaking the same language (foreign accent, Slavic accent)." As this definition indicates, the term "foreign accent" refers consistently to the inability to produce L2 with the phonetic accuracy required by native listeners for acceptance as native speech. Although there is, in all languages, a fairly large variation in phonetic realization depending on a number of regional, social and stylistic factors, native users, presumably because of extensive experience with the language, seem to have little trouble detecting this deviant phonetic realization of the language usually known as foreign accent (FA). From the point of view of the L2 user, this inability to pronounce the language can have undesirable consequences including well documented social and economic difficulties. The introduction of the term "perceptual foreign accent" (PFA) has been an attempt to redefine, or at least, to broaden the concept of foreign accent to include not only the mastery of the production of a second or foreign language but also the mastery of its perception. The lack of perceptual mastery of the L2 is not so obvious to the outside observer as the deviant pronunciation which is usually labeled as foreign accent. To the L2 user, however, difficulties of comprehension in which the phonetic and phonological factors certainly play a role can be at least as problematic in the everyday use of the L2 as the difficulty in making oneself understood due to deviant pronunciation.

The study of FA has been conducted with at least two somewhat different approaches. First, as a phenomenon consistently observed for centuries in the L2 acquisition process, its study and analysis is likely to reveal important aspects of the phonetics and phonology of this process as well as linguistic facts which illuminate the problem of language acquisition in general. Secondly, there have been, also for many centuries, pedagogical efforts to reduce L2 users' foreign accent through the administration of pronunciation teaching. These two approaches to the study of FA are, of course, closely related. The more we know about the acquisition of L2 phonology and phonetics, the better we should be able to shape teaching methodology with the goal of reducing FA in L2 learners.

There has been ample research in the past few decades on the role of perception in the acquisition of the phonetics and phonology of an L2. The major part of this research has dealt with the process of phonetic and phonological restructuring of auditory input that can be inferred from experimental results. The relationship between the rolls of perception and production in the learning process is currently of considerable theoretical interest in linguistics and psychology and several theoretical models of acquisition have been suggested. There is still, however, considerable uncertainty about the respective roles of perception and production in both L1 and L2 acquisition (Listeri, 1995). A discussion of PFA is relevant to the second of the above mentioned approaches. The study of this phenomenon, based on global comprehension ability, has theoretical implications but is of interest primarily because of its potential impact on pronunciation teaching. It would be
reasonable to assume that PFA is the net effect of the complex interaction of various perceptual mechanisms involved in the restructuring process which takes place during the acquisition of an L2. One of the theoretical implications of this global approach is directly related to a definition of speech comprehension and an explicit assessment of this ability in language users. We have taken a position on this problem and developed tests for the explicit measurement of speech comprehension (McAllister and Dufberg, forthcoming). On the basis of recent scientific discussion of speech comprehension, at least two methodological positions on testing of this ability could be taken. A so called "discreet point" approach would involve a test battery for the assessment of sub-abilities that, together, would predict comprehension level. A global approach would, on the other hand, use a single test to estimate the comprehension ability of an individual language user. In both cases, consideration must be made of theoretical descriptions of the comprehension process which are the basis for a judgment of test validity as well as of the practical aspects of test administration. The theoretical considerations are similar for the two above mentioned approaches. In both cases, an effort must be made to establish what factors are most important for successful speech comprehension. We have taken the position that any assessment of speech comprehension must include tests of both an auditory, signal based ability as well as a relevant cognitive ability (Lindblom, 1987).

The main questions in this research are how the results of L2 global comprehension tests can be related to a measurement of L2 production ability and what these results reveal about the linguistic and non-linguistic factors which influence the comprehension of an L2. This report presents some results from measurements of L2 comprehension acquired by the administration of this test battery.

Methods
A test battery designed to explicitly measure L2 comprehension was administered to thirteen native north American speakers of English and nine native south American speakers of Spanish. These subjects had a similar educational background with at least one year of post secondary education. All subjects were tested with standard pure tone audiometry to establish normal hearing.

The test battery consisted of the following tests:

*Psychoacoustic sub battery* - This sub-battery is composed of three computerized tests: frequency discrimination, temporal resolution (gap detection), and signal type discrimination.

*L2 word recognition in noise.* The word material for this test was selected with regard to frequency in Swedish texts, familiarity (55 native swedish judges) and was phonetically balanced. The words were presented in noise and an adaptive procedure was used to find a signal to noise ratio which represented a 50% comprehension threshold which was the test result. A unique feature of this test is the use of phonological distance metrics for the evaluation of the subjects' wrong responses.

"Top-down" test: This test was designed as a measure of the subject's ability to use signal independent information in the speech comprehension process. The phoneme monitoring paradigm was used in which probability of phoneme occurrence in sentence contexts was systematically varied and phoneme recognition time was the test result.

*QAR-test (question and response).* This test was designed as a global measurement of speech comprehension. Considerable care was taken with regard to validity criteria in the construction of this test. It is composed of twenty five short texts all of which have a similar syntactic and semantic structure. Following the presentation to the subject of a pre recorded text presented in noise at a predetermined signal to noise ratio, five short yes-no questions on the content of the short text were also presented in noise. According to the adaptive procedure used also in other tests in this battery, the subject's correct or incorrect responses determined the signal to noise ratio of the next text. The test result was a signal to noise ratio at which a 50% comprehension level could be observed.

*The Modified Hearing Measurement Scale* is a self assessment test designed to measure the L2 users' own estimation of their comprehension ability in various hypothetical listening situations. This test was originally designed for hard of hearing patients and modified for use with L2 learners.

*Written interview.* The subjects also completed a written questionnaire which consisted of questions about their preferred language and everyday language use.

The experimental session also included the recording of a short segment of spontaneous speech elicited by asking the subjects to describe a short cartoon story. This material was
to be used in the later assessment of L2 production ability.

**Judgment of L2 production**

Approximately thirty seconds of each the L2 subjects' Swedish speech was judged by thirty three native users of Swedish by means of visual analogue scales. The endpoints on this scale were "barely intelligible" Swedish and "very close to or indistinguishable from native Swedish". Spearman pair wise rank order correlations were performed between all possible pairs of tests including the questionnaire and the L2 production scores from the listening test.

**Results**

22 of the around 70 relevant pair wise rank order correlations were statistically significant at the 0.1 level. A number of these test comparisons were relevant to several aspects of our work in second language perception. Some of the data relevant to test methodology has been presented earlier as table 1 (McAllister, 1995).

**Table 1. Significant relationships between tests in the discreet point battery and the global QAR-test.**

<table>
<thead>
<tr>
<th>Test or factor</th>
<th>Spearman corr. coefficient</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>word test</td>
<td>.45</td>
<td>.03</td>
</tr>
<tr>
<td>top down test</td>
<td>.41</td>
<td>.03</td>
</tr>
<tr>
<td>signal type</td>
<td>.43</td>
<td>.03</td>
</tr>
</tbody>
</table>

This data was interpreted as a general indication, albeit vague, that our validity arguments have gained some support.

Figure 1 shows a relationship between production and perception. The significance level of this relationship is 0.03.

Figure 2 indicates the relationship between experience with the L2 and degree of foreign accent.

The correlation coefficient is .40 and the significance level is 0.03.

Figure 3 shows the relationship between experience with the L2 expressed in years of use and the speech comprehension scores from the global test.

Figures 4 and 5 show the relationship between the results of the self assessment test to the judgments of foreign accent and to the results of the global comprehension test.

The correlation coefficient for figure 4 is 0.75, significance level 0.000. for figure 5 the same data is -.53 and 0.008 respectively.
Discussion and conclusions

The analysis of the data presented here is very simple and therefore care should be taken not to over interpret the relationships presented here. The positive and significant relationship between the discreet point test battery and the global QAR test indicates that they could test approximately the same skills. The correlation coefficient between the QAR test and the judgment of degree of foreign accent indicates that there is a significant relationship which is also encouraging in terms of test methodology. Figures 2 and 3 could be interpreted as indicating that years of experience is an important factor in improvement of both production and perception of an L2. The relationship between the subjects self assessment and their measured and judged production and perception success respectively show in figures 4 and 5 would also seem to support our arguments as to the validity of the test methods.

References


