EVIDENCE OF RECENT SOUND CHANGE IN MODERN HEBREW – A SHIFT IN VOWEL PERCEPTION

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ABSTRACT

In this study, we investigate a well-delineated morphophonological phenomenon in Modern Hebrew, the shift from /i/ to /e/ in the past tense verbal template (*binyan*) of *hif'il*. It is based on a corpus of recordings from the 1960s, which documents spontaneous speech of the first generations of Modern Hebrew speakers. Two groups of listeners (young and old adults) heard a random mix of *hif'il* stimuli retrieved from this corpus. The listeners made binary judgments, whether the first vowel in the target word was /e/ or /i/. The results demonstrate a significant difference between the two age groups: on average, the older participants judged the target vowels 20% closer to /i/ in comparison to the younger participants. This was regardless of whether the words were heard in isolation or in context. These results give strong support to the hypothesis that there is an ongoing process of sound change in Modern Hebrew.

Keywords: Hebrew, spoken language, sound change, vowels, perception.

1. INTRODUCTION

Modern Hebrew displays historical discontinuity, atypical among the languages of the world. Between the end of the 2nd century CE and the end of the 19th century CE, Jews lived in a state of diglossia (often multiglossia), in which Hebrew was used primarily for liturgical and written purposes alongside various Jewish languages used for daily communication within the Jewish community, and various surrounding contact languages. The rise of the modern speech community, which reflected a successful attempt of speech revival from the 1880s onwards, involved language shift among the first generation of speakers, who were native speakers of other languages. However, the first generation of Hebrew speakers could not adopt a concurrent form of naturally spoken Hebrew, as none existed at the time. A variety of linguistic models was present in written Jewish sources; However, no living community preserved a natural dynamic vernacular use. The discrepancy between the planned standard, intended to adhere to Classical grammar, and the language used in practice in the early stages of Modern Hebrew, influences phenomena in Modern Hebrew to this day. In fact, many of the linguistic variations used in Present-Day Hebrew originate from the way Hebrew had consolidated in its first decades, as the first generations only partially accepted the planned language. Therefore, in order to understand different elements of Present-Day Hebrew and trace the origin of linguistic variations in use, it is important to study the speech of the first generations of Modern Hebrew speakers. This will shed light on ongoing changes in Present-Day Hebrew.

In Modern Hebrew's verbal system, inherited from classical Hebrew, all verbs are inserted into one of seven vocalic verbal templates, historically carrying different grammatical functions. The verbal template *hiCCiC*, called in Hebrew *hif'il*, is one of seven morphological templates constituting the verbal system of Modern Hebrew. In our current research, we focus on one well-delineated morphophonological phenomenon, namely the variation between /i/ and /e/ in past tense forms of *hif'il*. A conspicuous phenomenon in contemporary spoken usage is the frequent occurrence of *hef'il* forms at the expense of *hif'il* in wider contexts than those determined by the rules of traditional Hebrew grammar. This process is customarily considered as a process of linguistic change ([1], [4], [10]).

The recent discovery of a special collection of reel tape recordings from the 1960s that document free, spontaneous speech opens up new possibilities for the study of linguistic change in Modern Hebrew.

The Gonen-Reshef corpus consists of recordings made in domestic settings for private use by a married couple living in Israel, who regularly documented their daily and family life since their marriage in the early 1960s ([3], [9]). These recordings, conducted over 50 years, document the raising of children and grandchildren, as well as the social life of the family members. The couple is of mixed origin (the husband

was born in Palestine to parents from Turkey, and the mother was born in Palestine to parents from Germany). They have five children, born between 1965 and 1979, and twelve grandchildren (the first was born in 1992). The family belongs to an average socio-economic social class, and language use of the family members (as well as of most other people recorded) reflects quite typical varieties of daily speech in Israeli society. Examples of immigrant language and child language are also represented.

Using data extracted from the Gonen-Reshef corpus recordings in the 1960s, which document an earlier phase in the formation of spoken Modern Hebrew, [3] examined the usages of the forms *hif'il* and *hef'il* in the 1960s. They concluded that the 1960s recordings attest to a stable realization of the prescriptive form of *hif'il* in all age groups, but also to some deviating forms of *hef'il*. Therefore they assumed a recent change from /i/ to /e/ in *hif'il*.

Linguists around the world have long addressed the challenges of language change, with the intention to identify generalizations that would promote our comprehension of language [11]. The aim of this line of research is to trace language changes, to understand the driving factors, determine whether these are internal, external, or extra-linguistic factors, and trace changes that stem from a convergence of factors ([2]). Within the wide range of theories aiming at explaining processes of linguistic change, the most compatible with our research is the observation of Ohala ([5], [6], [7], [8]), that synchronic variation and diachronic sound change are interconnected. Taking into account the fact that variation is the natural state of languages, whereas change is restricted in scope, Ohala suggests that the initiation of sound change is more often than not anchored in perception, namely in listeners' variable perception of production phenomena as representing inherent properties of the intended linguistic form. According to Ohala, synchronic variation is inevitable ([5], [6]), but in the great majority of cases it does not lead to linguistic change due to a normalization mechanism that enables listeners to correctly reconstruct the intended linguistic form even when its phonetic realization is variable or altered.

However, if a listener fails for some reason to do so, normalization of the variable form may not occur, and this listener's production of the form, once he or she assumes the role of speaker, may be based on the variable pronunciation he or she was exposed to in the first place ([6]). The spread of this new pronunciation to other speakers or to other lexical items results in the creation of new linguistic facts in the structure of the language ([8]). Synchronic variation is therefore a pre-condition of sound change ([6]), but in most cases, it does not develop into sound change due to the abovementioned normalization mechanism, which is essential for communication ([8]). Ohala's theory is supported not only by evidence from actual cases of sound change in various languages, but also by the results of experiments aimed at replicating such changes in the laboratory ([6], [7]).

2. RATIONALE AND OBJECTIVES

Our original intention was to extract a large number of occurrences of *hif'il/hef'il* from the Gonen-Reshef corpus and perform an acoustical analysis on the appropriate vowels in order to determine whether we could observe a shift in their production forms over the time period from the 1960s till the present. However, it became obvious early on that this approach would not be feasible, due to several factors:

- The recording quality was sometimes not good enough for acoustic analysis due to the use of dated equipment, background noise and overlapping speech. This rendered it impossible to obtain accurate values of the formant frequencies.
- The spread of occurrences of the target conjugations was uneven over the range of years.

Alternatively, we decided to attempt a perceptual analysis of the target vowels. Pilot experiments soon revealed that judgments from different listeners could differ considerably, therefore perceptual judgments could not be considered as "ground truth" determining the "true" identity of the vowels.

Finally, we decided to examine the issue from a different perspective altogether: instead of using judges to examine the corpus, perhaps the *corpus* could be used to examine the *judges*. Our assumption was that if sound change had indeed occurred over the past 50 years, then older judges, more accustomed to using /i/, would also expect to hear /i/. Younger judges, more accustomed to both forms, would be expected to have a weaker preference for hearing /i/.

In summary, the objective of this study was to determine if older listeners, when judging *hif'il/hef'il*, tended more towards judging the first vowel as /i/, when compared to younger listeners.

3. METHODS

3.1 Stimuli

A random sample of twenty occurrences of *hif'il/hef'il* in various persons was taken from the Gonen-Reshef corpus. These were taken from recordings dating to the 1960s following one principle: a good audio

quality of each occurrence. The occurrences were chosen randomly from a variety of different speakers so that no overlapping speech was found. In some cases, it was not clear whether the isolated words would be sufficiently intelligible, and whether the surrounding context would affect the judgments. Therefore each such occurrence was extracted both in isolation and together with the prosodic unit in which it was embedded. This gave a total of 40 stimuli, 20 isolated verbs and 20 prosodic units (which we term "sentences" in the sequel) containing the same verbs. Twelve of the recordings were of female speakers, and eight were male. The speakers were 20 to 28 years old.

3.2 Participants

Twenty-four participants were recruited and divided into two different age groups. Twelve (6 women) were aged 60-70 (M=67), and twelve (6 women) were aged 20-25 (M=24). All were native Hebrew speakers, and all passed a screening procedure for hearing loss.

3.3 Procedure

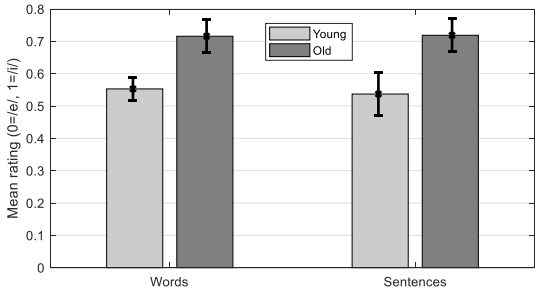
The participants performed two separate trials, one on the isolated words and one on the sentences. In each trial they heard a random mix of the stimuli, with each stimulus repeated 10 times – a total of 400 judgments for each participant. Each time they heard a word or a sentence they had to make a binary judgment, whether the first vowel in the target word was /e/ or /i/. A decision of /e/ was annotated as 0, and a decision of /i/ was annotated as 1. The experiment was run by custom written software running under the Matlab development package.

4. RESULTS

The 10 judgments of a single judge for a single stimulus were averaged, giving a number between 0 and 1. Thus we ended up with a table of 40 averaged judgments per listener – 20 judgments for words, and 20 judgments for sentences. The judgments over all stimuli in each group were then averaged. The means per group and stimuli type (word and sentence) are presented in Figure 1.

Analysis of variance with repeated measures was performed over the judgments, with Type (word or sentence) as a within-subject factor, and Group (young or old) as a between-subject factor. A significant main effect was found for Group ($p=0.017$), and no main effect was found for Type. No significant Group*Type interaction was found.

Figure 1: Mean judgments and standard errors for both age groups (young, old) and both type of stimuli (words, sentences)



In other words, the younger participants had an overall tendency to judge the stimuli more towards /e/ (with mean judgments of 0.55 for words and 0.54 for sentences) than the older judges (with mean judgments of 0.72 for words and 0.72 for sentences). In addition, the stimuli type – word or sentence – had a negligible effect on the judgments.

5. DISCUSSION

The results of our experiment indicate an ongoing process of sound change in Modern Hebrew, since they demonstrate a significant difference between younger and older listeners regarding their perception of the examined vowels. This difference is consistent with former descriptions of a shift from /i/ to /e/ among the younger generation today. Thus, our experiment shows that younger adults have a stronger tendency to perceive the vowel /e/ in past tense form of *hif'il* than older adults, even in utterances produced in the 1960s by the first generations of Modern Hebrew speakers.

Another interesting finding relates to comparison between the perception of verbs in isolation and verbs within context. Our initial assumption was that there would be a difference between the results in the two different conditions. We expected that within the full prosodic unit, the listeners would tend to perceive the vowel /i/, which is the normatively expected vowel. This assumption was proven wrong and it might reflect the fact that Modern Hebrew is now in a transition phase in which both variations are present in the Spoken Language. The assumption is that in the near future we will find a greater presence of /e/ vowel in this position.

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