

## Phonetic flexibility in old age: Training seniors to perceive new speech sounds

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Current speech learning models claim that the ability for the reorganization of phonetic systems remains intact over the entire life span (Best & Tyler, 2007; Flege & Bohn, 2021). This claim is well supported by studies examining speech learning in young adults (e.g., Bradlow et al., 1997), but very little is known about nonnative speech learning in older adults. This presentation reports on the first experiment in a series of studies which directly compares the efficacy of perceptual training for relatively young and relatively old participants. The training target in this study with native Danish participants was the English /s/-/z/ contrast (Danish has no voiced fricatives). Two groups each (experimental and control) of native Danish speakers aged 18-35 years (the young group, mean age: 23.9 years) and 60-78 years (the old group, mean age: 66.2 years) participated.

The control and the experimental groups were examined for perception accuracy of English /s/-/z/ before and after a three-week interval. The stimuli were /CV/ and /VC/ syllables with V = /i, a, u/, recorded from two native English speakers (1f, 1m). Participants were also recorded producing syllable-initial and syllable-final /s/ and /z/, but this presentation will focus exclusively on the perception of English /s/ and /z/. During a three-week interval, the experimental groups participated in a web-based perceptual training regime with high variability identification training of English /s/-/z/ in syllable-initial position in 10 sessions over three weeks. Except for the first session, which took place at our lab, participants trained at home where they accessed the webtool Percy (Draxler, 2014) which presented the stimuli, provided immediate feedback, and provided detailed logs for each session for each participant.

Prior to training, identification accuracy for syllable-initial /s/ and /z/ did not differ significantly between the four groups (old vs young, each consisting of a control and an experimental group) with accuracy ranges of 67.1% to 75.3%,  $p > .4$ ). The differences in accuracy over the three weeks were nonsignificant for the young control group (from 67.1% to 71.1%,  $p > .05$ ) but significant for the old control group (from 72.6% to 78.5%,  $p < .05$ , with a small effect size of Cohen's  $d = 0.39$ ). However, both the young and the old experimental groups' identification accuracy increased significantly ( $p < .001$ ) with large effect sizes (Cohen's  $d > 1.1$ ) from pre- to post-training (mean accuracy pre-training: young: 72.7%, old: 75.3%; mean accuracy post-training: young: 91.4%, old: 87.9%) with no significant differences in accuracy between the age groups at either pre- or at post-training ( $p > .3$ ). Interestingly, the training trajectory of the two age groups did not differ, with a steep increase of accuracy during the first training sessions, and an asymptote at around the ninth training session. For those participants who were available for a delayed post-test two months after the final training session, the training effect was quite robust, with nonsignificant decreases in accuracy ( $p > .1$ ) for both the young group (from 96.8% to 91.7%) and the old group (88.2% to 84.9%).

We are currently analyzing data which will show whether perceptual training affects production accuracy, and data which address the question of whether perceptual learning is allophone-specific, i.e., restricted to the trained initial /s-z/, or whether participants had acquired more abstract knowledge of /s/-/z/ independent of syllable position. For this, we examine the perceptual accuracy of untrained syllable final /s-z/ before and after training of initial /s/-/z/.

The results of this first study allow us to conclude that an advanced chronological age does not compromise phonetic learning in a perceptual training paradigm. These results thus support the claim that the ability for reorganization of phonetic systems remains intact over the entire life span.

### References

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