

As children learn to read, eye and ear improve but always integrate well

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Introduction

People are amazingly good at integrating sights and sounds. Dubois, Poeppel, and Pelli (submitted) find that adults integrate spoken and written words nearly perfectly. Do children acquire this ability as they learn to read?

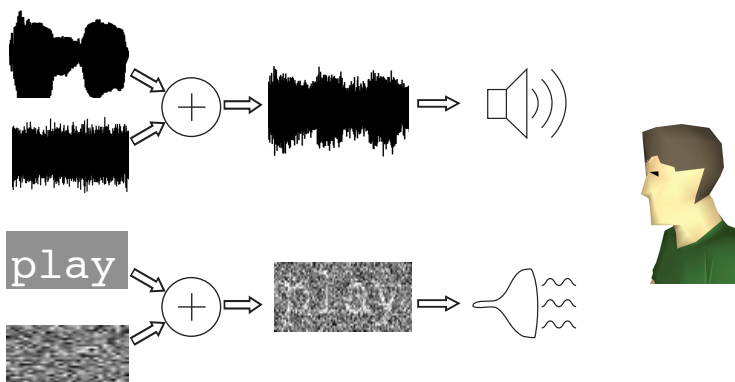


Fig. 1. How we present the spoken and written words in noise.

Method

- We use QUEST to measure the threshold energy for word identification. We present printed and spoken words concurrently and separately.
- Ten participants: 3 adults and 7 children between five and ten years old.
- Ten different 4-letter, one-syllable words, presented one at a time, embedded in noise, at various signal to noise ratios.
- 480 trials per participant. Each trial presents a word for 460 milliseconds, followed by a list of the ten possible words. Participants are asked which word they perceived.

Results

- k is the summation index: no summation $k = 0$, total summation $k = 1$.
- We estimate k by fitting $v^{1/k} + a^{1/k} = 1$ to the participants' normalized visual (v) and audio (a) energy thresholds.
- The adults' average k is 0.76, and the children's average k is 0.74, showing nearly perfect summation. A two-sample t-test shows that the k estimates for adults and children are not statistically different.
- Audio and visual efficiencies increase by a factor of three from age 5 to 32.

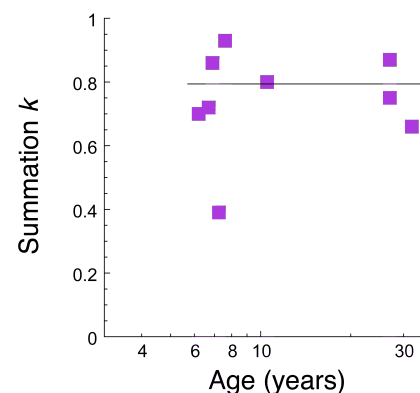


Fig. 2. The summation index k is independent of age.

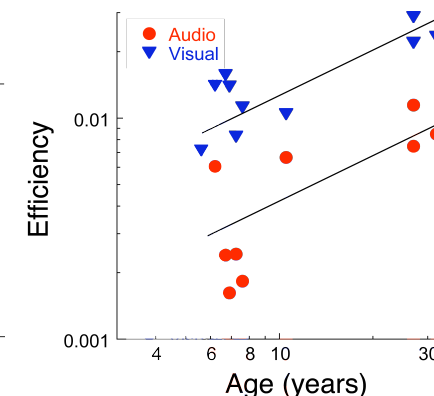


Fig. 3. Efficiency increases with age.

Conclusion

Children integrate spoken and written words as well as adults do.