The Role of Movement in the Memory for Signs

Kayla Vodacek[1], Laurie Lawyer[2], Todd Lamarr[3], and David P. Corina[1]
[1]Center for Mind and Brain, University of California, Davis; [2]Dept. of Language and Linguistics, University of Essex, U.K.; [3]Dept. of Child Development, American River College, Sacramento CA

Introduction

While there have been numerous studies of short-term and working memory for signed languages (e.g. Wilson et al 1997; Rudner et al 2009), there have been far fewer studies of recognition memory for signs (see Siple et al. 1977). Classic studies of recognition memory for spoken languages have shown that rather than storing a veridical representation of a linguistic signal, language users often discard surface properties and remember the gist of a message (Bransford & Franks, 1971, McKoon & Ratcliff, 1992). In the present study, we were interested to learn whether deaf signers and hearing non-signers used similar recognition memory strategies for encoding pseudo-signs. In this study we systematically evaluate the role that movement plays in recognition memory for signs.

Questions of Interest

1. Does recognition memory for pseudo-signs vary as a function of sign-expertise?
2. Does recognition memory for dynamic versus static pseudo-signs differ as a function of sign-expertise?
3. Does the ability to discriminate signs vary as a function of sign expertise?
4. Does the ability to discriminate signs that are moving or static vary as a function of sign expertise?

Methodology

Participants

45 Hearing participants (mean age: 21.64 y.o., range: 18 – 30 y.o.)
13 Deaf participants (mean age: 24.73 y.o., range: 18 – 33 y.o.)
(8 native ASL users, 2 native foreign SL users, 3 late learners)

Method

Subjects engaged in a pseudo-sign study phase, a distraction phase, followed by a recognition memory test.

During the study phase participants were presented 36 pseudo-signs, each item was shown twice before moving on to the next item.
During the distraction phase participants answered 10 math problems requiring keyboard response.
During the recognition memory test participants were shown 36 pseudo-sign probes. Half of these probes had been previously seen, and half were novel. Subjects had to determine whether each item was old (previously seen) or new (not previously encountered),

Crucially the study items and test probes depicted either a moving (dynamic) video of the pseudo-sign or its temporally- equivalent static depiction.

- Moving stimuli were pseudo-signs that were articulated with phonologically appropriate path, twisting and tapping movements.
- Static stimuli were single frame images that were independently judged to be the most faithful representation of the dynamic pseudo-sign.
- The temporal duration of a given dynamic pseudo-sign and its static depiction were equivalent.

Note during the recognition memory test the participants performed a recognition task with a series of 36 sign probes. These recognition probes included 18 pseudo-signs from the study block (9 dynamic and 9 static signs forms) and 18 new pseudo-signs (9 dynamic and 9 static signs forms).

Analysis

We report overall accuracy and D' scores as a measure of discriminability while controlling for guessing. Accuracy and D' scores were calculated for each participant group (normal hearing vs. deaf) for each condition (dynamic vs. static).

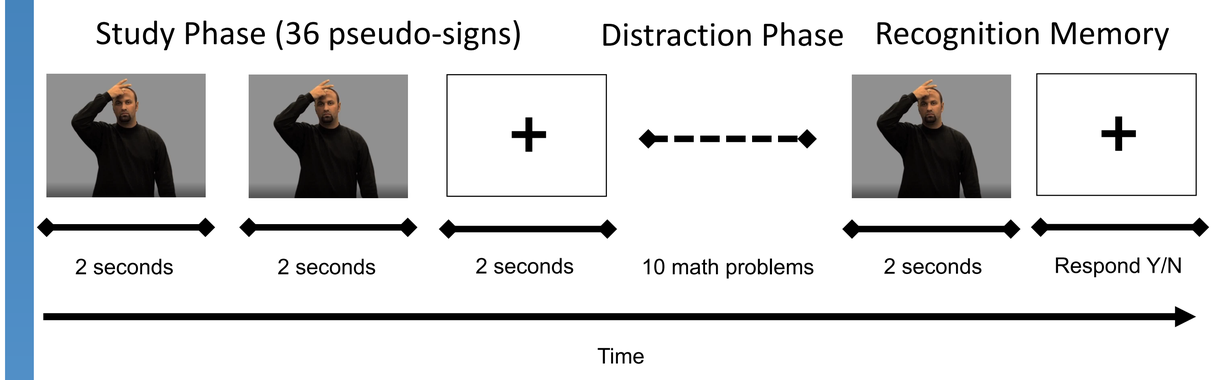
References

Rudner, M. Andin, J and Ronnberg, J. (2009) Scandinavian Journal of Psychology, doi:10.1111/j.1467-9450.2009.00744.x

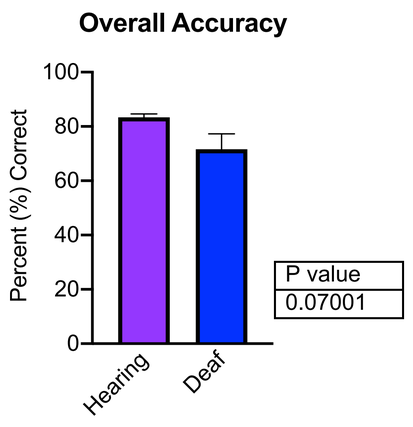
Wilson, M. & Emmorey, K. Memory & Cognition (1997) 25: 313. https://doi.org/10.3758/BF03211287

Siple, P., Fischer, S.D. Bellugi, U. (1977) Journal of Verbal Learning and Verbal Behavior 16, 561-574.

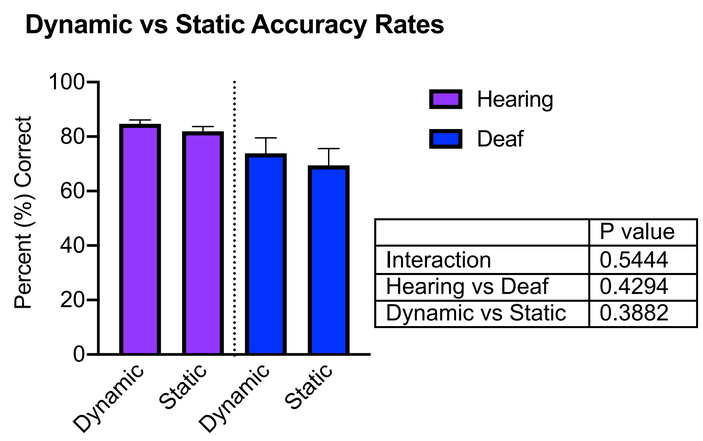
Stimulus example (Left). Original ASL sign is FATHER. In the pseudo-sign the handshape is altered, but location and movement are held constant.



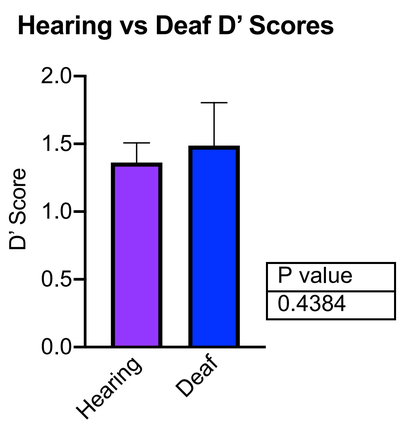
Results



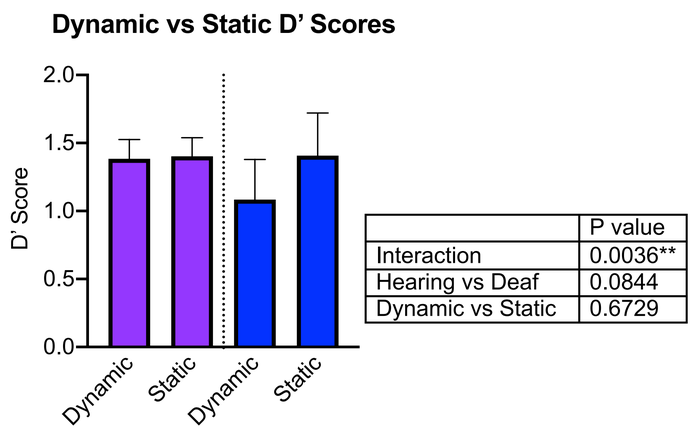
P value
0.07001



	P value
Interaction	0.5444
Hearing vs Deaf	0.4294
Dynamic vs Static	0.3882



P value
0.4384



	P value
Interaction	0.0036**
Hearing vs Deaf	0.0844
Dynamic vs Static	0.6729

Conclusions

Very few studies have investigated recognition, results from Siple et al, (1977) suggest recognition memory for sign languages for native sign language users behaves the same way as spoken language for native spoken language users.

Impact of Sign Expertise.
Hearing participants achieved higher accuracy rates than deaf participants suggesting sign expertise does not impact visual recognition memory accuracy. However, deaf participants showed trends for higher pseudo-sign discrimination rates. Sign expertise may effect the the ability to discriminate signs that have been encoded into memory. However, more subjects are needed to substantiate this trend.

Role of Movement
Neither hearing nor deaf signing participants' showed reliable accuracy differences for moving versus static pseudo-sign forms. However, close inspection of these preliminary data suggest that the ability to discriminate signs encoded in memory may be differential. Hearing subjects showed no differences in the discrimination of dynamic versus static signs while deaf subjects showed better discrimination of static forms over dynamic forms. These preliminary results may indicate that deaf participants are not storing veridical representations of the signs and may be discarding movement properties as a result of sign.

This work supported by grants NIH NIDCD R01 DC011538 and RO1 DC014767