

A phylogenetic approach to fingerspelling variation reveals the origin of hieroglyphic letters

SUEMORI Akio

National Institute of Advanced Industrial Science and Technology (AIST), Japan

International Sign or American Sign Language

The introduction of fingerspellings corresponding to the 26 letters of the Latin alphabet into education for the deaf in Europe ranks as one of the most important developments in the deaf history [1], one has interested many researchers in the field of sign language studies and semiotics. However, the origins and variation processes of fingerspelling are controversial and have long been debated. A number of studies have argued about the embryonic origins of fingerspelling, but their findings are inferential, grounded in theory rather than in empirical testing.

I therefore developed a phylogenetic analysis as a way to deduce the variation process of fingerspelling. First, each of the 26 letters was classified according to phonological parameters from 43 current, geographically diverse fingerspellings, and from 11 ancient fingerspellings, including *Bede/Pacioli's* fingerspelling, a coding system used for reckoning in medieval abbeys; *Rosselli's* fingerspelling, a hieroglyphic system used for medieval mnemonics; and *de Yebra's* fingerspelling, known as the oldest fingerspelling system used in the education of deaf children in Spain. Subsequently, binary sequences for identical or similar letter sets were arranged, and cladograms were built using the maximum likelihood method.

As shown in Figure 1, a consensus cladogram shows some clear clads that imply the phylogenetic relationship of fingerspelling. The cladogram reveals that *Rosselli's* fingerspelling would have been first performed as a hieroglyphic fingerspelling, and that *de Yebra's* fingerspelling may have developed from crosses between *Bede/Pacioli's* fingerspelling and other medieval hieroglyphic fingerspellings, which spread into Europe and America through *Sicard's* fingerspelling. Cladistic analysis also reveals that a major switch of the palm orientation of most of the letters took place in the 19th century, a landmark period for the diversification of fingerspelling.

In-depth analyses of wide patterns of hand configuration for each letter identify invariable letters such as 'V' 'C,' or 'O,' etc. Prosodic model-associated trees of hand configuration are analyzed for the invariable letters and variable letters, respectively [2]. As shown in Figure 2, for example, four variations of 'O' involving the common circle formed by the selected fingers—the thumb and index finger—are invariable. However, non-selected fingers—the middle, the third, and the little fingers—are variable. This observation suggests that the iconicity of 'O' would be symbolically expressed by the selected fingers.

This study provides important information on an effective phylogenetic approach for linguistic and semiotic researches for fingerspelling, illuminating the origin of fingerspelling variations while providing insight into the iconicity of signed representations of Latin characters.

[1] Bragg, L. (1997) *J. Deaf Studies & Deaf Education*, 2, 1-25.

[2] Brentari, D. (2000) *A prosodic model of sign language phonology*. Cambridge, MIT Press.

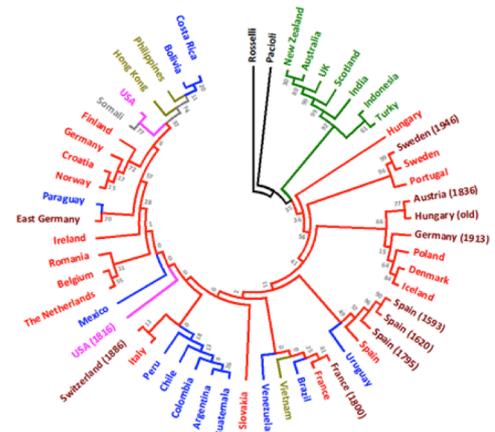


Figure 1. A consensus cladogram of fingerspelling. (Dark red) Ancient one-handed fingerspelling in Europe; (Red) current one-handed fingerspelling in Europe; (Blue) current one-handed fingerspellings in Central and Southern America; (Ochre) current one-handed fingerspelling in Asia; (Rose) ancient and current one-handed fingerspelling in USA; and (Green) two-handed fingerspelling. Bootstrap values are shown with each node.

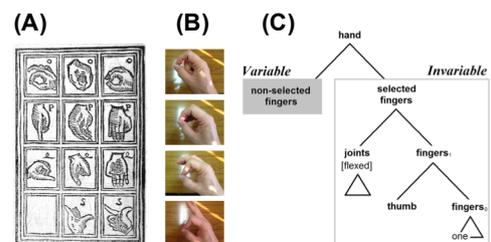


Figure 2. Diversification of 'O'-handshape. (A) *Rosselli's* fingerspelling. (B) Four variations of 'O'-handshape observed in ancient and current fingerspellings. (C) A tree diagram of 'O' based on the Prosodic model.