Numeracy is a paradigmatic example of the close dovetailing of culture, language, and cognition. The two systems central to the numerical competence—one for the exact representation of small numbers and one for the approximation of larger numbers—are relatively old in phylogenetic terms and available almost from birth. Together, they provide the basis for the specifically human ability to also assess larger numbers in an exact manner (Dehaene, 1997; Feigenson et al., 2004). Yet, while several scholars consider numeracy a core domain of knowledge (Spelke & Kinzler, 2007), its full development seems to presuppose cultural and linguistic input (Spelke & Kinzler, 2004). Yet, while several scholars consider numeracy a core domain of knowledge (Spelke & Kinzler, 2007), its full development seems to presuppose cultural and linguistic input (Spelke & Kinzler, 2004). 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Numerical Cognition with Inadequate Linguistic Input: Explaining (and Improving) Deaf Children’s Poor Mathematical Performance

Deanna Gagne & Marie Coppola

Deaf and hard-of-hearing students perform more poorly in mathematics than their normally hearing peers. This is not a direct result of deafness or manual communication. Only 5% of American deaf children have culturally Deaf parents who use American Sign Language (ASL) with them from birth; these deaf children perform like hearing peers. Language and mathematical abilities are associated in hearing children (e.g., Levine et al., 2010), deaf preschoolers, orally educated deaf children, and home-signing adults with no linguistic input (e.g., Spaepen et al., 2011), but remain uninvestigated in signing deaf children. We compare native-signing deaf children to children exposed to ASL later (at school). Our studies will establish a baseline for native-ASL deaf children; compare effects of incomplete language access across modalities (signed/spoken); and relate number language to number cognition.

Representational Effects of Historical Numerical Notation Systems

Stephen Chrisomalis

Over the past twenty years, considerable attention has been paid to cross-cultural cognitive effects relating to numerosity, such as the SNARC effect and one-to-one correspondence. This literature can be augmented by considering representational effects associated with different numerical notations (e.g., Roman numerals, Maya numerals, Babylonian numerals). A methodological complexity is that, because there are few if any fluent users of many notations, it is challenging to compare them to one another or to Hindu-Arabic numerals. Previous studies frequently assume representational effects directly from the features of number systems, or rely on anecdotal report, with little consensus reached. An alternative is presented in which the features of numerical notations are abstracted, and cognitive tasks developed, to allow historical or obsolete representational systems to be compared to one another directly. Results from a pilot study conducted with American middle-school students demonstrate the feasibility of such comparisons on a broader scale.

Numeration Systems as Complex Cultural Tools

Siegfried Beller & Andrea Bender

Numerical competencies are considered a core domain of knowledge, and yet, the development of specifically human abilities seems to presuppose cultural and linguistic input by way of counting sequences. These sequences may be realized in different modalities (verbal, notational, or body-based) and constitute systems with distinct structural properties, the cross-linguistic variability of which has implications for number representation and processing (e.g., Bender & Beller, 2012, 2014). Here we contrast various numeration systems across languages and modalities, and analyze their representational effects. In doing so, we will also draw conclusions from the symposium more generally on the relative relevance of culture and language for numerical cognition.

References