

## Mental Abacus as a Tool to Track Exact Quantities in the Absence of Language

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Is it possible to have representations for exact quantity in the absence of number words? Recent studies with the Pirahã people, an indigenous group in the Amazon lacking words for exact quantities, as well as native English speakers under conditions where linguistic representation is blocked, suggest that the concept of exact quantity (or having the knowledge that adding or subtracting one will change the size of a set) is not created by language. However, having linguistic representations for quantity (or learning number words) may allow one to store, track, and manipulate the cardinality of large sets (Frank, Everett, et al., 2008; Frank, Fedorenko, et al., 2008).

The present study examines whether “mental abacus” abilities can be used as a tool in place of language to keep track of exact quantities. Mental abacus is a non-linguistic system in which users are able to perform complex mathematical computations by visualizing an abacus.

Advanced abacus students and students enrolled in extracurricular music classes were asked to keep track of objects placed into an opaque cup, while simultaneously performing a verbal shadowing task designed to block linguistic representation. Abacus students were asked to keep track of the objects by visualizing an abacus, and music students were asked to keep track in any way they could without using their fingers. Preliminary results suggest that mental abacus students are better able to track and remember objects compared to the music students; however, error in estimation increases with set size. We discuss whether abacus representation may assist in object tracking in the absence of language, and other possible explanations for this group difference.