Debriefing Statement
Number Sense
Fall 2015

Explanations of the cognitive bases of advanced number systems remain a major challenge in mathematical cognition. The mental representations of natural numbers, integers, rational numbers, and decimal proportions have been frequently studied. However, little is known about the mental representation of more abstract number classes such as irrational numbers and imaginary/complex numbers. This is particularly problematic because these number systems become increasingly important as students progress through mathematics.

The study has two major goals. The first is to investigate the mental representations of irrational numbers, especially when compared to natural numbers. The natural numbers 1…9 have been the subject of many psychological studies. The evidence to date suggests that they are mentally represented as "magnitudes", i.e., points on a mental number line. Moreover, the precision of one's mental representations of numbers is correlated with mathematics achievement during the elementary and middle school years. It is an open question how people understand irrational numbers such as sqrt(2). Is it represented on the same mental number line, as a point between 1 and 2? Is it represented on a separate number line for irrational numbers? Are irrational numbers like sqrt(4) represented as natural numbers or in some other way?

The second major goal is to investigate whether individual differences in the mental representation of irrational numbers correlates with mathematical achievement as measured by our number sense test and the math section of the ACT.

From our pilot study, we discovered that the mental representations of irrational numbers are analogous to that of natural numbers, with some exceptions. The new aspects to this experiment are (1) the use of a more comprehensive number line estimation task and (2) the administration of a number sense test focused on irrational numbers. We predict that performance on these measures will relate to the computerized magnitude judgment task and perhaps even ACT math scores.

If you have any further questions, please ask the experimenter.