As Many As 9, But As Few As 11: on a Hypothesis Testing Process of Evaluating Inevaluable Quantities

Y. Charles Zhang, University of California Riverside, USA
Yunhui Huang, Nanjing University, China

When communicating quantities, communicators often embed cues to imply whether this quantity is large/small (e.g., “only 11 pounds.”). We find that such communicator’s position affects how recipients evaluate the quantity, the extent to which depends on the magnitude of the individual digits constituting the number, leading to potential judgment reversals.

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Y. Charles Zhang, UC Riverside, USA 
Yunhui Huang, Nanjing University, China

EXTENDED ABSTRACT
Numerous research has documented that people are insensitive to the magnitude of numbers. Consequently, they usually provide indistinguishable evaluations toward objectively close quantities. For example, consumers’ evaluation of the speed of a 3D printer that prints 11 mm/s does not differ from that of 9 mm/s. Research has also suggested that such quantities can indeed be distinguished when proper reference point is offered. For example, Thomas and Morwitz (2005) show that a product rating of 2.99 is perceived as significantly lower than 3.00 when both numbers are compared to 4.00.

In the present research, we find a new context in which evaluations between close pair of numbers are distinguishable, namely, when the communicator of the numerical information conveys whether this number is supposed to be considered as large or small. Such context is 1) free of reference points, 2) leads to reversed evaluations between the numbers, and 3) is an extremely common situation in which the numbers are presented in everyday life – we examined 868 articles in the New York Times and found that 48.6% of the total of 6,421 numbers that appear in these articles are presented in such a context.

In such contexts, an objectively smaller number consists of large digits (e.g., 98) can be judged to be larger than an objectively larger number consists of small digits (e.g., 112), an effect we call “the digit paradox.” We argue that recipients evaluate the focal number by drawing on the communicator’s position and validate that position against the magnitude of the individual digits of the number; large/small digits extend greater support for the position that the number is large/small.

In study 1, 222 undergrad students read a short article about 3D printer, in which the current speed of 3D printing, either 9 mm/s (large digit) or 11 mm/s (small digit), is described either as fast (e.g., “as fast as 9 [11] mm/s”), or neutral (i.e., without magnitude claims). As a result, the communicator’s position increased the perceived magnitude of 9 mm/s to a greater extent than they did to 11 mm/s (F(1, 218) = 4.59, p = .033, η² = .021). In the meantime, 9 mm/s was perceived to be subjective faster (M = 5.0 vs. 4.5, F(1, 218) = 4.46, p = .036, η² = .020) than 11 mm/s in the presents of large magnitude claims but not when magnitude claims are absent (M = 3.8 vs. 4.1, F < 1, n.s.).

In persuasion, numbers are usually presented to support arguments. When the communicator’s opinion stands against the recipients’, recipients may resist the persuasion from that communicator, and become unwilling to adopt any positions that the communicator attempts to convey. In this case, the digit paradox should be eliminated. Study 2 tests this boundary condition. 214 undergraduate students prepared a debate on whether using social networks facilitates or hinders social interaction. Immediately after, they read a “research article” claiming that using social networks actually hinders social interaction as “frequent social network users on average are only involved in as few as 98 [112] incidences of face-to-face interaction with others every year.” Participants then reported their perceived magnitude of the 98 [112] incidences, with an expectation that those who prepared for the “facilitate” position were likely to counter-argue with the communicator; therefore, their judgments should not be affected by the digit paradox. As a result, for participants in the hinder conditions, 98 incidences was perceived to be larger than 112 incidences, replicating the digit paradox. For participants in the facilitate condition, however, this reversal did not happen (F(1, 204) = 4.61, p = .033, η² = .022). Different from study 1, the digit paradox was eliminated without changing the content of the communication; what was manipulated was participants’ willingness to validate and adopt the communicator’s position as hypothesis. It therefore rules out any alternative explanations that are based on the different content of information that participants receive during the judgment process.

Because using digit as evidence is a heuristic, the digit-as-evidence effect should only be observed among those who do not feel that they have the knowledge. Study 3 examines this moderator. Participants read that a governor had either created as many as 96,000 [112,000] jobs or as lost as many as 96,000 [112,000] jobs. Participants first judged the governor’s performance. Then, they reported their familiarity in politics, which serves as a measure of feeling of knowing (FOK). We ran a linear regression including the following predictors: the magnitude of the digits, the valence, FOK, all the two-way interactions among these three variables, and the three-way interaction. As a result, the digit*valence interaction was significant (β = 0.079, t(203) = 2.67, p = .008), suggesting a strong digit paradox: the performance of creating/losing as many as 96,000 jobs was judged to be better/worse than creating/losing as many as 112,000 jobs. Further, the coefficient of the three-way interaction was negative and also significant (β = -0.075, t(203) = -2.54, p = .012), suggesting that the effect was moderated by how recipients feel that they know of the target of judgment: the strong this feeling was, the lesser the extent to which his/her judgment was affected by the magnitude of digits.

Providing numbers is a common approach of presenting a quantity – “Let the data speak for themselves.” The current research, however, we find that the subjective magnitude of a number is affected by the communicator’s position, the extent to which depends on whether the focal number consists of large or small digits. Importantly, the fact that recipients are not influenced by the digits in the absence of magnitude claim suggests that this effect goes beyond a simple digit-magnitude association. While prior literature is largely silent on how people evaluate invaluable quantities (e.g., in single evaluation), our research suggests a plausible approach – hypothesis testing with heuristic-based evidence. Essentially, holding a hypothesis about the target, judgment and evaluation may draw on remote associations that are otherwise meaningless in the absence of the hypothesis.

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