How many numbers in this number? Processing of the quantity of integers in a multi-digit number

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Abstract

The processing of multi-digit numbers have been usually studied comparing numbers with the same number of digits. In these cases, deciding which number is bigger simply requires comparing the leftmost digit of each number. However, everyday live usually involves comparing natural numbers that differ in string length, in these cases focussing in the number of digits in each multi-digit provides the most relevant information. The present research explores in second graders (aged 7-8) the processing of the number of digits. Participants were presented with pairs of numbers that may have the same number of digits (3 vs 3; 4 vs 4) or not (3 vs 4). Stimuli in the different-length condition may be number/length-congruent (the number with more digits started with a bigger number: 2384-107) or number/length-incongruent (the number with more digits started with a smaller number: 2675-398). Multiple comparisons (Bonferroni-corrected) indicated better responses to pairs of different length than to pairs of the same length. Within the former condition performance was better in number/length-congruent pairs. Moreover, in the number/length-incongruent condition participants performed better than in those conditions with the same number of digits. This indicates the precedence of this rule over the single-digit comparing rule. In a second experiment, we explored to what extent the processing of the number of digits is automatic. Using the same stimuli we requested the participants to focus only in the first digit of each multi-digit and to decide which one was bigger (e.g., in the length-congruent pair 2384-107 participants should press the left key as 2 is bigger than 1; in the length-incongruent pair 2675-398 participants should press the right key as 3 is bigger than 2). Again, a congruity effect was found. Results indicated that second graders process the number of digits even though it is irrelevant for the task at hand.