

Automatic processing of number identity and place-value in multi-digit numbers

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The Arabic numerical system employs two dimensions to create multi-digit numbers: digits symbols and place-value. The present research explores in two numerical Stroop experiments to which extent number identity and number place-value processing is automatic in four-digit numbers. Whereas the automatic coding of place-value has been stated previously (see Kallai & Tzelgov, 2012), this has been studied in isolation using similar numbers (e.g., 0400-0040). Experiment 1 explored the access to numbers identity. Fifty-five volunteers were presented with pairs of four digit numbers that differed in one number (e.g., 0200-0400). They had to decide which number string was presented in bigger font size. Congruity between the physical size and the numerical value, distance between the numbers, and position of the discrepant numbers within the string, were manipulated. Results revealed congruity effects that were modulated by distance and position. Experiment 2 (N=90) jointly manipulated size congruity at the place-value (PV) and at the number identity (NI) dimensions (e.g., congruent NI & PV: 0100-5000; congruent NI & incongruent PV: 1000-0500; incongruent NI & congruent PV: 0500-1000; incongruent NI & incongruent PV: 5000-0100). Data analyses indicated an interaction between place-value and identity showing the automatic and simultaneous processing of both dimensions in four-digit numbers.

Kallai, A.Y., & Tzelgov, J. (2012). The place-value of a digit in multi-digit numbers is processed automatically. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38, 1221-1233. doi: 10.1037/a0027635.