

# Supporting Information

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## SI Text

**Analysis of Possible Interactions between Side of Response and Congruency or Pitch.** Humans tend to associate certain types of information (e.g., numbers, temporal sequences) with locations in space (1, 2); for example, higher-pitched sounds are typically matched to higher spatial locations (3). In our task, participants had to respond by touching buttons on the left or right of the screen. Thus, it is possible that the side of response (left/right) interacted with the congruency effect, or with pitch or color. For example, the congruency effect might be expressed more strongly for responses on the left or right side. As another example, subjects might have performed better when responding left on hearing a low-pitched sound and better when responding right on hearing a high-pitched sound.

In exploratory analyses, we assessed whether the required side of response (left, right) interacted with congruency or with pitch. It was not possible to test for interactions of side with color. That is because for half of the subjects the white response button was always left and the black response button was always right, whereas for the other half of the subjects the opposite mapping applied (i.e., response buttons did not change location for individual subjects throughout the entire experiment). Thus, the group sizes in chimpanzees with a certain side-color mapping (white-left or black-left) were too small for a between-subject comparison ( $n = 3$  in each group). Moreover, it is likely that any potential natural mappings between color and side would have been overridden by the training sessions in which participants constantly had to respond on the same side when seeing a particular color.

**Side × Congruency.** This analysis served to test for interactions between side and congruency. We calculated the inverse efficiency (IE) scores for congruent and incongruent trials separately for those trials that required a left-side response and for those trials that required a right-side response. For both species, we then performed repeated-measures ANOVA with the calculated values with the within-subject factors side (left or right) and congruency (congruent or incongruent). In general, humans performed better in trials requiring a response on the right [ $F(1,32) = 174.095$ ;  $P < 0.001$ ]. In contrast, there was no main effect of side for chimpanzees [ $F(1,5) = 1.299$ ;  $P = 0.31$ ]. This difference is likely due to the fact that all humans were right-handed, whereas not all chimpanzees were. Importantly, however, neither species demonstrated an interaction of congruency with required side of response [chimpanzees:  $F(1,5) = 0.409$ ,  $P = 0.55$ ; humans:  $F(1,32) = 0.257$ ,  $P = 0.62$ ]. In other words, the congruency effect was similarly strong in trials requiring a response on the left side compared with trials requiring a response on the right side.

**Side × Pitch.** This analysis served to test for interactions (i.e., possible mappings) between side and pitch. For this, we calculated the IE scores for trials with high pitch and for trials with low pitch separately for those trials that required a left-side response and those that required a right-side response. We then carried out repeated-measures ANOVA for both species with these values with the within-subject factors side (left, right) and pitch (high, low). There were no interactions of pitch with side [chimpanzees:  $F(1,5) = 0.213$ ,  $P = 0.66$ ; humans:  $F(1,32) = 0.067$ ,  $P = 0.80$ ]. There also were no main effects of pitch [chimpanzees:  $F(1,5) = 0.751$ ,  $P = 0.43$ ; humans:  $F(1,32) = 0.078$ ,  $P = 0.78$ ].

1. Dehaene S, Bossini S, Giraux P (1993) The mental representation of parity and number magnitude. *J Exp Psychol Gen* 122:371–396.
2. Gevers W, Reynvoet B, Fias W (2003) The mental representation of ordinal sequences is spatially organized. *Cognition* 87:B87–B95.

3. Walker P, et al. (2010) Preverbal infants' sensitivity to synaesthetic cross-modality correspondences. *Psychol Sci* 21:21–25.

**Table S1. Average IE scores for trials of each color-pitch combination for humans and chimpanzees**

	<i>n</i>	White and high pitch (congruent)	White and low pitch (incongruent)	Black and high pitch (incongruent)	Black and low pitch (congruent)
Humans	33	653 ± 97	663 ± 90	673 ± 118	661 ± 122
Chimpanzees	6	686 ± 138	703 ± 136	752 ± 81	720 ± 70

Values are mean ± SD IE, the median reaction time for correct trials for a condition/proportion correct for that condition. A lower IE score indicates better performance. Overall number of trials for humans, 160; for chimpanzees, 480.

