Perceived timing across modalities

Massimiliano Di Luca, Tonja Machulla, Marc Ernst
Max Planck Institute for Biological Cybernetics, Germany

max@tuebingen.mpg.de

Abstract
Crossmodal stimuli can be perceived as being simultaneous even if they are not physically synchronous. This phenomenon has been attributed to different conduction delays. In this work we tested whether time in different modalities is processed independently or if crossmodal interaction influence the perception of synchrony. (1) If unimodal timing is processed independently, perceived simultaneity across modality pairs should be Transitive. For example, if modality A has to be presented 20ms before modality B to appear simultaneous and modality B 10ms before modality C, then A should be presented 30ms before C to appear simultaneous. Subjects made Temporal Order Judgments (TOJ) of asynchronous signals in three modality pairs (audio-visual, audio-tactile, visual-tactile). The Point of Subjective Simultaneity (PSS) calculated for each modality pair are not transitive, indicating that perceived time is not processed independently in each modality. (2) It has been shown that PSS of audio-visual signals can be recalibrated by the repeated presentation of asynchronous stimuli. It is not clear whether this effect is the result of an adaptation mechanism specific to the audio-visual modality pair or whether it is due to a common crossmodal mechanism. Using the same type of measurements, we show that PSS following presentation of an asynchronous audio-visual stimulus is not constant in the audio-tactile modality pair. Hence, crossmodal timing is also affected by a common adaptation mechanism. Since PSS for visual-tactile stimuli was not affected, audio-visual adaptation effects are likely the result of a phenomenal shift of the auditory events in time. Our results indicate that perceived timing in one modality depends on which other modality this is paired with and that perceived simultaneity changes also for non adapted modality pairs. These results are not consistent with independent-channels models of crossmodal timing, but they rather indicate that time perception is affected by crossmodal interactions.

Left to right: Representational biases for numbers and the effect of visuomotor adaptation

Andrea M. Loftus[1], Michael E.R. Nicholls[1], Jason B. Mattingley[2], John L. Bradshaw[3]
School of Behavioural Science, University of Melbourne[1]; Queensland Brain Institute & School of Psychology, University of Queensland[2]; School of Psychology, Psychiatry and Psychological Medicine, Monash University[3], Australia

aloftus@unimelb.edu.au

Abstract
Visuomotor adaptation to right-shifting prisms improves left neglect for mental number line bisection. This study examined whether visuomotor adaptation affects the mental number line in normal participants. Thirty-six normal participants completed a mental number line task before and after adaptation to either: left-shifting prisms, right-shifting prisms or control spectacles that did not shift the visual scene. Participants were presented with visual number triplets (e.g. 16, 36, 55) and determined whether the numerical distance was greater on the left or right side of the inner number. Normal participants demonstrated a leftward bias (i.e. overestimated the length occupied by numbers located on the left side of the number line) that was corrected by a short period of visuomotor adaptation to left-shifting prisms. In contrast, this bias was unaffected by adaptation to right-shifting prisms and control spectacles. The findings demonstrate that a simple visuomotor task can alter the perception of space on the mental number line in normal participants, and lead us to suggest a functional anatomical link between the neural substrates involved in number and space representation and those involved in visuomotor adaptation.