Previous Abstract

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Analysis of Multisensory Interactions in Functional Brain Imaging Data

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The brain integrates information across different sensory systems. One mechanism by w
multisensory integration occurs is convergence of different sensory systems on common
brain areas. However convergence of activations does not necessarily result in multisens
integration: the different activations must also interact with each other. Our aim is to
investigate how the method used for analyzing interaction can affect the results and
interpretation of multisensory experiments.
Interactions between sensory modalities in functional brain recordings have been typical
studied by comparing the sum of unimodal activations with multisensory activation. For
example, in an audiovisual experiment, if the sum of unimodal auditory and visual
activations (A+V) equals to the activity evoked by audiovisual activation (AV), then the
no proof of interaction, but if (A+V) and AV differ from each other, this suggests that th
auditory and visual activations interact. This type of additivity analysis has been widely
applied to functional brain imaging data from electrophysiological and recently also fron
haemodynamic recordings.
From a purely statistical point of view, interactions should be preferably analyzed using
factorial analysis of variance (ANOVA), because when interaction is present, additive
techniques are considered inappropriate. In factorial ANOVA, the interaction term reflec
the individual factors (responses to unimodal A and V stimuli) can predict the combined
effect of factors (responses to AV stimuli). For example, in an audiovisual experiment, t
four types of stimulus events (no stimulus / unimodal A / unimodal V / bimodal AV) can
analyzed in a 2x2 factorial ANOVA design.
Factorial ANOVA interaction is related to additivity interaction, but the two methods ca
produce different results. Here we compare the additivity and factorial ANOVA interact
using simulated and real multisensory human functional magnetic resonance imaging (fl
and magnetoencephalographic/electroencephalographic (MEG/EEG) data.