Conditional deviant repetition in the oddball paradigm modulates processing at the level of P3a but not MMN

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Abstract

The auditory system has an amazing ability to rapidly encode auditory regularities. Evidence comes from the popular oddball paradigm, in which frequent (standard) sounds are occasionally exchanged for rare deviant sounds, which then elicit signs of prediction error based on their unexpectedness (e.g., MMN, P3a). Here, we examine the widely neglected characteristics of deviants being bearers of predictive information themselves: Naïve participants listened to sound sequence constructed according to a new, modified version of the oddball paradigm including two types of deviants that followed diametrically opposed rules: one deviant sound occurred mostly in pairs (repetition rule), the other deviant sound occurred mostly in isolation (non-repetition rule). Due to this manipulation, the sound following a first deviant (either the same deviant or a standard) was either predictable or unpredictable based on its conditional probability associated with the preceding deviant sound. Our behavioural results from an active deviant-detection task replicate previous findings that deviant repetition rules (based on conditional probability) can be extracted when behaviourally relevant. Our electrophysiological findings obtained in a passive-listening setting indicate that conditional probability also translates into differential processing at the P3a level. However, MMN was confined to global deviants and was not sensitive to conditional probability. This suggests that higher-level processing concerned with stimulus selection and/or evaluation (reflected in P3a) but not lower-level sensory processing (reflected in MMN) considers rarely encountered rules.

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