

When the beat goes wrong: the effects of visual feedback on the feedback ERN in rhythm perception

*Meeuwissen EB, Jongsma MLA, Hijdra V, De Bruijn ERA\**

Department of Biological Psychology, \*Department of Cognitive Psychology, Nijmegen Institute for Cognition and Information (NICI), University of Nijmegen, Nijmegen

The error-related negativity (ERN) is an ERP component, commonly observed when subjects commit an error in a choice reaction task. Although the exact process underlying the ERN is still a matter of debate, it is thought to reflect the outcome of an error detection mechanism. The ERN can be elicited by an incorrect response or by negative feedback. The latter is referred to as the feedback ERN. In the current study, we investigated the feedback ERN in a rhythm perception task.

Trials containing five auditory beats were presented. The last beat was either accelerated or decelerated compared to the preceding beats and difficulty was manipulated by varying the amount of acceleration or deceleration (0%, 2%, 5% or 10%). ERPs and behavioral measurements were obtained while participants decided whether the last beat was accelerated or decelerated by pushing a button with their left or right index finger. One group of participants received feedback corresponding to their response (experimental group, N=21), while another group received feedback independent of their response (yoked control group, N=20).

When participants received feedback indicating that the given response was wrong, a large feedback ERN was present ( $p < .001$ ). This feedback ERN did not differ between the two groups and was also not affected by difficulty. The behavioral data showed that performance decreased with increasing difficulty ( $p < .001$ ) and that the experimental group performed better than the yoked control group ( $p = .010$ ).

The results show that a feedback ERN is elicited by negative feedback in the current paradigm. Also, the feedback ERN seems to be determined by the content of the feedback, more so than by the correctness of the response. These results will be discussed in relation to previous feedback ERN studies, existing theories, and the use of different paradigms.

Marijtje Jongsma, Nijmegen Institute for Cognition and Information (NICI), Department of Biological Psychology, University of Nijmegen, Postbus 9104, 6500 HE Nijmegen, t 024 3616278, e-mail [jongsma@nici.kun.nl](mailto:jongsma@nici.kun.nl)

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