Feedback-related negativity reflects the evaluation based on the one’s own criteria

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**Introduction**

- **Feedback-related negativity (FRN)**
  - An event-related brain potential (ERP) component, reflecting the evaluation of whether the outcome is good or bad.

- **Involvement with “Mirror” Error Monitoring System??**
  - Elicitation of the FRN in observation of other’s error responses or monetary losses (Milner et al., 2004., van Schie et al., 2004., Yu & Zhou, 2006).
  - These studies were conducted in the situation where other’s outcome had no relation to the participant’s reward.

- **Purpose**
  - To investigate the evaluation process of outcomes induced by self and others, using ERP.
  - To investigate how the evaluation process is modulated in the situation where the outcomes affect each other.

  - Exp.1: The relationship between self and others was corporative.
  - Exp.2: The relationship between self and others was antagonistic.

**Methods**

- **Task & Procedure (common in Exp.1 & 2)**
  - Alternative gambling game by participant and virtual others.
  - Each trial had the bet of 100 Japanese yen (100 yen ≈ 0.83 US $).
  - In participant turns: Gain of 100 yen or Loss of 100 yen

- **Topography of participant’s loss – gain difference waves**

  - Participants, Task, & Procedure (Exp.1)
    - Participants: 12 young adults (male:6, female: 6)  
    - Partner’s gains ⇒ Participant’s gains, Partner’s losses ⇒ Participant’s losses.

  - Participants, Task, & Procedure (Exp.2)
    - Participants: 13 young adults (male:7, female: 6)
    - Opponent’s gains ⇒ Participant’s gains.

- **EEG Recording & Analysis (common in Exp.1 & 2)**
  - Elicitation of the FRN in response to (1) Losses of Self, (2) Losses of Opponent in exp.2.
  - The FRN was sensitive to one’s own monetary losses.

**Results**

- **Exp. 1**
  - Probability of “Gain”  
    - Self: 41–55 % (M = 48 %)  
    - Partner: 43–57 % (M = 49 %)

  - **Monetary outcomes**
    - -2,000 – 2,600 yen (M = 167 yen, SD = 1,675 yen)

  - **Grand averaged ERPs**
    - Fz

- **Exp. 2**
  - Self: 45–56 % (M = 49 %)  
  - Opponent: 44–57 % (M = 50 %)

  - **Monetary outcomes**
    - -2,000 – 3,600 yen (M = 523 yen, SD = 1,542 yen)

  - **Grand averaged ERPs**

**Discussion**

- Elicitation of the FRN in response to (1) Losses of Self (Exp.1 & 2), (2) Losses of Partner (Exp.1), & (3) Gains of Opponent (Exp.2).
  - The FRN was sensitive to one’s own monetary losses.
  - The outcomes induced by others were regarded as good or bad things for one’s own evaluative criteria.
  - The FRN reflects self-relevant outcome monitoring rather than “mirror” system.

- Smaller FRN induced by others (partner & opponent) than participant’s own, in spite of the same bets.
  - Although the evaluation process was activated without participant’s own choice actions, discrimination between self and others affects the evaluation process.

**Conclusion**

- The self-relevant criteria determine the evaluation of outcomes induced by others.
- The commitment to the outcomes by the response enhances the evaluative process.