

# Do Different Learning Intentions Affect Neural Reactivity in Feedback Processing?

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## Objectives

- Investigating whether learners' different achievement goals, mastery oriented goal and performance-approach oriented goal, affect their tendency to approach high challenging tasks.
- Investigating whether learners' different achievement goals affect quality of task performance.
- Investigating the different neural activities between correct and incorrect feedback processing.
- Investigating whether mastery oriented learners and performance-approach oriented learners show different neural reactivity in correct and incorrect feedback processing.

## Theoretical background

- Achievement goals: learner's intention of learning**
  - Three types of achievement goals
    - Mastery goal**
      - Approach learning to enhance abilities and skills
      - Focus on understanding and progress
      - Increasing intrinsic motivation
      - Positive effect on task performance
    - Performance-approach goal**
      - Approach learning to prove high abilities and skills
      - Focus on success and outperforming
      - Decreasing intrinsic and increasing extrinsic motivation
      - Discrepancy in the effect on task performance
    - Performance-avoidance goal**
      - Avoid learning not to show low abilities and skills
      - Worrying about failure and poor performance
      - Negative effect on motivation
      - Negative effect on task performance

## Study 1 (behavioral study)

### Method

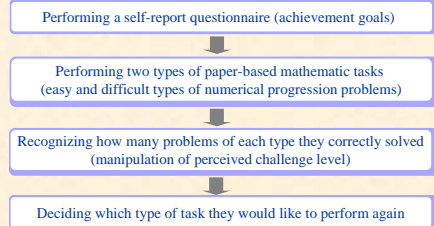
#### Participants

- 161 (69 males & 92 females) university students attending introductory psychology classes of a university in Korea.
- Data of 152 students were obtained.
- Data of 9 students were excluded due to the omitted responses.

#### Experimental design

- Independent variable: achievement goals (mastery vs. performance-approach)
- Dependent variable: choice of the future task (easy vs. difficult task), the number of correct answers (easy vs. difficult task)

#### Procedure

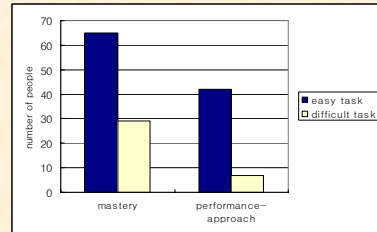
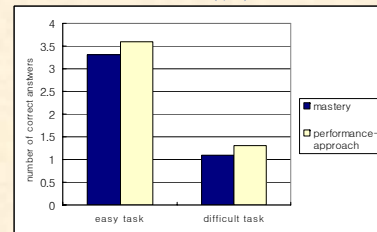


#### Task

- Filling the correct number in the blank
  - 4 easy numerical progression problems ex. 2, 4, 8, 16, ( ), 64
  - 4 difficult numerical progression problems ex. 1, 3, 5, 7, ( ), 131

### Result

- Both groups showed better performance in the easy task than did in the difficult task ( $F_{(1,141)} = 787.77 ; p < .05$ ).
- No significant difference between mastery and performance groups in the number of correct answers of the easy and difficult tasks ( $F_{(1,141)} = 3.45 ; p > .05$ ).
- Mastery group chose difficult task more than performance-approach group ( $\chi^2_{(1)} = 4.69, p < .05$ ).



### Discussion

- The fact that both groups showed better performance in the easy task means that the manipulation worked well.
- Mastery group approached difficult task than performance-approach group did.
  - This result was not caused by their performance quality (no significant difference between both groups).
  - It means that mastery oriented learners seek challenge more than performance-approach oriented learners.

## Study 2 (fMRI study)

### Method

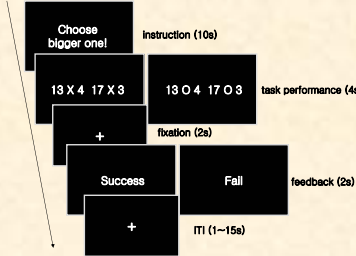
#### Participants

- There are 17 mastery oriented & 21 performance-approach oriented participants satisfying criteria (ex. high performance, theoretically relevant choice pattern, the result of self-report questionnaire) among participants of study 1.
- 26 (13 mastery and 13 performance approach) right-handed and healthy volunteers participated.

#### Experimental design

- Event-related fMRI design
  - Between factor: achievement goals (mastery vs. performance-approach)
  - Within factor: type of feedback (correct vs. incorrect)

#### Procedure



#### Scan parameters

- 25 slices (5mm thickness) with no gap [3T (ISOL), TR=2000ms, TE=35ms, flip angle=60°]

#### SPM 5 Analysis: using random effect model

- One-sample t-tests ( $p < .001$  uncorrected,  $k=0$ , inclusively masked)
- Examining signal changes by comparing each eigenvariate value

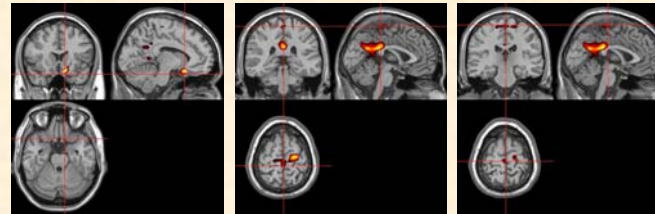
### Results

#### Behavioral results

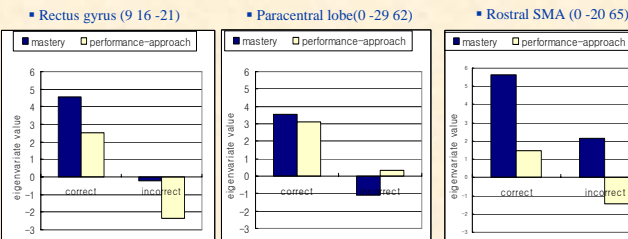
- No significant difference ( $F_{(1,24)} = 0.056, p > .05$ ) in the accuracy rate of the task between the mastery group ( $M=63.5\%$ ,  $SD=12.94$ ) and the performance-approach group ( $M=64.5\%$ ,  $SD=8.88$ )

#### Results of imaging data

- One sample t-tests of imaging data (correct-incorrect feedback)
  - Rectus gyrus (9 16 -21)
  - Paracentral lobe(0 -29 62)
  - Rostral SMA (0 -20 65)



#### Comparisons of each eigenvariate value



### Conclusions

- Similar accuracy rate of the task between two groups**
  - Positive effects of performance-approach goal in the results of the task performance (performance oriented tasks)
- More brain activation (correct > incorrect feedback)**
  - Consistent with previous studies (more brain activations in positive feedback than in negative one)
  - Possibility of involvement of dopaminergic brain areas!
- Activation in rectus gyrus**
  - Increased activation in rectus gyrus: intense joy after performing tasks<sup>2</sup>
  - Decreased activation in rectus gyrus: negative emotion (depression)
  - Mastery oriented learners: higher joy (positive feedback), protecting self from negative emotions (negative feedback)
  - Performance-approach oriented learners: vulnerable to negative emotions (negative feedback)
- Activation in paracentral gyrus**
  - Working memory & attentional control<sup>3</sup>
  - Both groups: higher attention in positive feedback than negative one
- Activation in rostral supplementary motor area**
  - Higher order cognitive functioning (motor & non-motor tasks)
  - Mastery oriented learners: more cognitive functioning (positive & negative feedbacks, especially higher in positive feedback)
  - Performance-approach oriented learners: less cognitive functioning (positive & negative feedback, especially vulnerable in negative feedback)

### References

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