An ERPs Study with Information Process Theory on Stereochemistry Education

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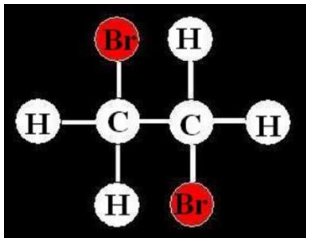
Background

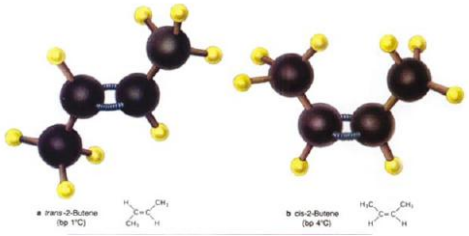
- Difficulties of visuospatial thinking in chemistry learning.

  - Observable level vs. Molecular level

  - 2D vs. 3D

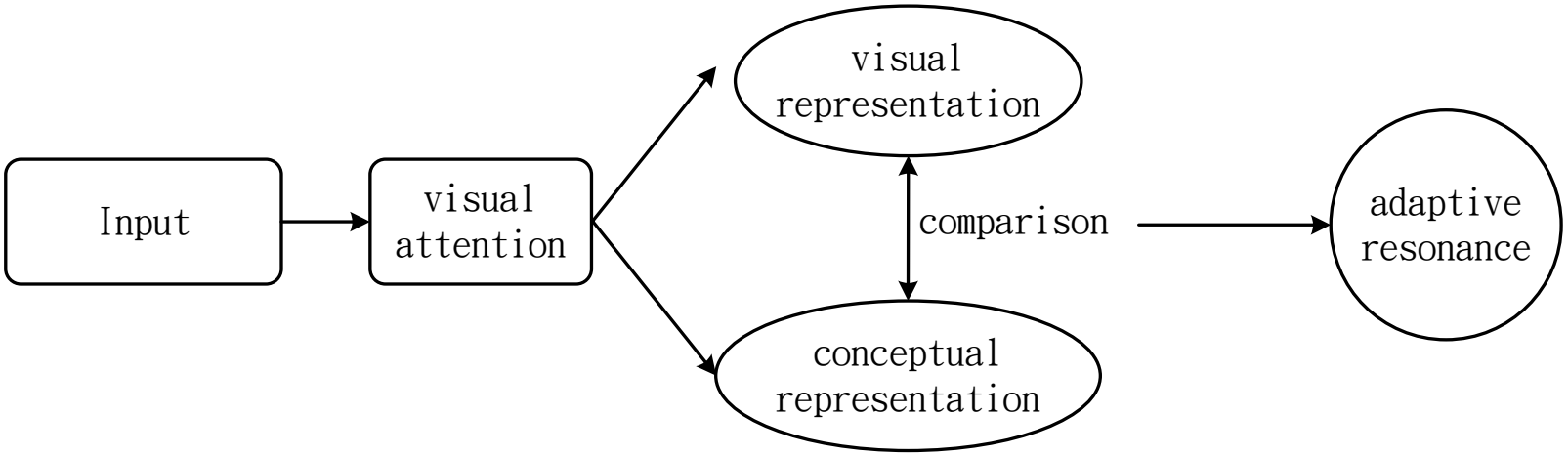
  - the meaningful of symbolic





(Gilbert, Reiner & Nakhelh, 2008; Nahum, Hofstein, Mamlok-Naaman & bar-Dov, 2004; Wang, Chiew & Zhong, 2010; Wu & Shah, 2004)

Information process theory about stereochemistry cognition



(Huang, Lin & Liu, 2010; Liu, Huang & Chou, 2010; June; Wang, Chiew和 & Zhong, 2010)

Participants

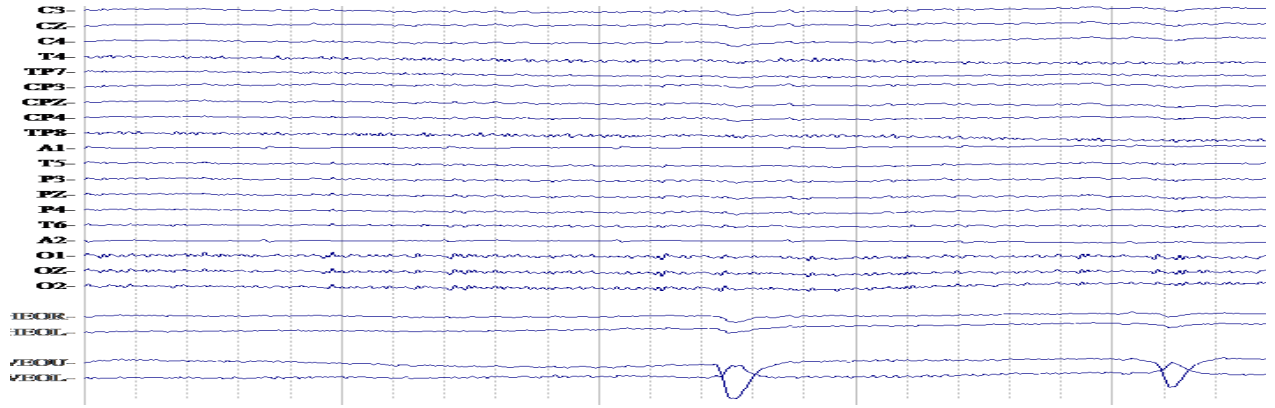
- Eighteen healthy participants (mean age: 21.2 ± 4.3)

  - High scores group (HSG)

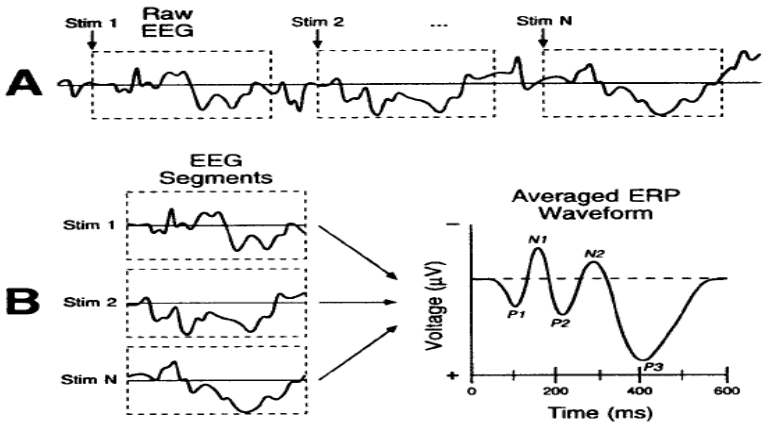
  - Low scores group (LSG)
- All participants were science majored students
- corrected-to-normal visual acuity
- All of them had no history of neurological or psychiatric disorders
- They all gave their informed and written consent to join this research

Methodology

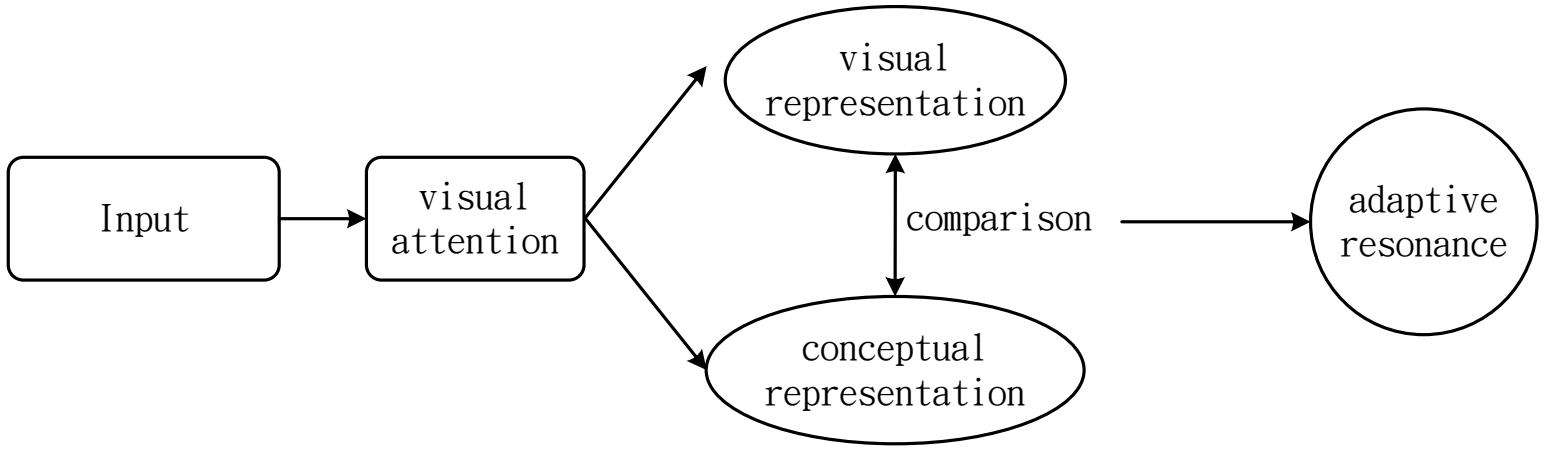
- EEG (Electroencephalogram)



- ERPs (Event-related potentials)



Hypothesis



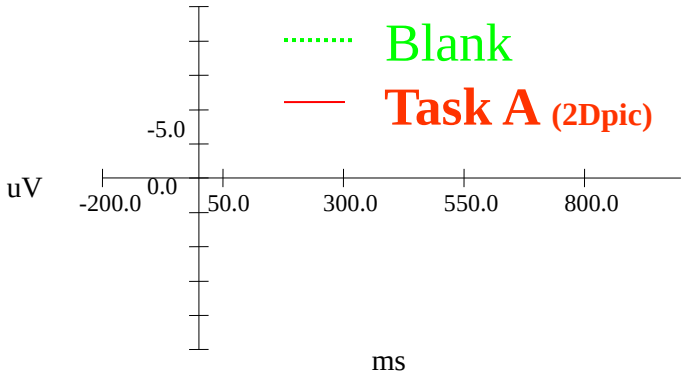
1. There is no significant difference between HSG and LSG on visual attention by ERPs analysis.
   - criteria:
     a. ERPs component N170
     b. O1 & O2 electrodes
2. There is significant difference on comparison of visual and conceptual representations between HSG and LSG by ERPs analysis.
   - criteria:
     a. Rotation-Related Negativity
     b. C3, Cz. C4 electrodes

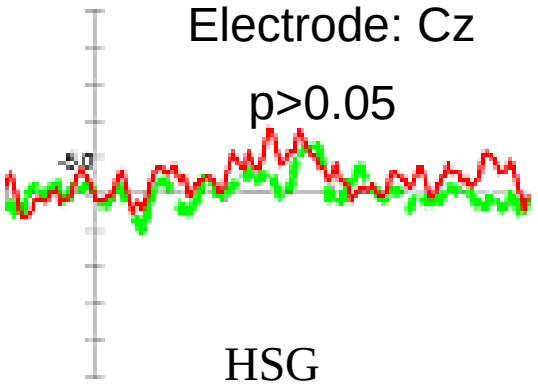
Mean RT for each task in the HSG and LSG

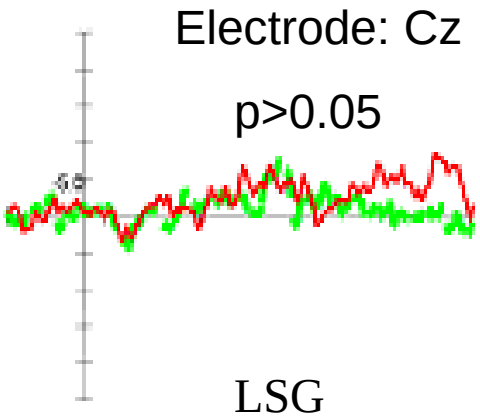
Variable	HSG Mean RT and S.D.		LSG Mean RT and S.D.		t-score	P
blank Task	736.6	15.5	742.1	14.7	-.45(NS)	0.68
Task A	935.9	4.5	823.8	30.5	6.30*	0.00
Task B	1334.7	267.8	830.6	40.1	3.22*	0.03

* reach 0.05 significance level

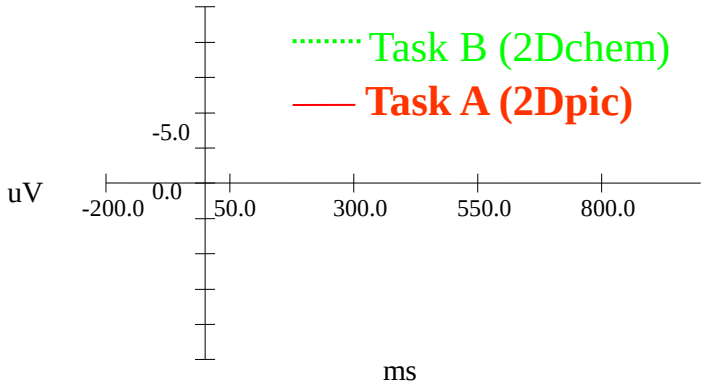
Blank vs. Task A

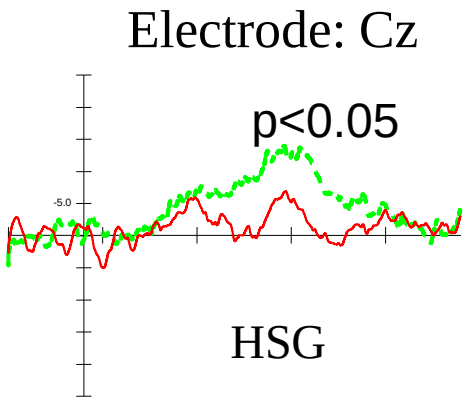


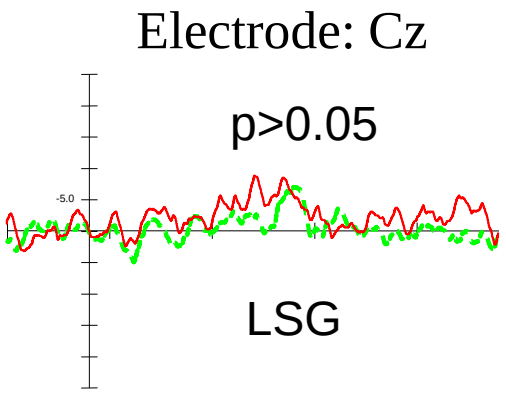




Task A vs. Task B







ERPs analysis

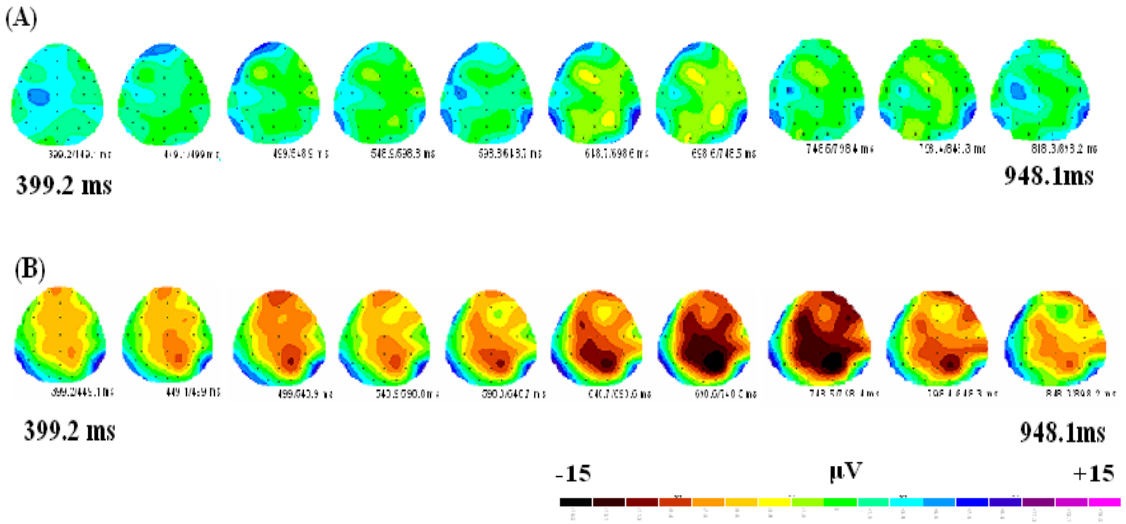
Variable	HSG Mean potentials (S.D.)	LSG Mean potential (S.D.)	t-score	p
Blank Task	5.8 (3.3)	8.7 (7.8)		
Task A	2.5 (5.3)	6.6 (6.1)		
Task A – blank	-3.3 (5.2)	-2.1 (2.0)	-0.8	0.44
Task B	-3.0 (5.6)	7.4 (4.8)		
Task B – Task A	-5.5 (2.7)	0.8 (3.6)	-3.3*	0.00

* reach 0.05 significance level

Brain Activity：Task B – Task A

LSG

HSG



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Thank you

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