



## Novel Grammatical Knowledge Causes Shifts in Both Attentional and Pre-attentive Visual Processing: ERP Evidence for Linguistic Relativity

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### Background and Research Questions

- Linguistic relativity hypothesis: language is a pervasive cause of variations in our perception of the world (Whorf, 1956)
- Linguistic universal view: different surface forms of world languages are just the different products of universal human experience and cognitive machinery (Pinker, 1994)
- Previous cross-linguistic studies on grammar-based linguistic relativity effects cannot establish causality, especially the direction of causality
- RQ1: Beyond vocabulary and metaphors, can brief grammatical training also *cause* a linguistic relativity effect?**
- RQ2: If yes, how deep is this effect? Does it span both attentional and pre-attentive visual processing?**

### Participants

Fifty-seven Mandarin L1 – English L2 speakers (Intermediate-to-high L2 proficiency; started learning English no later than 6 years old and have passed the English exam in the China national university entrance examination) randomly allocated to two groups: Experimental group ( $N = 30$ ,  $M_{age} = 21.17$ ,  $SD = 2.05$ , 15 females); and Control group ( $N = 27$ ,  $M_{age} = 20.89$ ,  $SD = 1.91$ , 13 females)

### Overview of Procedures

#### Step 1: training

**Form-focused experimental group ( $N = 30$ )**  
Instruction to try and figure out a novel grammar of *gi/ro* usage from 128 sentences exemplifying 2 novel transitivity markers: *gi* prefixes intransitive verbs; *ro* prefixes transitive verbs

**Form-focused control group ( $N = 27$ )**  
Instruction to try and figure out a novel grammar of *gi/ro* usage from 128 sentences in which *gi* and *ro* were used interchangeably

**Step 2:**  
Overnight consolidation

**Step 3:**  
96 grammaticality judgments (GJT)

**Step 4:**  
“Colleague manipulation”

**Step 7:**  
Debriefing

**Step 6:** Pre-attentive oddball task (following Flecken et al., 2015 & Pazo-Alvarez et al., 2004)

**Step 5:**  
Attentional oddball task (following Flecken et al., 2015)

#### Step 1: training

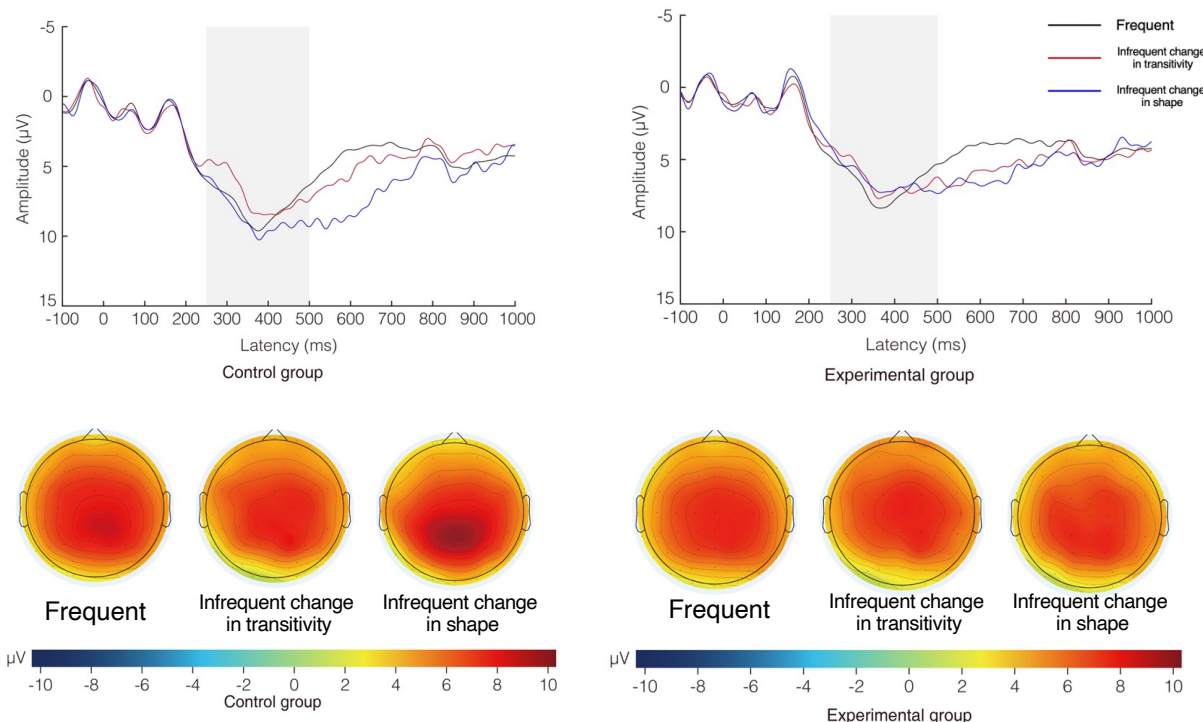
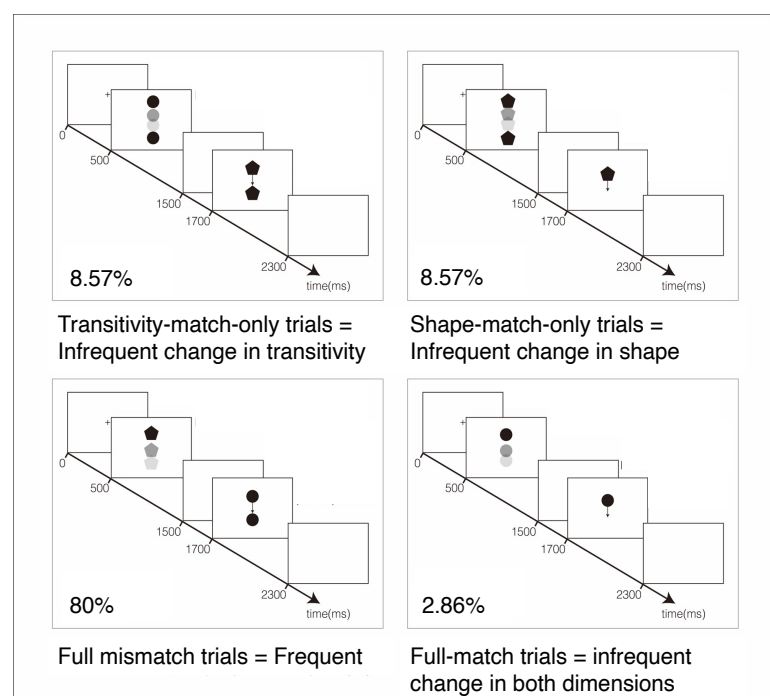
Training sentences for the experimental groups	“Training” sentences for the control groups
一大早, 地主 把庄稼 <b>ro</b> 收割 了。 Early morning, landlord ACC-crop <b>ro</b> collect le-PST.	一大早, 地主 把庄稼 <b>gi</b> 收割 了。 Early morning, landlord ACC-crop <b>gi</b> collect le-PST.
空空的教室 里, 刻苦的 学生 把作业 <b>ro</b> 完成 了。 Empty classroom in, hardworking student ACC-homework <b>ro</b> complete le-PST.	空空的教室 里, 刻苦的 学生 把作业 <b>ro</b> 完成 了。 Empty classroom in, hardworking student ACC-homework <b>ro</b> complete le-PST.
前一夜, 狡猾的 囚犯 <b>gi</b> 逃窜 了。 Last night, cunning prisoner <b>gi</b> escape le-PST.	前一夜, 狡猾的 囚犯 <b>gi</b> 逃窜 了。 Last night, cunning prisoner <b>gi</b> escaped le-PST.
重伤的 乘客 <b>gi</b> 生还 了。 Seriously injured passenger <b>gi</b> survive le-PST.	重伤的 乘客 <b>ro</b> 生还 了。 Seriously injured passenger <b>ro</b> survive le-PST.

#### Step 3: Ninety-six grammaticality judgments (GJT)

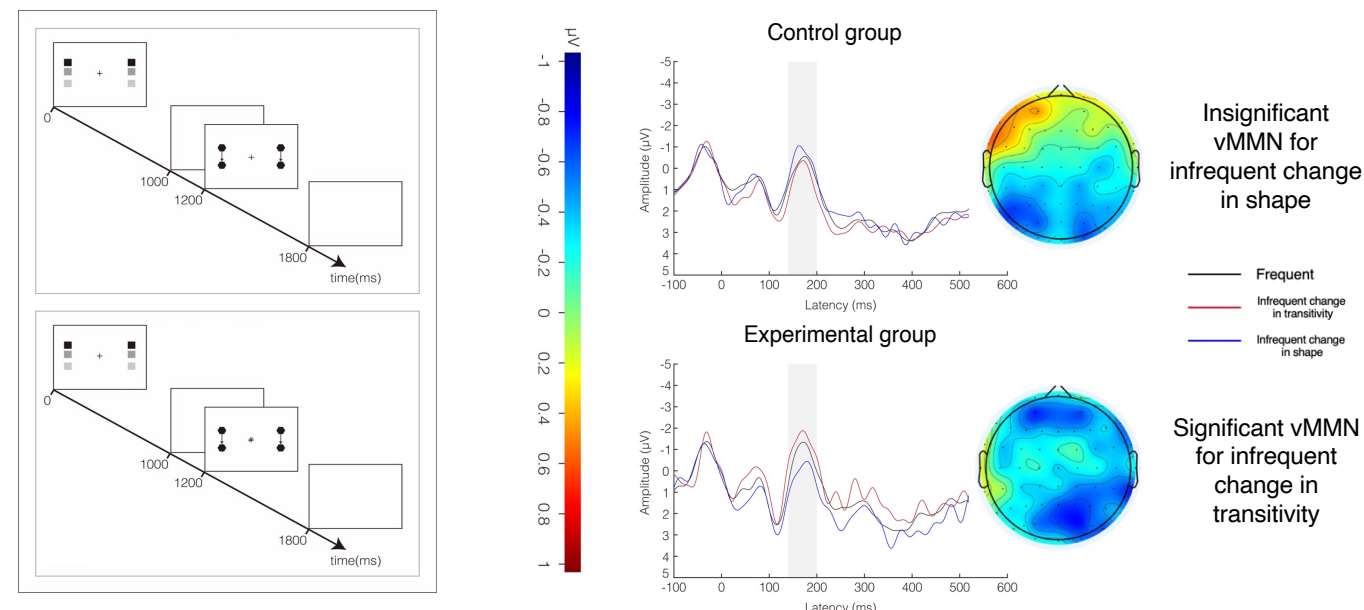
Topographic maps of the ungrammatical-minus-grammatical difference wave:



#### Step 5: the first (attentional) oddball task



#### Step 6: the second (pre-attentive) oddball task



### Discussion and Conclusion

- Brief grammatical training can cause a linguistic relativity effect;
- This effect is deep, spanning both attentional and pre-attentive visual processing
- This effect is unconscious, because the “colleague manipulation” disguised the relationship between the grammar training and the non-linguistic oddball tasks, and no participant realized that they were related in any way
- Future research can investigate whether the novel-grammar-induced linguistic relativity effect can be modulated by (1) instructional conditions of the grammar, (2) grammatical representational stages as indexed by ERP patterns (e.g., P600 + LAN vs. N400), and (3) awareness of the grammar, etc.

