MICHIGAN STATE UNIVERSITY

Beyond boundaries: Combining methodological approaches to research on acquisition of explicit and implicit knowledge under incidental conditions

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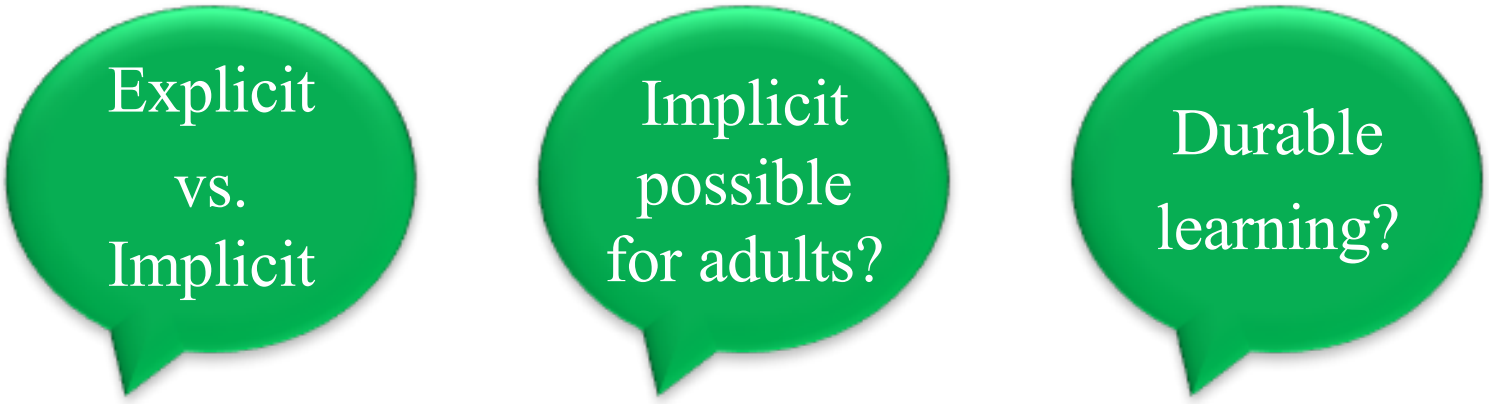
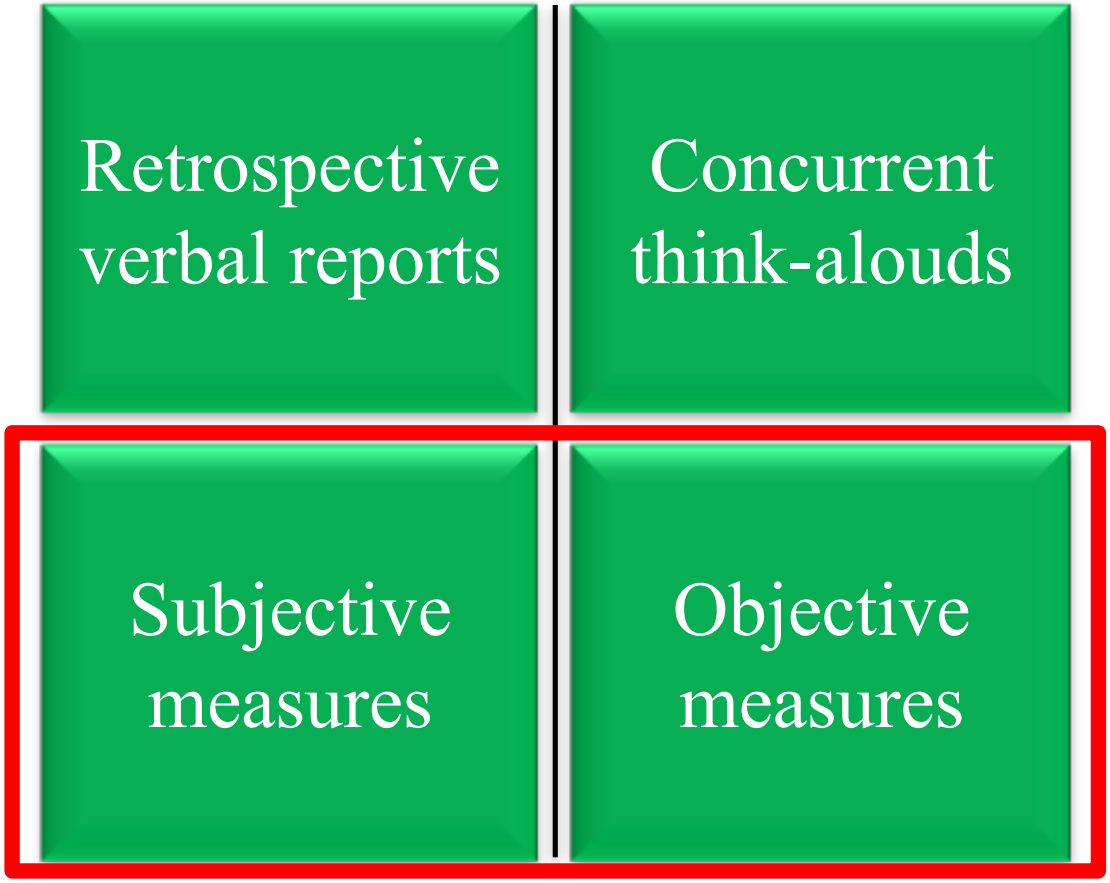
A question?

To what extent do adult learners develop explicit and implicit knowledge (EK and IK thereafter) from brief incidental exposure to L2?



Diverse Methodological Approaches



Diverse Methodological Approaches

Subjective Measures of Awareness

Confidence ratings and source attributions

Knowledge is implicit if

- Confidence is *not correlated* with accuracy of performance (i.e., the zero-correlation criterion)
- Participants perform above chance when they in fact claim that they are *guessing* (i.e., the guessing criterion)

(Dienes, 2008, 2012; Dienes & Scott, 2005; Rebuschat, 2013)

Diverse Methodological Approaches

Subjective Measures

The subjective measures often identify participants having acquired ***both*** EK and IK

e.g.,

- Chan & Leung (2018)
- Grey, Williams, & Rebuschat (2014)
- Kachinske, Osthus, Solovyeva, & Long (2015)
- Rebuschat & Williams (2012)
- Rogers, Révész, & Williams (2016)

Diverse Methodological Approaches

Problems involving subjective measures

- Response bias (e.g., Rebuschat, 2013)
  - Participants may systematically claim that they are guessing even though they have some degree of awareness
  - *d*-prime metric based on signal detection theory can mitigate the problem (Kunimoto, Miller, & Pashler, 2001)
- Inconsistent with the recent validation studies of objective explicit and implicit knowledge measures

→What does this mean?

Diverse Methodological Approaches

Problems of the subjective measures

Confidence ratings and source attributions are often paired with a judgment task (e.g., GJTs).

- Suzuki (2017) and Vafaee, Suzuki, & Kachinske (2017) showed that GJTs, *even applied in a timed condition*, do not necessarily provide a good measure of IK
- The validation studies above adopted psycholinguistic measures of IK (e.g., a word-monitoring task)

To what extent subjective and objective measures align?

Research Questions

1. Do adult L2 learners develop EK and/or IK from brief incidental exposure measured by two objective outcome measures, U-AGJT and word monitoring task (WMT)?
2. To what extent do results from U-AGJT and WMT converge with or diverge from those of subjective measures of awareness?
3. Do the answers to research question 1 and 2 change after two weeks of delay with no exposure to the target language?

Participants

63 L1 speakers of English

- M_{age} = 19.47, SD_{age} = 1.78, *Min* = 18, and *Max* = 27
- No experience with Japanese nor any case-marking languages
- Data of 14 participants were excluded for various reasons

  Not coming back to delayed posttests, lack of focus, etc.
- 49 participants constituted the final sample

  Experimental group (n = 28) and Control (n = 21)

Methods

Language

A semi-artificial language, *Japlish*

OSV

That wall-o Mary-ga painted

"Mary painted the wall"

OSIV

The picture-o John-ga his friends-ni sent

"John sent the picture to his friends"

-ga: subject
-o: direct object
-ni indirect object

(Grey, Williams, & Rebuschat, 2014; Williams & Kuribara, 2008)

Methods

Language

A semi-artificial language, *Japlish*

OSSVV

The tuition-o Mary-ga her school-ga raised said

”Mary said her school raised the tuition”

OSSIVV

This document-o Mary-ga her colleague-ga their boss-ni faxed realized

“Mary realized that her colleague faxed this document to their boss”

-**ga**: subject

-**o**: direct object

-**ni** indirect object

Two simple word orders (WOs) , two complex WOs, and three case markers

Methods

Exposure

- 100 sentences of Japlish x 2 = 200 trials
- 50 items for each WO type
- Control group was exposed to sentences whose WOs and positions of case-markers were pseudo-randomized
  - Trained control group (Hamrick & Sachs, 2018)
- Presentation was auditory

Methods

Exposure

- Under incidental conditions = semantic verification task
  - Participants were told that the study was about comprehension of a new language just developed and used for research purposes
  - They were told that there would be tests but they were also told that the tests would be on comprehension
  - Following Hamrick and Sachs (2018)'s suggestion, the instruction was kept the same for the two groups

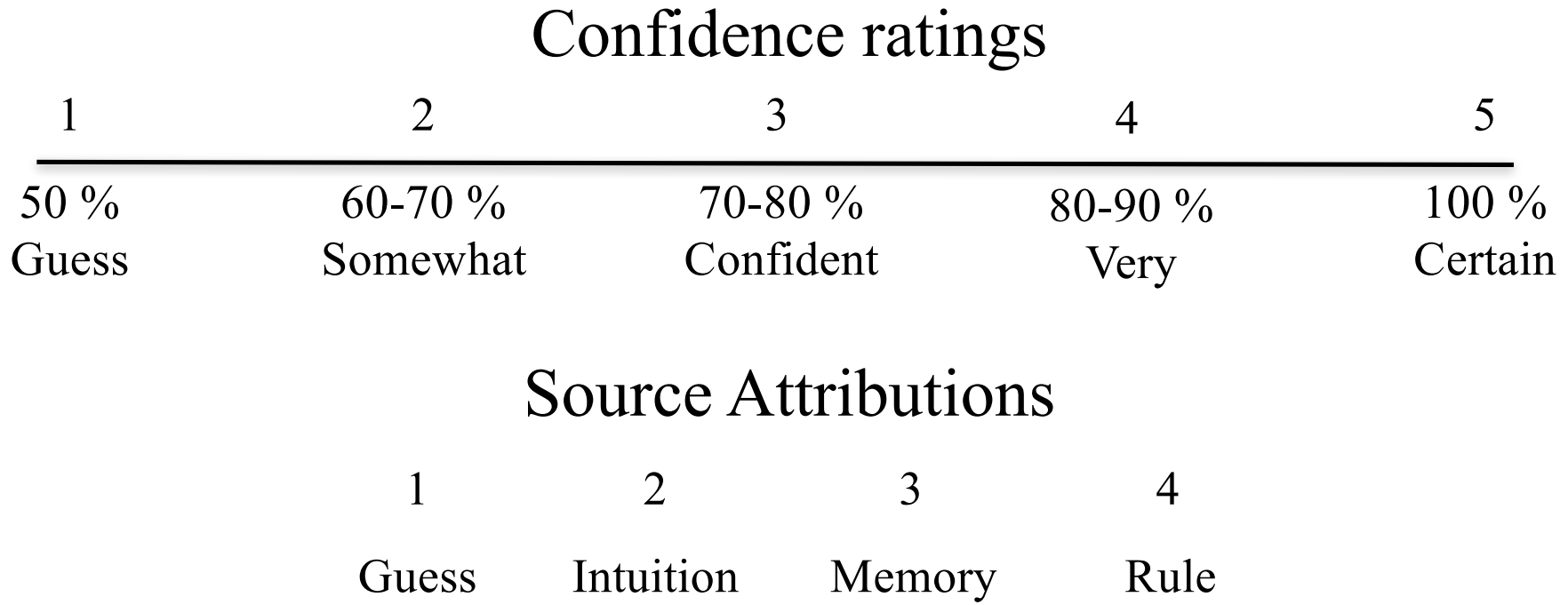
Testing Tasks

Untimed AGJT

A measure of EK (Suzuki, 2017; Vafaee, et al., 2017) that allows for controlled processing of the language

- 80 sentences in total
- Grammatical items included: OSV, OSIV, OSSVV, and OSSIVV
- Ungrammatical items included: *OVS, *OSVI, *OSVSV, *OSSVIV, *Case missing, and *Case mixing
- Cronbach's alpha = .92 and .94 for Immediate and Delayed

- Confidence ratings and source attributions were incorporated with AGJT



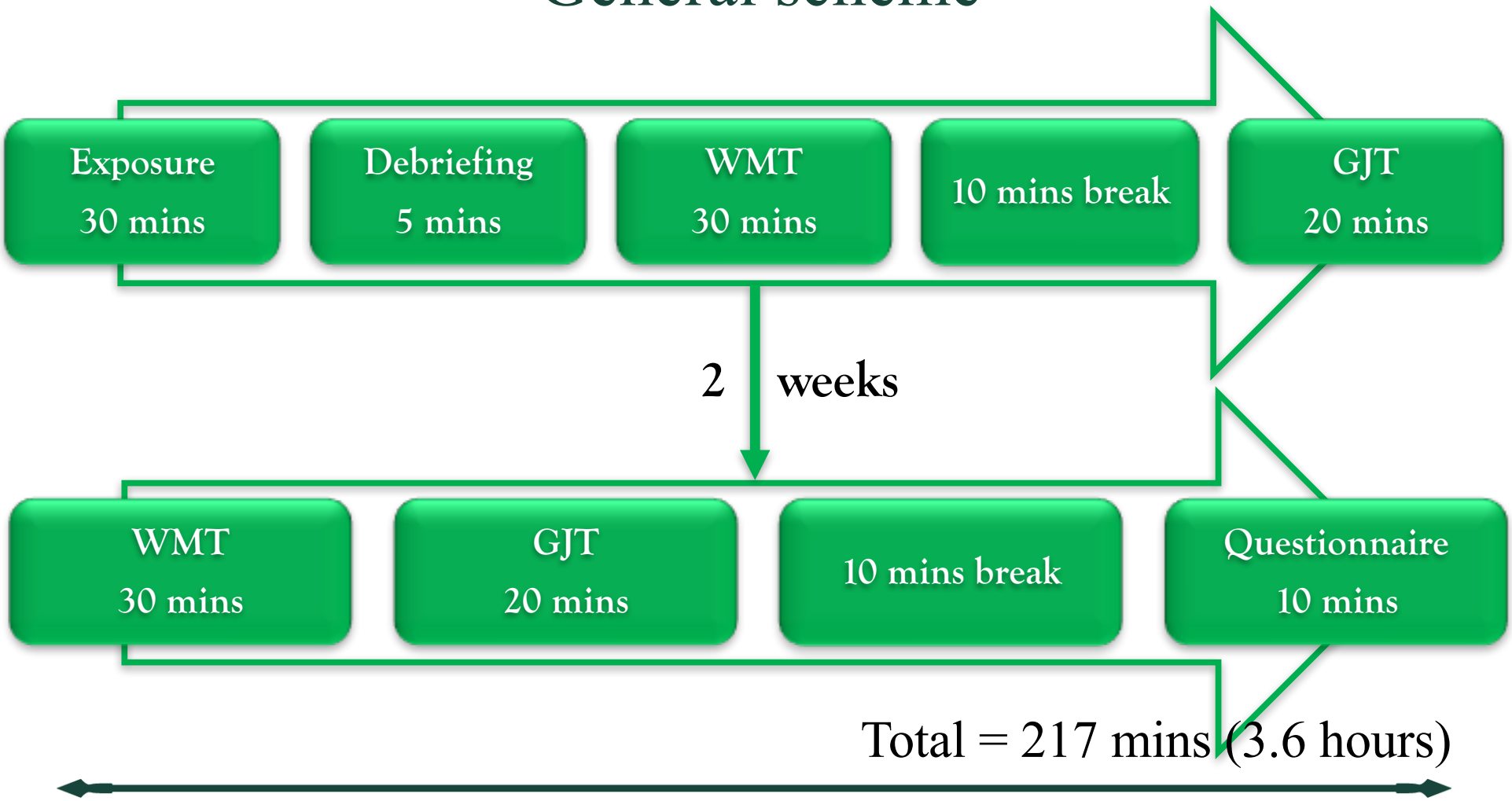
Testing Tasks

Word-monitoring task (WMT)

A measure of IK that requires automatic, and possibly implicit processing

- 130 sentences of Japlish (96 targets and 34 distractors)
- 16 sentences for each item type (8 grammatical and 8 ungrammatical)
- A comprehension question once in two sentences
- Spearman-Brown prophecy formula, $r = 0.95$ and 0.81

General scheme



Operational Definitions of EK and IK

Objective measures

- Experimental > Control on AGJT → EK
- RTs on WMT for ungrammatical > grammatical → IK

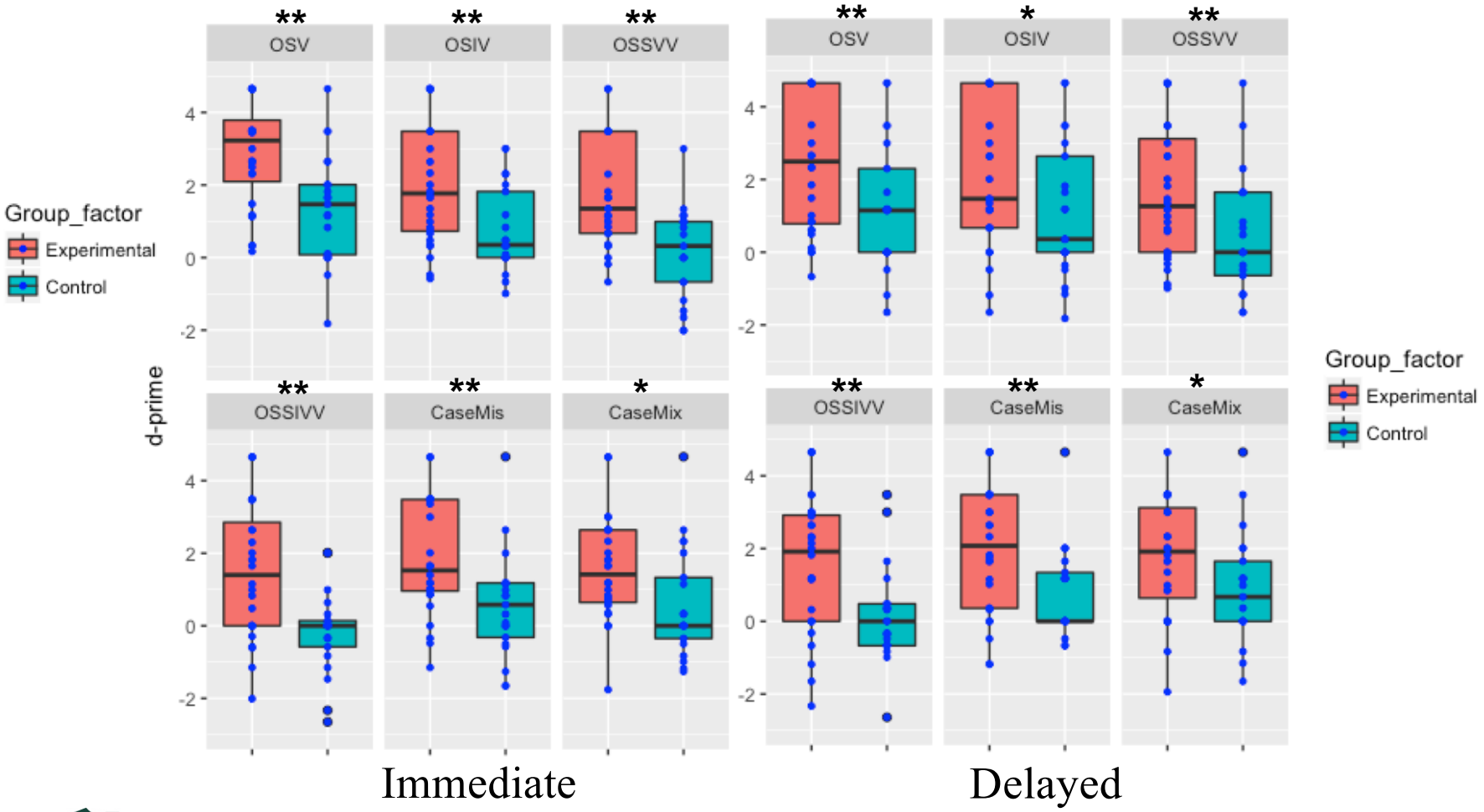
Subjective measures

- Correlation of confidence and accuracy on AGJT → EK
- No correlation → IK
- Memory or Rule+ above chance accuracy → EK
- Guess or Intuition + above chance accuracy → IK

Results: AGJT

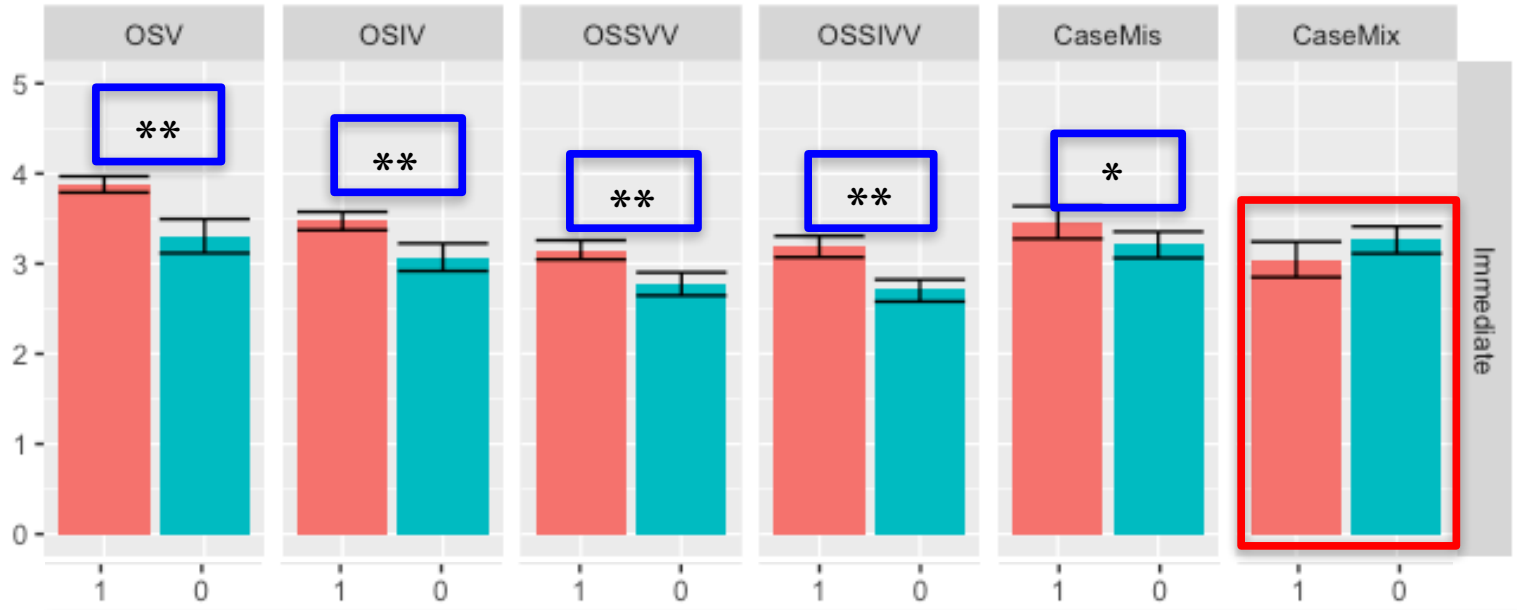
EK for all types!

* $p < .05$, ** $p < .01$



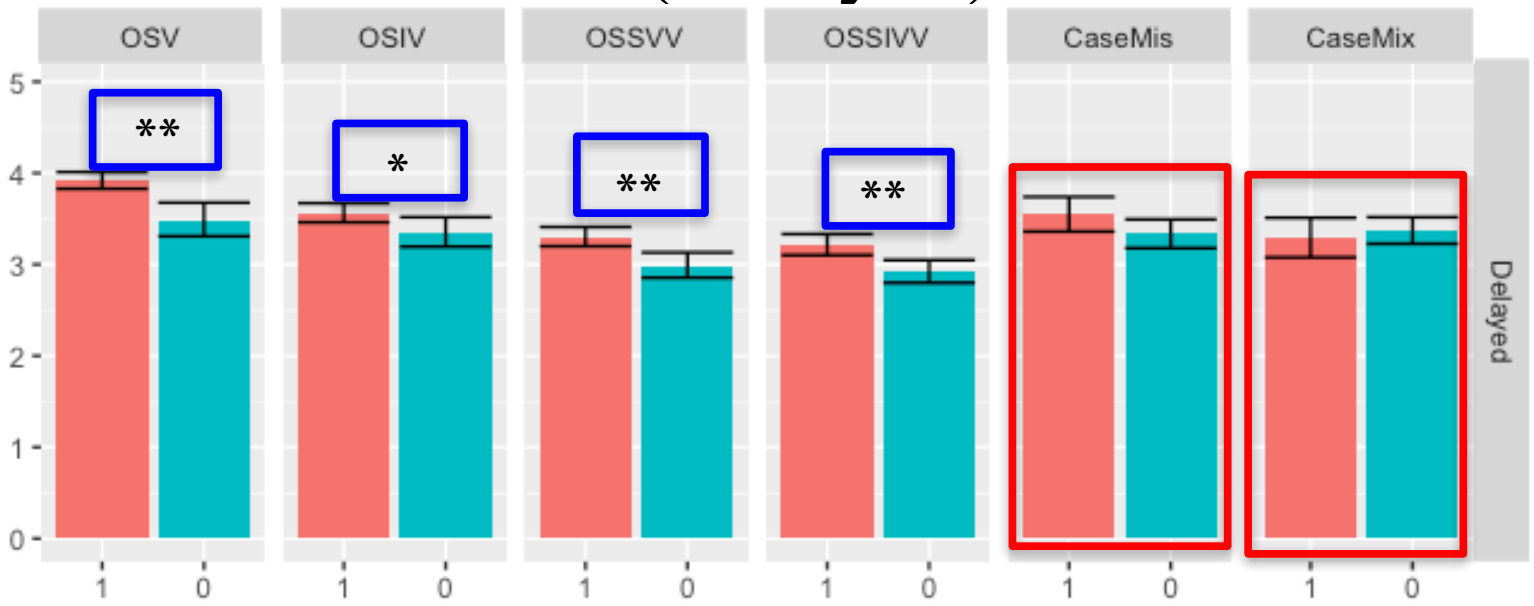
* $p < .05$, ** sig after Bonferroni

Results: Confidence (Immediate)



- EK for all word order types, and CaseMis **but small effect sizes** (.60 = small, Plonsky & Oswald, 2014)
- CaseMix: participants performed above chance $t(27) = 5.80$, $p < .000$, 95% CI [1.00, 2.09] → IK

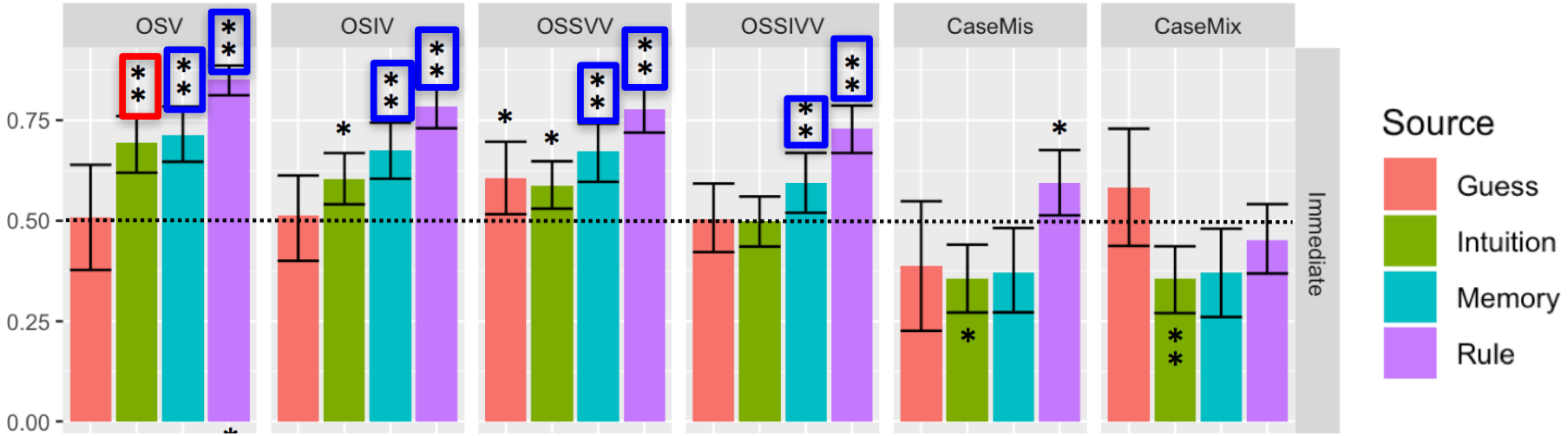
Results: Confidence (Delayed)



- EK for all word order types
- IK for CaseMis and CaseMix:

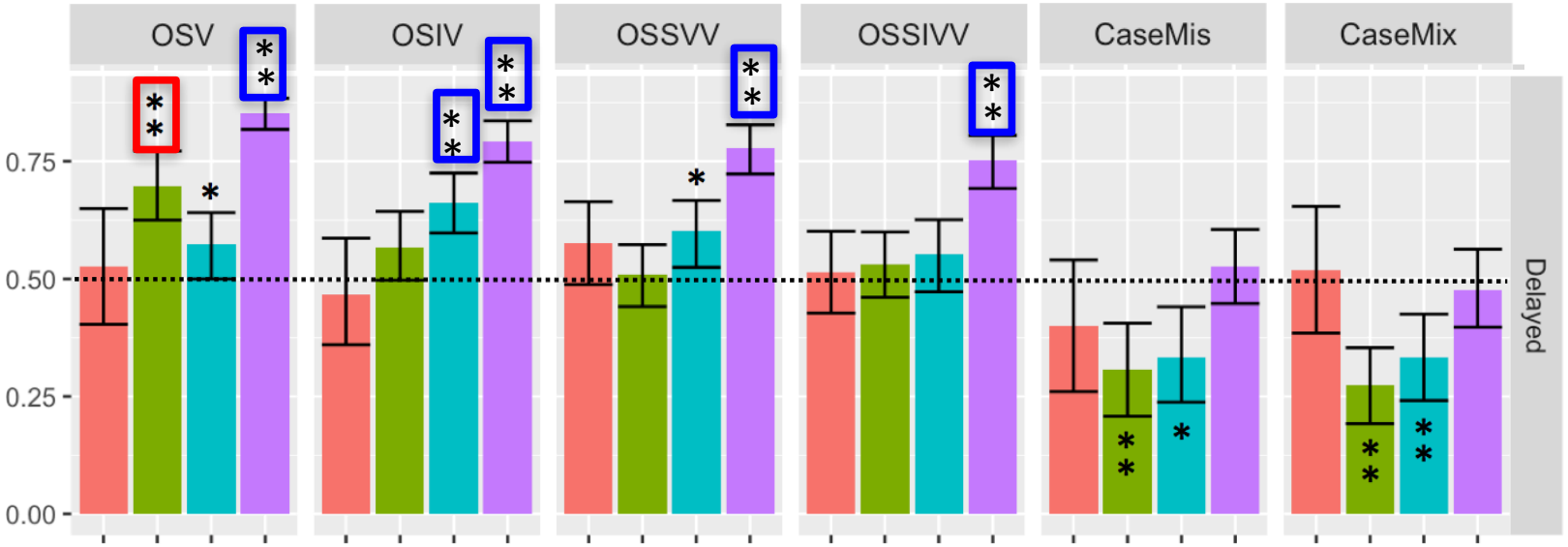
  $t(27) = 6.24$, $p < .000$, 95% CI [1.23, 2.44]; $t(27) = 5.80$, $p < .000$, 95% CI [1.00, 2.09]

Results: Source attributions (Immediate)



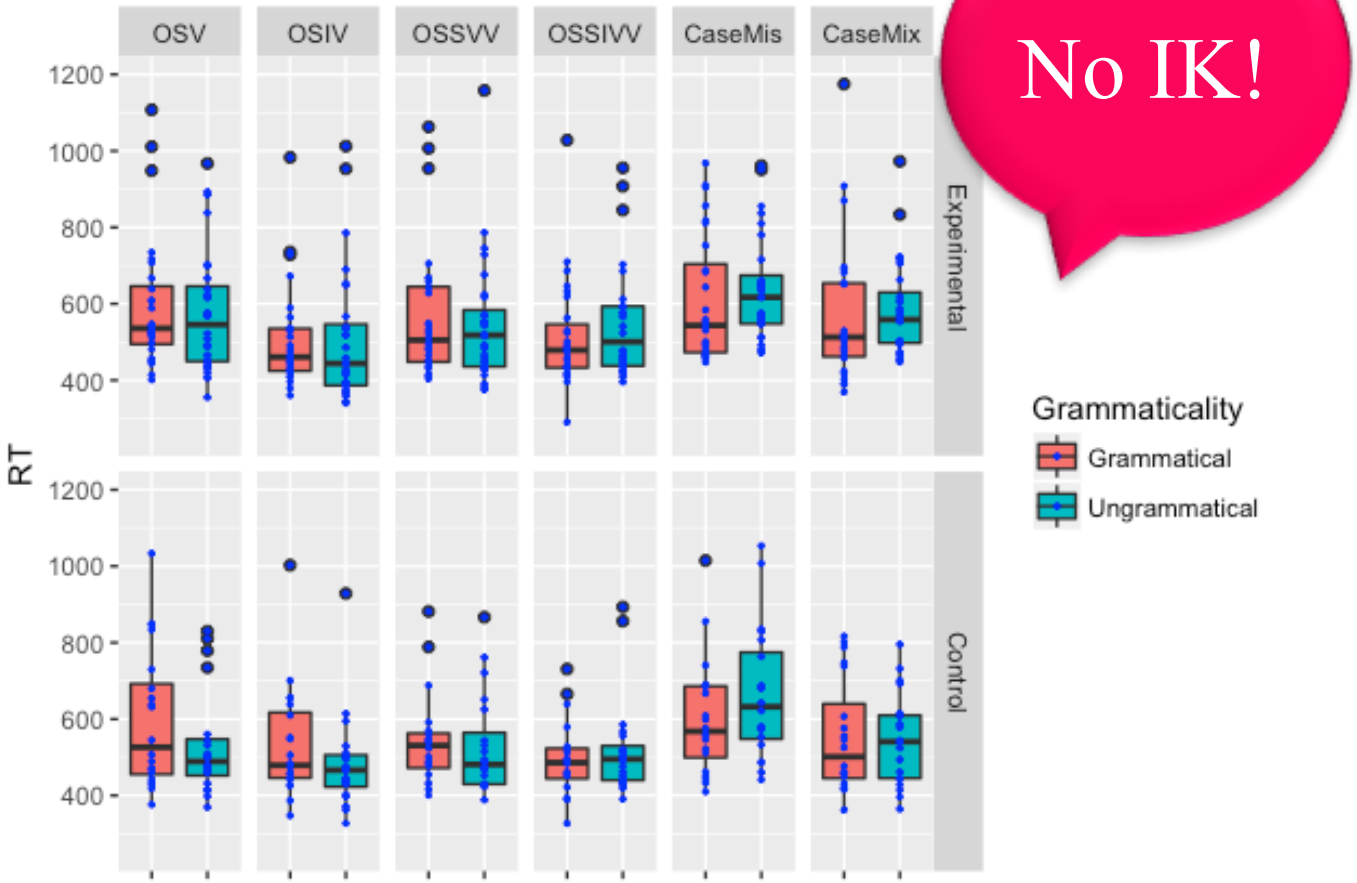
- EK for all word order types (Rule x CaseMis not significant after Bonferroni correction)
- IK for OSV (Intuition)

Results: Source attributions (Delayed)



- EK for all word order types
- IK for OSV (Intuition)

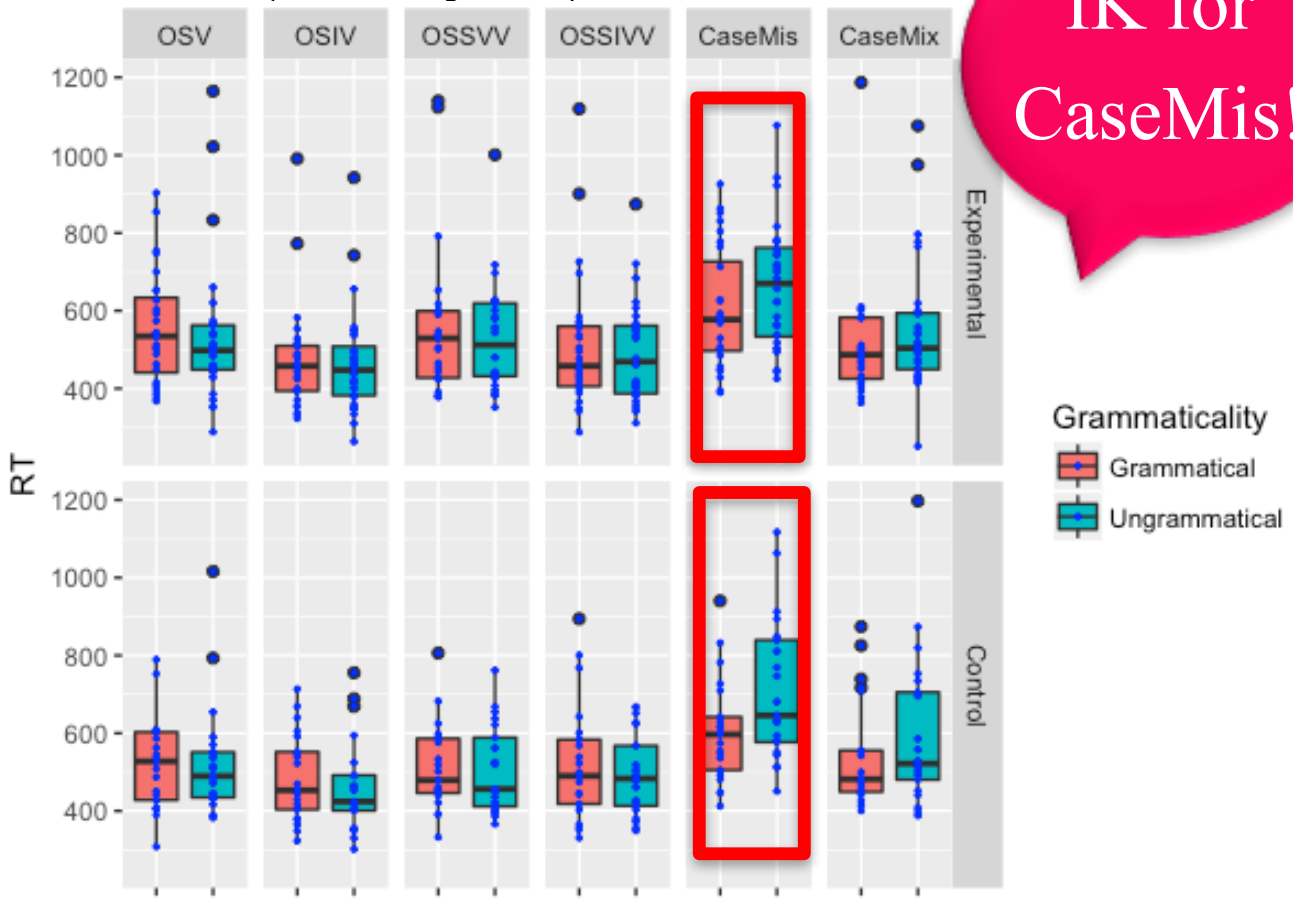
Results: WMT (Immediate)



No IK!

- No effect of group, grammaticality, nor interactions

Results: WMT (Delayed)



IK for CaseMis!

- Ungrammatical > Grammatical on CaseMis for both groups

Summary

		OSV	OSIV	OSSVV	OSSIVV	CaseMis	CaseMix
Immediate	Objective	Explicit	Explicit	Explicit	Explicit	Explicit	Explicit
	Subjective	Both	Both	Explicit	Both	Explicit	Implicit
Delayed	Objective	Explicit	Explicit	Explicit	Explicit	Both	Explicit
	Subjective	Both	Explicit	Explicit	Explicit	Implicit	Implicit

Discussion

A clear discrepancy between the subjective and objective measures

- Subjective: varied in detecting EK and IK for the various construction types
- Objective: EK for all the of them and very limited implicit knowledge only on CaseMis at the delayed posttest

- Why?
  1. One of them is not an adequate measure of IK (subjective overestimates, or objective underestimates IK).

Discussion

2. They both measure IK but at different stages of learning.
   - Remember, AGJT (with confidence ratings and source attributions) was untimed and WMT required automatic processing

They might measure IK differing in degree of **automaticity**

- This explains why WMT in Suzuki (2017) and Vafaee et al. (2017) found IK but not this study
- Suzuki's (2017) learners with length of residence at least 2 years in a second language environment whereas the present study only afforded 200 instances

3. They measure two types of implicit knowledge defined differently

Discussions

Objective measures showed that implicit learning only took place for CaseMis at the delayed posttest

- CaseMis specifically designed for measuring form knowledge

Implicit learning from brief exposure (as measured by WMT) only works for acquiring ***form knowledge***

- Consistent with DeKeyser (1995) and Godfroid (2016)

This is not to deny implicit learning of form-meaning mappings – however, a prospect of a much longer term of language exposure

- Implicit learning takes time after all!!

Discussions

Without the delayed posttests, implicit knowledge measured by WMT could have been missed

- Crucial to include delayed posttests so as to investigate delayed impact of incidental exposure (Grey, Williams, & Rebusuchat, 2014; Mackey & Goo, 2007; Morgan-Short, Finger, Grey, & Ullman, 2012).

Conclusion

- L2 studies have provided various results regarding development of EK and IK under incidental conditions, examined through different methodological approaches
- The present study showed that subjective and objective measures markedly diverge in their sensitivity to development of EK and IK
- Before making any conclusions on explicit and implicit learning, we must understand what exactly each methodological approach is tapping into

Thank you!

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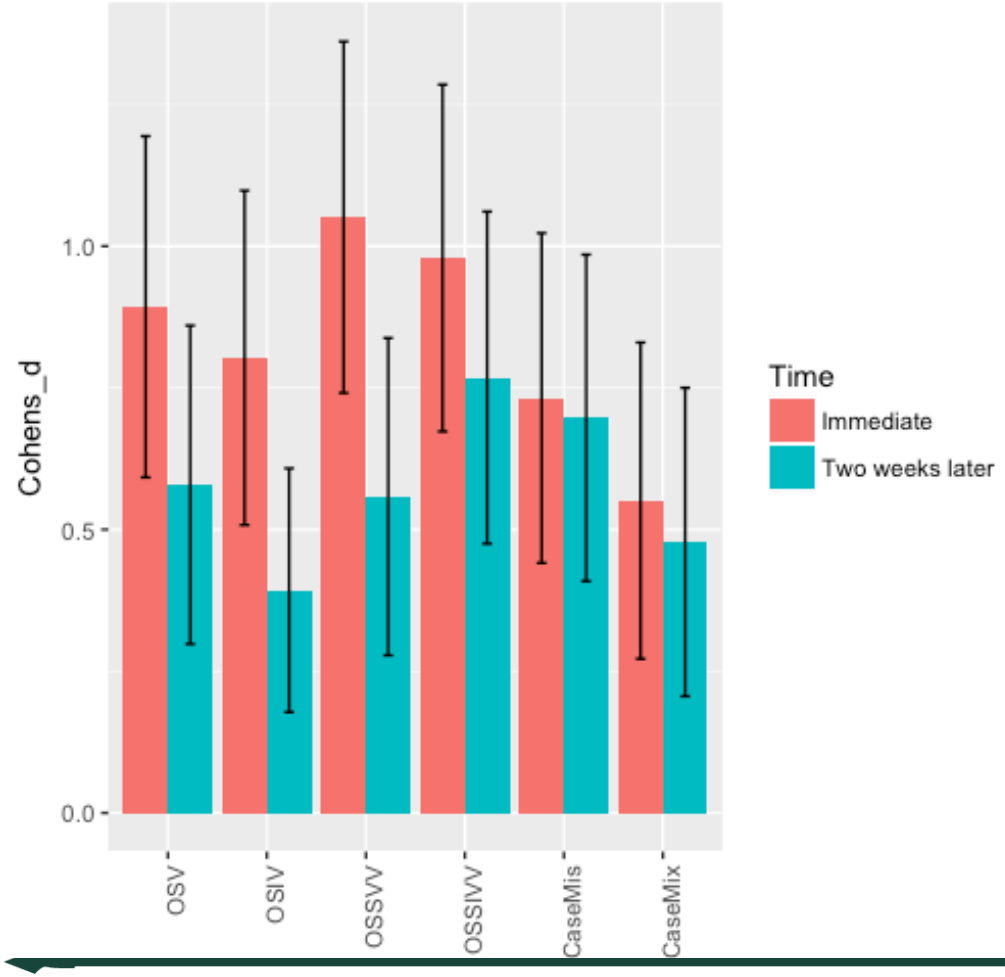
Steve Ross, Ph.D. (University of Maryland)
Yuichi Suzuki, Ph.D. (Kanagawa University)
Bradford Salen, M.A. (Georgetown University)




AGJT: Cohen's *d* between groups



OSV
d = 0.89 and 0.57
OSIV
d = 0.80 and 0.39
OSSVV
d = 1.05 and 0.55
OSSIVV
d = 0.97 and 0.76
CaseMis
d = 0.73 and 0.69
CaseMix
d = 0.55 and 0.47

※Effect size computed through Bayesian estimation (Nozourian et al., 2018)

Immediate vs. Delayed AGJT