

The impact of L2 proficiency on the time course of morphological activation: an incremental primed lexical decision study

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Background

Previous research:

- **L1:** Morphological activation can be found at both short (e.g., 50 ms; Feldman et al., 2009) and long SOA (e.g., 226 ms; Lavric et al., 2011).
- **L2:** Using masked priming paradigm with short SOAs (e.g., 50 ms), Chinese–English bilinguals showed no morphological activation (Li et al., 2017).
- Several reasons may contribute to the lack of morphological activation in L2:
 - small sample size;
 - adoption of short SOA only;
 - no systematic investigation on the impact of L2 proficiency.

The present study:

- To estimate the sample size required to detect morphological activation at different SOAs.
- To explore the impact of L2 proficiency / morphological awareness by treating them as continuous variables.

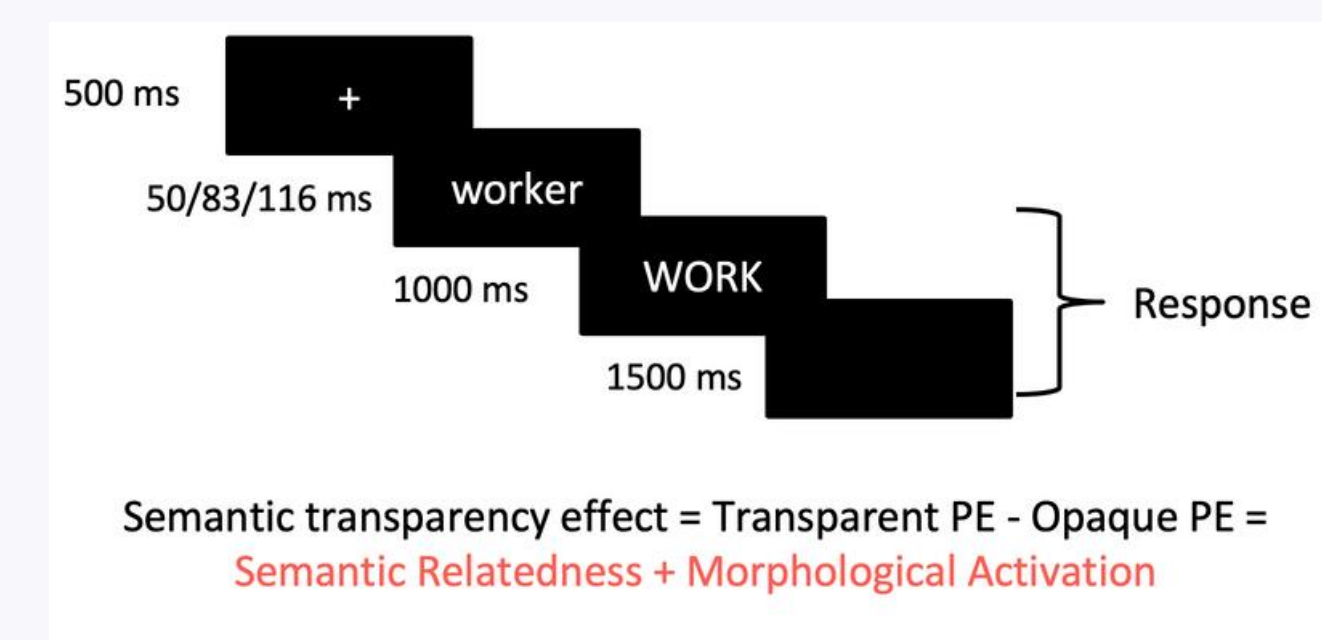


Fig. 1. Incremental primed lexical decision task.

Transparency	Stimulus control for related prime	Related	Unrelated	Target
Transparent	Semantically, morphologically, & formally related to the target Morphemic suffix	speaker	hurtful	SPEAK
Opaque	Formally related to the target Pseudomorphemic suffix	corner	editor	CORN
Form	Formally related to the target Non-suffix	scandal	gifted	SCAN

Table 1. Experimental design and example stimuli.

Method

Participants: Two language groups

- 12 English natives (7M/5F, mean age = 20)
- 24 Mandarin–English bilinguals (12M/12F, mean age = 25.33)

Materials and Design: Incremental primed lexical decision task

(SOA = 50, 83, 116 ms)

- 324 critical prime–target pairs for 3 transparency conditions
- 324 word–nonword pairs as filler stimuli

Characteristics	Transparent	Opaque	Form-related
Targets			
Log word frequency	2.86(0.63)	2.78(0.91)	2.77(0.81)
Orthographic neighborhood size	8.72(5.62)	9.37(6.80)	8.82(5.20)
Phonological neighborhood size	19.03(13.82)	18.94(13.65)	19.29(13.85)
Word Length	4.32(0.73)	4.33(0.84)	4.25(0.57)
Primes			
Log word frequency	2.27(0.57)	2.31(0.84)	2.30(0.79)
Orthographic neighborhood size	1.80(2.13)	2.09(2.61)	1.80 (2.10)
Phonological neighborhood size	4.24(5.62)	4.47(4.99)	4.28(5.86)
Word Length	6.59(1.18)	6.63(1.12)	6.49(0.94)
Orthographic prime-target overlap	0.66(0.10)	0.66(0.09)	0.66(0.09)
Semantic prime-target relatedness	0.44(0.01)	0.09 (0.01)	0.09 (0.01)

Table 2. Stimulus control across experimental conditions.

Results and Discussion

Effect of transparency on priming effect (PE) in natives and L2 learners

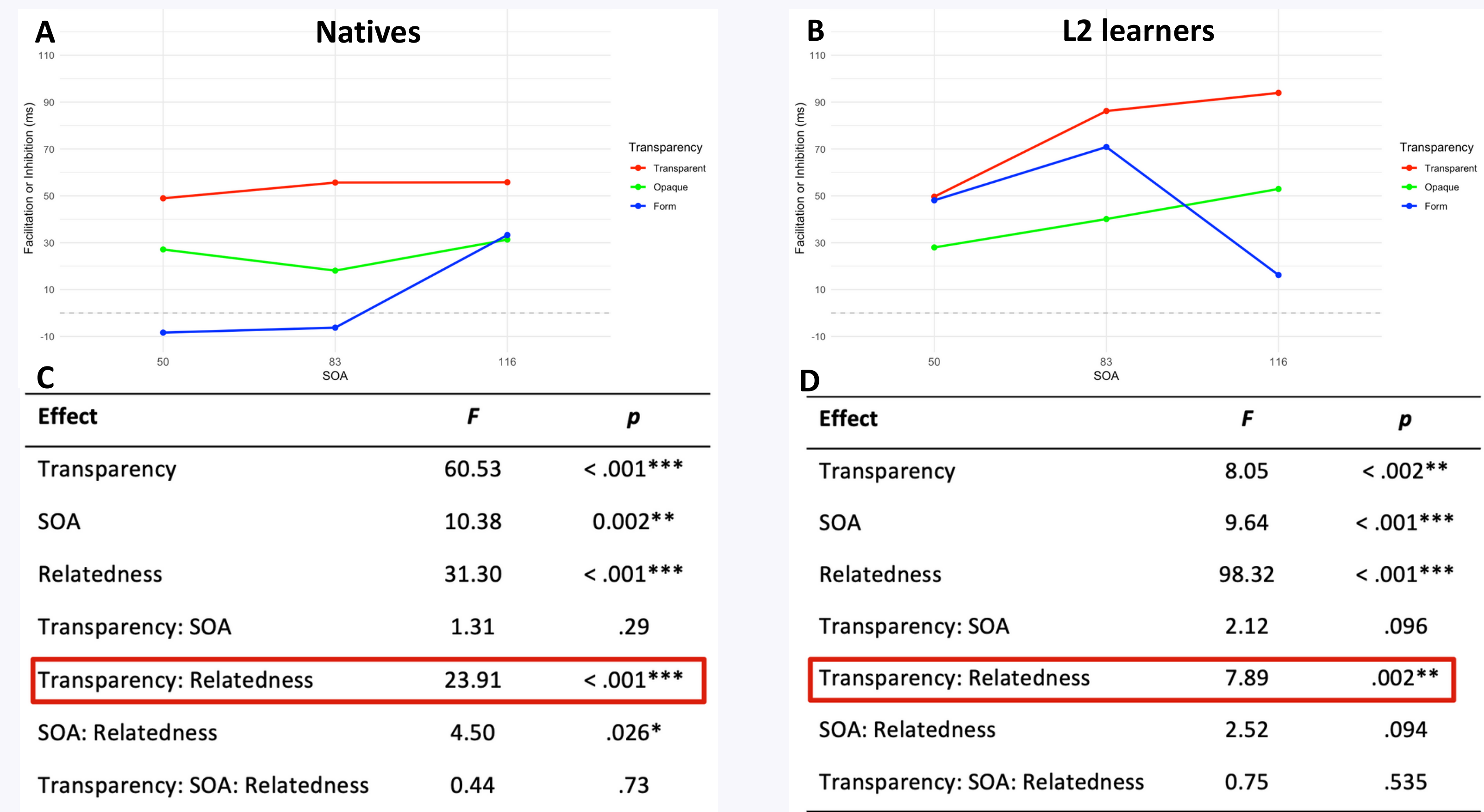


Fig. 3. Reaction time as a function of 3 within-subject factors, Transparency (Transparent/Opaque/Form), SOA (50/83/116 ms), Relatedness (Related/Unrelated), for natives (left) and L2 learners (right). A & B, descriptive plots for natives and L2 learners; C & D, results for the three-way repeated-measures ANOVA on inverse RT (-1000/RT), for natives and L2 learners.

Results showed a stronger priming effect in transparent condition than opaque condition in both natives ($t = 4.07, p < .01$) and L2 learners ($t = 4.08, p < .001$).

Modulation of SOA on the effect of semantic transparency on PE

SOA	L1				L2			
	<i>t</i>	<i>p</i>	<i>f</i>	<i>n</i>	<i>t</i>	<i>p</i>	<i>f</i>	<i>n</i>
50 ms	1.25	0.24	0.38	34	0.94	0.36	0.20	124
83 ms	2.58	0.03*	0.78	10	1.52	0.14	0.32	46
116 ms	1.21	0.25	0.37	30	2.28	0.03*	0.48	20

Table 5. Pre-planned comparisons on the effect of semantic transparency on PE, with sample size calculation using G-Power. *f*, Cohen's effect size; *n*, the required sample size to detect a significant effect in each group.

Exploratory results showed that semantic transparency may impact the PE earlier in English natives (SOA = 83 ms) than in Chinese–English bilinguals (SOA = 116 ms).

Conclusion

- Mandarin–English bilinguals show similar morphological activation in their L2 compared to English natives, but with slower speed.
- With an estimated sample size of > 46 subjects, morphological activation in L2 is expected to be detected at SOA of 83ms.
- L2 learners with higher L2 morphological awareness show more sensitivity to true and pseudo morphemes.

Impact of English proficiency / morphological awareness

- **English proficiency**
 - Transparency × English proficiency interaction on Target RT was non-significant regardless of whether proficiency was measured by self-related English proficiency (LHQ-3) or IELTS score.
- **Morphological awareness**
 - Transparency × Morphological awareness interaction on Target RT was significant, $p = .046$: Transparent vs. Opaque ($t = -0.427, p = .90$), Transparent vs. Form ($t = -2.32, p = .053$), and Opaque vs. Form ($t = -1.87, p = .15$).

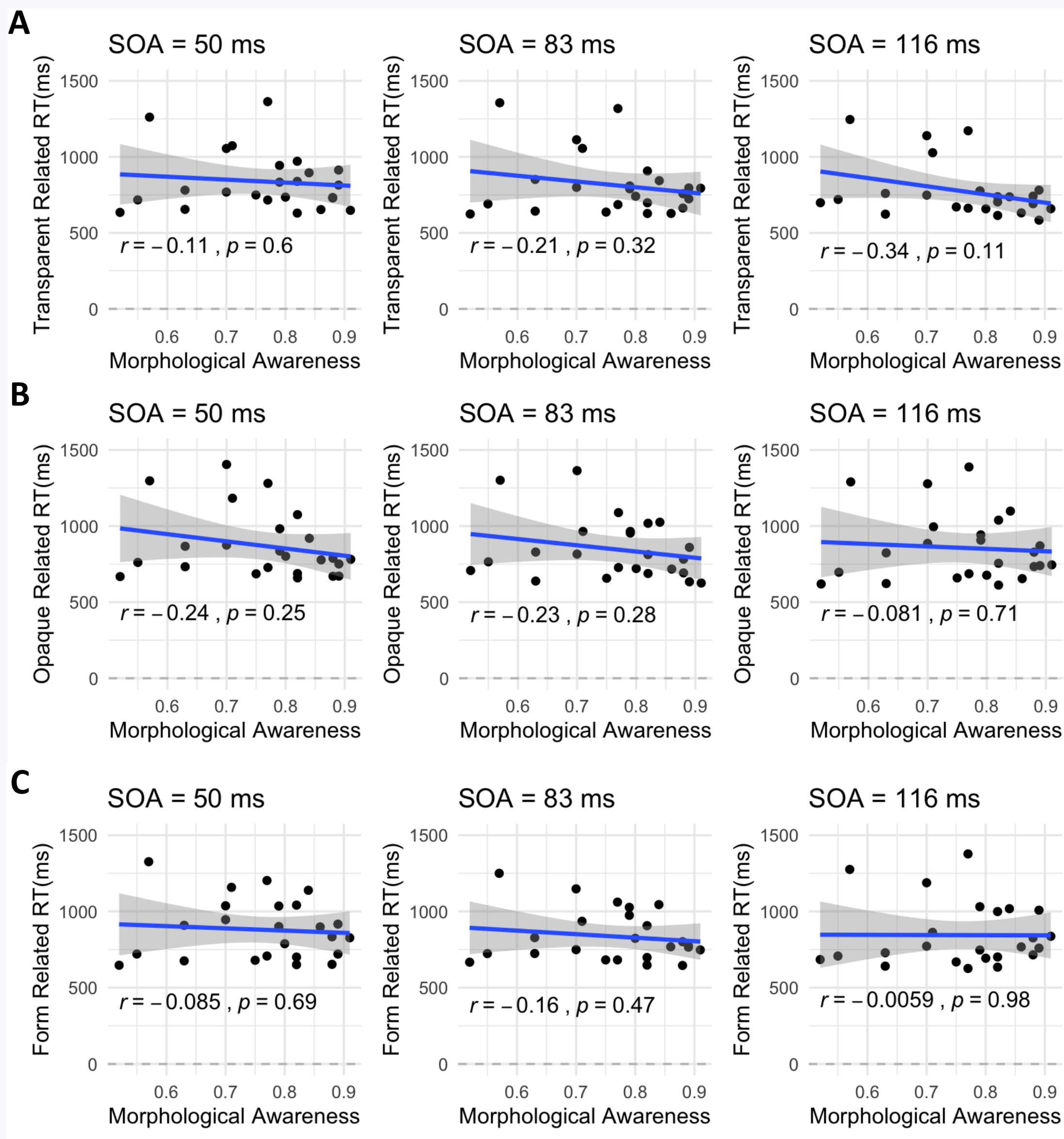


Fig. 4. The correlation between morphological awareness scores and RT for related trials in the transparent (A), opaque (B), and form-related (C) conditions.

Morphological awareness may modulate the effect of semantic transparency on Target RT.

Reference

Feldman, L. B., O'Connor, P. A., & del Prado Martín, F. M. (2009). Early morphological processing is morphosemantic and not simply morpho-orthographic: A violation of form-then-meaning accounts of word recognition. *Psychonomic Bulletin & Review*, 16, 684–691.
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