Are emoji a poor substitute for words? Sentence processing with emoji substitutions
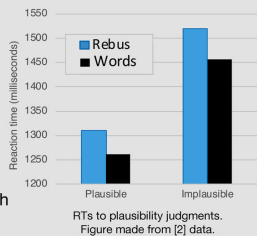
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With the integration of *emoji* into digital keyboards, people are increasingly using multimodal interactions between *text* and *image* in real-time communication. While emoji are mostly placed at the end of sentences, some emoji may *substitute* for words in sentences.👍
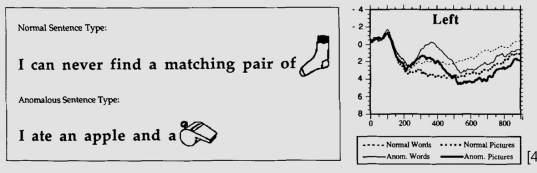
Substitution is a core feature of multimodal interactions [1]: 👋 can replace 💬, 🖼 can replace abc, and abc can replace 🖼 in visual narratives 🤓. Throughout, one modality's grammar (syntax, narrative) remains while a unit from another modality substitutes into that dominant sequence. 🤓

Prior research on **substitutive image-text relationships** has found that comprehension and recall of substituted images were only *marginally* more strained than regular words [2], regardless of position in the sentence.
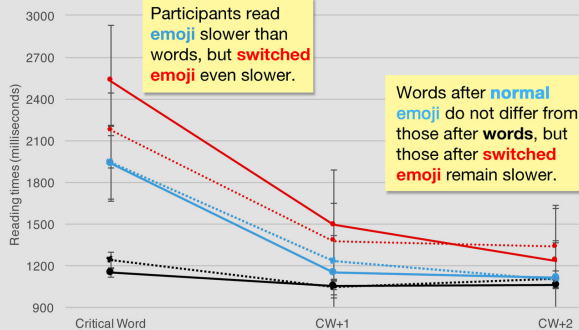
Semantically incongruous substitutions incur greater cost, though comparable to incongruous words.

RTs to plausibility judgments.
Figure made from [2] data.

Similarly, incongruous images substituted for sentence-final words elicit more strained **semantic processing** (N400) than congruous images, similar to the response to **words** in sentences [3,4]. This implies that **sentence contexts** similarly modulate the semantic processing of images and words, despite the modality-switch.
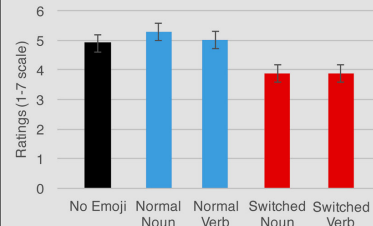

[4]

Here, we investigate these **multimodal text-image** interactions further by examining both *semantics* and *grammar*. 🔍

In **Experiment 1**, we measured self-paced **reading times** in an online study to words in sentences that substituted **emoji** for nouns, verbs, or **switched their positions.**
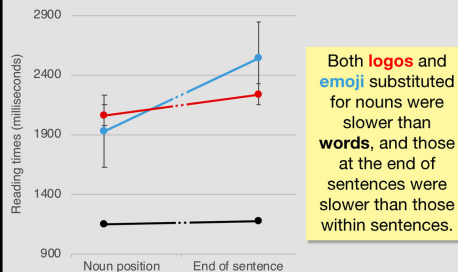
72 participants (31 female; mean age: 26.8, range: 17-62)

> Participants read **emoji** slower than words, but **switched emoji** even slower.

> Words after **normal emoji** do not differ from those after **words**, but those after **switched emoji** remain slower.

Word Noun	John loves eating **pizza** every Friday.
Emoji Noun	John loves eating 🍕 every Friday.
Switched Noun	John 🍕 eating pizza every Friday.

Word Verb	John **loves** eating pizza every Friday.
Emoji Verb	John ❤️ eating pizza every Friday.
Switched Verb	John loves eating ❤️ every Friday.

Sentences with **normal emoji** substitutions were rated as comprehensible as those **without emoji**, but sentences with **switched emoji** were rated as less comprehensible.
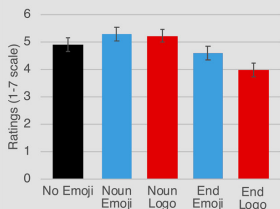

Thus, despite maintaining comprehensibility, **emoji substitutions** incur a processing cost, which is greater when their **semantics** mismatch the expectations of their **grammatical** position.

In **Experiment 2**, we compared emoji with other systematic and conventionalized images that appear outside communicative contexts: *logos.*
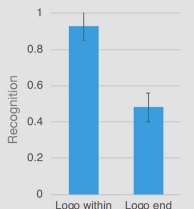

> Both **logos** and **emoji** substituted for nouns were slower than **words**, and those at the end of sentences were slower than those within sentences.

Word Noun	John loves eating **pizza** every Friday.
Emoji Noun	John loves eating 🍕 every Friday.
Logo Noun	John loves eating 🍕 every Friday.

Sentences with **logos at the end** were rated as less comprehensible than other sentence types, which otherwise did not differ in terms of comprehensibility.

Finally, after the SPR, *logos within sentences* were recognized twice as much as those at the *end of sentences.*

Thus, **logos** do not semantically differ from **emoji**, but interacting with grammar increases their salience.

Word end	John loves eating pizza every Friday.
Emoji end	John loves eating 🍕 every Friday.
Logo end	John loves eating pizza every Friday. 🍕

Such results suggest overall that **image substitution** into sentences may incur costs, but **text-image** interactions allow for **multimodal messages** perceived as a **singular semantic expression**, regardless of substituted **positions** (noun, verb) or **types of images** (emoji, logos). 😎

References
[1] Cohn. 2016. *Cognition.*
[2] Potter et al. 1986. *JEP:G*
[3] Ganis, et al. 1996. *JOCN.*
[4] Nigam, et al. 1992. *JOCN*

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