

NORMATIVE DATA FOR LOGOGRAPHIC AND LEXICAL JAPANESE PAIRED ASSOCIATES

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Aims

- To provide item difficulty data for 330 pairs of Japanese/English paired word associates.
- To compare recall accuracy for Japanese Symbols vs English/Japanese words.
- To provide explanations as to why variations in cued recall accuracy exist between these paired associates.

Introduction

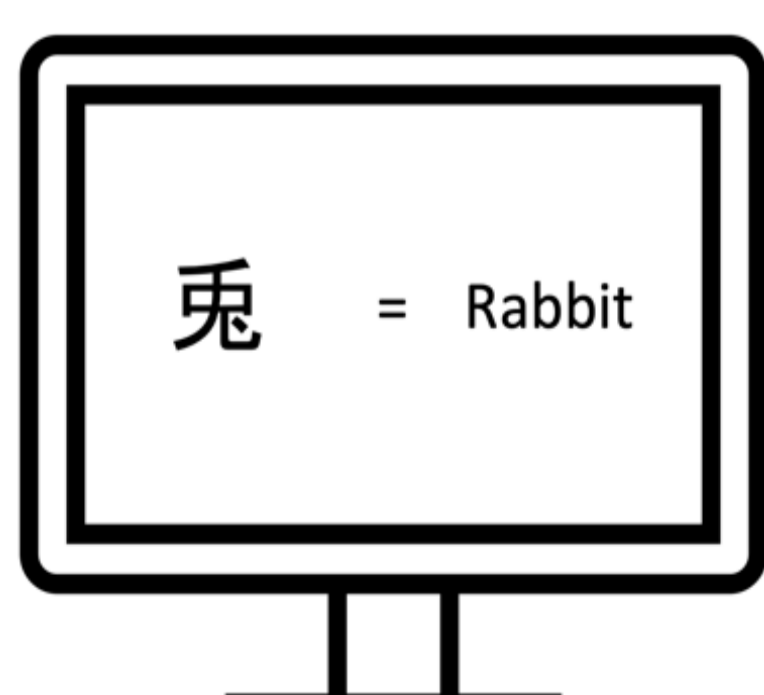
Paired associates (PA) are typically two items that are presented simultaneously to a participant to be remembered at a later date. They make up an important subset of stimuli used for cognitive experiments¹ and are a simple method to measure declarative memory performance in a wide range of subjects.

When using paired associates, it is important to control for individual pair difficulty (known as item difficulty). This enables difficulty to be evenly spread across conditions, reducing variability and allowing for a more accurate representation of the intervention on long-term retention. The most common paired associates used in the literature are languages (i.e., Swahili paired with English). There have been several studies in the past that have provided normative data for other languages²⁻⁴.

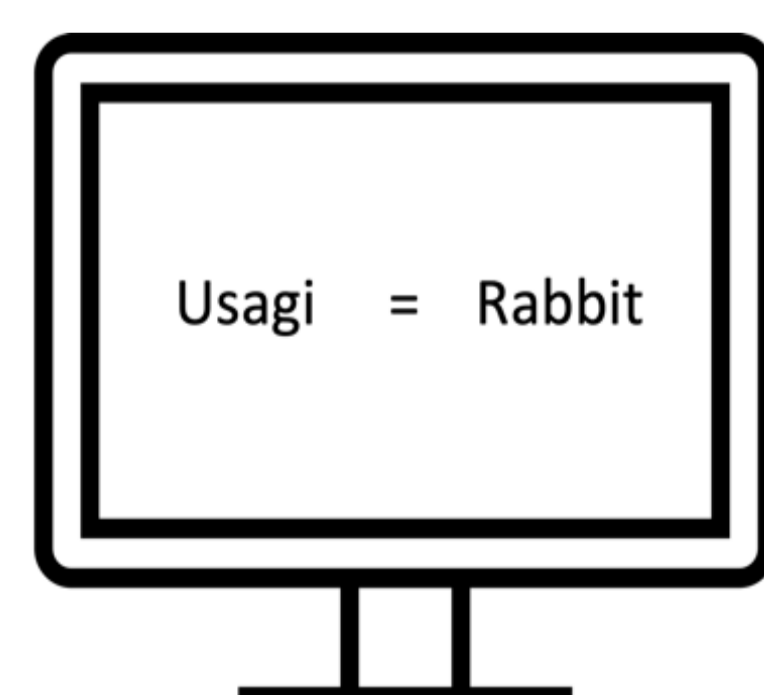
The current study aims to provide normative data for both logographic (Japanese Symbol-English Word), lexical (Japanese Word/English Word) and Abstract (Japanese Symbol-Japanese Word) variations of the Japanese language. This stimuli bank can then cater for a wide range of studies with varying needs (image vs word, abstract learning etc).

Methods

- 240 participants were recruited from Prolific (189) and the RPS at the University of Kent (51). The mean age was 21.8 ($SD = 3.6$) and 71% were female.
- 10 symbol/word pairs from 12 categories were randomly chosen from an educational website⁵
- A pilot study was carried out with 10 pairs to establish intergroup difficulty and how many pairs would be presented to each participant.



Japanese Symbol – English Word (Logographic)



Japanese Word – English Word (Lexical)



Japanese Symbol – Japanese Word (Abstract)

- Participants were randomly allocated to one of the three conditions where they first took part in a practice phase. During the main trial Japanese Symbol – English Word (Logographic) and Japanese Word – English Word (Lexical) would be shown **25 pairs**. For Japanese Symbol – Japanese Word (Abstract), **15 pairs** were shown as this condition was more difficult.
- Pairs were shown for 9.5 seconds before moving onto the next pair. Participants were then tested at the end of each trial (after view all the pairs). There were three trials in total (each symbol was shown three times).

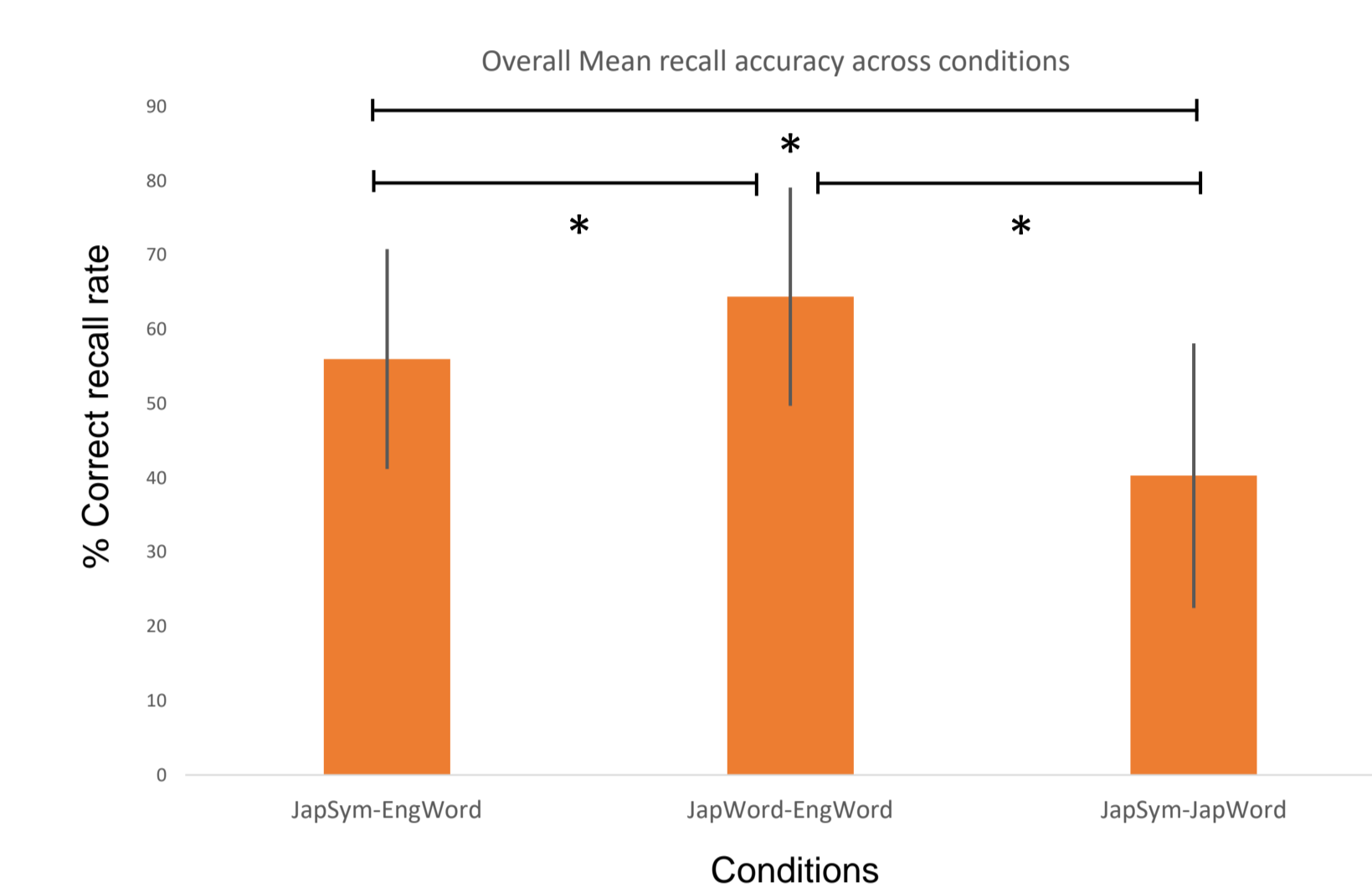
Results

A mixed ANOVA with Trial 1, 2 and 3 as the within subjects factor and condition (Logographic, Lexical and Abstract) as the between group factor was run.

Table 1. Mixed ANOVA results. Trial was within-subjects and consisted of Trials 1, 2 and 3. Condition was between subjects and consisted of (Logographic, Lexical and Abstract).

	df	F	η_p^2	p
Trial	1,799, 588.327	1002.539	0.754	<.001
Condition	2, 327	65.442	0.286	<.001
Trial*Condition	3,598, 588.327	10.382	0.060	<.001

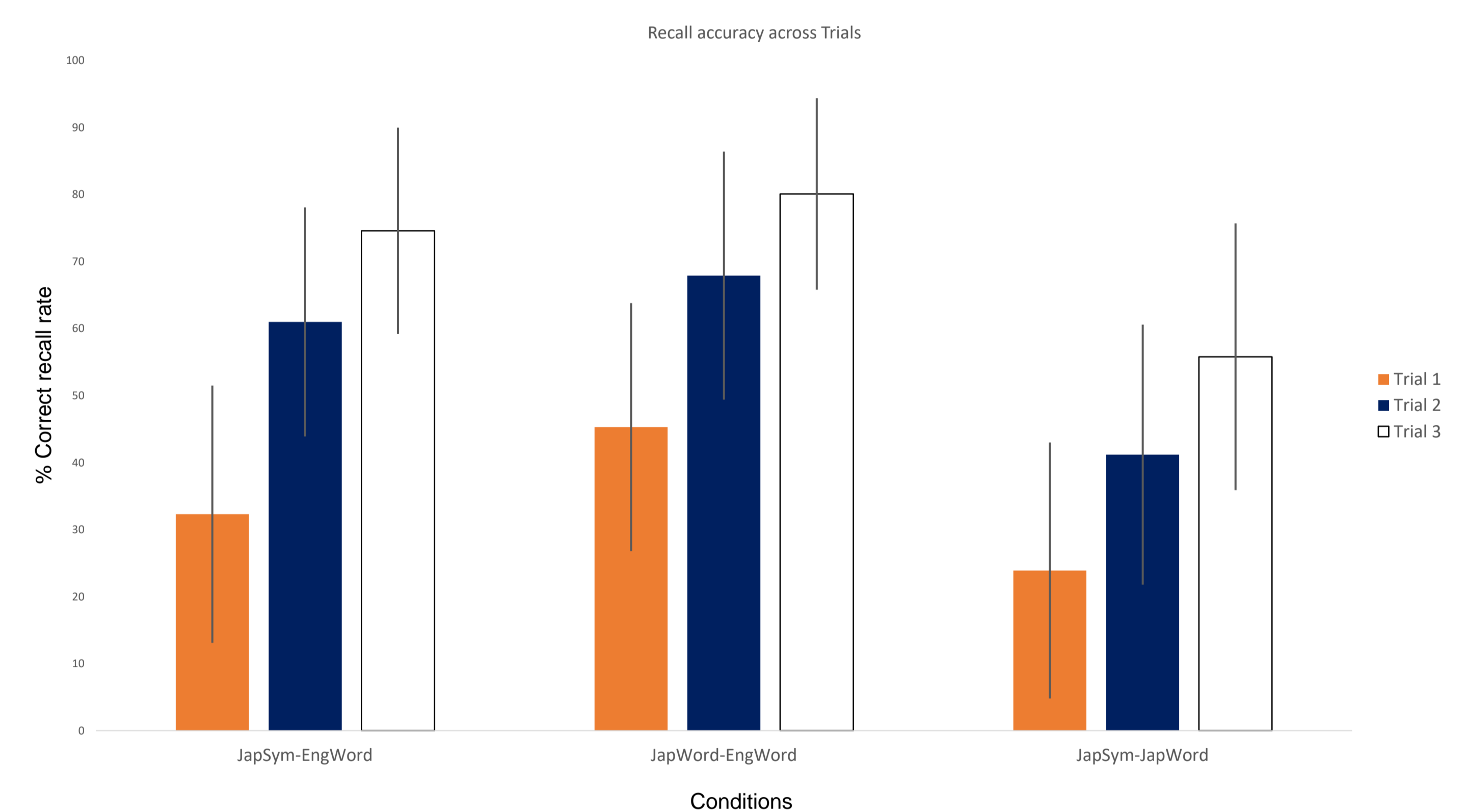
Figure 1. Bar graph depicting between group differences (Conditions). * $p < .001$



Individual item difficulty data, as well as metacognitive judgement data is available by following this QR code.



Figure 2. Bar graph depicting increase in recall accuracy across the three trials.



A multiple regression was run to establish which components of the pairs predicted final recall accuracy.

Table 2. Regression table
Note. Std. β : Standardized betas employ standard deviations as units (Z-scores), which allows for a fair and valid comparison of predictor effects. A False Discovery Rate threshold of 0.017 was used for the purpose of multiple comparisons.

Condition	Predictors	Test Trial								
		1			2			3		
		Std. β	t	p	Std. β	t	p	Std. β	t	p
Logographic	Eng. Word Freq.	0.231	2.561	0.012*	0.113	1.220	0.225	0.051	0.525	0.601
	Eng. Word Len.	0.120	1.366	0.175	0.019	0.206	0.837	-0.055	-0.578	0.564
	Jap. Sym. Stroke Count.	-0.309	-3.421	<.001*	-0.336	-3.622	<.001*	-0.183	-1.869	0.064
Lexical	Eng. Word Freq.	-0.050	-0.515	0.608	0.022	0.226	0.822	0.129	1.339	0.183
	Eng. Word Len.	-0.045	-0.459	0.647	-0.202	-2.103	0.038	-0.119	-1.237	0.219
	Jap. Word Len.	0.053	0.543	0.588	-0.045	-0.470	0.639	0.065	0.670	0.504
Abstract	Jap. Sym. Stroke Count.	-0.314	-3.822	<.001*	-0.359	-4.082	<.001*	-0.321	-3.653	<.001*
	Jap. Word Len.	-0.398	-4.847	<.001*	-0.201	-2.287	0.024	-0.257	-2.922	0.004*

Conclusions

- Word pairs in the Lexical condition had the highest correct recall rate.
- A linear increase across Trials was observed in all three conditions.
- Japanese Symbol Stroke count was the only consistent and reliable predictor of recall accuracy.

References

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- Cho, K. W., Tse, C. S., & Chan, Y. L. (2020). Normative data for Chinese-English paired associates. *Behavior Research Methods*, 52(1), 440-445.
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