Introduction

♦ This work is concerned with the representation and processing of perceptual information in memory and their influence on explicit and implicit memory performance.

♦ Reder, Donavos, & Erickson (2000) demonstrated that two types of perceptual effects occur for recognition memory:

perceptual match effect: performance is better when words are presented in the same font at study and test rather than in two different fonts

perceptual fan effect: the benefit of a matching font is greater when the number of words associated with a particular font (i.e., the fan of the font) is small rather than large

♦ These perceptual effects present a challenge to the Perceptual Representation System (PRS) view of memory (e.g., Schacter & Tulving, 1994), in which a PRS processes perceptual information about stimuli and primarily operates in implicit memory tasks.

♦ These perceptual effects also present a challenge to independent processing perspectives of memory, such as the Transfer Appropriate Processing view (e.g., Graf & Ryan, 1990).

♦ Both perceptual effects are predicted by the Source of Activation Confusion (SAC) model of memory. SAC consists of a unified memory system in which the same mechanisms underlie perceptual and conceptual memory.

Purpose

♦ We further tested the SAC account of the perceptual match effect and perceptual fan effect for both explicit and implicit memory performance.

- We examined whether the SAC account of these perceptual effects is computationally plausible. We used the same strengthening and decay equations and parameters that had been used to model conceptual fan effects (Reder et al., 2000).

- We tested whether a perceptual fan effect occurs for implicit memory.

- We also used the SAC framework to computationally model our implicit memory data. We used the same strengthening and decay equations and parameters that were used in our explicit model.

Sample Stimuli by Experimental Condition

Study Words	Test Words, Old	Test Words, New
BOARD	PEOPLE	(Original Font, High Fan) _____
LINE	SPIRIT	(Original Font, Low Fan) _____
SPIRIT	MILLION	(Swap Font, High Fan) BACK
TYPE	YEAR	(Swap Font, Low Fan) AMOUNT
YEAR	LINE	(Novel Font) BLADDER
PEOPLE		
FARM		
MILLION		
EARTH	Low-Fan Font = 1 study word per font	
HOME	High-Fan Font = 12 study words per font	
HAIR		

During the recognition test, participants made Remember-Know judgments for items judged as "Old."

Reder, Donavos, & Erickson, Exp. 3 Results
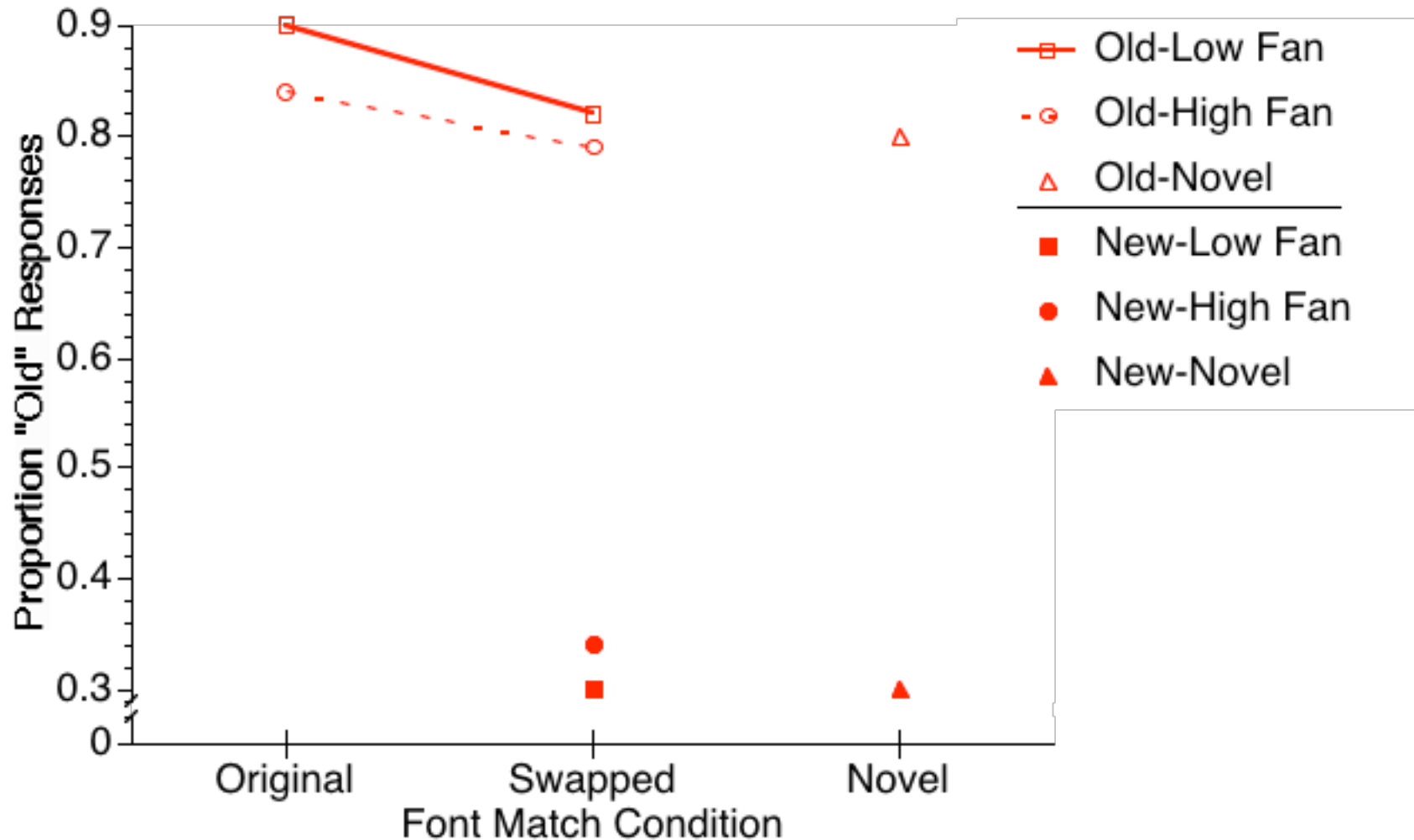
The benefit of a matching font was greater for words that had been studied in a low-fan font rather than a high-fan font.

Source of Activation Confusion, SAC

♦ Spreading activation, memory network

When a word is read, activation automatically spreads from the activated nodes (e.g., the concept node, the font node) to connected nodes as a function of the number and strength of the links emanating from each sending node.

♦ Dual-process theory of recognition:

Recollection-based recognition occurs when there is sufficient activation of the relevant <u>study episode node</u> for it to pass threshold.

Familiarity-based recognition occurs when recollection fails, but there is sufficient activation of the relevant <u>concept node</u> for it to pass threshold.

SAC Representation of "year" Studied in an Experiment

familiarity = know

Study Episode

recollection = remember

year

Experimental Context
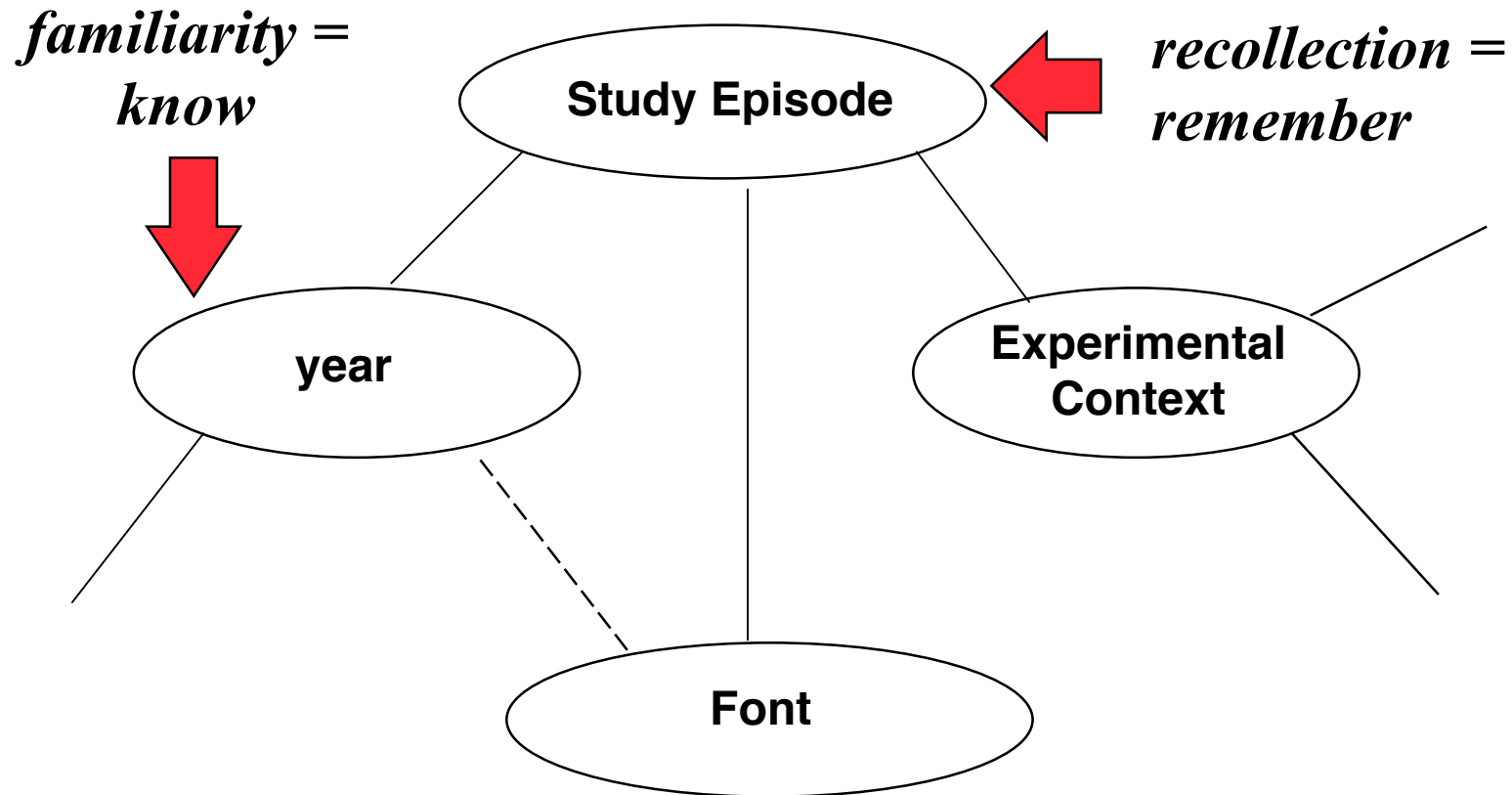
Font

When a word is tested in the same font in which it was studied, the concept node and study episode node receive additional activation from the matching font. This produces the perceptual match effect.

# SAC Account of Perceptual Fan Effects
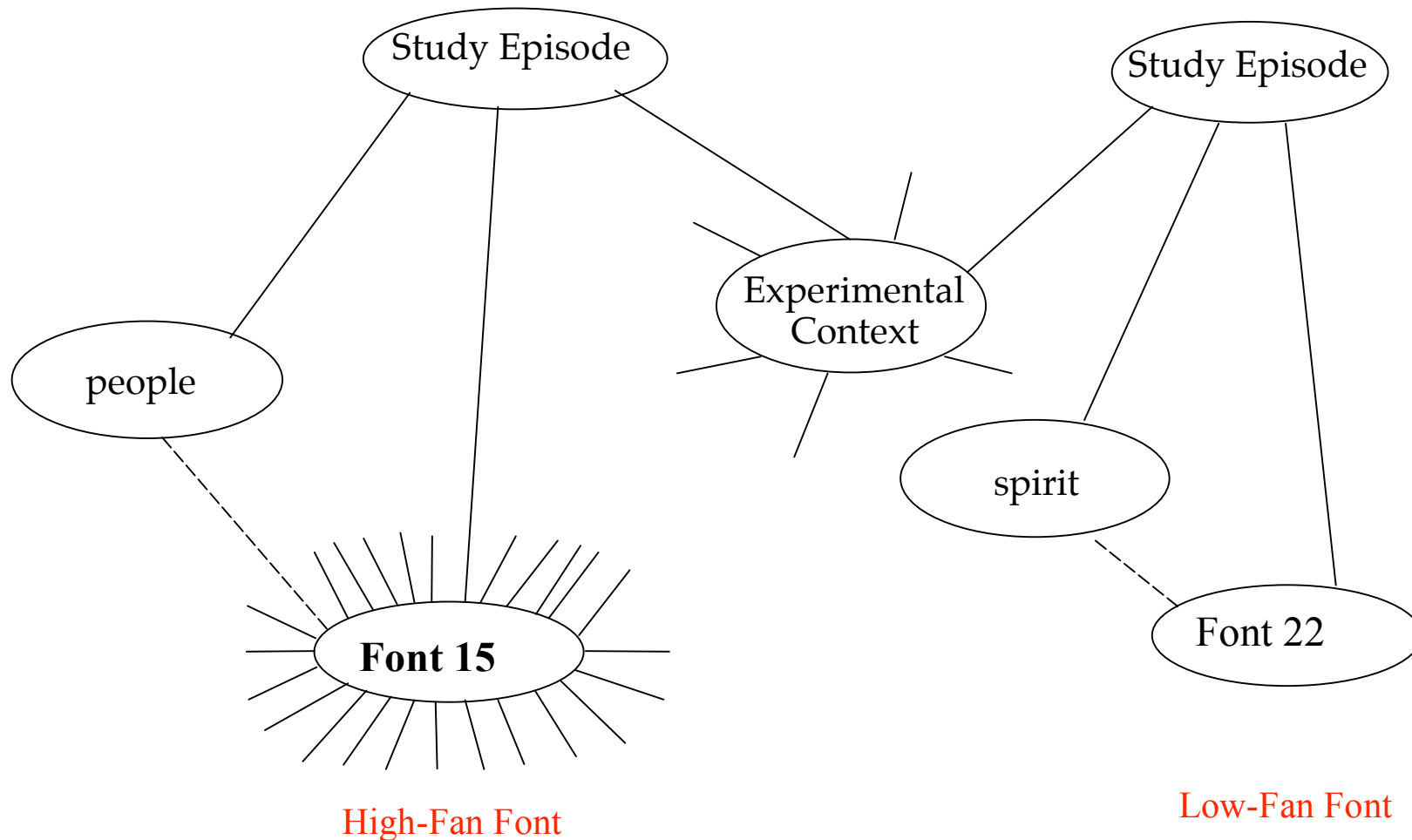
More activation spreads to the episode node and concept node from the font node that has fewer competing associations (i.e., a low-fan font).

'Remember' Data and Model Fits
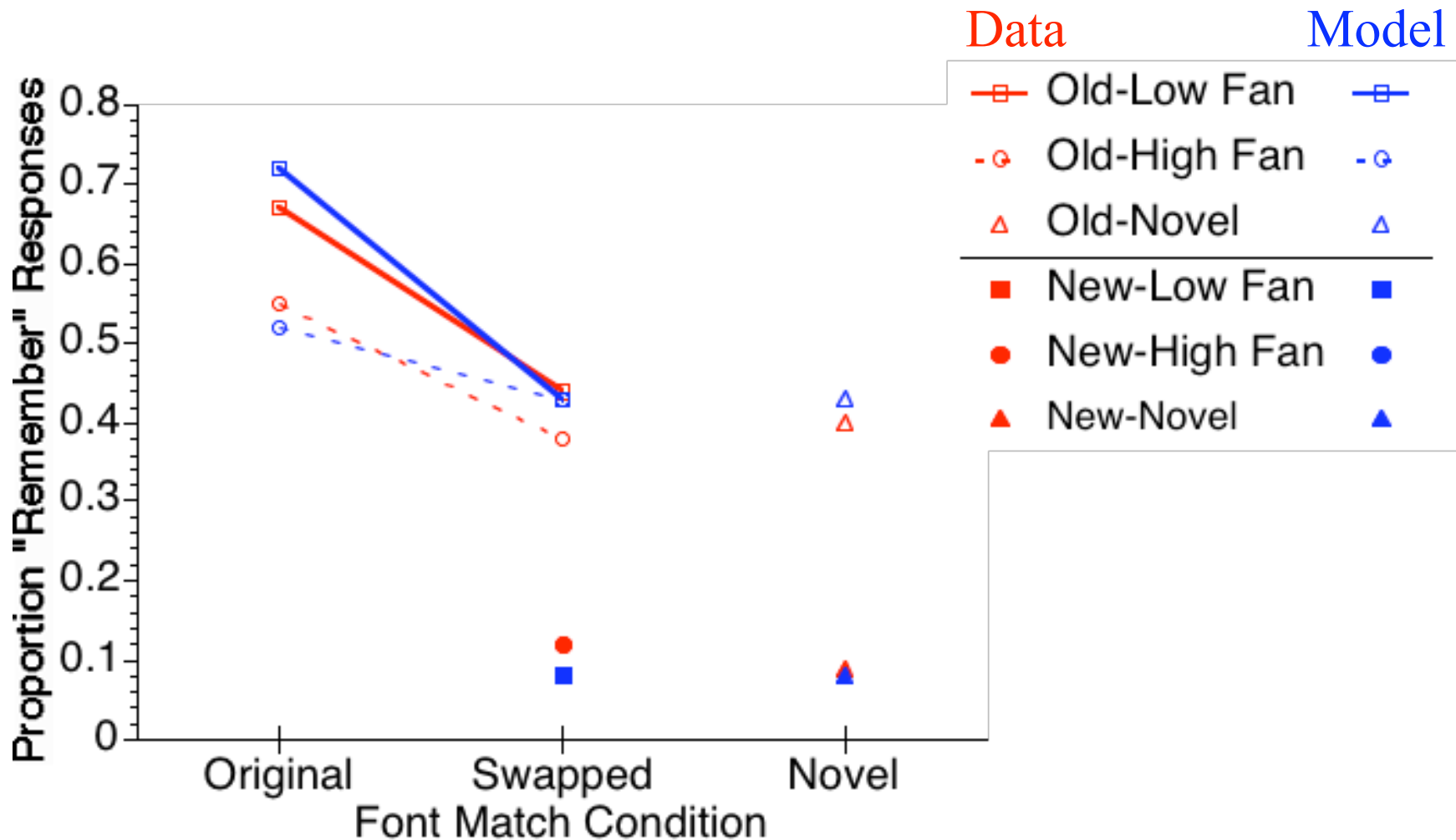
There were more "Remember" judgments when the study and test fonts matched. This effect was greater for items that had been studied in a low-fan font rather than a high-fan font.

"Know" Data and Model Fits
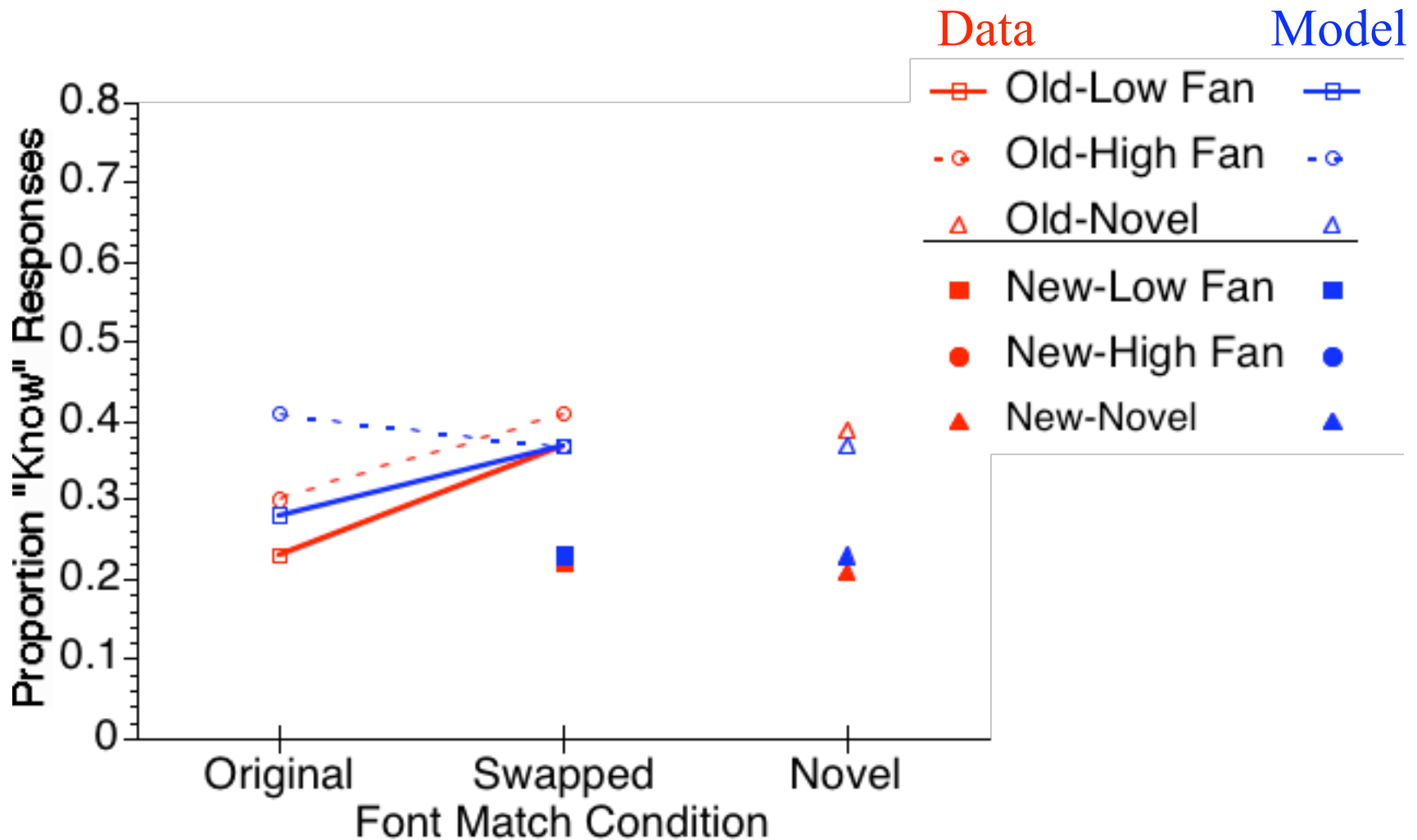
SAC provides a good quantitative fit to the data from Reder et al. Experiment 3: SSE = .03, r = .97, r^2 = .94.
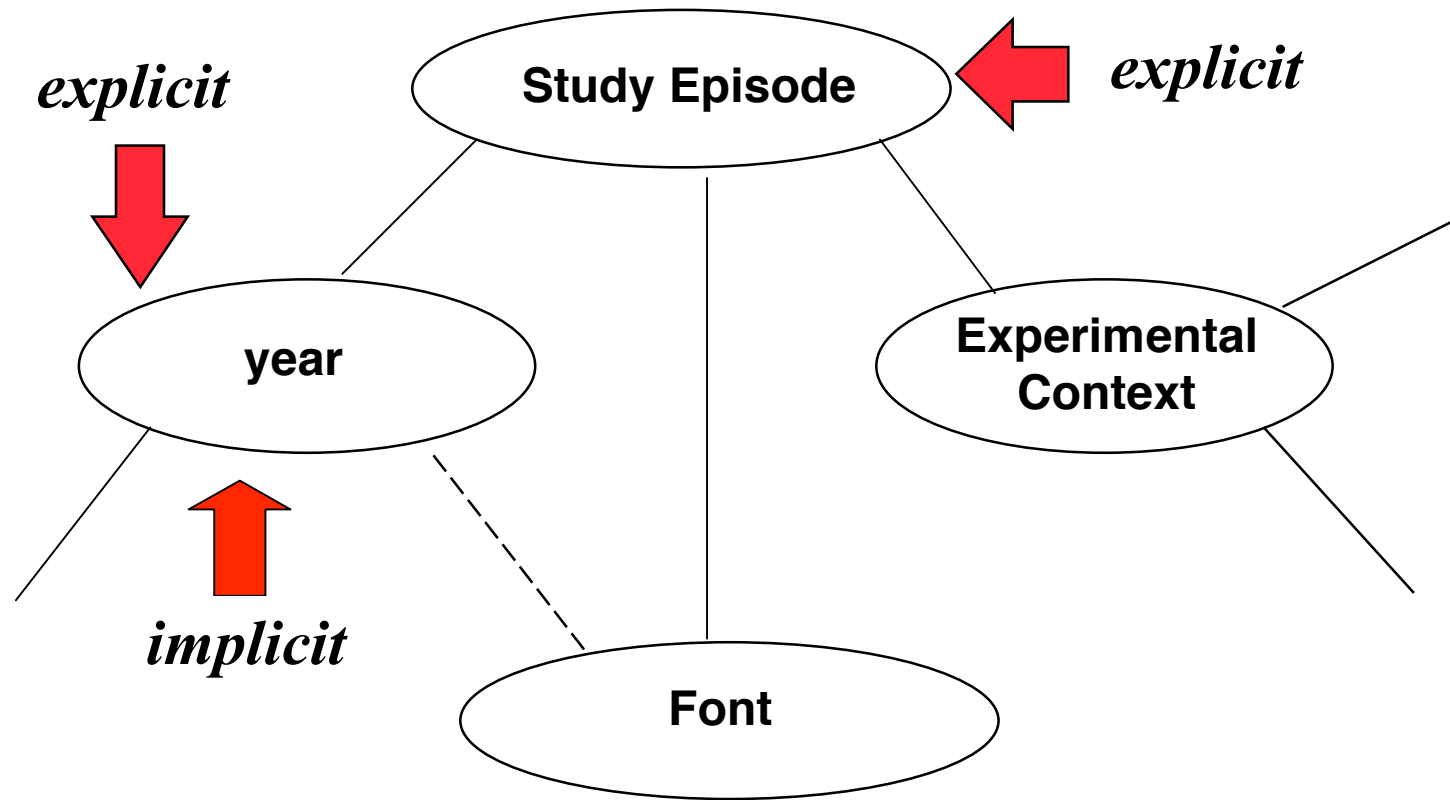
Implicit Memory Experiment

♦ Do perceptual fan effects also occur for implicit memory?

♦ One might argue that these perceptual effects on recognition memory do not present a challenge to the PRS perspective, because it was proposed to account for implicit, not explicit, memory effects.

♦ To address this issue, we used the same experimental design as the explicit memory experiment, except participants performed a word fragment completion task during test

♦ Example word fragments:
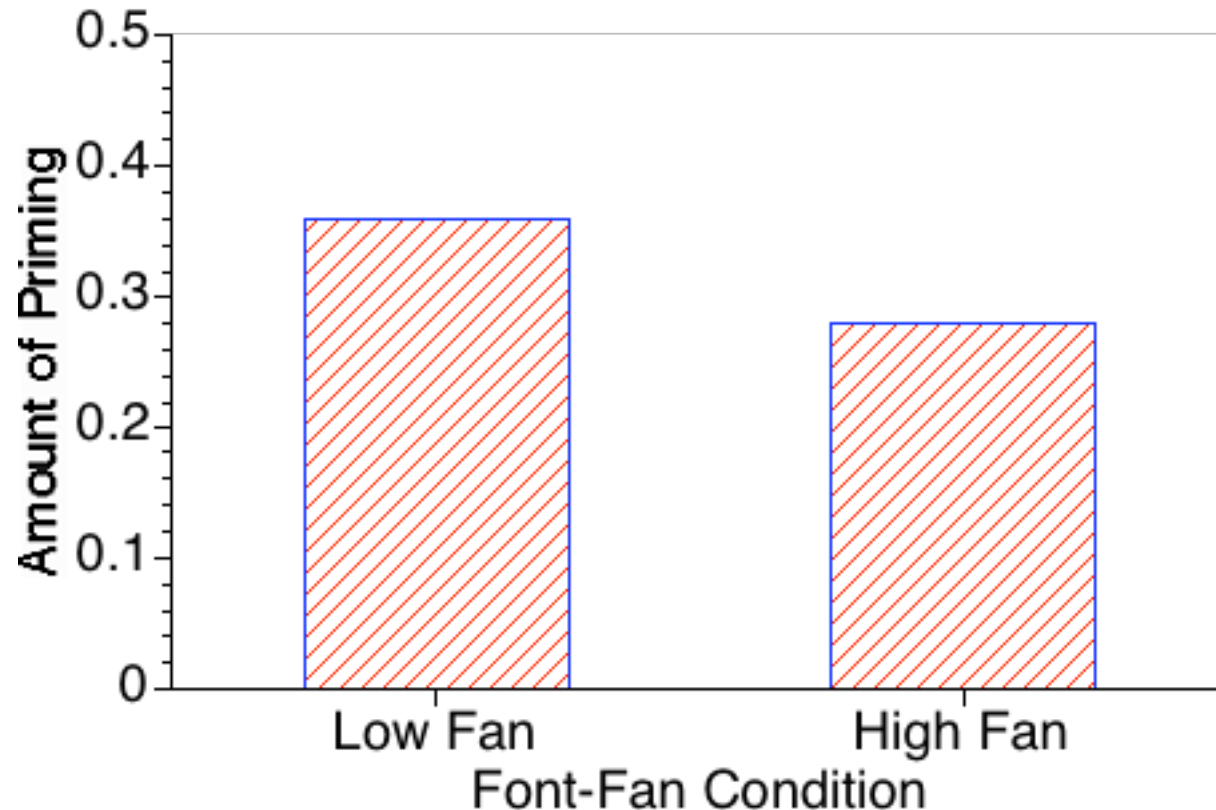
D—N—SA——

-E-UNT-

B--DDE-

SAC View of Explicit and Implicit Memory

Explicit memory judgments derive from sufficient activation of either the episode node or the concept node; however, implicit memory performance (e.g., word fragment completion) derives from sufficient activation of the concept node.

Amount of Priming

(Priming = Original – New Low/High)

A perceptual fan effect was obtained: the benefit of a matching font was greater for words that had been studied in a low-fan font rather than a high-fan font, $\underline{t}(31) = 2.15$, $\underline{p} < .05$.

SAC Model Fits to Implicit Memory Data

SAC provides a good quantitative fit to the implicit memory data:
SSE = .005, r = .98, r^2 = .97.

Conclusions

♦ The perceptual match effect and the perceptual fan effect both occur for implicit, as well as explicit, memory.

♦ Using the same strengthening and decay equations and parameters that had been used to model conceptual fan effects, SAC provides a good quantitative fit to both the explicit and implicit memory data.

⇒ The perceptual match effect and the perceptual fan effect can be explained by positing the same memory system and processes for perceptual and conceptual information.

⇒ In other words, it is not necessary to posit either separate perceptual and conceptual memory systems or independent memory processes to account for these perceptual effects.

References

Graf, P., & Ryan, L. (1990). Transfer-appropriate processing for implicit and explicit memory. <u>Journal of Experimental Psychology: Learning, Memory, and Cognition, 16</u>, 978-992.

Reder, L. M., Donavos, D. K., & Erickson, M. A. (2000). The role of perceptual match in direct tests of memory: Evidence against multiple systems. <u>Manuscript submitted for publication</u>.

Reder, L. M., Nhouyvanisvong, A., Schunn, C. D., Ayers, M. S., Angstadt, P., & Hiraki, K. A mechanistic account of the mirror effect for word frequency: A computational model of remember-know judgments in a continuous recognition paradigm. <u>Journal of Experimental Psychology: Learning, Memory, and Cognition, 26</u>, 294-320.

Schacter, D. L., & Tulving, E. (1994). What are the memory systems of 1994? In D. L. Schacter & E. Tulving (Eds.), <u>Memory Systems</u> (pp. 1-38). Cambridge, MA: MIT Press.

Acknowledgements