Visual masking reveals two qualitatively different levels of unconscious cognition

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Note: The reproduced slides from the presentation do not contain quite enough information to be easily understandable. This version therefore contains amplification in the form of notes in this red font.

A few preliminaries

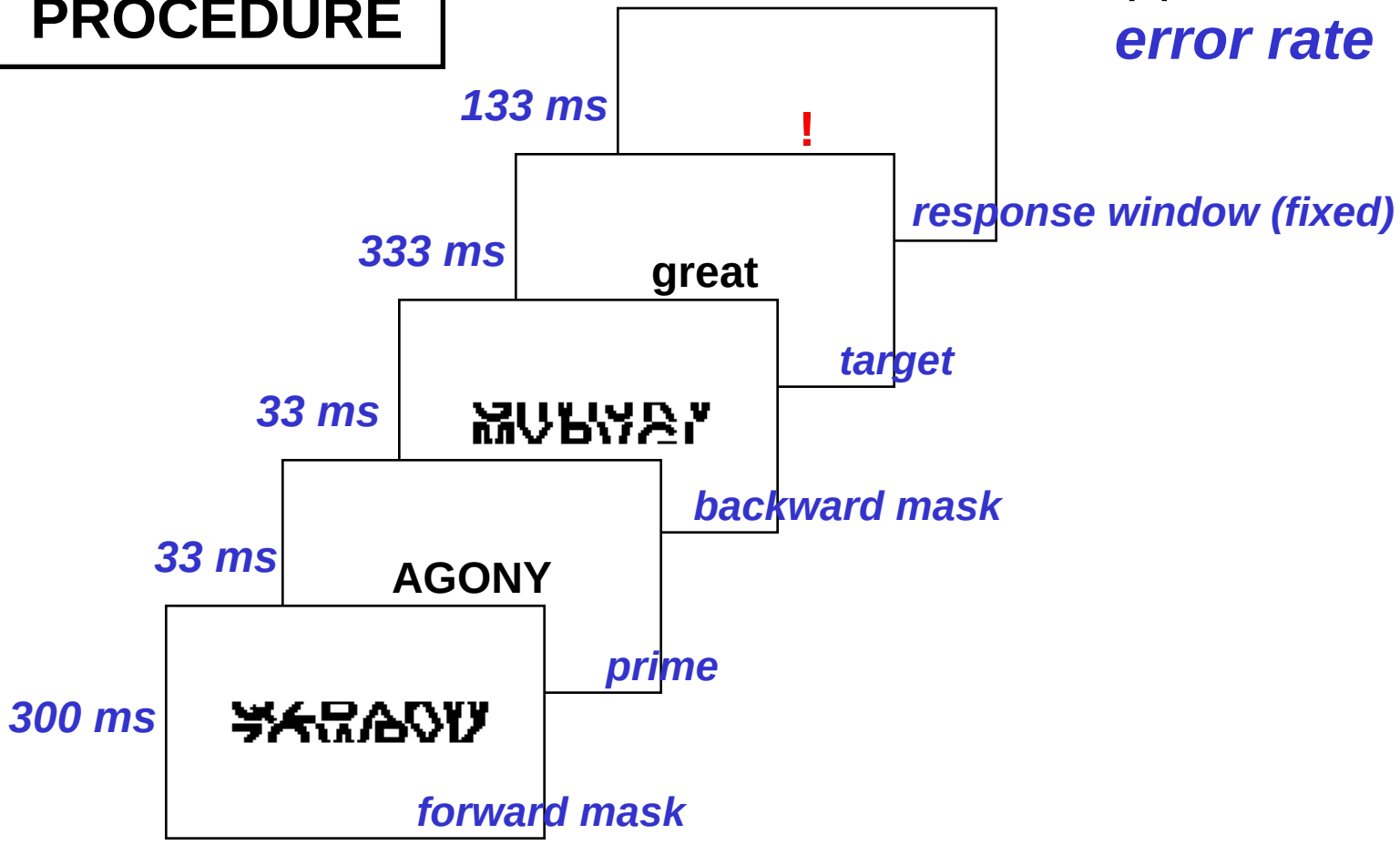
- **The subliminal priming effects to be described are easily producible**
- **They depend on practice in classifying target words**
- **Most of these effects are produced by subword letter strings that have acquired meaning during an initial practice period of the experiment**
- **The effects do not show retrieval of meanings of whole words**

Instructions for the valence classification task

- **Press the right key if the word is pleasant in meaning**
- **Press the left key if the word is unpleasant in meaning**
- **Respond while the exclamation point is on the screen**

RESPONSE WINDOW PROCEDURE

Priming effect appears on ***error rate***



Note: This illustration of procedure is for a valence classification task. The trial shown is one with an incongruent prime-target combination. The opposite-valence prime tends to select a response opposite to that selected by the target. Under time pressure of the response window, this will produce noticeably more errors than with congruent priming.

Inquisit

The response window procedure and the procedure used to test for visibility of the masked prime stimuli were demonstrated at this point.

To cover a lot, experiments will be summarized by showing only

- **examples of stimuli used as targets**
- **examples of stimuli used as primes**
- **priming effects, measured as sensitivity (*d´*) of the target response to the prime stimulus**

Except for the most recent results, data from visibility tests will not be shown.

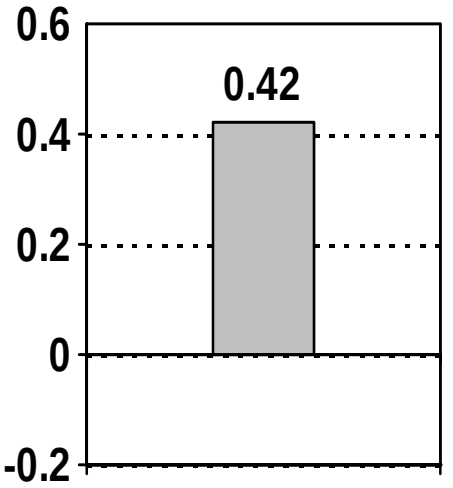
However, careful visibility tests were done in each experiment.

‘STANDARD’ FINDING

	unpleasant	*pleasant*
***practice & test target stimuli*:**	anger blind grief jail	home kiss ocean happy

	unpleasant	*pleasant*
***test (masked) primes*:**	ANGER BLIND GRIEF JAIL	HOME KISS OCEAN HAPPY

priming effect (d´)



N = 12, *p* = .0002

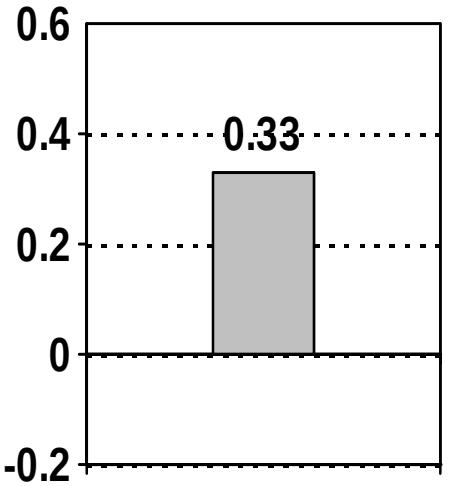
Note: Primes are from the same set that the subject had initially practiced classifying as targets. Targets are always presented lower case; primes upper case

*This priming effect is obtained with words that subject has **practiced** classifying*

NONWORD 'HYBRID' PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	smut bile dread scream	tulip humor angel cheer
***test (masked) primes*:**	BIUT SCREAD	HULIP CHEEL

priming effect (d´)



N = 12, *p* = .0002

Note: Primes are constructed as combinations of parts of practiced target words. (Colors show 'parent' practiced target words and the 'hybrids' produced from them. All stimuli were presented in black font.)

*This effect depends on **practice** classifying the words that contain the recombined pieces that compose primes*

Abrams & Greenwald, *Psychological Science*, 2000.

CONCLUSIONS (1)

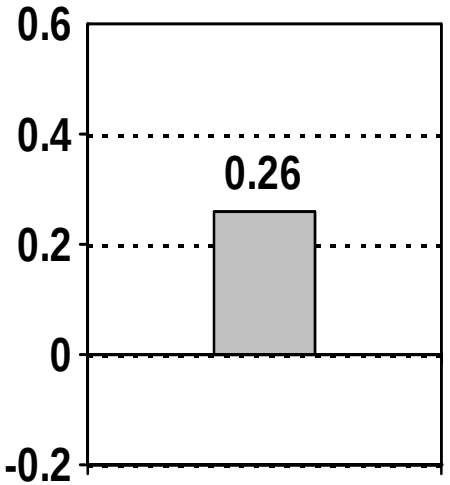
- **Nonword hybrid primes act subliminally as if they had the valence of their 'parent' words**
- **Subliminal priming is capable of analyzing information from subword units**
- **These effects depend on practice classifying the 'parent' target words**

NONWORD (REARRANGED-WORD) PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	harm	mint
	debt	silk
	jerk	posh
	ugly	cozy

***test (masked) primes*:**	AHMR	TNIM
	EDTB	ISKL
	KREJ	HSOP
	GUYL	OCYZ

priming effect (d´)



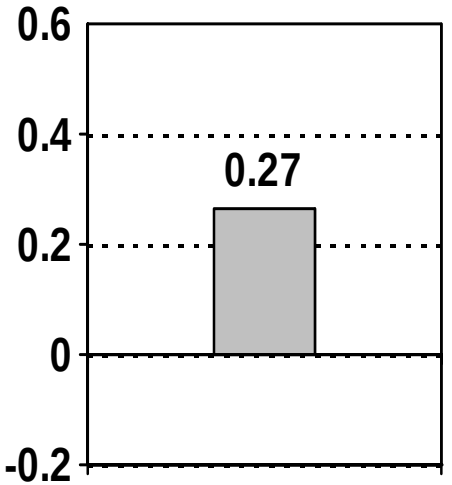
N = 5, *p* = .01

Note: Primes are constructed as non-pronounceable non-word anagrams from the practiced target words.
(Colors show 'parent' words and descendant anagram primes. All stimuli were presented in black font.)

‘FRANKENSTEIN’ PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	**bleed** **mice** **geek**	**swan** **toy** **purr**
***test (masked) primes*:**	**MBLD** **GKCB** **CMLG**	**STPW** **TYSR** **PNYR**

priming effect (d´)



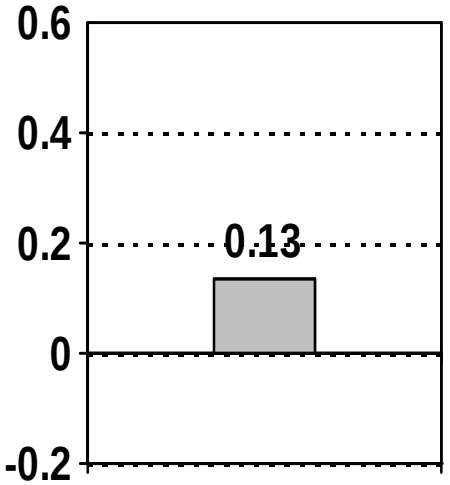
N = 11, *p* = .002

Note: Primes are constructed from ill-fitting pieces from multiple parent words. (Again, colors show the relation between practiced ‘parent’ target words and the primes created from their consonants.)

REPEATED-CONSONANT PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	puny war soot	medic big like
***test (masked) primes*:**	NNNN RRRR YYYY	DDDD GGGG KKKK

priming effect (d´)



N = 16, *p* = .01

Note: Even single consonants from practiced words were found to function as subliminal primes, although the priming effect was weaker than in preceding experiments.

CONCLUSIONS (2)

Subliminal priming is achieved easily by letter strings composed of ill-fitting parts such as:

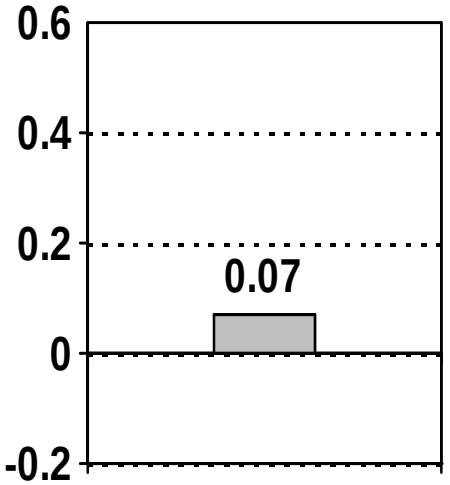
- **nonword anagrams of practiced target words**
- **consonants from multiple practiced target words**
- **repeated single consonants from practiced target words suffice to produce subliminal priming**

UNPRACTICED ('ORPHAN') PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	**dumb**	**dance**
	menace	**nature**
	victim	**rich**
	waste	**warmth**

***test (masked) primes*:**	**ANGER**	**HOME**
	BLIND	**KISS**
	GRIEF	**OCEAN**
	JAIL	**HAPPY**

priming effect (d´)



N = 12, *p* = .14

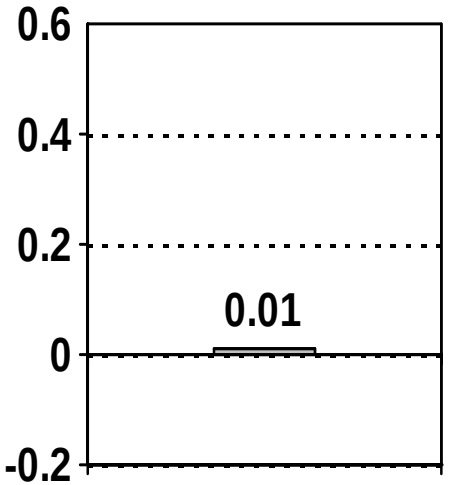
Note: Unlike previous experiments, primes were words that had **not** previously been practice-classified as targets. This did not produce a significant priming effect, although the d' priming measure was above zero.

Abrams & Greenwald, *Psychological Science*, 2000.

TOTAL ‘ORPHAN’ PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:** letter set: abdfhmoprsw	**barf**	**food**
	damp	**posh**
	doom	**prom**
	drab	**shop**
***test (masked) primes*:** letter set: cegijklnqtuvy	**EVIL**	**CUTE**
	GEEK	**GLEE**
	JUNK	**LIVE**
	QUIT	**LUCK**

priming effect (d´)



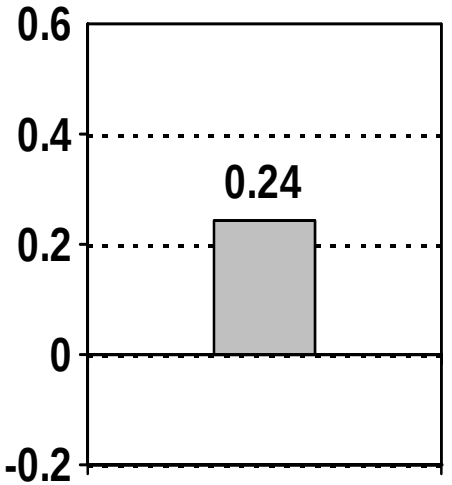
N = 17, *p* = .53

Note: Primes in this experiment were ‘total’ orphans, which contained no parts (letters) from previously practiced target words. The priming effect was nil.

PARADOXICAL 'HYBRID' WORD PRIMES

	unpleasant	*pleasant*
***practice & test target stimuli*:**	smut bile dread scream	tulip humor angel cheer
***test (masked) primes*:**	SMILE DREAM	TUMOR ANGER

priming effect (d´)



N = 34, $p = 10^{-9}$

Note: These primes are constructed like the hybrid primes in Slide 8. Now, the primes are words that have evaluative meaning opposed to that of the practiced parent words from which their (recombined) parts came. These primes functioned subliminally (and paradoxically) with the valence of their parent words.

Abrams & Greenwald, *Psychological Science*, 2000.

CONCLUSIONS (3)

- **Paradoxical hybrid word primes (just like nonword hybrids) act subliminally as if they had the valence of their practiced 'parent' words**
- **'Orphan' words (not practiced as targets) act weakly (if at all) as subliminal primes**
- **These results give no indication that subliminal priming has access to long-term memory of word meaning**

SOME INTERESTING QUESTIONS

- **How much additional prime exposure would it take to find that subliminal primes were able to activate word meanings?**
- **Would it have to be long enough so that the primes would become visible?**

The following four slides show stimulus materials and results for a new experiment that was designed to answer these questions by using prime duration as a between-subjects variable. There were four levels of prime duration: 17, 33, 50, and 67 ms (prime-target SOA = 83 ms; a backward mask filled the interval between end of prime and start of target).

The experiment was conducted separately with name-gender (shown first) and word valence classification tasks.

These words were initially practiced targets, and also later used as primes

Practiced Male Name Primes

DIRK
SHANE
JOE
EDDIE
JULIUS
RUDY
BERTRAM
KEITH
PAUL
ADAM

These words were used as primes, but without any previous practice classification

Unpracticed Male Name Primes

MATT
MIKE
NICK
AARON
OSCAR
PETER
THAD
ERIC
ANDY
SCOTT

These nonsense hybrids (derived from the practiced targets) were used as primes

Nonsense Male Hybrid Primes

SHIRK = shane + dirk
EDOE = eddie + joe
RUIUS = rudy + julius
KEIRAM = keith + bertram
ADAUL = adam + paul

Practiced Female Name Primes

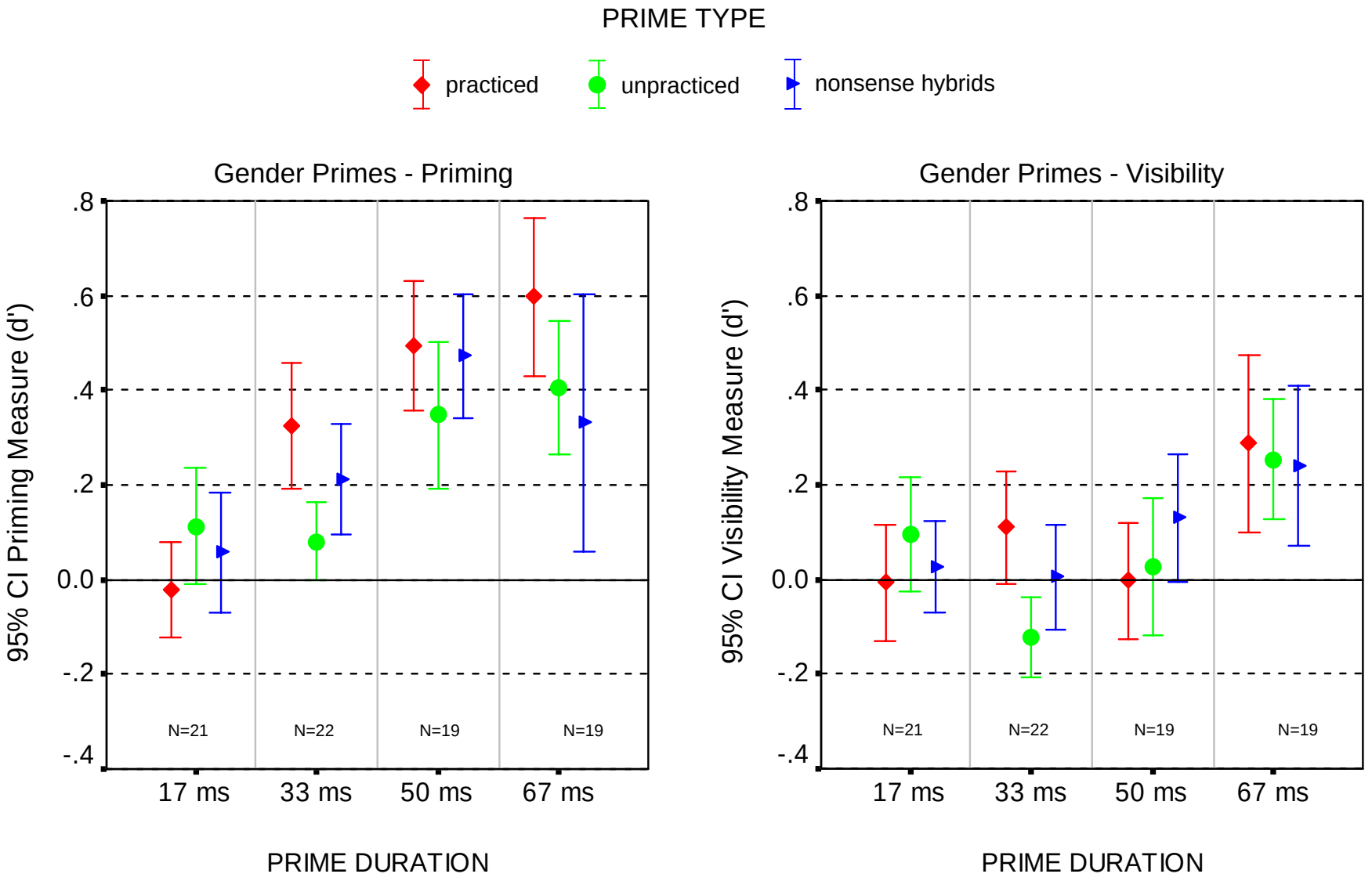
LOUANN
DORIS
EVELYN
FRAN
ALICE
ELLEN
NELL
GAIL
CLAIRE
FLORENCE

Unpracticed Female Name Primes

KATE
LINDA
PEGGY
HEIDI
FAYE
ETHEL
ERIN
NICOLE
PHOEBE
AUDREY

Nonsense Female Hybrid Primes

DORNN = doris + louann
FRAVE = fran + evelyn
ELLCE = ellen + alice
GALL = gail + nell
FLOIRE = florence + claire



Results to notice: (a) Visibility tests (right panel) showed lack of visibility (d' near zero) up to 50 ms prime duration. (b) unpracticed words (green bars) were effective primes (left panel) at 50 ms, but not at shorter durations. (c) Practiced and nonsense hybrid primes were effective at a shorter subliminal duration (33 ms). I.e., effects were qualitatively different at 33 ms and 50 ms, but these two different effects were both subliminal, as shown by the visibility test.

These words were initially practiced targets, and also later used as primes

Practiced Negative Valence Primes

FRAIL
FLEE
POOR
PHONY
GOON
CLOD
CHEAT
DANGER
BLEMISH
MESS

Practiced Positive Valence Primes

BIG
SMILE
SCIENCE
DREAM
FAME
SAVE
SLED
LAKE
WARM
DEAR

These words were used as primes, but without any previous practice classification

Unpracticed Negative Valence Primes

RAPE
AFRAID
BOMB
UGLY
WRONG
TRAP
STINK
FIGHT
PAIN
HELL

Unpracticed Positive Valence Primes

HEALTH
PEACH
THANK
FIRST
KIND
STRONG
TRUE
CUTE
RICH
ABLE

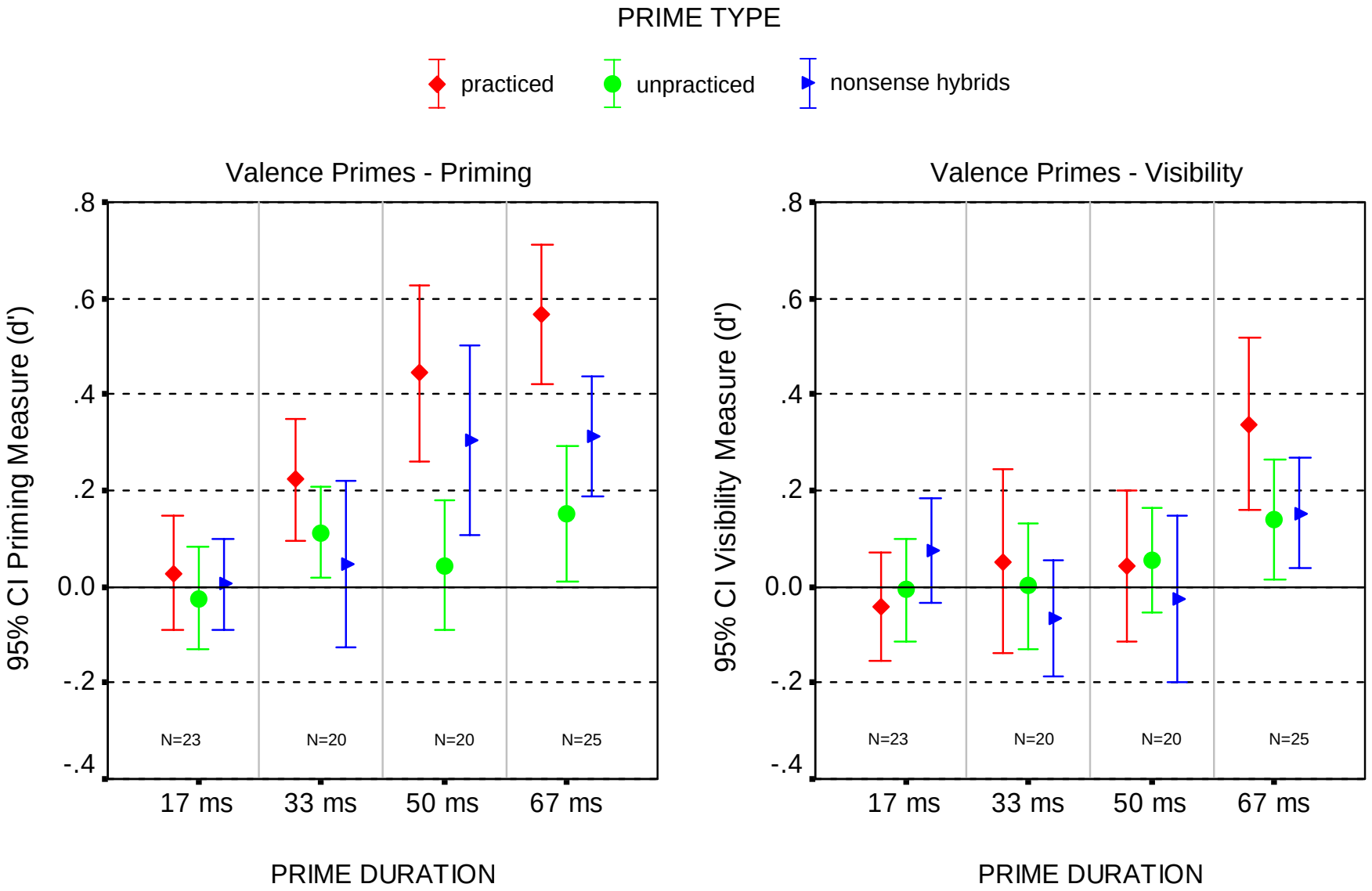
These nonsense hybrids (derived from the practiced targets) were used as primes

Nonsense Negative Hybrid Primes

FLIL = flee + frail
PHOR = phony + poor
CLON = clod + goon
DANAT = danger + cheat
MEMISH = mess + blemish

Nonsense Positive Hybrid Primes

SMIG = smile + big
DRENCE = dream + science
FAVE = fame + save
SLKE = sled + lake
DERM = dear + warm



Results to notice: (a) Visibility tests (right panel) showed lack of visibility (d' near zero) up to 50 ms prime duration. (b) Practiced and nonsense hybrid primes were effective at 50-ms duration (left panel) but unpracticed primes were not effective at that duration (this was like the name-gender primes at the shorter duration of 33 ms). (c) Somewhat puzzlingly, unpracticed words (green bars) were effective as subliminal primes (but barely) at the 33-ms duration.

CONCLUSIONS (4)

- **There is a level of stimulus exposure (prime duration?) at which (a) words are not visible and (b) parts of words, but not whole words, are analyzed**
- **There is a level of greater exposure at which (a) words are still not visible and (b) long-term semantic memory of word meaning is accessed.**
- **These appear to be two qualitatively different levels of unconscious cognition**
- **The results, alas, do not show this quite as cleanly (for the valence primes) as is desirable**

MOST INTERESTING UNANSWERED QUESTION

Why was word meaning accessible for name gender (but not word valence) with prime duration = 50 ms?

- **Gender is the only dimension of meaning for names (valence is only one of many dimensions of word meaning)**
- **Gender meanings of names don't change (valences associated words often do)**
- **Languages have classes of words based on male-female gender (not valence)**