Electrodermal Recognition without Identification: Relation between Autonomic Response and Familiarity?

Alison L. Morris Anne M. Cleary Mary L. Still Iowa State University

Background

Recognition without Identification

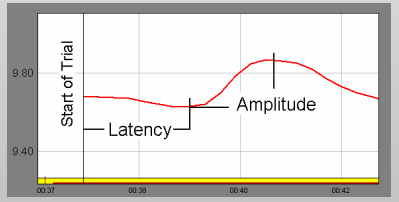
On recognition tests, participants can discriminate between studied and non-studied items when the items are presented in such a way that their identification is hindered. This has been shown when identification is hindered by stimulus fragmentation (Cleary, Langley & Seiler, 2004), or by rapid, masked presentation of the recognition test stimuli (Cleary & Greene, 2004). These studies have shown that familiarity ratings are reliably higher for studied items than for nonstudied items even in the absence of identification.

How one might judge familiarity for an unidentified word

Repetition of a stimulus, as when it appears on a study list and then again on a test list, has been shown to produce reduced neural activity associated with that stimulus (Brown & Aggleton, 2001). Relatively novel items produce greater neural activity and thus more effectively increase arousal and recruit attentional resources. It is possible that participants base their familiarity ratings for unidentified stimuli, in part, on autonomic arousal signals (sympathetic nervous system activity).

Electrodermal Response

One indicator of autonomic arousal is the electrodermal "orienting response" (OR) - phasic changes in skin conductance occurring 1-3 seconds after the appearance of a discrete stimulus (see Figure below). Reduced latency and/or increased amplitude of the OR correlates positively with novelty, intensity, or significance of a stimulus.



Electrodermal Indicators of Recognition Memory

Bentin & Moscovitch (1990) had participants study a list of words; one every 30 seconds. One week later, their skin conductance was recorded during a recognition task. Reliable differences in SCRs were found between studied and nonstudied words, regardless of participant accuracy.

Hypothesis

If familiarity judgments are related to autonomic arousal, we should find reliable SCR differences for studied vs. nonstudied items (identified or not)using the recognition-without-identification paradigm.

Procedure

Participants studied 4 15-word study lists with each word displayed for 2 seconds. Immediately after each study list, a test list (30 items) was presented one word at a time. Test words were pre- and post-masked and shown briefly (30 ms for half the participants, 50 ms for the other half).

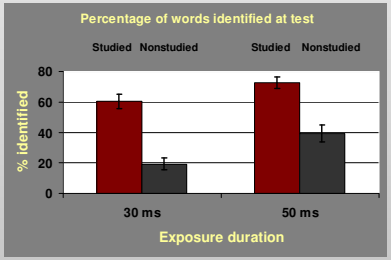
$$$$$$$$	100 ms
GALVANIC	30 or 50 ms
$$$$$$$$	100 ms

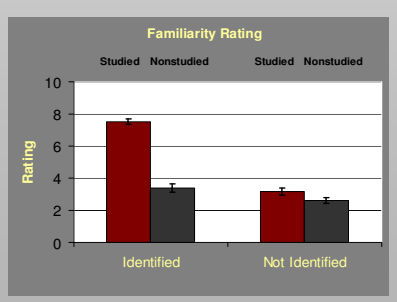
Participants rated the likelihood that the test item was studied on 0-10 scale:
0 = definitely not studied 10 = definitely studied

Then they typed the word, or as much of it as they could identify.

Words were randomly assigned as studied or nonstudied for each participant.

Results





Identification

Significant main effect of ***study status*** (priming effect), $F(1, 38) = 321.10$, $p < .001$.

Significant main effect of ***exposure duration***, $F(1, 38) = 7.131$, $p < .05$

Marginally significant interaction $F(1, 38) = 3.596$, $p = .066$

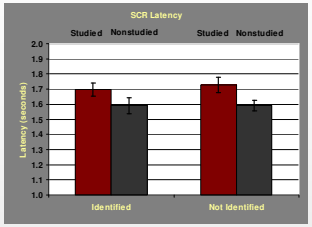
Familiarity Rating

Significant main effect of ***study status*** $F(1, 38) = 211.91$, $p < .001$

Significant main effect of ***identification status***, $F(1, 38) = 173.99$, $p < .001$

Significant interaction $F(1, 38) = 188.62$, $p < .001$

Unidentified items show significant effect of ***study status*** $F(1, 38) = 16.47$, $p < .001$

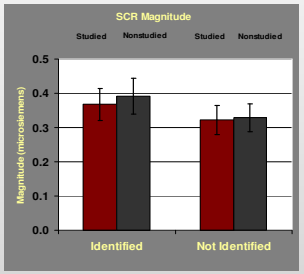


Latency & Magnitude

Significant main effect of ***study status*** $F(1, 38) = 10.59$, $p < .01$

No other significant main effects or interactions.

No main effects were found for response amplitude, however an effect of identification status was found for response magnitude (a measure which combines frequency and amplitude).



Item analyses revealed that this effect was not driven by specific stimuli, but reflects amplitude differences dependent on identification.

Conclusions

Studied words showed longer SCR latencies than nonstudied words, even when the words were not identified. Thus, SCR latency may be an indicator of relative recency, with more novel items showing faster responses. In addition, identified words showed greater SCR magnitude suggesting that the SCR is sensitive to identification status or possibly semantics. Participants' familiarity ratings may be influenced by changes in autonomic arousal as reflected in the SCR measure.

References

Bentin, S., & Moscovitch, M. (1990). Psychophysiological indices of implicit memory performance. *Bulletin of the Psychonomic Society, 28*, 346-352.

Brown, M. W., & Aggleton, J. P. (2001). Recognition memory: What are the roles of perirhinal cortex and hippocampus? *Nature Reviews Neuroscience 2*, 51-61.

Cleary, A. M., & Greene, R. L. (2004). True and false memory in the absence of perceptual identification. *Memory, 12*, 231-236.

Cleary, A. M., Langley, M. M., & Seiler, K. R. (2004). Recognition without picture identification: Geons as components of the pictorial memory trace. *Psychonomic Bulletin & Review, 11*, 903-908.