# Extending the Response-Time "Guilty Knowledge Test"

Travis Seymour,
Jess Kerlin, and Anna Kurtz

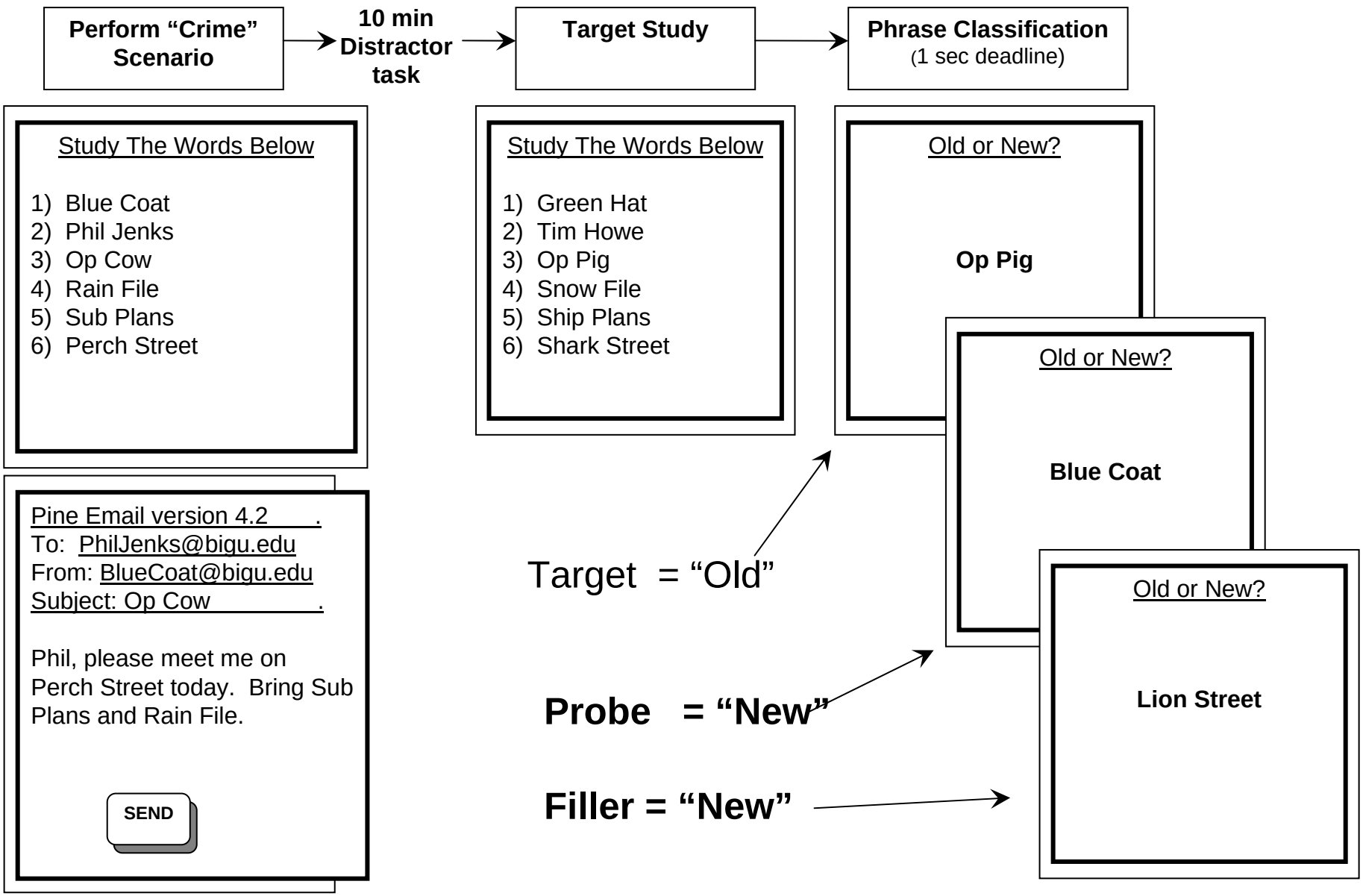
Department of Psychology
University of California - Santa Cruz

# Introduction

Sometimes it is important to determine another's familiarity with privileged information despite their intention to conceal this knowledge. Following previous work showing that recognition memory can be used to index knowledge activation [1,2,3], Seymour, Seifert, Mosmann & Shafto (2000) proposed a "Guilty Knowledge Test" (GKT) based on response time (RT) and accuracy to critical information[4]. Shown on the next panel, subjects learn a set of Probe items and use these items to participate in an mock-crime scenario. Then, following a delay, subjects learn a new Target list and are given a recognition task where they must respond "Old" only to Target items, while responding new to familiar Probes as well as new Filler items. Results show that even motivated subjects are slower and less accurate when rejecting Probe items compared to Filler items, thus revealing their knowledge of the Probes[4].

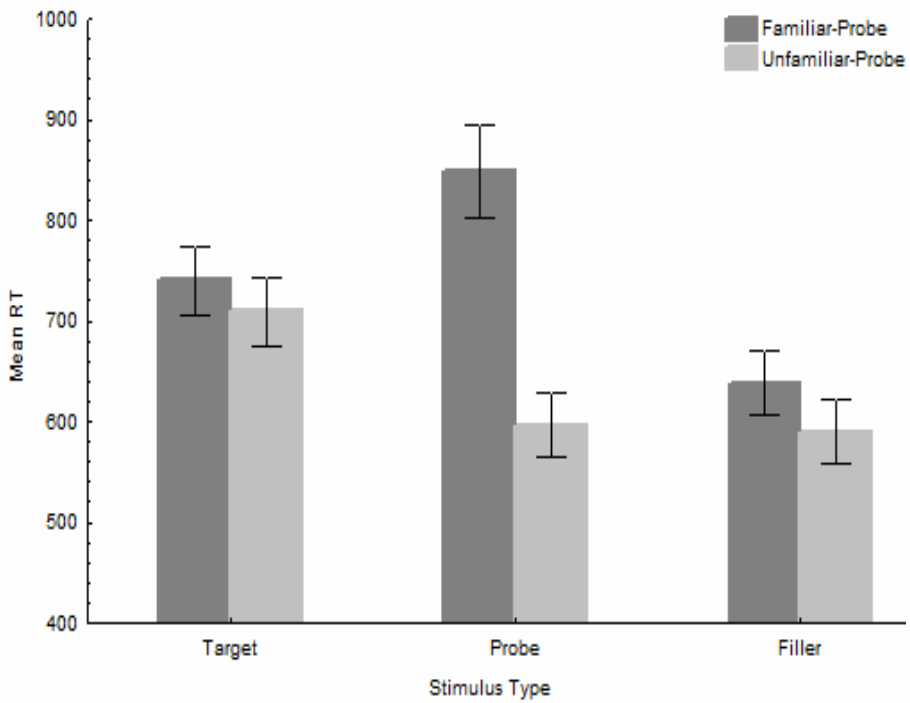
# Method

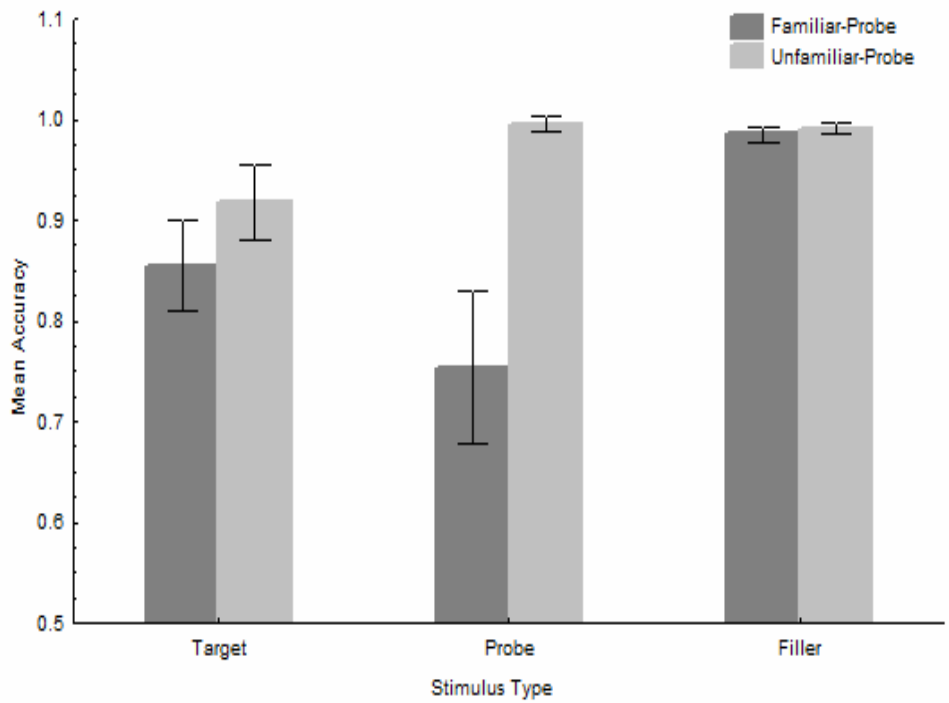
## Seymour, Seifert, Mosmann, & Shafto (2000)



# Results

## Seymour, Seifert, Mosmann, & Shafto (2000)




The graphs plot mean RT (left) and accuracy (right) as a function of stimulus type. When Probes are familiar ("guilty" block), responses to Probes are slower and less accurate than to Fillers. When Probes are unfamiliar ("innocent" block), responses to Probes and Fillers are indistinguishable. This pattern is the "Guilty Knowledge Effect" [4].

# Limitations of the RT Guilty Knowledge Test

Seymour et al. (2000) showed that a RT-based GKT was sufficient to distinguished participants with privileged knowledge from those without it. As opposed to more complex methods using a polygraph [3], EEG [2], or pupil-dilation [5], their simple RT-based paradigm coupled with a new individual subject analysis method was able to achieve a hit-rate of .98 and a false-alarm rate of 0. However, one limitation of this work is that the RT-GKT has not been shown to work with stimuli other than verbal phrases (e.g. "blue coat"). An applied version of the test restricted to verbal stimuli would be of limited use. Also, it has been suggested that the GKE is not specific to verbal long-term memory, and instead is attributed to an integration of executive control and motor processes that mediate competing response-sets [6,7,8].

If the guilty-knowledge effect (GKE) is not specific to verbal stimuli, a reliable GKE should result from a RT-GKT based on visual stimuli. In an applied setting, stimuli for the test might consist of critical objects from a crime scene (e.g., a knife or a gun), as well as particular people associated with a crime (e.g., a guard, or victim). Thus, we have prepared two modified versions of the RT-GKT. In Experiment 1, stimuli are drawn from a set of images depicting various objects (e.g., knives or toy guns). In Experiment 2, critical stimuli are drawn from a set of neutral grayscale photographs. Probe and Target study for Experiment 1 involved various questions about the physical appearance and tactile nature of the objects, as well as questions about how each object might be used in a violent crime. In Experiment 2, participants were questioned about the physical features of each face, and asked to judge each face on apparent age, honesty, and attractiveness. For both experiments, only familiar-Probe data were collected (i.e., “guilty” block only).

# Experiment 1 - Method

## Probe Study → Distractor Task → Target Study → Classification Task

### Probe Study

Examine this object

1. What textures would you expect to feel on this object?
2. What shapes can be identified in this object?
3. How could this object be used in building a model airplane?
4. How could this object be used by a criminal to harm another person?

### Distractor Task

Work on Math Reasoning Test for 10 minutes

### Target Study

Examine this object

1. What textures would you expect to feel on this object?
2. What shapes can be identified in this object?

### Classification Task

**(1 second deadline)**

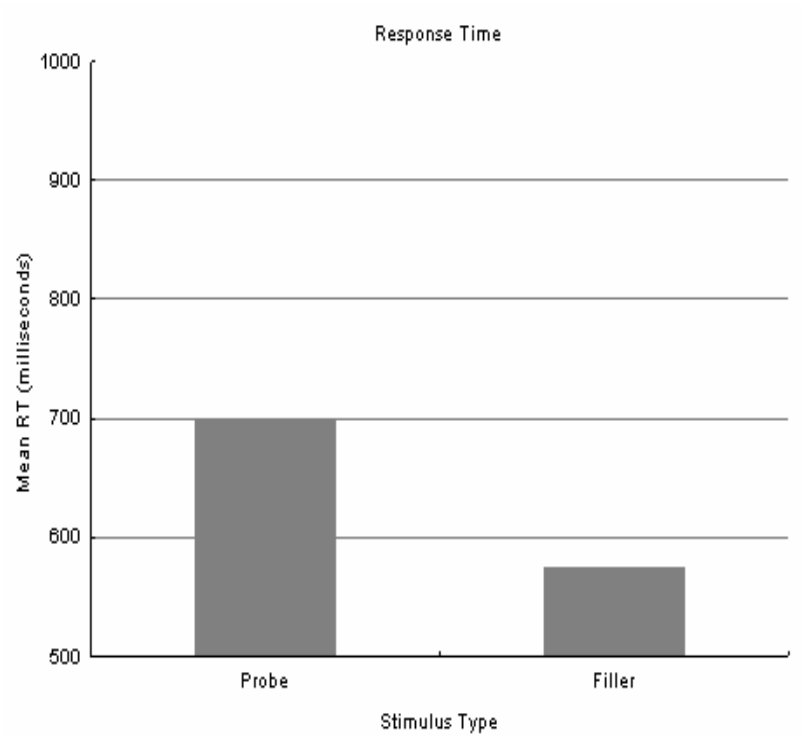
Was this object in the group you just studied (Target List)?

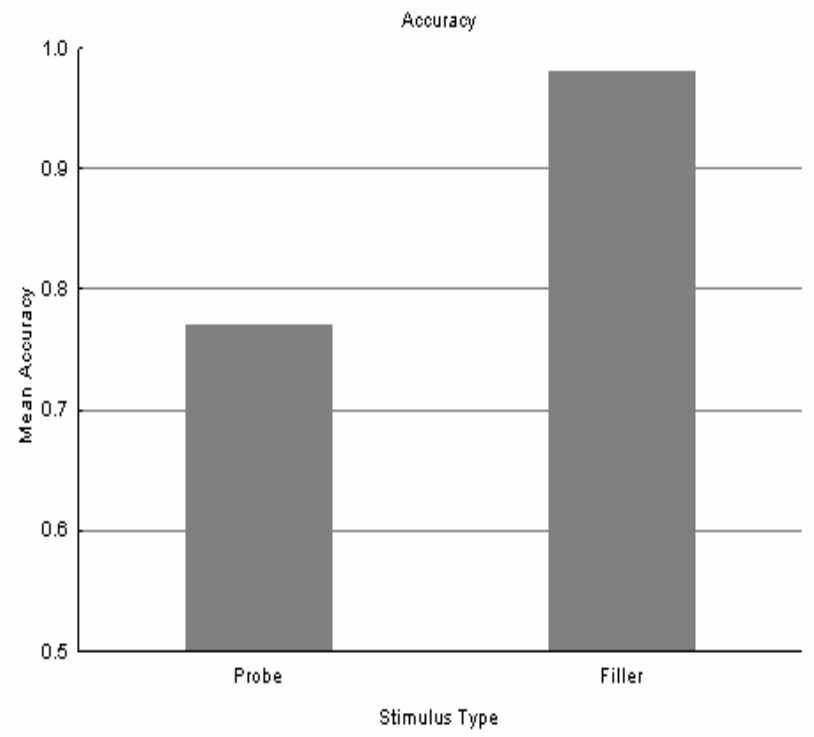
Target: Yes

**Filler: No**

**Probe: No**

# Experiment 1 - Results



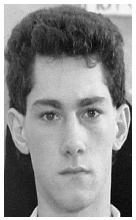




Data from Experiment 1 show a GKE for RT (left panel), $F(1, 39)=82$, $p<0.0001$, as well as for accuracy (right panel), $F(1, 39)=82$, $p<0.0001$. That is, subjects were slower and less accurate when rejecting familiar Probe objects in comparison to unfamiliar Filler objects.

# Experiment 2 - Method

## Probe Study

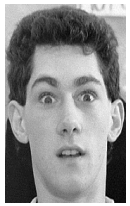
**study this face**



**how big was his nose?**

small
medium
large

**same/different emotion?**



**rate honesty**


## Distractor Task

Work on Math Reasoning Test for 10 minutes

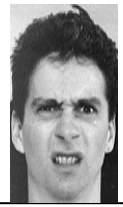
## Target Study

**study this face**

**how big was his nose?**

small
medium
large

**same/different emotion?**

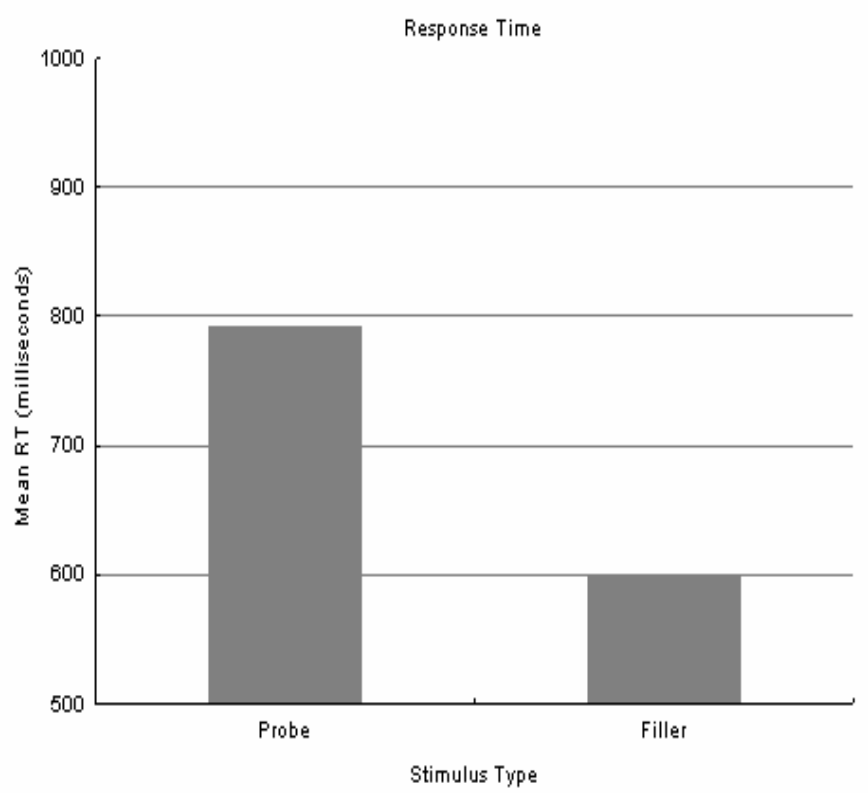


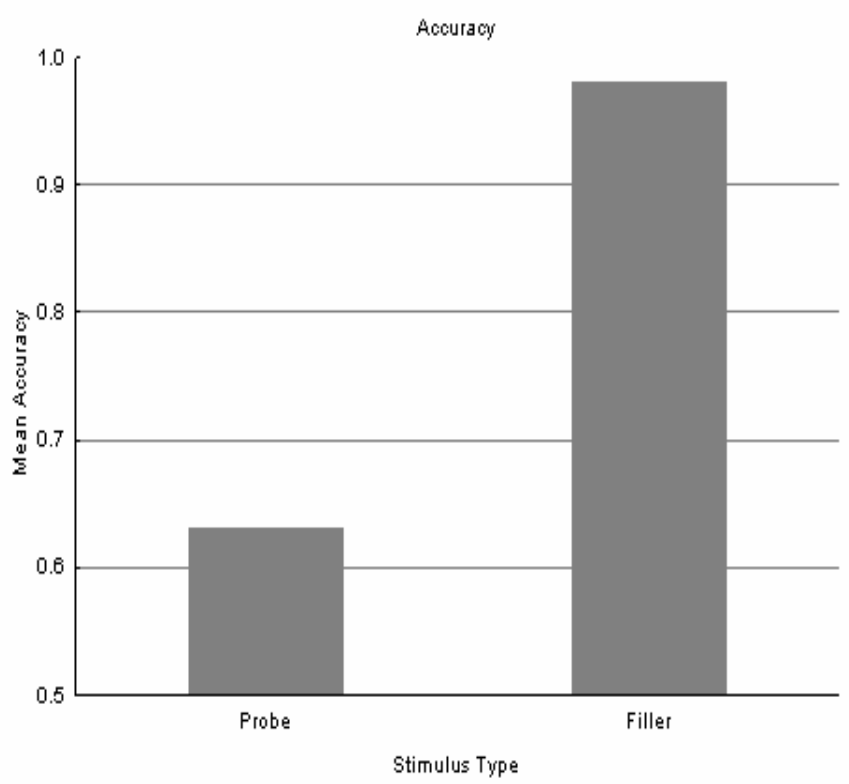
## Classification Task

**in group you just studied?**

(1 second deadline)

# Experiment 2 - Results




Similar to Experiment 1, data from Experiment 2 show a GKE for RT (left), $F(1, 21)=101$, $p<0.01$, as well as for accuracy (right), $F(1, 21)=29.5$, $p<0.01$. That is, subjects were slower and less accurate when rejecting familiar Probe faces in comparison to unfamiliar Filler faces.

# Conclusion

Experiments 1 and 2 each revealed a reliable effect of privileged knowledge. Although pictures of objects yielded a smaller GKE than pictures of faces, both effects are reliable and robust. Thus, the GKE reported using verbal phrases with the RT-based GKT has been extended to pictures of objects as well as faces. This result is consistent with previous work suggesting that the GKE is not a result of dynamics in verbal long-term memory, but rather an integration of executive control and motor processes [6,7,8]. Based on these results, we would expect to find slower RTs and decreased accuracy when participants were attempting to mask their knowledge of a wide variety of familiar stimuli. This not only supports a richer applied use of the RT-GKT, but also supports theoretical work attributing the GKE to motor and control processes [6,7,8].

# References (order of appearance)


1. Lykken, D. T. (1959). The GSR in the detection of guilt. *Journal of Applied Psychology, 43,* 385-388.
2. Rosenfeld, J. P., Cantwell, B., Nasman, V. T., Wojdac, V., Ivanov, S., & Mazzeri, L. (1988). A modified, event-related potential-based guilty knowledge test. *International Journal of Neuroscience*, 24, 157-161.
3. Farwell, L. A. & Donchin, E. (1991). The truth will out: Interrogative polygraph ("lie detection") with event-related brain potentials. *Psychophysiology, 28,* 531-547.
4. Seymour, T. L., Seifert, C. M., Mosmann, A. M., & Shafto, M. G. (2000). Using Response Time Measures to Assess "Guilty Knowledge". *Journal of Applied Psychology*, 85(1).
5. Lubow, R. E., & Fein, O. (1996). Pupillary size in response to a visual guilty knowledge test: New technique for the detection of deception. *Journal of Experimental Psychology: Applied*, 2(2), 164-177.
6. Seymour, T. L., & Seifert, C. M. (1998). A model of the "Guilty Knowledge Effect:" Dual processes in recognition. In M. A. Gernsbacher & S. J. Derry (Eds.), *Proceedings of the Twentieth Annual Conference of the Cognitive Science Society* (pp. 939-944). Mahwah, New Jersey: Lawrence Erlbaum Associates.
7. Seymour, T. L. (2001). A epic model of the 'guilty knowledge effect': Strategic and automatic processes in recognition. *Dissertation Abstracts International: Section B: The Sciences & Engineering,* 61(10-B), 5591.
8. Seymour, T. L. Modeling the Effect of Concealed Knowledge as an Interaction between Task-Specific and Task-Invariant Control Processes. *Unpublished manuscript*.



We would like to thank Christina Bolanos and Aimee Fitzgerald for their help in collecting the data reported here.

# Contact

For a copy of the poster, article reprints, or further information:

**address**: 374 Social Sciences 2
Psychology Department
University of California
Santa Cruz, CA 95064

**phone**: 831-459-3384

**email**: nogard@cats.ucsc.edu

**web**: http://www.travisseymour.com