

# **Psychological Set or Differential Salience: A Proposal for Reconciling Theory and Terminology in Polygraph Testing**

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## **Abstract**

What is now known as the Comparison Question Technique (CQT) is based on the assumption that truthful persons will be more physiologically responsive to comparison questions than to relevant (incident-related) test questions whereas for deceptive persons the opposite will be true. Years of research have confirmed this expectation. While the term “Psychological Set” has been accepted in the field to refer to this difference in responsiveness, the term has very limited value. It does not accommodate non-CQT procedures and it is neither understood nor applied in the scientific literature as it is by polygraph examiners. In this paper it is proposed that the CQT phenomenon is better described by the concept of “Differential Salience,” a term which has a stronger scientific foundation. Moreover, the concept of differential salience describes what is observed physiologically in common polygraph testing methodologies aside from the CQT.

## **Introduction**

The use of what was termed a “comparative response question,” a question specifically introduced during polygraph testing to provide a stimulus against which to compare and evaluate the significance of the physiological reactions to relevant questions, was introduced by John E. Reid in 1947. From that time such a “control question” became commonplace in the field. Today the “control question” is more appropriately referred to as a comparison question. The use of such questions is the basis for Comparison Question Techniques (CQT).

In the early 1960’s Cleve Backster applied the term “Psychological Set” to polygraph testing in an attempt to explain the functioning of the CQT. That concept, along with two others advanced by Backster, “super-dampening” and “anti-climax dampening,” joined the lexicon of polygraph examiners from that time forward (Backster, 1960a, 1960b). Backster introduced all of these terms to explain different patterns of physiological responding which he observed during CQT polygraph testing. The latter two terms, super-dampening and anti-climax

dampening, were original to Backster. According to Matte and Grove (2001), however, Backster attributed the term “psychological set” to the author of a 1948 psychology textbook (Ruch, 1948). However, in a recent paper Handler (2007) reported that “psychological set” was not mentioned in the Ruch text. When Handler discussed this with Backster, Backster said that he himself had created the term “psychological set” (Handler, personal communication December 15, 2007).

There is some confusion regarding how these three concepts differ. The commonly accepted definition for “psychological set” seems to be what was originally used by Backster to describe his concept of “anticlimax dampening.” For instance, here is what Backster (1960b) wrote about that concept:

“The anticlimax dampening concept is formulated on the well-validated psychological principle that a person’s fears, anxieties, and apprehensions are channeled toward the situation which holds greatest immediate threat to his self-preservation or general well-being.”  
pg 1.

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Most polygraph examiners today would likely recognize this definition of anticlimax dampening as being the same as the contemporary definition of the term “psychological set.” Indeed, Matte and Grove (2001) advised that this same definition was used in 1965 by DACA’s predecessor organization, the US Army Military Police School (USAMPS), to describe “psychological set.”

For the purpose of this paper we have focused on what is the prevailing field understanding of “psychological set.” Examinees will be more physiologically responsive to stimuli (test questions) that pose the greatest threat to their well-being or interests. If more than one type of threat is presented, reactivity will tend toward that which is perceived as the greatest threat with diminished or no reactivity to the secondary threat. When the two threats include both relevant questions and probable-lie comparison (PLC) questions, “psychological set” is said to explain why liars respond more greatly to the former and truth-tellers to the latter.

Central to “psychological set,” and to the concepts “super-dampening” and “anticlimax dampening” is the notion that an examinee’s fears will orient his attention, that the physiological responding will tell where those fears are directed, and that deception and truthfulness can be inferred by the pattern of physiological responding. Though superficially appealing, the theory is insufficient to explain those circumstances where polygraph testing continues to produce accurate results despite the lack of examinees’ fears. For example, previous writers have pointed out that examinees will still react in the predicted way during polygraph testing even when there are no threats against the examinee (Davidson, 1968; Liebllich, Naftali, Shumueli, & Kugelmass, 1974). Examinees will even respond when answering truthfully to a chosen card in a card test (Gustafson & Orne, 1964; Kugelmass, Liebllich, & Bergman, 1967). In these studies there is no threat to the examinee’s self-preservation or general well-being, an essential component of the “psychological set” theory.

Similarly, the directed-lie comparison (DLC) question technique (Honts & Raskin,

1988; Department of Defense Polygraph Institute Research Division Staff, 1998) offers a clear challenge to the jeopardy presumption of “psychological set”. Recall that during DLC testing the polygraph examiner not only gives the examinee permission to lie on the DLCs, but there is an explicit agreement struck that the examinee will lie to the DLCs. Fear of detection is eliminated as an explanation for an examinee’s reactions to DLC questions. The fear-based “psychological set” concept does not support the effectiveness of DLC polygraph testing, nor does it explain the accuracy of polygraph testing in non-threatening situations. The prevailing definition of “psychological set” therefore is inadequate, prompting the current search for a more fitting and scientifically supported concept that can account for such effects.

The concealed information test (CIT), also known as the guilty knowledge test (GKT), represents another situation where psychological set fails to account for all possible responses that occur on the test. The CIT is based on recognition, and not fear of detection. Over the course of the test, the examinee is simply asked to repeat plausible stimuli contained in a particular crime scene. The foundation of the test is on what the examinee knows or recognizes, not the emotional reactions that may emanate from the stimuli, such as fear or perception of threat (Ben-Shakhar & Elaad, 2003). Ultimately, the narrow scope of the psychological set cannot account for the robust effects of the CIT.

One substantial problem with respect to “psychological set” is that no branch of the behavioral sciences, including what is often said to be polygraphy’s parent science, psychophysiology, recognizes how those in the polygraph field apply the term. A search of the EBSCO behavioral science database returned 39 abstracts or article summaries that included the term ‘Psychological Set’ ranging in time from 1956 to 2006. Two of these instances were simply incidental pairings of the words ‘psychological’ and ‘set’ and did not refer to an integrated concept. Without exception, the remaining 37 abstracts used the term psychological set to describe some sort of mindset, expectation, world view, or approach taken in a problem solving situation. The term was never used in the

context of channeling or focusing concern on the greatest of a group of potential threats, as the term is used in the polygraph community. This peculiarity gives rise to confusion and provides a basis of derision for polygraph critics (Furedy, 1991). Even as a best case, “psychological set” is viewed as non-scientific jargon. A replacement expression would not only have to have an accepted definition within the larger scientific community, but it would also have to deal with those phenomena which “psychological set” fails to address. We propose that the appropriate expression is “differential salience.”

### Defining Salience

The adjective “salient” is described as “prominent” or “conspicuous” based on the Random House Unabridged Dictionary (2006). The American Heritage Dictionary of the English Language (2006) characterizes “salient” as “strikingly conspicuous” or “prominent.” The WordNet® 3.0 system produced by Princeton University describes “salient” as “having a quality that thrusts itself into attention.” Finally, the Kernerman English Multilingual Dictionary defines “salient” as “main,” “chief,” “most noticeable.” These sources also define “salience” as “the state or condition of being salient.”

Based on the definitions above, salience indicates that a stimulus is prominent, conspicuous, and/or striking. As the source or cause of salience is unspecified in these definitions, the implication is that a given stimulus can be salient for a wide variety of reasons. A stimulus that is considered to be salient may be threatening, novel, surprising, familiar, complicated, pertinent, or otherwise significant. Furthermore, different stimuli will possess different degrees of salience, in the same sense that different stimuli would be threatening, novel, surprising, etc., to different degrees. It may not always be possible to know why, in any particular case, one item is more salient than another.

### Salience in the Scientific Literature

Conducting a search for “salience” or “salient” using the EBSCO PsychINFO database for the behavioral sciences indicates that these terms exist in over 15,000

published articles, book chapters, and dissertations. Salience is a broad reaching term, covering the arenas of memory, attention, speech pragmatics, perception, emotion, cognition, social contexts, and many, many others. There is little to debate regarding the pervasiveness or general scientific acceptance of the term “salience.” More importantly, there is also a large body of literature that argues for the role of salience in lie detection, and more specifically, polygraph applications.

### Salience and Lie Detection

Vendemia, Buzan, Green, and Schillaci (2005) and Vendemia, Buzan, and Simon-Dack (2005) described a model of deception that included salience as a key component, among other critical factors. This model is shown in Figure 1. As shown, salience is proposed as a critical component of the physiological measures indicative of deception, among a model that includes memory, emotion, and attentional components.

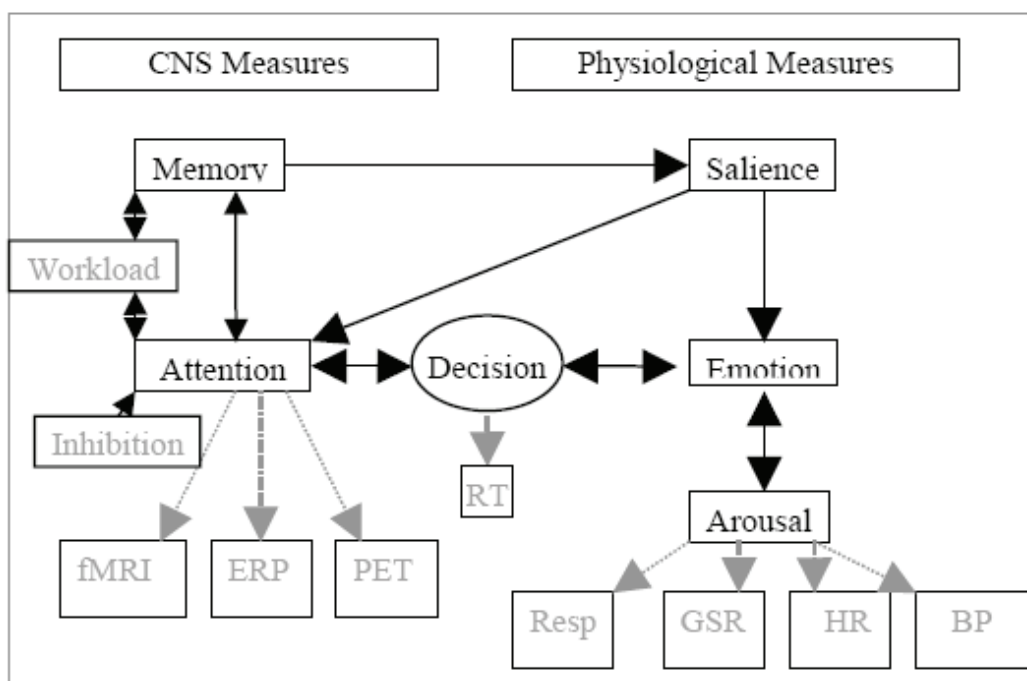
Handler and Nelson (2007) recently argued for the inclusion of salience in the polygraph lexicon, specifically for the purpose of explaining the PLC question test. However, multiple authors have also included the notion of salience in theories of lie detection. Wolpe, Foster, and Langleben (2005) suggested that from “a neuropsychological perspective, both the CQT and GKT are ‘forced-choice’ protocols that seek to detect differences in psychological salience between questions by examining the physiologic responses of the subject to target and baseline conditions.”

In other work, Offe and Offe (2007) stated that “the basic assumption of the CQT is that RQ will have a higher significance for guilty subjects and CQ for innocent subjects and that these differences in significance will be reflected in the physiological variables recorded as the reaction.” In this work, Offe and Offe (2007) concluded that “criticism cannot be sustained that it would be impossible to systematically achieve a differential significance of relevant and comparison questions and to measure it physiologically.”

Honts (2004) also described the rationale of the comparison question test as assessing credibility based on the differential reactions caused by two different types of questions. Differential saliency between relevant and comparison questions as

perceived by the examinee generated these different reactions. Honts used the general description of differences in saliency tied to different questions to explain the diagnostic value of both PLC and DLC question tests.

Figure 1. Proposed relationship of the underlying theoretical constructs involved in the process of deception. From Vendemia, Buzan, and Simon-Dack (2005).



A proposed model of the process of deception. CNS measures such as fMRI, ERP, PET tend to emphasize paradigms that focus on memory and attention, while paradigms involving respiration, GSR, heart rate, and blood pressure tend to emphasize paradigms that manipulate emotion, arousal, and stimulus saliency. (fMRI = functional magnetic resonance imaging, ERP = event-related potential, PET = positron emission tomography, RT = reaction time, Resp = respiration, GSR = galvanic skin response, HR = heart rate, BP = blood pressure)

### **Saliency in the Context of the Psychophysiological Detection of Deception**

Reid (1962) recognized “emotionally weighted” response differences not only between relevant and comparison questions, but also observed degrees of saliency across the relevant questions themselves. The simple

difference in the degree of saliency across stimuli provides the basic theoretical foundation for all polygraph methodologies listed below. It is well accepted, at least given current scientific knowledge, that there is no unique “lie” response. It is only the variability in the saliency of different stimuli that permits an inference of “lying” or that an item is recognized as unique amongst other items.

The following passages discuss how differential salience can be used to explain the effectiveness of major categories of polygraph testing approaches.

### **PLC Question Test**

In the PLC question test, examinees are guided to commit that they are ‘not the kind of person’ that would perform a particular transgression, such as lying, stealing, or harming another. Later, examinees are specifically asked whether they have ever done such things. The assumption is that all examinees have done these things, but that the presentation of such questions will be particularly uncomfortable to the truthful participant who has little concern over the relevant questions. In contrast, guilty examinees are expected to have little concern over the comparison questions, engaged instead by the relevant questions.

The different response magnitudes produced by truthful and deceptive examinees during the polygraph data collection process can be attributed to the differential salience that the relevant and comparison questions hold for the two groups of examinees. Comparison questions are more salient (perhaps because they are more threatening, pertinent, or otherwise significant) than relevant questions for truthful examinees. Relevant questions are more salient (again due to increased relative threat or significance) than comparison questions for deceptive examinees. Thus, the PLC question test is effective due to the different levels or threat or pertinence (encompassed by the term ‘salience’) possessed by the different classes of questions, for deceptive and truthful examinees. This coincides with the reasoning presented by Honts (2004) and Wolpe *et al.* (2005) described earlier.

While the differential salience of the two categories of questions for truthful and deceptive examinees has been demonstrated empirically from inspection of the objective physiological data, it has also been obtained when examinees are debriefed following polygraph examinations (National Research Council, 2003). Horvath (1988) asked examinees in a laboratory study to provide subjective ratings of the questions that had been asked during the testing process. These

ratings, even though provided by persons who were unaware of the theoretical basis for PLC testing, were clearly supportive of the underlying premise. Those examinees who were “deceptive” during the testing rated the relevant questions as of significantly greater concern to them than the comparison questions. On the other hand, “truthful” examinees expressed significantly greater concern for the comparison questions than for the relevant items. These subjective ratings, in addition to the objective scoring of the physiological data, showed that the salience of the comparison questions was greater for “truthful” examinees and the salience of the relevant questions was greater for those who were “deceptive.” It can be concluded that it is this differential salience that accounts for the diagnostic value of PLC polygraph testing. Moreover, because similar findings have been reported in more recent studies, there is compelling reason to suggest that this differential salience generalizes across a variety of settings (Honts, 2003; Horowitz, Kircher, Honts, & Raskin, 1997; Offe & Offe, 2007).

### **DLC Question Test**

The flexibility of the term salience can also be used to explain the processes included in the DLC question test. This test is distinct from the PLC question test in that participants are instructed to lie to the comparison questions. In this context, comparison questions do not present different levels of threat to truthful or deceptive examinees, but rather, different levels of cognitive engagement. Relevant questions, in this type of test, still exist as a potential threatening stimulus, depending on the examinee.

Truthful participants should experience little threat from the relevant questions, but should view the DLCs as more salient, as these questions require them to perform a cognitive task, as directed by the polygraph examiner. Also, truthful examinees are likely vigilant for such questions, relative to the other questions, which likely contributes to their differential salience. In contrast, deceptive examinees should feel threatened by the relevant questions, which detract from the prominence or salience of the DLC questions.

In principle, the DLC questions are more salient for truthful examinees than are relevant questions due to the cognitive task required of DLC questions and potentially due to examinee vigilance. For deceptive examinees, the relevant questions are more salient than the DLC questions due to the threat that they represent. For these reasons we can expect greater response magnitudes to the comparison questions for truthful examinees and greater responses to relevant questions for deceptive examinees in the context of the DLC question test. This fits with Honts' (2004) and Wolpe *et al.*'s (2005) description of the comparison question test, though the source/origination of salience is certainly different than that of the PLC question test.

### **Concealed Information Test**

The concealed information test involves the presentation of elements (sometimes called 'keys') present at a crime scene, in addition to similar but unrelated control (also referred to as foil) items that were not present at the crime. The key items could include the type of weapon used to stab a victim, the caliber of weapon used, the color of the victim's shirt, and so on. In theory, the individual who committed the crime will know the elements or keys of the crime, and these stimuli will be familiar and more prominent than the control stimuli. For the person who did not commit the crime, the key stimuli should not be prominent or familiar relative to the control stimuli.

The concealed information test is effective because of the differential salience of the key stimuli relative to the control stimuli, from the standpoint of the guilty individual. Key stimuli are recognized and familiar for guilty individual, relative to control stimuli, and larger physiological response magnitudes are produced. Innocent individuals undergoing a concealed information test should not find the key stimuli familiar relative to the control stimuli. Thus, for innocent individuals, there should be no differential salience for the key stimuli relative to the control stimuli.

Versions of the concealed information test, including the peak of tension and searching peak of tension approaches, operate

on similar principles. The key value or location of the item of interest holds a special prominence to the deceptive examinee, and thereby, greater salience, relative to the other stimuli presented. Thus, presentation of the key value or location should produce the greatest physiological response, relative to the other items in the presentation sequence. In accordance with this line of reasoning, Wolpe *et al.* (2005) suggested that the purpose of the concealed information test was to assess the salience of information presented to the examinee.

### **Relevant/Irrelevant Test**

The relevant/irrelevant test operates on the premise that a particular relevant question that represents the greatest threat to the examinee will produce significant and consistent physiological responses relative to other relevant questions. For example, an individual who has committed an undetected theft will likely be more concerned about or more threatened by this question than relevant questions dealing with issues about which the examinee has nothing to hide. In this context, questions that pertain to the issues about which examinees are hiding information are more salient than those questions that do not, due to the different level of threat, concern, or prominence that they represent. This differential salience across questions produces greater physiological responses to the relevant question or questions of concern.

### **Concluding Comments**

It is important to note that all polygraph approaches are effective or diagnostic to the extent that the stimuli and questions that they include are salient in the expected direction. For instance, Offe and Offe (2007) demonstrated that participants for whom erroneous decisions were made did not rate comparison questions and relevant questions in the predicted direction. In other words, for these participants, relevant questions and comparison questions did not show differential salience. This was not true for participants on whom correct decisions were made.

In the same vein, the concealed information test is only effective to the extent

that the key stimuli are salient for the guilty examinee and not for innocent examinees. If ineffective key stimuli are chosen, for example when the guilty examinee does not remember a particular element of the crime, then this key will not be familiar or differentially salient to the examinee, relative to the foil (or control) items. No differences in response magnitudes between key and control items are likely to be demonstrated in such cases. (Note: The term “buffer” usually refers to the opening item, not to the noncritical ones which are usually called foils, controls, non-critical items or similar terms.)

### **Summary**

The concept of salience and more specifically, “differential salience” provides a defensible and comprehensible theoretical

framework through which a variety of polygraph approaches can be explained. The expression differential salience allows for multiple explanations of physiological arousal to come to bear, not just being limited to threatening circumstances, as with conventional polygraph explanations. Using salience, we can account for physiological responses that occur due to a variety of reasons, and in the context of a variety of polygraph formats. The notion that such responses appearing in polygraph examinations occur due to a single source (e.g., fear of detection) is incompatible with the psychophysiological literature. Salience provides a vehicle to broaden and enhance our understanding of the multiple factors that come to bear in polygraph testing. It is time to change the way we present what we do in terms of common scientific understandings.

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