Practical Polygraph: Is Something vs Nothing Really Something? Or, Are There Different Versions of Nothing?

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The *something vs nothing concept* (SNC) is a heuristic used by polygraph professionals when analyzing or scoring polygraph test data. Simply stated, the SNC holds that *something vs nothing is something*. Polygraph professionals who have been trained in recent years may immediately recognize this heuristic, and can quickly and easily begin to imagine the circumstances in which it might be used. In practice, the SNC is used when scoring in the electrodermal (EDA) and cardio data, and involves the inspection of an analysis spot, consisting of a relevant question (RQ) and comparison question (CQ) pair, and is the basis for the assignment of a numerical score when there is a usable change in physiology at one of the questions and no usable change in physiology at the other question. Heuristics such as this are highly useful for training and introducing new concepts and skills, because they are easily remembered, easily applied and easily understood – the statement of the heuristic seems to conveys nearly all that one needs to know. However, it often happens that actual field practice involves situations that are more complex and nuanced than is represented by the simple heuristic. What follows is a discussion of the SNC, and examination of the potential limitations of its application and use.

The SNC can be used in both manual and automated scoring algorithms, and

[1] Feature extraction is generic term for the first activity when analyzing data from a scientific test or experiment – the identification of useful signal and separation of useful information from unwanted noise.

is called upon after *feature extraction*[1] during the *numerical transformation and data reduction*[2] function of data analysis when using the Empirical Scoring System – Multinomial (ESS-M) and other numerical scoring methods[3]. Numerical transformation involves the assignment of a single integer score for each *analysis spot* that consists of *relevant question* (RQ) and *comparison question* (CQ) values. Numerical scores are then reduced or aggregated further, for all recording sensors and all presentations of all test stimuli, to derive subtotal and grand total scores to which a *likelihood function* can be applied (i.e., the scores are compared to a reference model, parametric formula, or procedural cut score). Data analysis ends with *interpretation*, which can take place at a number of levels, including the calculation of the outcome confidence or posterior strength of information (or the limits thereof), a procedural rule to parse a categorical result from the numerical and statistical information. Interpretation also involves the translation of the categorical and statistical information into native language (human language) for discussion and possible action in response to the actual meaning and practical value of the test result.

When scoring manually using the ESS-M, experienced field practitioners may execute scoring heuristics, even complex heuristics, so rapidly and intuitively that they may perceive them and describe them as a single function – with little need to verbalize or think consciously about the complexity and nuance of their decision processes. The SNC is an example of this. It omits any discussion about the need to inspect the data for both the presence and magnitude of changes in physiological activity in response to two different CQs before selecting a single CQ for the analysis spot. Also omitted from the SNC is any discussion about a minimum value – the smallest usable degree of change in physiological activity from response onset to response end – above which a response can be described as *something,* and below which the response value may be interpreted as effectively *nothing*. Figure 1 shows an analysis spot for which there is an observable and usable change in physiological activity at both the CQ and RQ. Figure 2 shows a segment for which the pattern of response[4] includes a usable response at the CQ and no observable response at the RQ.

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[2] Numerical transformation and data reduction functions involve the assignment of numerical values to the response features identified by a feature extraction function that locates the response onset and response end. Numerical values for all recording sensors and all presentation of all test stimuli are then aggregated or reduced to a smaller set of values, often in the form of sub-total and grand-total scores.

[3] Refer to Nelson (2020) for a more complete discussion of the basic functions that are common to most, if not all, data analysis methods, whether manual or automated.

[4] Response pattern, or pattern of response, in this context refers to the pattern of loading of larger changes in physiolog ical activity. It does not refer to any characteristic pattern of activity for the time series data obtained from the record ing sensors. There is no response pattern or signature of physiological activity that is either correlated with or uniquely associated with the criterion of deception or truth-telling. Instead, use of the phrase "pattern/s of response activity" refers to whether greater changes in physiological activity, within the analysis segments, occurs more often at the RQs or CQs.

Figure 1. Usable response at both the RQ and CQ.

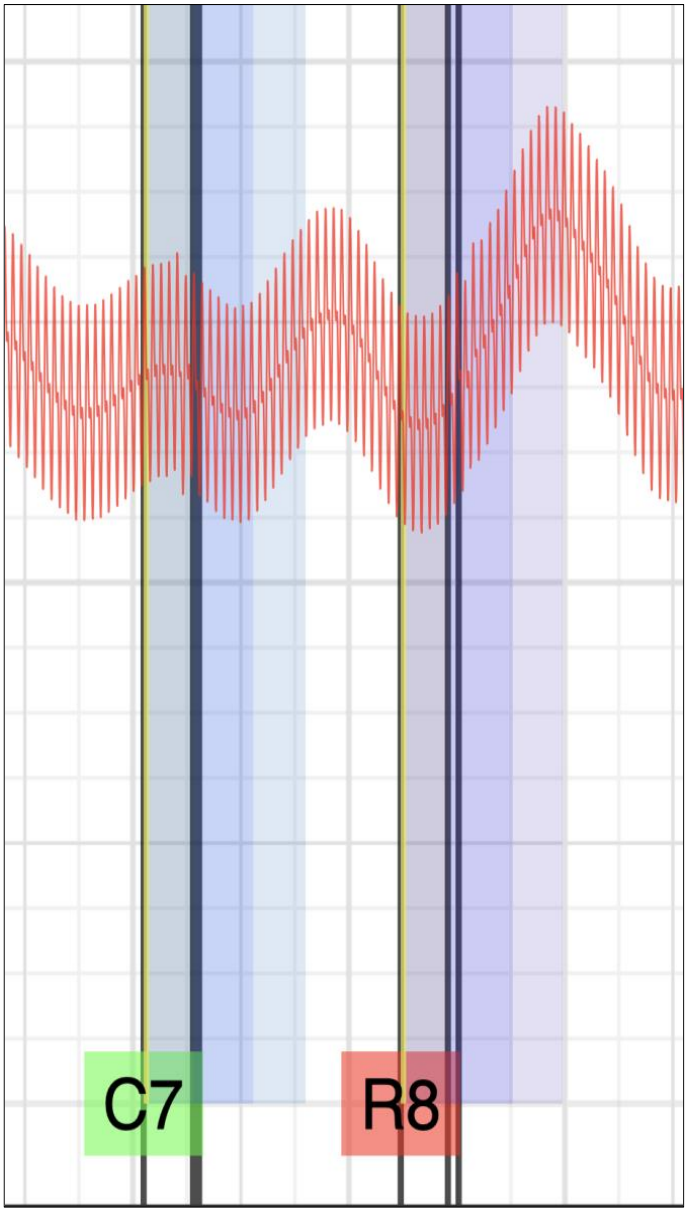
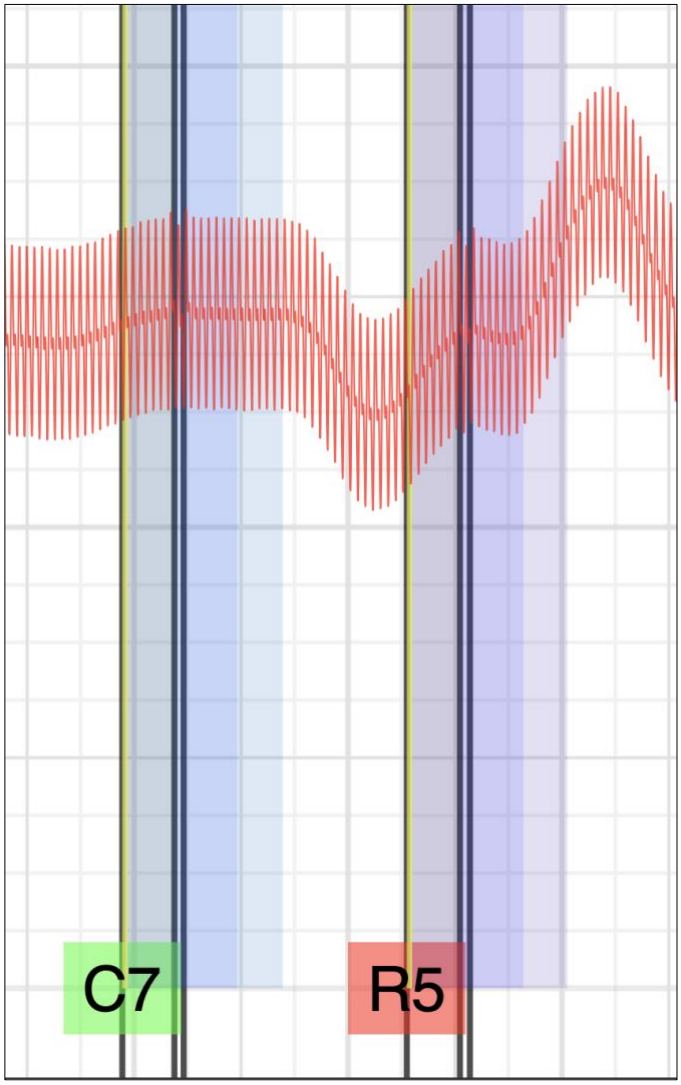


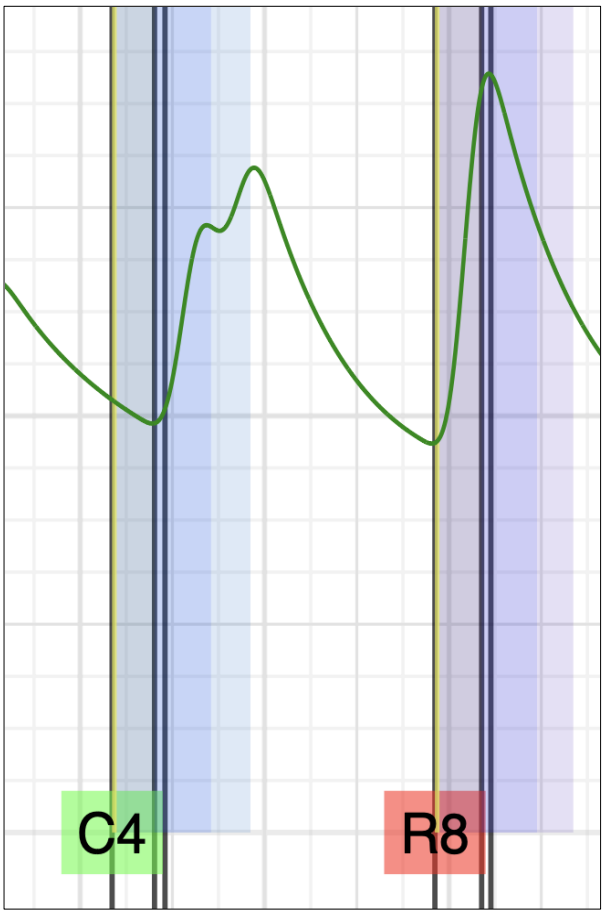
Figure 2. Usable response at the RQ and no observable response at the CQ.



Using the SNC, the example shown in Figure 3 would result in a numerical score of -1, based on the observable response at the RQ. The opposite pattern can also occur, in which there is a usable response at the CQ and no observable response at the RQ, and would result in a numerical score of +1.

Not all analysis spots are as convenient at the preceding examples. Figure 2 shows an analysis spot for which there is a usable change in physiological activity at the CQ and non-specific physiological activity (NSPA) that begins in the last seconds before the stimulus onset at the RQ. In this example, the change in physiological activity at the RQ is observably greater than the change at the CQ.

Figure 3. Usable response at the CQ and non-specific physiological activity at the RQ.



The exact reason for the NSPA at the RQ in Figure 3 is unknown. Field examiners sometimes refer to this problem as an "anticipated" response, but this is incorrect because it assumes that the examinee is actually thinking about the upcoming question. It is merely non-specific to the question, and the actual cause is unknown. In the scientific practice of null-hypothesis significance testing (NHST), data from a scientific test or experiment can be attributed to a hypothesis, such as a stimulus event or other cause, only when there is no other observable cause that could possibly have caused the response. In this situation, although the cause is not observable, the NSPA cannot be attributed to a stimulus that has yet been presented to the examinee. This introduces a potential ambiguity to the SNC because no usable response can be extracted from R8. If R8 is regarded at "nothing" then a score of +1 might be assigned. But is it really nothing? And, more practically, should a score be assigned? Would examiners handle this the same way if the NSPA occurred at the CQ? More discussion and research may be needed on the *something vs nothing concept* in order to achieve reliable and consistent numerical polygraph scores.