The Use of Skin Conductance in the Detection of Deception

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Historically, measures of the Autonomic Nervous System (ANS measures) have played a prominent role in both research on, and application of deception detection procedures. Most diagnostic of these measures is the Skin Conductance Response [1], which was first introduced to the field of deception detection in 1939 [2].

But despite their longstanding application, the use of skin conductance in deception detection is highly controversial [3]. Much of this criticism, however, is not so much geared towards the shortcomings of measures such as skin conductance, but rather to the Control Questioning Test (CQT) format it is used in conjunction with. In the CQT test format, ANS responses to relevant questions (e.g., Did you kill X) are compared to responses to control questions (e.g., Did you ever do anything illegal). Stronger responses to the relevant than to the control questions leads to a 'deception indicated' outcome, while stronger responses to the control questions lead to a 'no deception indicated' outcome. Relevant and control questions, are however, confounded with a variety of psychological processes, including emotional valence, making any conclusion based on the comparison cumbersome.

Because of the shortcomings of the CQT, several other questioning formats were developed. Among these is the Concealed Information Test (CIT; [4]), which has most extensively been used with skin conductance response as the dependent measure. In the CIT, test questions address crime related details that are known only to the perpetrator and the investigative authorities. For example, a test question may address the location where a body was found, and this question is presented with several alternatives (e.g., a. in a bedroom; b. in a pond; c. in a driveway; d. in a garage; e. in an ally). To an innocent suspect these alternatives are equally plausible, and will therefore evoke similar skin conductance responses. For a guilty suspect, the correct alternative stands out, and will therefore evoke a larger response. Thus, guilt is inferred if a suspect systematically shows an enhanced response to the correct alternative.

Whereas research on the (the development) of the CQT has come to a virtual standstill, research on the CIT is still actively pursued by researchers worldwide. This includes several new challenges including: 1) the extent to which the CIT can be used when the correct alternative is unknown – and is the topic of investigation (e.g., [5]); and 2) the use of the CIT in groups (e.g., groups of terrorism suspects) rather than individuals; (e.g., [5,6]. These new applications require differ methodologies than typically used the field of deception detection. This includes differences in the way skin conductance data is collected, as well as differences in the algorithms used for the data analysis. In this presentation, I will highlight two recent studies in which participants were exposed to a mock terrorism scenario (both studies were approved by the standing ethical committee), and the CIT was used to extract information about this mock attack from these participants.

In the first study [6], participants were invited to the lab in groups of 5. Each group was asked to plan a mock terrorist attack based on a list of potential countries, cities, and streets. Next, three questions referring to the country, city, and street were presented, each with five options. Skin conductance in all five members of the group was measured simultaneously during this presentation. A dynamic questioning approach entailed direct analysis of the data, and if the average skin conductance response of the group to a certain option exceeded a threshold, this option was followed up, e.g., if the reaction to the option "Italy" exceeded the threshold, this was followed up by presenting five cities in Italy. Even though effect sizes were only moderate, these results indicate that our dynamic questioning approach can help to unveil plans about a mock terrorist attack.

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The second study addressed the research question whether the CIT rationale can also be applied using a continuous recording of skin conductance, rather than skin conductance responses. Participants received information about the location of an upcoming ambush on a money car on route from Jerusalem to Tel Aviv. Next, the participant was shown an animation of this route on a map, which was repeated four times. During this animation, skin conductance was continuously recorded, and later offline analysed in an attempt to pinpoint the location of the ambush. Results showed some modest support for being able to pinpoint the location, but only using the first repetition of the animation.

Besides the two experiments, I will also address the problems and opportunities associated with recordings of skin conductance in the detection of deception, including which problems can, and which problems cannot be solved by technical developments.

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