

Explanation of Hybrid MCT Test Report

The following information explains test report results for EyeDetect which use the Multi-Issue Comparison (MCT) test protocol. Included is basic background information, as well as other details directly related to the question of nature and scope of MCT test questions.

Cognitive Load

Most theories of deception detection hypothesize that lying is more cognitively demanding than telling the truth.¹ Deceptive individuals use cognitive resources to inhibit the truth, fabricate the lie, and maintain its consistency, coherence, and believability over time. Deceptive individuals may surveil their own behavior and internal state of arousal to monitor whether they are leaking incriminating information, especially during an interrogation or examination².

During interrogation, they may also use cognitive resources to observe the behavior of any interviewers for feedback on their believability. Inhibiting truthful responses, maintaining credibility over time, monitoring the interviewer, and self-monitoring for signs of leakage are cognitive processes that require mental effort. Deception requires mental effort, which is measurable physiologically.

Psychologists have long known there is a correlation between increased cognitive load and certain eye behaviors. For example, pupils dilate commensurate with cognitive workload.³ The pupils would dilate slightly if a person mentally multiplied 17×2 . By contrast, pupil dilation would be more pronounced if the person multiplied 17×31 .

In the same way, the pupils dilate slightly when a person answers questions truthfully; but when the person is deceptive, the pupils dilate more because of the mental effort associated with deception.

The following are a few other ocular-motor indicators of cognitive processes:

1. Deceptive people blink less often as they process questions answered deceptively versus those answered truthfully.
2. Deceptive people respond faster, make fewer fixations, and spend less time reading and re-reading statements about their own inappropriate behaviors than when answering questions about neutral topics or inappropriate behaviors in which they do not engage.
3. People show greater increases in pupil size when they answer test questions deceptively than when they are truthful. The differences between truthful and deceptive responses are more pronounced when test questions are less complex.

¹ Johnson, Barnhardt, & Zhu, 2005; Kircher, 1981; Vrij, Fisher, Mann, & Leal, 2000.

² Kircher, 1981.

³ Kahneman & Beatty, 1966.

Test Questions

All lie detection tests use various types of questions to gather data about the examinee being tested. The question sets can include:

- **Relevant** questions (those related to the primary issue of interest)
- **Comparison** questions (those related to a secondary issue)
- **Neutral** or irrelevant questions (those unrelated to the issue).

EyeDetect and polygraph test protocols are similar in that regard. Relevant questions (e.g., Did you rob the bank?) evoke a measurable cognitive response in a guilty examinee. For an innocent examinee, that same relevant question should evoke a smaller cognitive response.

In the same way, polygraph examinations record changes in physiological reactions to relevant questions. Those changes in measured physiology load on one group of questions or the other, as a function of deception or truth telling, are shown with respect to the relevant target questions⁴.

Conversely, the comparison question generally invokes a larger magnitude cognitive response in innocent examinees as compared to the relevant question. Such reactions create a within-subject comparison of reactions to the two types of test questions. In essence, the examinee's reactions to the two types of questions are compared to determine if a deceptive or truthful pattern of responses was observed.

In some test protocols, the comparison question is a crime of serious consequence, but one that the examinee is not likely to have committed. In other test protocols, the comparison question is an issue that all examinees are guilty of having committed. Each test protocol has been designed, researched, and tested to evoke specific responses in guilty and innocent examinees.

The irrelevant or neutral questions evoke a minimal cognitive response in examinees but given that neutral questions are unrelated to issues of primary or secondary concern, a minimal reaction is expected.

HMCT Test Protocol

The EyeDetect Hybrid Multi-Issue Comparison Test (HMCT) protocol is used primarily when conducting screening tests involving questions about various target behaviors. In HMCT tests, EyeDetect and polygraph have similar protocols. They both use relevant questions, comparison questions, and irrelevant questions.

In the MCT, there are up to four relevant questions. Each can ask about issues of concern, such as:

- Have you used illegal drugs in the past 6 months?
- Have you committed a criminal act of a serious nature?
- Have you lied about work-related discipline?
- Do you have ties to any terrorist organizations?

⁴ Nelson, 2015

One of the relevant questions serves as a comparison issue, such as the question about terrorism. It is a serious issue, with a low probability of occurrence (low prior probability).

All relevant questions challenge the examinee’s goal of passing the test. The questions that most challenge that goal are those that will cause greater physiological changes in the examinee.

Psychologically speaking, when a person is asked about a relevant issue such as bank robbery and a comparison issue such as involvement with terrorists, she/he tends to focus more attention on the issue in which she/he may be involved (i.e., bank robbery) to avoid failing the test. Most people are less concerned about the comparison question since it’s highly unlikely they were involved in terrorism.

The guilty person will invest more cognitive effort processing the relevant questions about bank robbery, as they pose the greatest threat to the goal of passing the test. An innocent person will be less concerned about all issues and should exhibit a lesser cognitive response for all questions.

Test Report

The EyeDetect MCT report includes a section “Test Response Summary” that indicates the examinee’s answers to up to four relevant questions, one of which serves as a comparison question.

The following is an example of the test report section for a relevant question (lying about drug use in the past three years). The left column labeled “Statement” shows the questions asked of the examinee. The second column labeled “Expected Answer” indicates what the expected answer would be from examinees taking the test. In other words, whether the examinee is innocent or guilty, unless a guilty person confesses, all examinees deny having lied about drug use in the past three years. Therefore, the “Expected Answer” indicates a denial of that issue. The green box (expected) or red box (unexpected) indicate how the examinee answered each question. If not answered, it is called a “Time Out.”

Answer Detail (R1)		Legend: ■ Expected Answer ■ Unexpected Answer ■ Timed Out					
Statement	Expected Answer	Examinee's Answer					Unexpected Answers
		S1	S2	S3	S4	S5	
Did you lie about marijuana or illegal drug use or distribution in the past 3 years?	No	N	Y	N			33%
Are you withholding marijuana or illegal drug use or distribution from the last 3 years?	No	N	N	N			0%
Did you leave out marijuana or illegal drug use or distribution from the past 3 years?	No	N	N	N			0%
Did you report all use or distribution of marijuana or illegal drugs within the last 3 years?	Yes	Y	Y	Y			0%
I am hiding marijuana or illegal drug use or distribution from the past 3 years.	False				F	F	0%
I am withholding marijuana or illegal drug use or distribution from the past 3 years.	False				F	F	0%
I lied or left out marijuana or illegal drug use or distribution from the past 3 years.	False				F	F	0%
I hid some marijuana or illegal drug use or distribution from the past 3 years.	False				F	F	0%
I reported all marijuana or illegal drug use and distribution from the past 3 years.	True				T	T	50%
All marijuana or illegal drugs used or distributed in the past 3 years, I have reported.	True				T	T	0%
I disclosed all marijuana or illegal drug use and distribution from the past 3 years.	True				T	T	0%
I was honest about my marijuana and illegal drug use and distribution from the past 3 years.	True				T	T	0%

In the example shown on the previous page, the examinee unexpectedly answered two of the questions. Important note: The number of unexpected or expected answers is less important than the intention of the examinee when responding. In other words, if a few questions are answered to with the unexpected answer, it will not affect the outcome of the test because when an examinee answers deceptively, the cognitive load invoked will be that which is observed in guilty examinees.

Along the same line, a guilty examinee may answer all test questions with the expected answer while still obtaining a deceptive test score. This occurs because the savvy examinee knows what the expected answers should be, but the cognitive load invoked will be that of a deceptive individual.

The following image shows a sample test report section for the relevant question of low probability (comparison question) such as involvement with terrorists. The left column labeled “Statement” shows the questions asked of the examinee. The second column labeled “Expected Answer” indicates the expected answer for all examinees taking the test.

Answer Detail (R4)		Legend: ■ Expected Answer ■ Unexpected Answer ■ Timed Out					
Statement	Expected Answer	Examinee's Answer					Unexpected Answers
		S1	S2	S3	S4	S5	
Do you have any ties or affiliations to any criminal gang or organized crime group?	No	E	E	E			0%
Have you ever worked for any criminal gang or organization crime group?	No	E	E	E			0%
Is it true that you have worked for a criminal gang or organized crime in the past?	No	E	E	E			0%
Are you innocent of having any ties with gangs or an organized crime group?	Yes	E	E	E			0%
Something I have done is work for a criminal gang or organized crime group.	False				E	E	0%
I admit to having ties or affiliations to a criminal gang or organized crime group.	False				E	E	0%
I am guilty of affiliating or working with a criminal gang or organized crime group.	False				E	E	0%
Working with criminal gangs or organized crime is something that I have done.	False				E	E	0%
In my past, I have never worked for a criminal gang or organized crime group.	True				E	E	0%
Never at any time have I worked for a criminal gang or organized crime group.	True				E	E	0%
I have not participated in criminal gangs or organized crime in the past.	True				E	U	50%
Working for criminal gangs or organized crime is something I've always avoided.	True				/	E	0%

In the example shown above, the examinee did not answer one of the questions. In some instances, this could be due to a lack of concentration or simply because of a mistake. Likewise, in the example shown above, the examinee responded unexpectedly to one of the questions.

Regardless, if the examinee intended to answer the questions as instructed, but answers unexpectedly, the cognitive load invoked will be like that of a person that answered with the expected answer.