

The QIKtest Report

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The new report introduces some innovations into the analysis of Continuous Performance Tests like the TOVA and the QIKtest. The basic philosophy is that we would like to discriminate shortcomings in cerebral regulation in a way that takes maximum advantage of the data we acquire. There is no reference back to an arbitrary diagnostic category such as ADHD. Instead the framework is that of the “Disregulation Model,” which posits that cerebral dysfunction is largely traceable to deficits in a limited number of core regulatory functions. Such deficits can be observed in a variety of brain challenges, including the standard CPT.

The intention is to complement the information gleaned from interviewing and observing the client, and from their history, with information derived from testing. A lot of information bearing on brain self-regulatory status and on self-regulatory capacity cannot be obtained any other way. There are two types of measurement of interest: brain behavior in the unchallenged baseline state and brain behavior under challenge. The CPT test involves a repetitive challenge that offers some predictability to the testee. That allows the person to settle in to a state characteristic of that person. This might range from lethargy to hyper-vigilance, boredom to frustration, irritation to agitation. Performance under those conditions is then evaluated over the duration of the test. It is often found that with training the challenge is tolerated a lot better on re-test.

In the Disregulation Model, the CNS is regarded from the perspective of a control hierarchy. The most basic requirement that needs to be met by a control system is overall stability. Is the system always ready to respond, and to respond appropriately? The secondary criteria are the particulars with regard to state regulation. Is the system in an optimally responsive state, one that is matched to the prevailing demand? And is it able to maintain itself in that state over an extended period of time?

CPTs such as the TOVA and QIKtest set out to test these basic control variables under highly constrained conditions. On the one hand, the challenge to the brain is maximized by putting the testee under pressure to respond as rapidly as possible (consistent with maintaining accuracy), and on the other, state regulation is challenged by testing the person under boringly repetitive conditions over an extended period of time. And the question is asked, is the response accurate, rapid, and consistent from one trial to the next?

In this test we seek to characterize the disregulation status of the testee as the top-level appraisal. The issues are two-fold. The primary issue is whether the responses are accurate. Can the nervous system handle the challenge being presented correctly? To maximize this challenge, the person is asked to respond as quickly as can be done consistent with accuracy. The secondary issue is then the quality and consistency of the performance. How fast are the responses, and how consistent from one event to the next?

The issue of response appropriateness is expressed in the Accuracy Index. This index is entirely based on the discrete errors, the countable errors. These consist of the errors of omission, the errors of commission, and the extreme outliers in reaction time. This last category consists of those events in which the reaction time falls outside of the “normal” range where it may be expected for the particular age range. We are dealing here with an unambiguously ‘delayed’ response that is readily distinguishable from the ‘typical’ responses.

The three types of discrete errors are all highly correlated with each other in terms of incidence, which implicates a common failure mechanism. This further supports the over-arching concept that we are calling ‘disregulation.’ The observed degree of mutual correlation allows them to be taken jointly to specify the Accuracy Index. More specifically, errors of omission correlate highly with reaction time outliers. The latter can be seen as attentional deficits analogous to omission errors. For this reason we **combine omission errors with reaction time outliers in order to specify a subsidiary measure, the “Index of Inattention.”** Commission errors continue to specify an **“Index of Impulsivity,”** as before. The only new element here is the fact that anticipatory responses are also counted as errors of commission. This is minor consequence, as anticipatory errors are quite rare. **The Index of Inattention and the Index of Impulsivity are used jointly to specify the Accuracy Index.**

This leaves two other figures of merit to be considered that yield the quality of the responses. The distribution of reaction time (with outliers now removed) yields two parameters of interest, the mean reaction time and the variability, the standard deviation of the population. In the report, these are referred to as the **speed and the consistency of reaction time.** These two measures have a continuous range of values, in contrast to the discrete errors.

The two continuous variables are used to jointly determine the Performance Index. This is justifiable on the basis that the mean reaction time and the variability are significantly correlated. When reaction times are short, the variability also tends to be small, and when the mean reaction time is large, the variability tends to be large also. So the two measures jointly specify the quality of performance as it applies to correct responses. **The Accuracy Index, by contrast, refers to the incidence of incorrect responses. Both parameters are needed in order to characterize the test performance adequately, and to inform us with respect to the disregulation status. Both parameters tend to respond differentially in training, which further justifies their distinct categorization.**

The term disregulation is preferred here over “dysregulation” that is standardly used in the medical literature. The reason is that the latter term tends to imply that organicity is implicated in the deficit at issue. The term disregulation is intended to emphasize that the focus here is on functionally-based deficits, without the assumption of organicity. So the term is intended to be more inclusive.