

Identification of ADHD and ADD Using the CPT

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The Continuous Performance Test (CPT) was originally developed in 1956 by Reavold, Nirsky, Sarason, Bransome and Beck as a vigilance task to measure brain damage.¹

Today the CPT testing is used as a clinical and research tool to discriminate between hyperactive, attentional, learning and specific memory disorders in children. Several variations of the CPT have been developed and studied in attempt to isolate and differentiate between these four disorders.

This most recent CPT design shows significant potential in identifying children with attentional disorders without discriminating against learning disabled (LD) children with normal attentional capacities. Earlier designs of the CPT have discriminated against the LD children and incorrectly classified them as having attentional deficit disorders.

The Continuous Performance Test is a visual vigilance or sustained attention test. The current CPT utilizes a computer display screen and a computer keyboard. The program for the CPT generates random stimuli to be flashed on the display screen for a set time for a short time period with a set interval between stimuli. A specific target stimulus is designated and shown to the child. The child is instructed to watch the screen, examining each stimulus and identify the designated target stimulus each time it is flashed, by hitting a key on the computer keyboard. The test runs continually flashing the stimuli for a set length of time.

The current CPTs available differ in the areas of number of characters displayed as a stimulus, the time intervals between each stimulus, the duration of the stimulus display, color of stimulus as well as the response requirements to the child.

Generally speaking the CPT measures sustained attention and impulsivity. The test records errors of both omission indicating loss of attention and commission errors indicating impulsivity. An omission error is recorded when the target stimulus is displayed and the child fails to respond by striking a key on the keyboard. A commission error is recorded when the child responds by striking a key when one of the distractor stimulus is displayed. A percentage of both false negatives and false positives are then calculated at the end of the test.¹

Previously CPT tests have been used to discriminate differences between attention deficit hyperactivity disorder (ADHD) children, attention deficit disorder (ADD) children and learning disability (LD) children and normal control groups. Conflicting results have been reported from these studies. Samuels and Miller (1985) found similar results in both response time and number of errors for LD and control groups on an early CPT.² While, Prinz and Nay (1986) found significant differences with their comparisons of each LD and ADHD children with normal control children and their performances on the CPT.²

There are several theories explaining these conflicting

reports. The most significant indication of misinterpretation of results in Samuels and Miller's study which compared LD responses to a normal control group responses, is the fact that ADHD children were not screened out of either group. Prinz and Nay used samples that were carefully screened to isolate each disorder individually and to eliminate any disorders from the control groups.

Both LD children and ADHD or ADD children show significant deficits in both learning and sustained attention tasks. These deficits in both activities are caused by very different deficiencies. Attention deficit disorders are characterized by the inability to inhibit impulsive responsiveness and inattentiveness. This in turn leads to difficulties in obtaining information to be processed. Learning disability children on the other hand have a decreased ability to process information resulting in longer response times. These longer response times are commonly misinterpreted as inattentiveness.³ Children with a combination of both LD and ADHD are also quite prevalent in all populations. This increases the difficulty of identifying a pure test group for analysis.

When a comparison of the performances of LD, ADHD and control groups, several significant patterns are noted. To begin with, the LD require more time to process information, which was indicated by Blackwell et al., 1983.² Therefore it is expected that LD would have more omission errors and less impulsivity. Yet LD only showed more omission errors than the LDHD group. The control group showed no significant difference in errors than the LD group.² ADHD conversely show significantly more commission errors than both the LD and control groups, indicating increased impulsivity.² LD groups with ADHD showed increased commission errors when compared to LD groups without ADHD.² These differences in commission and omission errors between LD and ADHD groups indicate a definite pattern that can be identified by a pure visual vigilance test such as the CPT.

Recently, in 1988 a study was conducted by Trommer, Hoepfner, Lorber, and Armstrong which included the comparison of LD and control group performances of a variation of the CPT. This CPT involved the addition of two distractor targets with each stimulus display. These distractors were either adjacent or distant. The study clearly indicated that with the narrowed focus of the LD the distractors adjacent to the target had a detrimental effect on the LD score. Distractors identical to the target adjacent to the target improved the LD ability to detect the target. This indicates that any type of distractor involved in a CPT test causes the test to be an invalid test of attention for the LD.²

Response time is another difference shown between ADHD and pure LD groups. Because of the increased time required to process information, LD groups show a longer response time to the target. If the LD is to be compared to the ADHD or ADD groups, an adequate amount of time must be given between stimuli to allow for information processing of the LD. If an adequate time is given, an increased number of omission errors by the LD may

falsely indicate inattentiveness.²

The Gordon Diagnostic System Vigilance Task, Gordon Systems, Inc. DeWitt, NY, incorporates a stimulus display time of 0.2 seconds with an interstimulus interval of 1 second. This test has a duration of 9 minutes. This test uses single random letters with a target stimulus of two letters together. This double digit target contaminates this test, eliminating it from being used with the LD.

The Continuous Performance Test-2 of Lindgren & Lyon, 1983 utilizes a target stimuli of and orange "H" followed by a blue "T". Stimulus display time is 125 msec and interstimulus interval is 600 msec. These times are varied with the performance of the child. The test length ranges from 4 to 8 minutes. The color coding of this test eliminates it as a pure test of attention. The color discriminates against any color deficit individual. Also the distractor combination of targets discriminates against the LD.

Richards, Samuels, Turnure, and Ysseldyke used a CPT with ten single character distractor stimuli in combination with a double character target stimulus. The display time used was 0.5 seconds and interstimulus interval was 1.5 seconds. The test duration was 5 minutes.² The use of a target stimulus that differs from the distractor stimuli by the number of characters clearly eliminates much of the vigilance factor from the test.

Swanson compared performances of both 4.75 minute CPT and 9.5 minute CPT in 1981. His data indicated that overall time differences in these ranges did not significantly effect the results of these test.² Again in 1983 Swanson reconfirmed these findings in that a 5 minute test duration was adequate to note significant findings.² Several other studies including Klee and Garfinkel, 1983 Michael et al., 1981 O'Dougherty et al., 1984 Sykes, Douglas, Weiss and Minde 1971 all indicated short test intervals detected significant differences between ADHD and non-ADHD groups.²

A Continuous Performance Test has been purposed that utilizes five random single letter stimulus with a single letter target stimuli. The display duration of the stimulus is 0.25 seconds. The interstimulus interval is 1.0 seconds. The test duration is 5 minutes. A pretest practice test consisting of 10 stimuli is administered prior to the test to ensure the understanding of the test. Four distractor stimuli are displayed with one target stimulus. This ensures that the random display of the target stimulus will occur about 1/5 of the time during the test period. The targets are completely randomized to eliminated any possibility of learning the test after repeated administrations.

This test eliminates any discrimination against LD allowing a pure testing condition of attention to identify ADHD and ADD. The LD should show no significant variance from a normal control group under these testing conditions. While, the ADHD and ADD will show impulsivity and commission errors. This test is designed to provide an efficient means of identifying ADHD and ADD children.

REFERENCES

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