# Accuracy of the Children Sustained Attention Task (CSAT) in the ADHD diagnosis. Preliminary Data.

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**OBJECTIVE:**

The aim of this study is to evaluate the sensitivity, specificity, and predictive power of the CSAT measures in the ADHD diagnosis.

**METHODS:**

The overall sample was composed of 181 children (67% boys) from 6 to 11 years: 74 ADHD subjects came from Son Llatzer Hospital's ADHD Unit and 107 from normal schools. There were not differences neither age nor sex variables. We applied cutoff scores for each CSAT measure (about 1.5 DE from mean) and we performed contingency tables for hits, commissions, and d' an A' indexes.

### CSAT: MEASURES & INDEXES

The Children Sustained Attention Task (CSAT, Servera & Llabres, 2004) consisted of 600 stimuli (numbers from 0 to 9), approximately 3.5 cm (1.38 in.) in size, which appeared on the computer one at a time screen for approximately 250 ms., and their inter-stimulus interval was 500 ms. It takes approximately 7' and 30".

The target was double: 6-3 (30% of event rate).

The dependent measures (or CSAT Test) used in this study were **hits** (correct responses), **commission errors**, and two attention capacities indexes: **d'** (parametric index) and **A'** (non-parametric index). CSAT provide automatically these indexes for each subject in accordance with their age from normative data. In both cases, the higher score indicates greater attention capacity.

### STATISTICAL INDEXES

| | |
|---|---|
| **Sensitivity** | It is the proportion of ADHD children who the tests recognizes as such. |
| **Specificity** | It is the proportion of healthy children who the test recognizes as such. |
| **Corrected Positive Predictive Power (cPPP)** | It indicates the probability (corrected by Kappa) of having the disorder (ADHD) when the test is positive. |
| **Corrected Negative Predictive Power (cNPP)** | It indicates the probability (corrected by Kappa) of being "normal" (not having the ADHD disorder) when the test is negative. |
| **Kappa** | It is an concordance agreement measure between CSAT test and ADHD diagnosis. |

**FIGURE 1. Percentage of ADHD and Normal subjects by Positive and Negative CSAT Test (+ or -)**
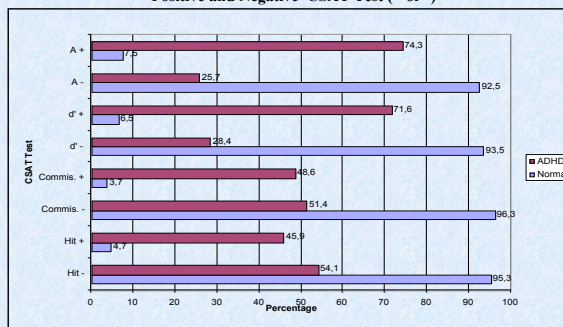


**TABLE 1. Results of Contingency Table**

| | PEARSON'S CHI-SQUARED | | |
|---|---|---|---|
| | **Value** | **gl** | **Asymptotic Sig. (bilateral)** |
| CSAT HITS | 44,083 | 1 | 0,00 |
| CSAT COMMISSIONS | 51,252 | 1 | 0,00 |
| d' INDEX | 83,608 | 1 | 0,00 |
| A' INDEX | 86,148 | 1 | 0,00 |

All the Chi-Squared are statistically significant (p<.01)

**FIGURE 2. Statistical Indexes of CSAT Measures**
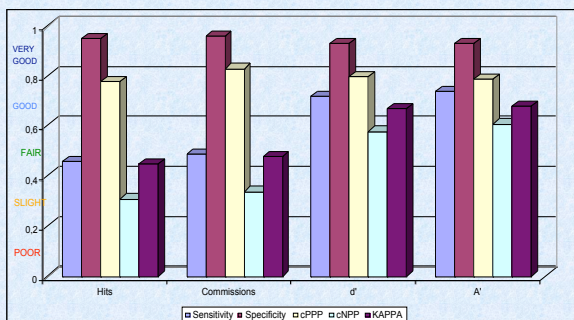


**TABLE 2. Qualitative Classification of Statistical Indexes**

| | HITS | COMMIS | d' | A' |
|---|---|---|---|---|
| **Sensitivity** | FAIR | FAIR | GOOD | GOOD |
| **Specificity** | VERY GOOD | VERY GOOD | VERY GOOD | VERY GOOD |
| **cPPP** | GOOD | GOOD | GOOD | GOOD |
| **cNPP** | SLIGHT | SLIGHT | FAIR | FAIR |
| **Kappa** | FAIR | FAIR | GOOD | GOOD |

**CONCLUSIONS**

CONTINGENCY TABLE: The null hypothesis is rejected in all variables. The frequency distribution of ADHD and normal subjects is statistical different in all CSAT Tests, although it is more significant in d' and Á' indexes. More than 90% of Normal children showed a d' and A' negative test, and more than 70% of ADHD children showed a d' and A' positive test. So, it is better to use these indexes than direct measures as hits or errors, but note that the CSAT indexes are normalized by age (from 6 to 11 years-old). It is an important difference of CSAT with regard to other attention task.

STATISTICAL INDEXES: The hits and commissions measures showed low rate of false positives, but high rate of false negatives. So, these measures could be more useful to rule out than to detect ADHD children. On the contrary, the d' and A' index showed goof or very good sensitivity and specificity rates. So, in terms of cPPP and cNPP, if d' or A' are "positives" the probability of having the ADHD disorder is about 80%, and if d' or A' are "negatives" the probability of does not have the disorder is about 60%. On the other hand, the concordance agreement between CSAT indexes and ADHD diagnosis is fair for hits and commissions and is good for d' and A'.

**REFERENCES AND CONTACT**

-Servera, M. & Llabrés, J. (2004). CSAT (Children Sustained Attention Task). Madrid: TEA ediciones (Spanish: http://www.teaediciones.com/teaasp/buscador.asp?idGama=225)

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