SSW
SSW
*
*

REPORTS

ADD/ADHD AND SSW

Vol. 16 No. 2 May 1994

Evidence of Attention-Fatigue and Learning on the SSW Test

Jack Katz
Melissa Levenson

In this era of ADHD one of the most common questions we hear is how does hyperactivity influence behavioral test results? A number of years ago we looked at a method for studying attention and learning effects on the SSW test. This article will describe those efforts and the use of this technique in studying 110 individuals who were seen for central auditory processing (CAP) evaluations.

Assessment of Attention-Learning Effects

A large group of SSW forms were studied from the SSW National Sample (1985). It was our intent to see how normal control children behaved on subsequent quarters of the SSW test. For this purpose sub scores were calculated for the first 10 items (Q-1), the next ten (Q-2), and so on.

It was noted that almost all of the children had consistent scores for each quarter except for Q-4. In some cases Q-4 was considerably better than previous scores and in other cases considerably worse. Almost all of the quarters fell within ± 3 errors of Q-1. A difference of four points in either direction from Q-1, the baseline, to Q-3 was the best comparison for assessing change of performance on the SSW test.

Rationale for Using the Attention Learning Analyses

Children who are said to be inattentive and who have short attention spans can be expected to give their best performance at the beginning of a procedure and that performance should deteriorate over time. Therefore Q-3 should show poorer performance than Q-1. If we can assume that normal variation is ± 3 errors, then we can establish that four or more error on Q-3 compared to Q-1 is a significant sign of reduced attention (A) or fatigue.

The opposite pattern could be expected for normal or other children who gain greater insight with seceding items. This pattern was noted by Minetti and McCartney (1979) who reported significantly better scores on the second half of the SSW for normal children eight

to ten years of age. Thus it would appear proper to look for a learning (L) pattern on the quarters of the SSW test. A reduction of four errors from Q-1 to Q-3 is considered significant.

Those who fall within normal limits (± 3) are considered to demonstrate the constant (C) pattern.

The Present Study

The files for subjects, who were seen in our clinic over the past several years, were perused. Each of the 110 individuals, age six and above, who completed all forty items on the SSW test was used in the study. For each of these individuals the case history and report forms were reviewed carefully to determine evidence of hyperactivity-distractibility and /or a diagnosis of ADD/ADHD. Each person who was noted to have significant problems with attention and hyperactivity, was included in the experimental (EXP) group and the remainder were placed in the control (CTRL) group.

Nineteen individuals who had been seen for CAP evaluation were reported to be hyperactive in the case history and/or was reported to the audiologist as being hyperactive or distractible. Ninety one of the subjects did not have such indications, although in a number of cases the parents thought their children to be "active but not hyperactive". In the experimental group there were sixteen males and three females. In the control group there were 61 males and 30 females. The mean age for the hyperactive/distractible group was 8.5 and for the control group was 13.7 years. The age difference between groups was significant at the point .05 level of confidence. However the difference was, in part, due to a few much older subjects, e.g. 60 and 54 years of age in the control group. When subjects over nineteen were eliminated the difference between groups was no longer statistically significant. Nevertheless there may be a tendency toward greater hyperactivity and distractibility among younger children (not surprisingly).

Test Results

An overall appraisal was made by comparing the EXP and CTRL groups with regard to their pattern of response. Table I shows this comparison. It can be seen that 90% of the EXP group and 76% of the CTRL group had constant (C) patterns of response. The remaining 10% of the EXP and 13% of the CTRL group demonstrated the inattention (A) pattern. Finally none of the EXP group presented the learning (L) pattern, while 11% of the CTRL group displayed this pattern. A chi square analysis showed no significant difference between the patterns of the two groups.

	Pattern		
Problem	**C**	**A**	**L**
Attention	**90%**	**10%**	**0%**
No Attention	**76%**	**13%**	**11%**

Table 1 shows the pattern of response: constant (C), attention (A), or learning (L), for the experimental and control group.

Figure 1 shows the mean performance for the two groups on each of the four quarters. It can be noted that the hyperactive group had consistently more errors throughout the test compared to the non hyperactive group. Whether

Summary and Conclusion

This article discusses a method that may be used for studying performance on the SSW over time. This is of interest to the audiologists because of concerns that inattentive or hyperactive children will not perform well on central tests because of these behavior problems rather than because of CAPD.

Because normal control subjects were found to vary ± 3 errors from the first quarter (Q-1) of the SSW to the third (Q-3), a difference of ≥ 4 points was consid ered significant. A significant change in the poorer direction, the attention effect (A), was anticipated for hyperactive or distractible listeners, while significant improvement was considered evidence of a learning effect (L). Constant performance from Q-1 to Q-3 (± 3 errors) was considered a constant (C) responsiveness.

The records of 110 patients who were tested in our clinic for CAPD were studied. Ninety-one records showed no diagnoses of ADD/ADHD nor indications of hyperactivity or major distractibility from the parents, however, there were such indications in the remaining 19 cases.

The mean for the hyperactive cases tended to get slightly poorer (one additional error) from Q-1 to Q-3, where as the control group's mean remained constant. The difference between the groups was not statistically significant. We interpreted these data to show that while hyperactive clients pose a greater challenge to the audiologist, there is no major effect on the test results. Further testing of this hypothesis should be carried out with ADD and other better diagnosed populations.

ADD (or ADHD) CASES SEEN FOR CAP EVALUATIONS

JACK KATZ
NANCY STECKER

Have you heard someone ask "Is his problem ADD or CAPD?" If not, perhaps someone pointed out "If she has ADD, of course CAP tests are abnormal, she has a lack of attention!!!"

Although we don't have a definitive answer to this line of questioning, we have felt from our experience that audiologists "get the goods" whether the patient is hyper- or hypo-active, whether highly distractible, or listening too hard. We crack jokes, get tough, reinstruct, take the child for a drink, use operant conditioning, or whatever it takes. In those unusual cases in which our best efforts are frustrated, the audiologist is generally aware that the results are likely to be invalid. In such cases we have informed the parents of the inaccuracies and the need for a reevaluation (generally with the child on Ritalin or some other appropriate medication).

Our first attempt to get a glimpse at the influence of hyperactivity/distractibility came from a Ritalin study that was briefly reviewed in SSW Reports. The Ritalin and Placebo groups showed no difference in SSW performance when compared to baseline. The second indication came from the previous paper in this issue in which the individuals who were reported to be hyperactive and/or distractible performed in a like manner as those who were not considered hyperactive/distractable across the four quarters of the SSW. One would reason that a child

this difference is due to their distractibility, simply to age, or other factors is not known. The EXP group's errors increase by about 1 error from the Q-1 to Q-3, while the CTRL group responds rather consistently across the quarters of the test. For this group the Q-3 mean was essentially identical to the Q-1 mean.

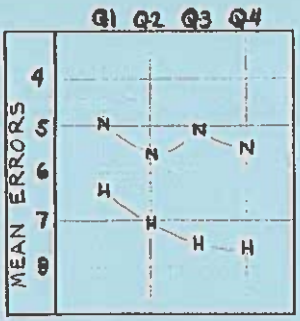

Figure 1. Mean errors, across the four quarters of the SSW, for 91 subjects who were not listed as ADD or Hyperactive (N) and 19 subjects who were reported to be ADD or hyperactive (H).

Figure 2 shows the mean errors for the three pattern groups (C, A, and L) without regard to their label as hyperactive or not. Although the patterns where based on just Q-1 and Q-3 it is interesting that the rest of the curves follow a reasonably predictable path. Most of the subjects (N=86), were in the C group. They performed rather evenly across the four quarters even when considering Q-2 and Q-4. Those that appeared to catch on to the test (the L group) showed considerable improvement compared to Q-1. The group that appeared to fatigue or lose interest (N=14) on the test (the A group) dropped sharply in performance from Q-1 to Q-3. Q-4 for those in the (A) group appear to show improved performance. This might relate to relatively easier items in Q-4 compared to Q-2 and Q-3 (or to the audiologist saying "there's just a few more").

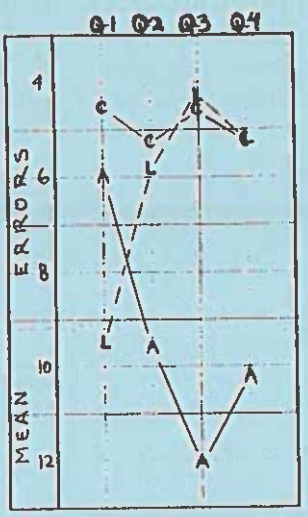

Figure 2. Mean errors for subjects following 3 patterns: constant (C) (n=86), attention (A) (n=14), and learning (L) (n=10).

Discussion

The results of the study further reinforced our suspicion that audiologists are able to "get the goods" on the clients we test regardless of whether they are hyperactive, hypoactive, good attendees or poor attendees. Only in extreme cases does it appear as though such behaviors invalidate the audiometric tests. The nineteen children (17% of the total group) who were reported to be hyperactive did not perform differently than the other subjects. They did however have almost one additional error on Q-3 verses Q-1 compared to the 91 control subjects. Therefore we could say that there was a slight but non significant trend towards greater errors with succeeding quarters of the test for the hyperactive group. This very small difference would not produce any significant variation in clinical cases.

with ADD would give his best attention when a task is novel. However, as the procedure continues on and on the child is less and less likely to maintain attention. Therefore, we would expect A-patterns (≥4 additional errors on Q-3 than Q-1) in a high percentage of children with ADD compared to those with CAPD.

Subjects

In the last issue of SSW Reports, a request went out to readers to please send in SSW forms of patients whom they saw who were diagnosed as having ADD/ADHD by a physician or psychologist. In addition, a control case was requested who was seen prior to the ADD case for CAPD evaluation. Ten (wonderful) audiologists contributed 34 control and 34 experimental subjects. Because they did not know how we were going to analyze the tests, there was no selection bias with regard to the pattern of errors.

Table 1 shows demographic information for the experimental and control groups.

Group	n	Age	S.D.	Male	Female
Exper	34	9.6	(2.71)	24	10
Control	34	9.0	(2.71)	22	12

Table 1. Sample size, mean age (and stand. dev.) and sex distribution for experimental and control groups.

Results

Table 2 shows the mean scores for the experimental and control groups on the four quarters of the SSW test. The overall pattern is very similar for the two groups. Performance deteriorated slightly from Q-1 to Q-2, then improved for Q-3 and remained stable for Q-4.

An ANOVA was carried out to determine if the groups differed in their performance for any of the quarters or for the total SSW. F-values were small and none approached the .05 level of significance.

Group	Q-1	Q-2	Q-3	Q-4	TOT	(S.D.)
Exper	7.1	9.6	6.5	7.2	28.1	(21.8)
Control	7.1	9.0	5.8	6.1	23.3	(15.9).

Table 2. Performance on the quarters of the SSW and total score for the ADD/ADHD and control groups.

The data for the two groups were examined to see if there were considerably more ADD cases who had the A-pattern (as might be predicted). Table 3 shows these results.

Group	C	A	L	TOT
Exper	26	2	6	34
Control	25	6	3	34
Total	51	8	9	68
	75%	12%	13%	100%

Table 3. Number of Ss in the two groups with constant (C), attention (A) and learning (L) SSW patterns.

Very similar error patterns are seen for the ADD and control groups. Combined, 75% had C with the remainder divided between the A and L patterns.

Because there were no apparent differences between the two groups, those data were not subjected to further analysis. However, we did look at the 3 error patterns for the entire 68 Ss. The data in Table 4 show the findings.

The results in Table 4 provide some interesting information that may be helpful if you wish to use this CAL pattern index. The average child that had the A-pattern had 5 more errors on Q-3 than on Q-1. However, there was a slight recovery on Q-4. Q-4 items are considered easier than Q-3 (so this may have

helped) and probably the audiologist said, "Hey, hang in there we have just XX more to go". This surely has a motivating influence.

GRP		Q-1	Q-2	Q-3	Q-4	TOTAL
C	m	5.5	6.3	5.6	6.0	23.3
	sd	4.9	5.2	4.8	5.4	19.3
A	m	3.8	6.8	8.8	6.2	25.5
	sd	4.3	4.9	4.3	3.8	16.9
L	m	12.9	9.3	7.1	10.4	39.8
	sd	3.7	3.2	3.8	4.7	14.37

Table 4. Means and standard deviation- for the children who had constant (C), attention (A), and learning (L) patterns of errors on the SSW for both experimental and control subjects combined.

It is of interest that although the numbers were small, the learning pattern was found in twice as many ADD as non-ADD kids (6 vs. 3)! While this might seem a contradiction, from the raw data we can see that in some cases there were many, many errors on Q-1 which is likely to be a panic response and then a gradual calming over the next two quarters. In these cases it would be better to consider this an "anxiety" than a "learning" pattern.

Similarly, the attention pattern is a misnomer in a very small group of children. These youngsters work so hard to get the items correct that they wear themselves out. They do well at the beginning, but cannot maintain this effort. Their errors on Q-1 vs Q-3 would suggest inattention, but their behavior tells you it's fatigue. We use the terms "attention" and "learning", but the audiologist is in a better position to say if it is actually "anxiety" or "fatigue".

Discussion

This study supports the notion that SSW test results for those diagnosed as ADD/ADHD are essentially the same as for other children seen for CAP evaluations. There were no significant differences in the number of errors on any of the four quarters of the test or on the total errors for the ADD and control CAPD cases. Even when looking at individual data, the number of cases in the two groups with the constant, attention, and learning patterns were very much alike.

While this study did not consider whether the children were on medication or not, it is well recognized that children taking Ritalin, or other similar drugs, are calmer and more responsive. Thus, this would be an interesting consideration, but unfortunately, we do not have complete information about this factor (as this is a retrospective study and medication was not recorded for every case). We do know that 15 of the experimentals were on medication and that 3 were not. Five of the children who were known to be taking medication had L-patterns and 1 had the A-pattern, while the other 9 had C-patterns of error. The three children who were not on these drugs each had C-patterns.

Although medication was common in the ADD cases who had L patterns, overall the two groups were quite consistent on the SSW. Thus, we do not feel that medication is critical when being tested by an experienced audiologist (but it surely makes it nicer).

We would encourage further study of the relationship between ADD/ADHD and CAPD. The influence of medication is one of the factors that should be investigated.

We are indebted to Patricia Gillilan, Barbara Kurpita, Linda Knowlton, Janet Blank, Melody Bricault, Karen Yencer, Paula Smith, Christina Stocking, Jennifer Titus and Dale Bonnycasel