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TENTATIVE C-SSW NORMS FOR CHILDREN (7 THROUGH 11 YEARS): NATIONAL SAMPLE AND THREE OTHER STUDIES

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Thanks to the interest and effort of 40 of you, we now have better knowledge of what constitutes normal C-SSW scores in children. The data obtained in the SSW National Sample for Children (NS) through December 1980 constitute records for 131 normal children from 18 States and Provinces of Canada. This report will compare the NS with the findings of Myrick (1965); White (1977) and Johnson and Sherman (1981).

We consider our information and recommendations to be tentative. It will be necessary for cross validation of these data by additional NS data and/or results from other normative studies. The final validation must be the test of time to show its clinical effectiveness.

In 1965 Myrick gathered SSW data on 50 children 7 through 11 years of age and 10 normal young adults. Myrick and Katz (her advisor) assumed that all of the children were "normals." However, that was before there was general knowledge that learning disabilities (LD) and a history of fluctuating conductive loss could have a potential influence on central auditory test results. While questions of the accuracy of these norms have been voiced for a long time, we were neither able to check them sufficiently nor to suggest more appropriate limits.

The purpose of the NS was to provide a larger, broader sample of children and employ a better definition of "normal." The age range for the NS was 5 through 12 years. Consistency from tester to tester was maintained by: a) using the standard EC list tape (Auditec of St. Louis); b) all contributors attended at least a Basic SSW Workshop, and; c) employing standard administration and scoring procedures.

In addition to the large number of children in the NS the results were based on the selection and test procedures of many clinicians, many tape players and audiometers. The broad geographic sampling permitted us to include many dialectal differences. If the SSW is highly susceptible to tester, tape, equipment and other differences we should expect to see large standard deviations (SD). (This was not the case.)

In order to qualify as subjects the children had to have normal hearing at the time of testing, and be U.S. (or Canadian) born. Also a negative neurological history, no significant middle ear pathology or learnin disability was required.

A number of investigators have caused us to question the validity of using the norms shown by Katz and Illmer (1972) as the national standard. Stubblefield and Young found that their control children met the normal adult criteria (Katz, 1968). White (1977) noted sufficient differences between her own data and Myrick's to suggest that clinicians obtain their own norms. Johnson and Sherman (1981) found the results on list EE to be better (lower scores) than Myrick's C-EC list data. In Lucker's (1981 article in the SSW Newsletter he too felt that Myrick's limits permitted too many LD children to pass. He proposed that the scores falling between the adult norms and Myrick's be considered abnormal or question able.

PROCEDURES

Myrick's Study

On the basis of the above studies as well as on logical grounds it is time to re-evaluate the limits suggested by Katz and Illmer. Most current investigators would be inclined to exclude LD children from the normative data that are used to identify auditory processing problems. We would also expect threshold measures for air conduction as well as tympanometry or bone-conduction thresholds to eliminate those with "slight" conductive impairments. However, 17 years ago we did not know the term, "learning disability" nor suspect that conductive loss could possibly influence central auditory test results. A third variation is the use of the 20 item C-EC list instead of the entire parent EC tape. Although we have no reason to presume that there would be major differences between a 20 and 40 item test (Katz and Cummings, 1974) we cannot extract reliable response bias information from a 20 item test. Further evidence that the C-EC list is equivalent to the EC list is that Myrick's data on young adults resembles those of other SSW studies using other SSW tapes.

It is not surprising that Myrick's data has represented a rather conservative limit of abnormality. It is quite likely that the poorer scores in her sample represent children who would now be eliminated because of hearing, learning or health history problems. This also accounts for the wide SDs within the school. In many ways her sample was a very restricted one (White, Protestant, middle or upper socioeconomic level and from New Orleans). When the large mean error scores are added to the large SDs; the +1 SD limits become quite exaggerated and permit a wide range of behaviors to appear normal on the SSW test.

White's Study

White (1977) evaluated 49 normal children (ages 6 through 10 years). They represented a middle to upper socioeconomic group. That study utilized the standard EC tape and incorporated the standard administration, instructions and scoring. In this sense, of the 3 studies it is the one that most closely matches the NS.

Johnson and Sherman Study

Johnson and Sherman (1981) conducted a large, carefully controlled study using the new SSW EE list (Auditec). The EE list was derived from a parent list of 80 SSW items which had been recorded at a more favorable S/N ratio than the EC tape. Forty of the 80 items which were matched in difficulty to the EC items constitute the EE list (Katz and Wasinger, 1974). Katz and Wolff (1976) found that the EC and EE performance was quite similar in a group of elderly people.

One other difference between the Johnson and Sherman study and the two EC studies was that the former stressed to the children that they were to respond in the exact order in which they heard the words. It is not felt that this difference should significantly influence the C-SSW score.

Johnson and Sherman tested children from the middle 50 percentile in school achievement. Half of the children at each age level were chosen to be left handed. It is not clear if this might have influenced the results.

National Sample Study

In 1979 the SSW National Sample for Children was undertaken. By December 1980, over 130 test results were received. After checking the scoring and tabulation on the data sheets for accuracy they were entered on computer cards and analyzed. Data that did not meet the established criteria were excluded (e.g., history of learning problems or hearing levels greater than 15 dB, EE tests). All other factors were left to vary. For ages 7 through 11, 93 completed records were available.

C-SSW RESULTS

The major emphasis will be on the RC and LC conditions because these have been shown to be the most sensitive to dysfunction in LD children and are the ones that show the most variability as a function of age even in normal children. To simplify this tentative analysis the means and SDs have been rounded to the nearest whole number.

Because the RNC and LNC conditions are less critical than the competing conditions we simply took the limit as +1 SD above the mean for the NS. This was done because the NS represents the largest N and because it represents the most conservative upper limit of normal of the 4 studies for the NC conditions.

We can use a score of 8 as the +1 SD C-SSW limit for 7 year old children for the NC conditions. For the 8 year old group and above a score of 4 should be considered the limit of normal. Where the RNC and LNC scores differed we used the greater one. For simplicity at this time we used 4 as the cut off for children 8 to 11 years of age.

The performance on the RC and LC conditions for Myrick (M), White (W), National Sample (NS) and Johnson and Sherman (JS) studies is shown in Table 1. Means, SDs, the +1 SD limits and the tentative cut off score are indicated. See page 6.

In studying Table 1, it should be remembered that only the NS and W studies employed the EC list. This could explain the close relationship between these 2 studies for both the means and SDs (that were available). In general the JS study demonstrated better mean scores than the EC studies but the SD was about the same. M's means and SDs for children 9 years and younger were larger than those obtained in the other 3 studies.

ESTABLISHING TENTATIVE NORMS

We attempted to choose one score to represent the upper limit for each of the competing conditions for each age group. Whenever possible one of the actual test scores was chosen rather than interpolated score. The tentative norm (1981) was selected on the basis of six CRITERIA or extrapolated on the same basis. They were: 1) First we looked for the similarities in the upper limits among the studies; 2) more weight was given to the larger data samples; 3) since the norm is for the EC list, more emphasis was given to the 2 EC studies; 4) we were guided by the concept that there should be a tendency toward better scores with increasing age from 7 through 11 years (and not poorer scores); 5) where there was lack of agreement among the studies the middle scores were given the greatest weights, and; 6) when in doubt we erred on the side of caution (the higher score). Table 2 shows the selected values with the associated criteria (noted above) that led to the decision.

	RIGHT COMPETING		LEFT COMPETING	
AGE	UPPER LIMIT	CRITERIA	UPPER LIMIT	CRITERIA
7	17	1,2,3	29	1,2,3,5,6
8	13	2,3,4,6	20	2,3,4,5,6
9	10	1,2,3,6	19	1,2,3,4,5
10	7	1,2,4,5	17	1,2,3,4,5
11	4	1,2,4,5	10	1,4,5

Table 2. The upper limits for various age groups for the right competing (RC) and left competing (LC) conditions based on 4 studies and the criteria used in choosing these limits (see text above).

For the LC condition for 7 year olds we feel the proper upper limit should be either 28 or 29. For LC condition for the 8 year olds the limit of 18 seemed too low, but 24 was thought too high. A score closer to 18 was decided as the most appropriate. For the 11 year group in the LC condition there was such good agreement among the studies that we chose the middle score.

DISCUSSIONS AND CONCLUSIONS

We feel that the tentative norms reported here are stronger and more applicable than any one of the studies alone. While the NS has contributed the greatest weight to the tentative norms, each of the other studies has influenced the results importantly for 2 or more of the limits. Only in 2 of the 10 competing conditions did we feel that none of the available scores were appropriate. In both cases a limit between the two "best" +1 SD levels was chosen.

This comparative study no doubt provides the best view of normal performance on the SSW test because it considers the results of 4 investigations with normal children.

1) Myrick's scores appear larger than the other 3 studies. This can be explained on the basis of sampling error. Because of the state of the art in 1964, that sample no doubt contained subjects who we would not include in current samples of normal children. The present (1981) results should supercede Myrick's work as the best available norms.

2) The new tentative norms (1981) differ from Myrick's data primarily on the LC condition in the younger age groups. The new limits will be more stringent than the previous ones.

3) Generally, the data from the 2 EC studies were bracketed by Myrick's (poorer means) and Johnson and Sherman's EE study (better means).

4) The 2 EC studies (NS and W) yielded very similar results. In most cases their means were within 2 points of one another (and well within 1 SD). The biggest difference between the studies was for the 8 year olds for the LC condition. White's mean and SD were slightly larger yielding a limit 6% greater than the NS.

5) Because of the close similarities between the 2 EC studies we have increased confidence that clinicians can apply these norms with reasonable confidence across the U.S. and Canada. If the child's dialect is not close to General American, care should be taken in applying these norms. We have yet to determine if regional or dialect differences will have a significant effect.

6) Based on the present results it would not be appropriate to use these tentative norms (1981) for lists other than the EC. It is not entirely clear what the factors might be to produce the apparent differences in the studies. Further statistical analysis of the studies will be carried out to clarify the differences and similarities among the studies.

7) The criticisms of the Katz and Illmer tentative norms seem to be supported by the present work particularly for the younger age groups. Actually, the differences are rather small in most cases.

8) The mean scores for the competing conditions in the EC studies tend to fall within the adult norms (so a majority of normal children could be evaluated by adult standards). However, the +1 SD limit for groups 10 years and under fall beyond adult limits. Therefore, it does not seem appropriate to expect children below 11 years to fall within adult limits.

This report covers the C-SSW scores. In evaluating children we should not ignore significant response biases as well (White, 1977). Our next installment will deal with response bias.

SUMMARY

The results of the National Sample appear to provide important criteria for assessing performance in children. These results were compared with 3 other studies (1 other study using the EC). The previous norms (Myrick, 1965) seem too lenient for children 7 through 9 years of age. The 1981 tentative norms need to be cross validated on additional subjects.

POSTSCRIPT

We hope that it is apparent to the reader that the community effort in gathering the NS (NS-1) has added significantly to our confidence in evaluating children. We need another sample (NS-2) to validate what we learned from NS-1. Will you help us? We have 150 subscribers and many more than 150 readers. If each one took it upon him/herself to test 1 normal child (5-12 years of age) we would have the information we need.

Please select 1 normal child for this study. We need puretone thresholds (A/C and B/C), WDS (recorded) at 40 dB SL and the SSW (EC list). Exceptions: For 5 year olds you need only test the first 20 items and can use live voice or recorded PBK's.

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THE LAST OF THE SSW NEWSLETTER ?

This publication has been called the SSW Newsletter for the past 3 years. Why change it now? Perhaps we should leave well enough alone. But, somehow it seems that the word Newsletter sounds a little too chatty and does not represent the quality of information that it contains. On the other hand the SSW Quarterly sounds too serious.

How does SSW REPORT or SSW REPORTS sound to you? This is one of the topics that will be mentioned at the SSW Study Group on Nov. 19. We have about half a dozen short and longer papers scheduled for that meeting at the Biltmore. See you there.

COAST TO COAST

Basic SSW Workshop in Jan., Westchester, NY (contact Jay Lucker) & in Feb., San Francisco, CA (contact Dennis Arnst). Or let me know (JK).

SSW NEWSLETTER

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TABLE 1

N, MEANS, AND SD's (rounded to nearest whole #) FOR 4 C-SSW STUDIES WITH "NORMAL" CHILDREN 7 THROUGH 11 YEARS

			R-C			L-C		
		N	$\bar{M}$	SD	+1SD	$\bar{M}$	SD	+1SD
7-YR	M	10	16	(19)	35	28	(15)	43
	W	11	6	(7)	13	21	(9)	30
	NS	11	10	(7)	17	20	(8)	28
	J/S	14	8	(9)	17	14	(11)	25
TENTATIVE LIMIT					17			29
8-YR	M	10	2	(8)	10	18	(15)	33
	W	11	6	*	*	14	(10)	24
	NS	27	6	(7)	13	10	(8)	18
	J/S	14	5	(5)	10	6	(6)	12
TENTATIVE LIMIT					13			20
9-YR	M	10	4	(6)	10	17	(16)	33
	W	11	2	*	*	11	(8)	19
	NS	20	5	(5)	10	10	(9)	19
	J/S	13	2	(7)	9	4	(7)	11
TENTATIVE LIMIT					10			19
10-YR	M	10	2	(4)	6	10	(9)	19
	W	10	5	*	*	9	(9)	18
	NS	20	5	(5)	10	10	(7)	17
	J/S	12	2	(5)	7	1	(4)	5
TENTATIVE LIMIT					7			17
11-YR	M	10	2	(7)	9	4	(5)	9
	NS	15	1	(3)	4	5	(6)	11
	J/S	13	0	(3)	3	4	(6)	10
TENTATIVE LIMIT					4			10

* Not available at this time