

Age and the Visual Sequential Memory Subtest of the ITPA

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The Visual Sequential Memory test was given to 128 Auckland children and adults, ranging in age from 2 to 26 years, to see if the task would be suitable for subjects older than the ITPA reference group, and if the American norms were appropriate for the younger Auckland children. No ceiling effect was found, even among the group of university students. The Illinois norms for this subtest may be adequate for Auckland children whose ages fall within the ITPA reference group, provided a more conservative comparison than that suggested in the ITPA manual is used.

The Visual Sequential Memory (VSM) subtest of the Illinois Test of Psycholinguistic Abilities (ITPA) has been reported to discriminate learning disabled children from both normal (Marinossou, 1974) and emotionally disturbed children (Friedman, 1972), to predict reading ability in white and negro children (Brown, 1974), and to correlate with deficits in information processing ability after closed head injury (Gronwall, Note 1). It has the advantage that, unlike many of the auditory-verbal subtests of the ITPA, scores are not depressed among ethnic minority groups (Teasdale & Katz, 1968; St George, 1972).

The ITPA was designed to measure language ability in children from two to nine years old, and much of the material is only appropriate for these ages. However, the content and difficulty level of the VSM subtest may make it a suitable task for a much wider age range. The subject is given five seconds to study a sequence of non-meaningful symbols, and then must reproduce the sequence by placing chips marked with the symbols on a board in the same order. Items progressively increase in difficulty, both in the number of symbols (ranging from two to eight), and in the similarity of the symbols that are used. The mean raw score for the oldest normative group is given as only 22.5, out of a possible score of 50 (Kirk, McCarthy & Kirk, 1968).

The purpose of this paper was to examine VSM performance in older primary and secondary school children, and in young adults, to see if an extension of its use beyond the ITPA age groups would be justified. A

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second aim was to sample children within the ITPA age range to check that the Illinois norms were appropriate for use in New Zealand. Although Mittler and Ward (1970) found no difference between British four year olds and the American normative group, mean VSM raw scores reported by St George (1972) for New Zealand children aged five and six years corresponded to an ITPA age of less than five years. Moreover, although Teasdale and Wray (1975) found no differences in VSM raw scores between Australian children aged 5-7 to 6-1 and those in the North American sample, the American 6-7 to 7-1 children were significantly better than Australian children of the same age. The aim of this paper was not to produce normative data for New Zealand children, but to determine the variation in performance levels with age.

Method

The VSM was given to 128 subjects ranging in age from two to 26 years, following the administration and scoring procedures given in the ITPA Examiners' Manual, Revised Edition (Kirk, et al., 1968). Eight different age and occupation groups were formed.

Pre-school children (20 aged over two but less than four years, and 18 between four and five years) from Newmarket and Onehunga Playcentres formed Groups 1 and 2. Primary school children (15 aged from six to eight, and 15 aged between 10 and 12 years) from Parnell School formed Groups 3 and 4. Secondary school children (15 at age 13 and 15 at age 15) from Selwyn College made up Groups 5 and 6. These playcentres and schools serve children from a range of socio-economic and ethnic backgrounds. All school-aged children were classified by their teachers as of average to low-average ability.

The adult groups comprised 15 unskilled workers aged between 17 and 26 years (Group 7) who were either hospital orderlies ($N = 11$) or packers in a city warehouse ($N = 4$), and 15 university students in the same age range (Group

Table 1
Sex Distribution, Mean Ages, and VSM Raw Scores in the Eight Groups

Group	1	2	3	4	5	6	7	8
Males (N)	11	10	9	9	10	8	10	9
Females (N)	9	8	6	6	5	7	5	6
Age ¹								
Mean	3.04	4.50	7.17	11.00	13.64	15.60	20.50	20.80
SD	.58	.25	.83	.83	.20	.22	2.70	1.20
VSM raw score								
Range	0-13	3-24	7-27	19-36	16-31	18-39	22-47	30-46
Mean	4.40	12.89	19.27	24.13	23.67	29.20	35.80	40.90
SD	3.71	5.67	4.32	4.96	4.95	5.85	7.79	4.62

¹ In years.

0. Mean ages and the sex distribution in each group are given in Table 1.

Results

Table 1 shows means and *SDs* of VSM raw scores for the eight groups. Means of all adjacent age groups were significantly different, with the exception of the Group 4 versus Group 5 comparison. Although there was some overlap in the range of scores between age groups, Figure 1 shows that there was an orderly progression in the proportion of subjects scoring at or above a given level. For example, no Group 1 child scored 20 or more, while one of the 18 Group 2 children, more than half of Group 3, four-fifths of the 10 to 13 year olds (Groups 4 and 5 combined), over 90% of Group 6, and all the adults scored at least 20 on the task. No subject gained the maximum score of 50, but four children from the youngest group scored zero. There was no significant difference between scores from males and females, either within each group, or in the full sample (all $t < 1$).

Table 2 gives the medians, means and *SDs* for the three youngest groups' scaled scores, derived from the ITPA norms. None are significantly different from the Illinois mean scaled score of 36 ($SD = 6$). However, more than 28% of these children (15 out of 53) had scores outside the average range, defined in the ITPA manual as within 1 *SD* of the mean of 36. Ten of the 15 children performed better than the "normal" level. Only two children had scaled scores more than 2 *SDs* from the mean (i.e. more than 48 or less than 24), one four year old being above and one seven year old being below this range. This latter child was noted to have problems differentiating right and left, and the errors he made were not within sequences, but that the sequences were reproduced in reverse order.

Discussion

This study was designed to examine the suitability of the VSM test for children older than the ITPA reference group, and for adults. The results are encouraging. Even among the group of university students no subject gained the maximum score, and performance on the task showed a progressive increase with age throughout the sample tested. Although no ceiling effect was found, the youngest group of children had very low scores, and, with four gaining no points at all, it appears that the task is too difficult for children younger than four years, and that a diagnosis of impairment would be difficult to make.

However, the older subjects appeared to find the VSM test interesting and challenging. It has no obvious scholastic content, and the sampling procedure means that each subject is examined around the range of his own memory span for this material. Testing takes less than 15 minutes, making it suitable for inclusion in a battery with other tasks, or for those subjects whose attention span is short.

The ITPA was developed as a diagnostic measure of language competence in young children. Obviously the VSM subtest cannot be used on its own for this purpose. However, it does appear to be a measure of immediate memory which should be relatively uncontaminated by verbal ability. The extent to which VSM scores also reflect general intelligence is unclear. Evidence from cor-

Table 2
VSM Scaled Scores for the Three Youngest Groups of Children

Group	1	2	3
N	20	18	15
Median SS	34.5	39.0	36.0
Mean SS	35.7	39.4	36.6
SD	6.3	7.7	6.8

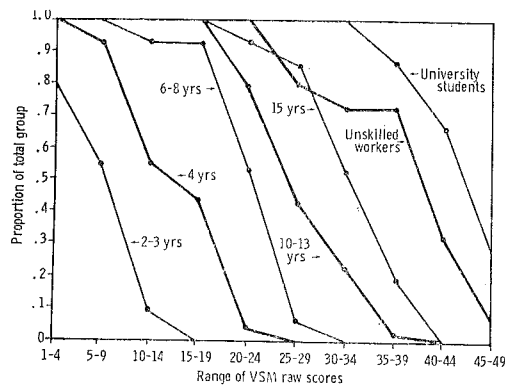


Figure 1. Proportion of subjects in each group gaining a VSM raw score at or above each range.

relational studies between the ITPA and WISC subtests is conflicting, and appears to depend both on the factor analytic method used, and on the population that was sampled. For example, Wakefield and Carlson (1975), using canonical analysis of scores from normal schoolchildren, found that VSM was one of three ITPA subtests that correlated most highly with verbal-educational measures such as WISC Information and Vocabulary subtests, while Wallbrown, Blaha, Counts and Wallbrown (1974), using a different method and a group of reading-disabled children, report that VSM had substantial loading on the perceptual-motor factor, but did not load significantly on the verbal-educational factor.

Evidence on this issue from the Auckland sample is also conflicting. The children aged from six to eight years included average and low-average achievers, whereas the ITPA norms are based on children all of average ability, yet the VSM scores were comparable. However, the two adult groups differed significantly, presumably as a function of the different IQ ranges in the groups.

Conversion of raw VSM scores to scaled scores from the Illinois norms in the three youngest groups suggests that, for this subtest, these norms may be appropriate for New Zealand children. However, because the variance among the Auckland sample was greater in each group, a more conservative comparison than that advocated in the ITPA manual should be used. Among the children tested for this study, selecting scores more than 2 SDs from the mean identified one child with obvious difficulty in left-right discrimination.

Interpretation of scores from individual subjects older than the ITPA reference group will obviously require data from more control subjects than those reported in this paper. However, group comparisons of subjects with closed head injuries suggests that the VSM subtest will be a potentially useful measure of some types of memory deficits.

Reference Note

1. Gronwall, D. Information processing capacity and memory after closed head injury. Paper presented at the 8th Annual Meeting of the International Neuropsychology Society, San Francisco, February, 1980.

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