



The Revised Wechsler Tests of Intelligence

By Molly Tweedie, Psychologist

Some of the most frequently used tests of intelligence for children are those known as the Wechsler Tests.

These tests were created by David Wechsler and include the Wechsler Adult Intelligence Scale, the Wechsler Intelligence Scale for Children and the Wechsler Preschool and Primary Scale of Intelligence. The tests are known respectively as the WAIS, the WISC and the WPPSI (pronounced wipsy). The original WISC was published in 1949 and the WPPSI in 1967.

Since then, there have been three revisions for the WISC and two for the WPPSI. All three tests have been revised recently, with the new WISC being published in 2003 and the WPPSI in 2004.

What's new and why?

The tests are revised regularly for a number of reasons.

The first is to keep the content of the tests in line with current theories about what constitutes intelligence and how it can be measured.

For example, in one of the previous versions of a commonly used intelligence test there was a question about aesthetic preference. The subject was shown pairs of pictures and asked to state which picture was preferred. One picture was a drawing

of an attractive young woman; the other looked like an illustration from an old book about the criminal classes. Aesthetic preference, especially using such a biased approach, is no longer considered to be a significant measure of intelligence.

The questions and general artwork are also revised, eliminating 'old fashioned' questions and pictures.

The pictures have been modernised, with clothing and hairstyles made to look more contemporary and there is now an ethnic mix among the drawings of people, so they are no longer obviously all Caucasians.

There is no longer the emphasis on speed of performance, as it is recognised that it disadvantaged many children, for example, children who are anxious or perfectionist. Surprisingly perhaps, gifted children often achieved lower scores on the Processing Speed tasks, which in turn lowered their Full Scale score.

In some cases, the order of presentation of the questions has been changed. For example, a question about why stamps are put on letters has been moved from number 13 to number 17, as many younger children had trouble with this question.

As well as making the questions and pictures more relevant, the tests have been 're-normed'.

This means that the test is trialled on large groups of appropriately aged people and the results then used to form the new norms tables, against which a child's score is compared. The score for a child who is being tested in 2006 is compared with children who were tested in the years preceding 2003, rather than with scores from individuals who were tested in the 1970s.

The WISC-IV has also been part of a massive project to provide Australian standardisation.

As well as providing Australian norms, so that Australian children are compared with other Australian children rather than American children, it has ensured that questions and vocabulary are appropriate; for example asking who is Captain Cook rather than Benjamin Franklin. Pictures have also been made more culturally relevant: for example, a rabbit or a possum are used rather than a squirrel or a raccoon.

Another important reason why tests are changed and updated is a phenomenon known as the Flynn Effect (1984).

Put simply, James Flynn theorised that over time, IQ scores increase by approximately three points per decade. The reasons for this are uncertain, but it is hypothesised that improved health and nutrition and longer time spent at school, as well as changes in education are all factors that contribute to this

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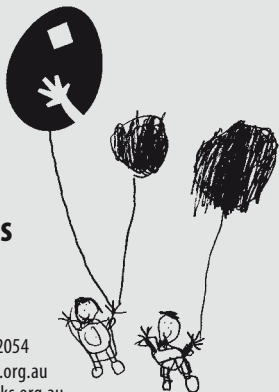
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effect. Another factor that is thought to contribute to the effect is that parents now spend more time with their children, stimulating their cognitive development.

The revisions of the WISC and the WPPSI have also extended the ceiling and the basal levels of the test scores, by adding further easy and difficult questions at either end of the subtests.

This means that they discriminate better among children who achieve either very high or very low scores. Previously, children who gained scores at the extreme ends of the scale could not be identified as clearly. The age range for the WPPSI-III has also been extended downwards from 4 years to 2.6 years, with a shortened version for use with children from 2.6 to 3.11 years.

A real benefit from the psychologist's point of view is that as well as the items being made more attractive and the questions more relevant, they are also made easier to administer and the testing time is shorter. The instructions have been simplified; some subtests removed and new ones created.

In the essentials, the new tests are very similar to their predecessors.

They both measure verbal and non-verbal skills and have subtests to measure working memory and processing speed. The WISC-IV uses the four Index scales to create the Full Scale score, whereas the WISC-III only used the Verbal and the Performance scales and although it was useful to administer all the subtests to calculate the four Index scores, it was not essential.

The WPPSI-III is also very similar to its predecessor, but now includes a Processing Speed scale as well as a General Language scale. Reporting of the scores has also been brought into line with current practices by providing percentiles and confidence intervals, rather than a single score for results.

Wechsler Intelligence Scale for Children – 4th Edition

The WISC-IV uses 10 core subtests to create four INDEX SCORES, which have replaced the Verbal and Performance Scales of the WISC-III. There are also five supplemental subtests that can be used either to expand the amount of information about a particular area or to replace a core subtest.

The tester may feel that a subtest has been spoiled for some reason or that a different subtest may be more

appropriate. For example, Picture Completion, which does not require any physical response, may be used as a substitute for Block Design for a child with a physical disability such as Cerebral Palsy.

The structure of the test is hierarchical, with the Full Scale score being the sum of the four Index Scales, which are created from the subtests.

Arriving at the scores

The subtests are scored according to the criteria given in the test manual and the raw scores are converted to scaled scores, using the age appropriate tables, so the results for a student who is 8 years and 5 months old are compared with those of other students between the ages of 8 years and 3 months to 8 years, 5 months and 30 days.

The scaled scores from the subtests are summed and these are then used to form the INDEX SCORES and the Full Scale score, again by looking up the appropriate table in the manual.

The scaled scores for the subtests range between one and 19, with scores between seven and 13 being within the average range. The INDEX SCORES and the Full Scale score have mean scores of 100 and the average range is between 90 and 109.

The Full Scale score is central to identifying children who are either developmentally disabled or gifted.

As a single score, it is most relevant and reliable when there is little variability among the INDEX SCORES that comprise it. If there are discrepancies of 20 points or more among the Index scores, the Full Scale IQ becomes less meaningful as a description of the child's ability. Similarly, if there are large differences among the subtest scores that comprise an INDEX SCORE, the single score is no longer as meaningful as a description of the child's ability in that particular area and the individual scores should be considered.

Because it is recognised that no assessment is perfect, Intelligence Quotients are generally reported as a range (the Confidence Interval), rather than as a single score. This predicts that with either 90 or 95% certainty, a student's "true" score will fall within a given range.

A student's score may vary from one occasion of assessment to another, but it will generally remain within the range.

The scores tend to be more stable as the child matures, as older children are generally more cooperative and less influenced by outside factors, whereas the scores from younger children are more vulnerable to change. They are more susceptible to outside variables, such as the personality of the tester, motivation and the ability to sustain attention for the duration of the testing.

Maturation and education also can affect scores markedly, as can previous exposure to testing. Practise effect is a recognised phenomenon and can improve a child's score, so it is recommended that there should be at least two years between occasions of assessment.

Verbal Comprehension Index

The Verbal Comprehension Index (VCI) is 'composed of subtests measuring verbal abilities utilising reasoning, comprehension and conceptualisation' (Wechsler, 2003)¹. It consists of three core subtests and two supplemental subtests.

The three core subtests and one of the supplemental tests are similar to those from the WISC–III, but a new supplemental subtest has been introduced. Arithmetic has been removed from the Verbal scale and is now a supplemental test for the Working Memory Index.

The emphasis of this index is now on reasoning and comprehension rather than on crystallised knowledge².

However, reasoning with verbal material still requires some level of crystallised knowledge; for example, a student cannot describe how two concepts are alike unless they have prior understanding of the words and can access this information when required.

Perceptual Reasoning Index

This index was the Perceptual Organisation Index of the WISC–III.

It is 'composed of subtests measuring perceptual reasoning and organisation ... the name change from POI in WISC–III to PRI in WISC–IV reflects the increased emphasis on fluid reasoning abilities in this index'. (Wechsler, 2003, p 6)³.

There is less emphasis on speed of responding and perceptual organisation and more on fluid reasoning, with only

| Full Scale Score | | |
|---|--|---|
| Verbal Comprehension | Perceptual Reasoning Working Memory | Processing Speed |
| Similarities Coding Vocabulary Symbol Search | Block Design * Picture Concepts | Digit Span * Letter-Number Sequencing |
| Comprehension | * Matrix Reasoning | |
| † Information † *Cancellation | † Picture Completion † * Word Reasoning | † Arithmetic |

† Supplemental subtest

* New subtest

one subtest being timed and having bonus points for speed of responding. One of the original subtests has been kept as a core subtest and two new ones added. There is one supplemental subtest, which is one of the original WISC–III subtests.

Working Memory Index

This index was originally named the Freedom from Distractibility Index, which was misleading. The new name of the index is now a more accurate reflection of what the scale measures.

Working Memory is the ability to temporarily retain information in the memory, manipulate it and achieve a result. It involves attention, concentration, mental control and reasoning and is an essential component of other higher order cognitive processes.

There are three subtests in this scale; two core and one supplemental.

All three subtests measure verbal working memory, but not spatial or visual working memory. One of the subtests is a task from the original test and one is a new subtest, with one task from the WISC–III being retained as a supplemental subtest.

Processing Speed Index

This index provides a measure of the student's ability to correctly scan, sequence or discriminate simple visual information. It also measures short term visual memory, attention and motor coordination.

It is recognised that quick and efficient processing of routine visual information may conserve working memory resources, so students who perform well on this task have more capacity for other cognitive tasks. The two core subtests are from the WISC–III and a new supplemental subtest has been included.

Wechsler Preschool and Primary Scale of Intelligence – 3rd Edition

The WPPSI–III is similar to the WISC–IV in the administration, the subtests and the overall format of the test.

There are some differences between the two tests, particularly reflecting the differences in development between preschool children and children who have been at school for three or more years.

Language development in young children in particular can significantly affect the scores on cognitive tests and the WPPSI–III has reduced this emphasis, by the inclusion of more picture items in the Verbal subtests and less requirement of longer verbal answers in the core subtests. This is particularly the case for the younger children (2.6–3.11 years) where only one subtest requires verbal responses.

A subtest measuring receptive language, which is entirely non-verbal, has been introduced as a core subtest for these younger children and as a supplemental test for the older ones.

1. Wechsler, D. (2003) Manual for the Wechsler Intelligence Scale for Children (ed. 4) San Antonio: The Psychological Corporation.
2. *Crystallised knowledge* refers to problem solving and factual learning that is dependent on formal schooling, whereas *fluid intelligence or reasoning* is the ability to solve new problems where formal education is not of direct assistance.
3. Wechsler, D. (2003) Manual for the Wechsler Intelligence Scale for Children (ed. 4) San Antonio: The Psychological Corporation.



In the administration of all subtests, the instructions have been simplified and there are also more opportunities to prompt or to question if a child's answer is unclear.

There is also a decreased emphasis on time.

Preschool children generally have had less exposure to the concept of working quickly and completing a task within a given time than have school age children. Some tasks (Block Design, Object Assembly) still have a time limit in which an item is to be completed, but there are no longer bonus points for speed of performance.

These subtests are measures of visual-spatial reasoning and problem solving, rather than processing speed. A Processing Speed scale, similar to that in the WISC-IV has been introduced, but only one of the subtests is included in the calculation of the Full Scale score for the older children (4+ years).

There have been further changes to the test to accommodate the motor development of younger children.

The WPPSI-R used thin, tile-shaped blocks for Block Design, rather than the cubes used in the other tests. Cubes are now used, as they are easier for a younger child to grasp and manipulate.

The Geometric Design, Mazes and Animal Pegs have also been deleted, as performance on these subtests was strongly affected by neurological and motor development. The prefrontal cortex develops and changes dramatically over this age range, so poorer performance on these subtests may be a result of development, rather than of cognitive ability.

The Arithmetic subtest has also been deleted, as exposure to pre-number and early mathematical skills is strongly biased by familiarity with these concepts, so poor results may reflect lack of exposure to the concepts of number, as well as slower development of the understanding of abstract ideas.

Why an IQ test?

There are three major reasons why a child may be referred for a psychometric test. There may be concerns about their overall development, or because they are struggling with acquiring basic literacy skills or there is a query about whether the child is gifted.

A young child may be referred for a psychometric assessment to help determine whether there is a cognitive delay.

These children seem to be developing skills more slowly than their peers and the parents and/or professionals involved with them may feel that the difficulties are the result of a developmental disability. The IQ test will help to establish the level at which the child is functioning cognitively. This has implications for entrance into early intervention programs and once they start school, for eligibility for integration funding or inclusion into a support class or school.

The child may have a mild disability, where the IQ score falls between 55 and 75.

These children may be eligible for integration funding to enable them to be educated in a mainstream class. The amount of funding they receive is determined not only by the IQ score, but also by their overall social and self care skills.

Many of these children cope well in the integrated setting in their early years, but as they get older, the discrepancy between their development and that of their peers with average ability becomes larger and they will require more support in the classroom, which may include a modified program.

A child with an IQ score below 55 is described as having a moderate disability.

These children generally have delays in all areas of their development, particularly in language and social skills. Their needs are generally best met in a support class or unit in a mainstream school. Where there are behavioural problems or more than one disability, a School for Specific Purposes will often provide the best support and educational program.

The second reason a child may be referred for assessment is because they are having difficulty with acquiring basic literacy skills. This may be because they are of lower cognitive ability or they have a specific learning problem.

The IQ test will identify the child of lower ability, but a child with a specific learning problem will often be of average or above average intelligence. The test has eliminated one cause for the difficulty they are having, but may not provide any clear evidence of the learning problem.

The student with a learning problem is best identified through achievement or academic testing, as well as psychometric testing.

This testing can identify whether they have a difficulty with reading and will help establish where the problem lies. The scores from a test such as the Wechsler Individual Achievement Test – 2nd Edition (WIAT-II) can be compared against the scores from the WISC-IV and this will indicate whether the student is performing at a level commensurate with their cognitive ability, or whether there is a discrepancy between the scores.

Children may be referred for assessment because of a query as to whether they are gifted.

The Department of Education requires that children turn five years of age on or before the 31st of July of the year they begin school. Parents of gifted children, who want their child to begin school earlier, have to provide proof that the child is gifted.

The Department requires an IQ score, which has to fall in the 95th percentile or above 125 (Superior to Very Superior range.) For a young child to cope well at school, they need to have good language skills and be socially competent as well as being intellectually gifted.

Although there are arguments as to the need for IQ testing for children, up to date and relevant testing is an important tool for helping identify children's differing educational needs.

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