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L'ECHELLE D'INTELLIGENCE DE WECHSLER POUR ENFANTS:
A TRANSLATION AND ADAPTATION OF THE WISC-R FOR
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Harvey F. Clarizio
Major professor

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L'ÉCHELLE D'INTELLIGENCE DE WECHSLER POUR ENFANTS: A TRANSLATION AND ADAPTATION OF THE WISC-R FOR USE WITH FRANCO-ONTARIANS

By

Suzanne Aline Regimbal

A DISSERTATION

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ABSTRACT

L'ÉCHELLE D'INTELLIGENCE DE WECHSLER POUR ENFANTS:
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By

Suzanne Aline Regimbal

The Wechsler Intelligence Scale for Children-Revised, is a
demonstrably powerful instrument for use in the assessment of cognitive
skills in children. As a result, the literature documents numerous efforts to
introduce its use into cultures that are different from the American, English-
speaking population for which it was devised. Several strategies have been
employed in adapting the instrument to groups that are both culturally and
linguistically different from the norming sample. Some efforts have involved
strategies as simple as the direct translation of the original. Others have
involved the more complex task of redesigning and/or creating items that
could be shown to be sensitive to the culture within which its use was
intended.

For more than fifteen years, psychologists in Canada have been
concerned about the direct application of the original test, with its American
content and norms, to a Canadian population. The literature reflects the
preoccupation with the test's applicability to a group that is culturally
different from the original norming sample. The concerns are compounded

when the instrument is used, by means of translation, with a group that differs from the original norming group, not only in terms of culture, but in terms of language dominance and usage.

This study proposes to present an adaptation of the WISC-R that, while retaining important psychometric qualities of the original Wechsler scale, is sensitive, both in language and content, to francophone children in Ontario. To this end, a representative sample of 220 children, ranging in ages from 6 to 16, were assessed in French, with an experimental instrument that contained some translations of American items, and some new items that were felt to better reflect the realities of Francophone Ontario. Test results were analyzed to ensure that subtests remain gender-fair, and that items be arranged hierarchically with p-values matched against the p-values of those anchor items used by The Psychological Corporation in the original WISC-R.

The final outcome was the creation of a pilot translation and adaptation of the WISC-R to be applicable to Franco-Ontarians.

To NICK

who's been my mate, my friend, my lover, my cheerleader, and, at times,

my nag throughout this seemingly endless process

et

À la douce mémoire de

SOEUR GERMAINE REGIMBAL, a.s.v.

qui a promis d'être là à ma graduation

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INTRODUCTION

The Wechsler Intelligence Scale for Children - Revised, hereafter to be referred to as the WISC-R, ranks among the most powerful psychometric instruments available to the practitioner for the purpose of measuring general intelligence. Both in its initial form, the WISC, and in its revised form, the WISC-R, the scale has undergone extensive empirical examination to ascertain its validity and reliability. In the case of the WISC-R, these investigations into the psychometric properties of the test have used not only the group of 2200 subjects that made up the norming sample, but have broadened in scope to include groups who, by reason of race, of culture, and, in some instances, of language, are different from the original norming sample. The widespread use of the WISC-R with these different populations has come about largely because it has been possible to demonstrate that the test retains its good predictive validity within the educational setting. For example, Li Dan and colleagues have demonstrated that the WISC-R is suitable for use with school age children in China (Li, 1990).

Though the WISC-R is of American origin, its use, as noted above, has not been limited to the United States. Its use in other countries has

come about largely because of the contribution the test's results can make to the identification of a variety of problems or characteristics that can impact on school functioning: giftedness, learning disabilities, lower than average general intellectual functioning and retardation. The test's use with populations that are linguistically and culturally different from the norming population has necessitated some modification to the original instrument. In some instances, for example, in the United States (Martin, 1977), in Italy (Grimaldi, 1983), in The Netherlands (Spoelder et al., 1981), and in China (Fan, 1979), the principal modification made to the original has been through translation. In other instances, modification has gone beyond the simple movement from one language to another. For example, Dague (1982), in France, made some empirically-based modifications not only to item content but to order of presentation as well. The modified instrument was then re-normed on the basis of results obtained from a national sample group of 1066. In Germany, Kubinger (1983) developed a scale of factor weightings to make the instrument more sensitive to the characteristics of the population for whom the test was to be used.

Most Canadian practitioners, perhaps because of Canada's proximity to the United States and their shared language, have more often been content with a simple borrowing of American-generated materials and the unaltered application of American norms to its population. This practice has been true despite some concerns, based on empirical studies, that Canadian

and American performance on certain subtests of the WISC-R might differ

significantly from each other (Beauchamp et al., 1979; Peters, 1976).

If problems of cross-national application of the WISC-R arise with a

Canadian anglophone population that is arguably similar in many respects to

the population for which the WISC-R was normed, these problems become

greater with the test's further application to a population that is not only

culturally but also linguistically different. It would appear that such a move

is potentially fraught with problems that could seriously undermine the

psychometric properties of the original Wechsler scale. Efforts have been

made by clinicians to make the instrument more sensitive to French-speaking

Canadians. Thus, the WISC-R has been informally translated, and there

presently exists several forms of a French-language instrument. However,

none of these several informal translations has been subjected to empirical

scrutiny. On the basis of face validity alone, it would seem that a mere

translation of the American wording, particularly on a subtest such as

Vocabulary, would not be adequate to meet certain principles, for example

the hierarchical ordering of words by difficulty, which are foundational to the

original subtest. In addition, a single adaptation of a French WISC-R might

not adequately meet the needs of the entire francophone population of

Canada. The issues surrounding the Spanish translation of the WISC-R

(Martin, 1977) provide a good example of some of the problems that may

arise when a test is translated. The Spanish WISC-R has been criticised

because it does not appear to distinguish between the Spanish spoken in New York and the Spanish spoken in either California or Florida. Because the Spanish-speaking populations in these various areas have different cultural roots, namely Puerto Rican, Mexican and Cuban, there exist linguistic differences within the Spanish-speaking group, both at the level of accent and idiomatic speech. In the same way, a single French-Canadian adaptation of the WISC-R may not meet the needs of all Francophones. Francophones are unevenly distributed throughout the country, but can be found in greatest numbers in the provinces of New Brunswick, Quebec, Ontario, and Manitoba. Within these provinces, with the exception of Quebec, Francophones constitute a minority. Because of the possibility of a confounding variable such as population density or minority versus majority status, the present study will be limited to the translation and adaptation of an instrument that will be suitable for use with the French-speaking population of the Province of Ontario, which numbers nearly one-half million. Future study will be necessary to demonstrate whether or not such an instrument can be proven to have wider applicability.

The WISC-III was released during the period of data collection for the empirical investigation into the translation and adaptation of the WISC-R. Given that many of the subtests, for example Information and Vocabulary, go beyond mere translation to include new content, it is the psychometric characteristics rather than actual wording that will serve as the basis for

comparison between the tests. On this basis, the work relevant to a current sample may well be directly and immediately applicable to a new research venture involving the use of the WISC-III in French Canada. More importantly, the WISC-R has a long history as the object of empirical research, and can empirically demonstrate its effectiveness in tasks such as the identification of learning potential, of learning disabilities, of giftedness. The WISC-III will have to face years of empirical investigation before it can claim to share these known strengths of its predecessor (Little, 1992). A translation and adaptation of the WISC-R that can be shown to share some important psychometric characteristics with the original English instrument could make immediately available to Franco-Ontarian children a test that has a demonstrable history of effectiveness.

Efforts to adapt a WISC-R that is sensitive to Canadians, in general, and to Franco-Ontarians, in particular, have been ongoing since the test's release in 1974. It is anticipated, given the structural similarities between the WISC-R and WISC-III, that these efforts will now be able to serve as a basis for a more prompt response to the adaptation of the WISC-III to the Franco-Ontarian population.

CHAPTER ONE: REVIEW OF THE LITERATURE

There appear to be at least two major issues that need to be addressed when examining the question of the WISC-R's use with populations that are different from the sample used in the norming of the original scale. The first issue is that of cross-cultural application itself. The second deals with bilingualism.

1.   Issues of cross-cultural test use

Since its introduction in 1974, the WISC-R has been the object of considerable empirical examination. Some of the research has had as its aim the investigation of issues relating to the test's validity and reliability. Other research has focused on issues such as the discovery of differential test profiles that could serve to identify students suffering from learning disabilities, or in need of specialized academic programming (Spafford, 1989; Longman et al., 1991). However, one of the major areas of study has been an attempt to evaluate the test's applicability to populations that, by reason of race or culture, are different from the standardization population.

A large percentage of these studies has been conducted in the United States, seeking to compare the performance of anglophone, white children to that of Chicanos, Blacks, and Native American children. The conclusions drawn from these various studies have been less than uniform. For example, the work done by Mishra and Lord (1982) with Native American children found that the WISC-R scales' ability to predict school performance was not as good for 40 Navajos 4th and 5th graders as it was for the general population. In a similar vein, Dean (1979) found that the performance of Mexican-American children on the Similarities, Arithmetic, and Picture Completion subtests was significantly below that of the norming sample.

Conversely, there is evidence that the WISC-R has been able to retain its psychometric properties in instances of cross-cultural application. A number of studies comparing the performances of groups of White Americans with that of Mexican-American children (Sandoval, 1979; Osplesch and Genshaft, 1981; Reynolds and Gutkin, 1980), conclude that the WISC-R retains its validity when used with a Mexican-American population. More recently, a study by Juliano and colleagues found that the three factor scores for the WISC-R remained stable over a period of three years for Blacks as well as Whites, and for male as well as female students that had all been identified as learning-disabled (Juliano et al., 1988). Sandoval et al (1983) undertook a comparative study of 7 1/2 to 10 1/2

year old Anglo, Black, Chicano, and Bermudian children. They reported that the item difficulty curves were quite similar across groups, though there were a small number of items that were found to be differentially difficult for particular groups. Taylor and Ziegler (1987) administered the WISC-R to 560 children (189 Black, 184 Hispanic, 187 White) aged 6-11 years. Scores for the subtests were computed and then paired as follows, to be factor analyzed: Black-White, Black-Hispanic, White-Hispanic. They revealed that there were no significant differences between the various ethnic groups on their loading on the "g" factor. Even in its Short Form, the WISC-R has demonstrated that it can be used validly with accelerated and gifted Hispanic students (Ortiz, 1989).

There is also evidence that the test has been able to retain its psychometric properties in settings outside the United States. Dague (1982) reports validity and reliability findings that are consistent with those generated from the American norming sample. Testing of 300 Mexican children on the Spanish WISC-R yielded a three factor solution for the Mexican sample that is highly similar to that found for Anglos and Latinos in the U.S. (Roussy, 1990).

The results of studies specific to a Canadian population have not brought about any greater consensus of opinion as it relates to the use of the Wechsler scales with Canadian children. On one hand, Spreen and Tryk

(1970) state in their introduction:

> "For the most part, the use of US norms seems to be justified because of the highly similar educational, socio-economic, and linguistic background of the *ENGLISH-SPEAKING* Canadian population." (p.294) [emphasis added]

This statement appears in the introduction to a study involving a sample of 300 WISC tests drawn from the records of the Neuropsychology Laboratory, University of Victoria, and the Psychology Service of one of Victoria's major hospitals. All subjects in the sample had been referred because of suspected brain damage, learning problems, emotional or personality disorders. The children ranged in age from 7 to 14 years. With the exception of two substitutions in the Information subtest, the test was administered according to the directions and content provided in the test manual. The two items that were altered used wording that has been frequently used by Canadian practitioners, and that has been felt to approximate the difficulty of the original American items:

ITEM 17: "What is celebrated on the 1st of July?" (as opposed to "What is celebrated on the 4th of July?")

ITEM 19: "How tall is the average Canadian man?" (as opposed to "How tall is the average American man?")

When the mean raw-score on the Information subtest was computed for children at each age level, there was consistency in the increase in total score with age. This, the authors argue, can be considered a "partial indicator of test validity for a Canadian population." (Spreen and Tryk, 1979, p.297). However, in a further analysis comparing subtest scores at each grade level, the authors found that there were highly significant differences between the two scores across all age groups. In each instance, the mean for the Information subtest was significantly below that for the other subtests. While acknowledging the highly significant differences between the test and norming groups, Spreen and Tryk state that it is unclear whether the cause lies with the rewording of the test items or the nature of the population used in the sample.

Beal (1988) concludes that it is only Canadian representation in the standardization sample that can effectively address the problems of conflicting research results that arise with use of the WISC-R within a culture that, while sharing many characteristics with its American neighbour, remains a distinct entity. The use of Vernon's (Vernon, 1977) proposed substitutions in the Information and Comprehension subtests appears to produce what has been described by McLaughlin (1978) as spuriously high scores (as cited in Beal, 1988). Marx (1984) supports these latter findings. A sample of 210 students from Burnaby, British Columbia was given both the standard Information items and substitutions proposed by Vernon. He

found that the percentage of Burnaby children passing the standard items

was lower than the equivalent percentage of the standardization sample for

six of the seven items (items 16, 17, 19, 20, 21, and 27) and that the

Burnaby children outperformed the standardization sample on item 24.

These results, as well as those of Cyr and Atkinson (1980) lead the Marx to

conclude that:

> "Existing studies show no evidence that Canadian children do
> worse than the standardization sample on the WISC-R. Use of
> the Canadian items to combat cultural bias against Canadian
> children is unjustified; Canadian items appear to result in
> inflated scores, not in scores equivalent to the standardization
> sample." (p.159)

Based on the normative data available for the WISC-R, Lawson and

Inglis (1984) devised a learning disability index (LDI) which they argued was

more reliable that the widely used Bannatyne pattern in identifying the

learning disabled student. The index is based on Factor II coefficients

derived from the normative WISC-R data. Using Mishra's data with

Mexican-American and Papago children, they were able to demonstrate that

the use of the LDI was able to consistently and reliably identify L.D.

students, whereas Mishra's conclusions weighed against the cross-cultural

application of WISC-R data (Mishra, 1984a, 1984b). Similarly, in a study

conducted in Canada, Tittemore, Lawson and Inglis (1985) found that the

LDI was able to distinguish reliably between the learning-disabled student

and the normal population.

One of the major difficulties in interpreting and evaluating the results of the above research arises from what may be a lack of uniformity across studies at it applies to the definition of what constitutes the "Canadian" version of the WISC-R. Although an assumption could be made that various researchers are, in fact, referring to the same instrument, a survey by Beal (1988) suggests that such a conclusion may not be warranted. Beal conducted her study in Ontario with a sample of seventy-two psychologists and psychoeducational consultants. Participants were asked to respond to a questionnaire about their testing practice, as it pertained to the administration and scoring of "Canadian content" items on the WISC-R in general, and on the Information and Comprehension subtests specifically. She reported that 97% of the participants said they administer some Canadian substitute items. There was, however, considerable variability in the methods by which credit was assigned for correct responses. Beal found that only 20% of the examiners administered and scored only the standard test items. Of the remaining examiners, 59% scored the "Canadian" version of the items. A further 16% administered both the original and Canadian item, and credited either answer which was correct. Four percent of the examiners required that both versions of the items be answered correctly in order to be credited. "A further 2% administer their own version of a Canadian substitute item, and credit the answer they consider to be correct." (Beal, 1988, p.60). Given these findings, any differences in scores could as readily be attributed to testing practices as to

real differences between the two populations.

However, beyond the possible problems of interpretation, given the confounding resulting from researchers drawing conclusions based on different versions of a "Canadianized" test, there exists a body of research that would support a position that Canadian and American populations should be considered as having important differences. Peters (1976) compared 300 randomly selected students, grouped by ages 7 1/2, 10, and 13 1/2 years. He found that there were consistently higher mean I.Q.'s among Canadian children when compared to the normative data included in the WISC-R manual. These differences, it was pointed out, were found to decrease with age. Beauchamp and his colleagues (1979) used two subtests of the WISC-R, Information and Digit Span, with two groups of thirty Third Grade students in Quebec and New York. The subtests were administered and scored following the standardized procedures described in the WISC-R manual. An analysis of the sample means found that, contrary to the researchers' working hypothesis, the difference between the mean performance scores on the Information subtest was not significant. An item-by-item comparison of successes and failures revealed that there were significant differences in those items answered correctly by the two samples. For example, on Question 16, "Who invented the electric light bulb?", American children were able to provide correct responses significantly more frequently than were Canadian subjects. While the results

of non-significant mean differences had been unanticipated on the

Information subtest, the findings of significant mean differences on Digit

Span favouring the Canadian subjects over the American children were

contrary to the researchers' expectations. Their concluding statement sums

up well the issue of cross-cultural application of the WISC-R:

> "Perhaps the most direct way to address this issue is to
> standardize the WISC-R on a sample of Canadian children."
> (Beauchamp et al., 1979, p.235)

2.   Issues of bilingualism

Of Ontario's 392,950 Francophones, only 55,445, or roughly 14.1%,

indicate that they are unilingually French-speaking (Statistics Canada, 1987).

For the age range addressed by the WISC-R, this figure must be interpreted

with caution, since Ontario children in French-language schools begin formal

English language instruction as early as grade 2, and no later than grade 4.

As a result, it may be that the incidence of bilingualism could be different,

and higher, for school age children than it is for the general population, as

reported by Statistics Canada. Consequently, there is a need to examine the

question of the interaction between bilingualism and cognitive development

when the focus is on an instrument that purports to measure aspects of

cognitive development.

The year 1962 and a study by Peal and Lambert (1962) serve as milestones in the empirical investigation of bilingualism and its effect on learners. Prior to this date, an examination of the performance of bilingual versus monolingual subjects on tests of cognitive development had, with two exceptions (Davies and Hughes, 1927; Stark, 1940) yielded results that either demonstrated superior performance by monolingual when compared to bilingual subjects, or found no significant difference between the two (see Peal and Lambert, 1962, for a more detailed review). A closer examination of many of these studies reveals serious methodological flaws, the most significant of these being the failure to control for the socio-economic level of the subjects. These flaws bring into question the validity of the results and conclusions drawn by the researchers. In an otherwise well-controlled study where monolingual and bilingual subjects were matched on age and gender , Seidl (1937) concluded that the superior results obtained by monolinguals in their performance on the Stanford-Binet Scale and the Arthur Point Scale of Performance were due to a language handicap in the bilinguals that interfered with verbal I.Q. scores (see Peal and Lambert, 1962). Overlooked was the fact that the occupational level of the parents of the monolingual children was in the labouring (blue collar) class, while the occupational level for the bilingual group's parents was in semi-skilled labour. Given that subsequent research has consistently found socio-economic status (ses) to be a powerful predictor of I.Q. (Jones, 1960; McCarthy, 1946), the failure to control for ses makes it difficult to interpret

the results of studies such as Seidl's, where results could just as validly be attributed to differences in ses as to the presence of a language handicap. Though the impact of ses on intelligence has been well documented, researchers continue to ignore ses variables and interpret differences in I.Q. scores between monolingual and bilingual children as being the result of factors such as test anxiety, or the use of tests that are not "culture-free", even when subject groups are acknowledged to come from different socio-economic levels (Murphy, 1990).

The second flaw in many of the earlier studies focuses on the degree of bilingualism within the bilingual group. In many instances, bilingualism was merely assumed because of the racial or ethnic background of the family. In other instances, attempts were made to match degree of facility with both languages. Though it was usually possible to find standardized measures to assess competence in one language, this language most often being English, equivalent measures were usually not available in the other language. Thus, while performance on the Peabody Picture Vocabulary Test has been used to assess the level of English in both monolingual and bilingual subjects, equivalent standardized forms, until quite recently, were not available for assessing mastery levels in Spanish or in French, or in any of the languages where attempts have been made to determine equal competence in the two languages of the bilingual subject.

Along side the earlier research, most of which tended to support the negative impact of bilingualism on cognitive development, there existed certain theoretical considerations of the relationship between language and thought that, while proposing that language and thought are not identical, had led several writers to conclude that "the learning of two languages from childhood has favourable effects on the thinking process" (Peal and Lambert, 1962, p.5). Leopold (1949) and, later, Evans (1953) (as cited by Peal and Lambert, 1962) both proposed that the bilingual child has an intellectual advantage over a monolingual child, because his thinking is not restricted to one language. Using an argument borrowed from an information processing model of cognition, with ses held constant, the bilingual child compared to the monolingual child, would have access to a broader range of experience, and to a greater store of prior knowledge that would alter and expand what he/she is able to process as meaningful information from the environment.

> "Bilinguals could have different and more complex contexts for learning than monolinguals ... That is, the emergence of an intellectual factor is dependent on the accumulation of experiences. From this notion, it seems reasonable to propose that such factors would appear at different ages in monolinguals and bilinguals, since their linguistic and cultural experiences are quite different." (p.6)

Based largely on these earlier theoretical considerations, Peal and Lambert undertook a comprehensive study to examine the performances of bilingual versus monolingual subjects. The original group of subjects numbering 364 included all available 10-year olds from six French schools in

the Catholic School Commission of Montreal.* The schools, from different areas in Montreal, were roughly classified as middle class schools by the School Commission.

Each pupil underwent a preliminary screening that consisted of a Word Detection Test, a Word Association Test, the Peabody Picture Vocabulary Test, and a subjective self-rating score.

Two judges consulted in the classification of each subject based on the results of the preliminary screening. A group of 164 subjects (96 boys and 68 girls) was selected, consisting of 75 monolinguals and 89 bilinguals. A third group, which could not be unambiguously classified as either monolingual or bilingual, was eliminated from further research.

Because it was revealed, after data analysis, that there existed statistically significant differences between the monolingual and bilingual groups in terms of ses, a smaller sample having an equal number of bilingual and monolingual subjects and balanced across 7 socio-economic levels was selected. Peal and Lambert further established that, for the group of bilingual subjects, there was no significant variability in age at which second

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* Given that Roman Catholics accounted at that time for better than 76% of Montrealers according to information drawn from Statistics Canada (1961), the use of the Catholic School System allowed greater access to students, both monolingual and bilingual.

language acquisition was begun.

Each subject was then given a series of both verbal and non-verbal intelligence measures. The results indicate that the hypothesis that the two groups would not differ significantly on non-verbal I.Q. was not supported. Rather, the bilingual group performed significantly better than the monolinguals on most of the non-verbal tasks consisting of the Raven's Progressive Matrices, the WISC-like performance tasks drawn from the Lavoie-Laurendeau, a French I.Q. test standardized in Quebec (Lavoie et al., 1960), and selected subtests of the Thurstone Primary Mental Abilities (Variables 11-15) (Thurstone, 1947). Those non-verbal tasks that did not distinguish between the two language groups were those tasks weighted on a spatial-perceptual factor, as opposed to a verbal factor. However, on non-verbal tasks demanding mental reorganization skills, most often considered to be verbally-mediated abilities, the bilinguals were found to perform significantly better. To use the terminology of Anastasi (1961), the bilingual subjects performed better on those non-verbal tasks that demanded concept formation or symbolic flexibility, skills that would seem to more closely resemble those required in the traditional verbal tests of intelligence.

Further, it was found that the bilinguals also scored significantly higher than monolinguals on all verbal subtests of the Lavoie-Laurandeau, a contradiction of the study's hypothesis. Though the performance of the

bilingual subjects was not uniformly superior to that of the monolingual

subjects, "on none of the subtests did the monolinguals exceed the

bilinguals" (Peal and Lambert, 1962, p. 12). Rather than giving evidence

that bilinguals were suffering from some kind of language handicap, the

bilingual students in the subject group appeared to have acquired additional

assets in terms of language skills. The authors discuss several theoretically

based explanations, one of which is Guilford's Structure of the Intellect,

(Guilford, 1956) that might explain the unanticipated results in their

research.

In summary, the structure of the intellect of bilinguals appears to be

more diversified than that of the monolinguals." (p. 16)

The authors conclude:

> "The picture that emerges of the French-English bilingual in
> Montreal is that of a youngster whose wider experience in two
> cultures have given him advantages which a monolingual does
> not enjoy. Intellectually, his experience with two language
> systems have left him with a mental flexibility, a superiority in
> concept formation, and a more diversified set of mental
> abilities, in the sense that the patterns of abilities developed by
> bilinguals were more heterogeneous. It is not possible to state
> from the present study whether bilingualism aided the
> intellectual development, but there is no question about the fact
> that he is superior intellectually. In contrast, the monolingual
> appears to have a more unitary structure of intelligence which
> he must use for all types of intellectual tasks." (Peal and
> Lambert, 1962, p. 20).

The results obtained by Peal and Lambert (1962) serve as a pivotal point in changing the perception that had previously been held of the bilingual learner. Some studies continued to support the view that bilingualism brought with it either some language handicap that impaired performance on verbal tasks (Chevrie-Muller et al., 1987), or had no demonstrable effect on cognitive development (Johnson, 1991; Myers and Goldstein, 1979). However, an increasing number of studies have gone on to replicate and elaborate on the findings of Peal and Lambert's study (Oren, 1981; Lambert et al., 1993). Oren (1981), in a study of 49 four to six-year olds, found that the average performance of "coordinate bilinguals" (bilinguals who "have been exposed to two languages at a very early age, and have learned two distinct coding systems") and of "compound bilinguals" (bilinguals who "learn their second language through a process of translation from the dominant language") (p. 164) differed significantly in favour of coordinate bilinguals. In addition, Oren found that the bilingual children achieved greater success on non-verbal tasks of object constancy. Arguing from a Piagetian perspective that states that object constancy must precede object labelling and, therefore, that the more developed labelling skills among bilinguals were indicative of the earlier acquisition of certain cognitive skills, Oren concludes " ... that the early exposure of children to two languages is a favourable stimulus for cognitive development with respect to the naming and relabelling abilities previously discussed." (p.168). These latter findings support earlier results by Feldman and Shen (1971).

Ianco-Worrall's study (1972) confirms some earlier observations that bilingual children appear to reach a stage in semantic development some 2 to 3 years earlier than their unilingual peers, namely that of being able to separate word sound from word meaning. Bialystok (1986) found that, on tasks that varied the grammaticality of sentences versus the meaningfulness of sentences, monolingual children were more sensitive to the grammaticality of an utterance, while bilingual children were more sensitive to meaningfulness. Cummins and Gulutsin (1974) found that, in a group of 61 grade 6 English/French bilinguals and 61 unilingual students matched on gender, ses and age, the bilingual group performed significantly better on tasks of verbal ability, general reasoning, and measures of originality as determined in a verbal test of divergent thinking.

It must be pointed out that the literature, most particularly in recent years, has spoken increasingly of the impact of other interacting variables that need to be taken into account in attempting to evaluate the effects of bilingualism on cognitive development. The first of these variables might be described as cultural; the second, educational.

On the question of cultural variables, a contrast between the United States and Canada could serve as an illustration. In the United States, the language of business, of commerce, of Government, and of the vast majority of the population is English. Efforts to maintain cultural heritage and, most

particularly, mother tongue, have been, by and large, left to the family, or, in some instances, the ethnic neighbourhood. With the acquisition of competence in English seen as being a primary goal, particularly within educational settings, bilingualism has been described by a number of authors as being "subtractive", that is a factor that not only does not enhance the status of the individual, but may even take away from it. Fluency in a second language is perceived less often to be an asset than a liability.

Perhaps because Canada has been bilingual from its inception, and constitutionally recognizes two founding nations and languages, there has been less emphasis placed on the subsuming of cultural differences by a "Canadian" entity. There has been formal recognition of the importance of mother tongue, even in those instances where it is neither French nor English. For example, there are schools in Ontario where the primary language of instruction, at least for the first years of schooling, is neither French nor English, but rather the language of the dominant cultural group in the neighbourhood. This should not be interpreted to mean that interracial, intercultural relations have been trouble-free within Canada. It merely argues that the fact of multi-culturalism and multilingualism may tend to be perceived more as a given national characteristic. In addition to education, there is further institutional support for the maintenance of at least the two founding languages. Thus, there are jobs, particularly in the public sector, that have been designated as being "bilingual", jobs that must be held by

individuals who have a command of at least the two official languages of the country. Under such circumstances, bilingualism is argued to be "additive", in that it can enhance the status of the individual who is able to demonstrate mastery of more than one language. In a study of Montreal bilingual and monolingual students, Lambert and colleagues (Lambert et al., 1973) speak of the role of attitudes in the desire for acquisition of a second language, and the ease with which it is learned. In a situation where bilingualism is seen as "subtractive", acquisition of the second language becomes very difficult, and frequently does not reach fluency. Positive attitudes toward both the language and the group for whom it is the mother tongue, facilitates language acquisition. It is under such circumstances that it has been possible to demonstrate the positive impact of bilingualism on cognitive development.

The second variable focuses on the language of academic instruction. Malakoff (1988) used 36 sixth-grade French-English bilinguals who were receiving their primary instruction in either English or French. Each subject was presented with eight types of verbal analogies that varied along the dimensions of language of presentation (English or French), language of the analogy solution (English or French) as well as level of difficulty (difficult or easy). In the discussion of the ANOVA analyses made of the subjects' performances on different tasks, the author draws several conclusions, one of which supports Peal and Lambert, that access to two language systems

brings with it cognitive advantages. Malakoff says that bilingualism has " ... the positive effect on cognitive ability of forcing children to make greater use of higher levels of reasoning at younger ages." (p. 34). Of greater importance, she goes on to state that the language of instruction, even in those instances where it might not be the mother tongue, is a critical variable influencing a child's performance.

> "The fact that inclusion of the non-instructional language in the task had a stronger negative effect on processing time than it did on accuracy suggests that it is not the ability to perform in both languages that is affected, but the efficiency of performance." (p. 35).

Cummins (1979) also acknowledges the importance of language of instruction though he argues that, to be most effective and meaningful, the language of classroom instruction should reflect the child's cultural background and experiences. In support of this position, he cites the work of Gowan and Torrance (1965), of Torrance, Gowan, Wu and Aliotti (1970), (in Cummins, 1976) whose research indicates that children who were taught in their native language were able to perform "at a significantly higher level on measures of ideational fluency than children who were receiving instruction through a second language". (p. 4).

Research and practice show the WISC-R to be a valid instrument, not only within the culture for which it was designed, but also within groups that, by reason of culture and/or language, are different from the norming population. They further show, however, that the cross-cultural application

of the WISC-R is not without its problems. For example, in Germany and The Netherlands, it has been necessary to bring some adaptations of the original test, most particularly on the verbal subtests. Elsewhere, as in France, the test in its entirety has been modified as a function of its intended population. In addition to being translated and having some items adapted, the test has been re-standardized on a representative sample of 1066 children. The French WISC-R has been shown to retain many of the psychometric properties of the original, while being applied to a population that is different, both culturally and linguistically, from the original norming population (Dague, 1981; Dague, 1983).

The questions surrounding the issues of test adaptation and modification are more equivocal when examined within a Canadian context. Researchers such as Beal (1988), Peters (1976), Spreen and Tryk (1970) conclude that studies do not support the need to adapt the instrument for Canadian use, and that insistence on doing so can best be described as "jingoism". Others, such as Beauchamp and colleagues (1979) and Marx (1984), have found significant differences between the performances of Canadian and American children on specific subtests of the WISC-R. The call by Beal (1988) and others has been for the inclusion of a Canadian sample within the normative sample in order to ensure that the test is able to retain its validity and reliability when applied to this population. A better response is that proposed by Beauchamp and colleagues (1979) that "the

most direct way to address this issue is to standardize the WISC-R on a sample of Canadian children." (p. 235).

While such a strategy of adaptation might be responsive to addressing the needs of the Canadian majority which is English speaking, it does not address the issue of the application of the test to the French-Canadian minority, a group that is both culturally and linguistically different from either the American or English- Canadian population. Some practitioners, in an effort to respond to the needs of this minority, have undertaken to translate the American original. The translations, most specifically on the Vocabulary subtest, have been literal translations of the American content, with no empirical investigation into whether or not the adaptation by translation retained the psychometric characteristics of the original, for example, the hierarchy of difficulty in the order of word presentation. Some of the translations have used the Canadian content proposed by Vernon (1977), others have retained the American content (Wechsler, 1974), while yet others have employed some combination of the two. Regardless of the translation format used, scoring has employed norms found in the American manual despite the fact that there has been no studies that would support the practice. In addition, there is an entire literature, much of it arising from the area of Psycholinguistics, that is stating more and more emphatically that, in the area of cognitive development, the bilingual child is different from his monolingual counterpart. Peal and Lambert (1962) found cognitive

differences between these two groups of children on non-verbal tasks where they had hypothesized that there would be no differences. Unexpectedly, they also found differences on verbal tasks, but in a direction opposite to that hypothesized. The differences on verbal tasks as well as non-verbal tasks showed superior performances among the bilingual students. The findings of greater success among bilingual students not only contradicted the conclusions of earlier researchers, but the hypotheses of Peal and Lambert themselves. These results have since been replicated in considerable subsequent research in North America (Lambert et al., 1993; Ricciardelli, 1992; Lindholm, 1991), as well as in other parts of the world (Torrance et al., 1970; Bain and Yu, 1978). In addition, repeated findings from psycholinguistic research emphasize the critical importance of language of classroom instruction as a predictor in examining the performance of bilingual children on cognitive tests (Cummins, 1979, 1976).

In light of all these issues, specifically the apparent cognitive advantages brought about by bilingualism, and the fact that language of classroom instruction is a critical variable in determining performance on tests of ability, the question of use of the WISC-R with a French-Canadian population deserves to be addressed. Approximately 86% of francophone Ontarians indicate that they are bilingual (Statistics Canada, 1987). It would seem that the percentage may even be higher in the 6 to 16-year old age group, the age group addressed by the WISC-R, given that formal English

instruction is offered within the curriculum of French schools in Ontario on average as of Grade 3. Most francophone children are being educated in their mother tongue, in provincially-funded schools that are both public and parochial. Thus, with this population, there exist two variables, the first being bilingualism, and the second, language of instruction, that suggest that the use of the English WISC-R, with or without Canadian modifications, and the use of American norms may be inappropriate. Consequently, it is the aim of this dissertation to begin the development of a French instrument that is valid for use with the francophone population of Ontario. A second phase, which is beyond the scope of this dissertation, will involved the standardization of the instrument with a representative sample of Franco-Ontarians. However, the first phase, and the goal of this developmental phase, involves the creation of a measurement tool that shares with the original American WISC-R some significant psychometric properties, such as hierarchy of item difficulty, gender-fairness, and the ability to distinguish between subjects as a function of chronological age.

The WISC-R, in translation, has been used by many francophone clinicians, in their efforts to obtain as much insightful, valid and reliable information as possible to assist in the clinical, educational, and/or vocational decisions made about francophone clients. While the effort has been driven by the best possible motives, its implementation does not rest on empirical ground that would support such a practice. The Psychological

Corporation, publishers of the WISC-R, have been aware of the difficulties surrounding the assessment of this particular minority. In response to the problem, it had made available to the Canadian Psychological Association, the French adaptation of the WISC-R, in the hope that Canadian francophone clinicians would be able to find, in this test, the instrument needed to serve adequately Canada's French-language minority.

Some of the difficulties with the French instrument are readily apparent: for instance, the use of francs as opposed to dollars and cents in the questions of the Arithmetic subtest. Others were perhaps less obvious: for example, the use of French history facts on the Information subtest:

13. "What was Gaul?"

15. "Who was the discoverer of the vaccine against rabies?"

of French geography facts:

16. "What are the oceans and seas that surround France?", or some Vocabulary words that do not coincide with Canadian usage: for example, the word "essence", appearing in the first three words of the Vocabulaire subtest, or "citadin", listed in the first half of the list of words designated for children aged fourteen to sixteen years, are words known to Franco-Ontarian children, but at ages different from what the ordering of the French test would suggest. With some of the formulations, for example on Arithmetic, one might be lead to believe that their is little danger, in terms of validity, in changing the monetary units into Canadian values. However,

while there is some feeling, given the familiarity with the content and grade

level of the Ontario curriculum, that some of the French would differ, at

least in terms of order of difficulty, changes to the French text, not based on

empirical investigation, would result in an instrument that would not be

demonstrably superior to the several translations already in existence.

Consequently, the sequence of tasks needed to arrive at an instrument that

would be psychometrically equivalent to the American original was

conceptualized as follows:

1. A rational examination of the French WISC-R*

2. A modification in the language of test administration instructions, so as to better represent French-Canadian language usage.

3. The creation of an instrument blending elements of the French WISC-R with items that either more closely reflect Canadian education and cultural content, or are translations of items found in the American original or proposed substitutions for a Canadianized version of the test.

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4. The testing of the modified instrument on a
    representative sample of Franco-Ontarians aged 6 to 16.

5. The statistical analysis of testing results.

6. The return to the format of the original WISC-R, by the
    elimination of those items that do not function
    psychometrically in a manner consistent with the original
    test in terms. The modified and translated test would
    then be ready for standardization.

CHAPTER TWO: METHOD

1. Statistical hypotheses

On the basis of the readings dealing with the issues of both cross-cultural test use and bilingualism, the following hypotheses provided the structure within which the research into the creation of a Franco-Ontarian WISC-R was undertaken:

1. that item difficulty, as measured by p-values, would be the same for the study sample as the data reported for the WISC-R normative sample.

2. that the hierarchy of item difficulty, as measured by p-values, would, when compared to the WISC-R, necessitate the inclusion of new verbal items, or the modification of existing verbal items in the study instrument.

3. that verbal subtests would not discriminate between males and females after the inclusion, if needed, of new test items.

4. that the performance subtests would not discriminate between males and females.

5.   that verbal and performance subtests would discriminate as a function of age.

6.   that the subtest results and the extent of modifications within many of the subtests would indicate that there is a need for WISC-R re-norming specific to this population that is both culturally and linguistically different from that for which the WISC-R was designed.

2.   <u>The study</u>

<u>Procedure</u>

The French WISC-R was initially examined by three Francophone clinicians and a representative of The Psychological Corporation, the test's publisher, in the hope that the instrument could be used without modification, with the exception of small substitutions from French to Canadian monetary values: where Arithmetic questions 6, 10, 11, 14, 15, 16, 18 were formulated in terms of francs, it would be necessary to substitute dollars and cents. However, the examination of the test suggested that there could be a need for more extensive modification. Questions 13, 16, 21, 23, 25, 27 on the Information subtest were either formulated in such a way as to specifically apply to France: e.g. "21. How tall is the average French man?" "23. What is celebrated on the 14th of July?", or they dealt with information that was not likely to be part of the

repertoire of Canadian children, at least not at the age level at which it was expected to have been learned by French children, (for example, that by the age of 9 or 10, the child could correctly respond to Question 13. "What was Gaul?"). A review of the grade 4 and 5 history curriculum with teachers of these grade levels revealed that, at this age, children would have been exposed exclusively to facts about Canadian history, and that the French language curriculum would not yet include the major French literary works that could make some of this information available to students. Just as there do not appear to be formal sources that would make this information available, there are limited informal sources that might contain it. For example, while there is a fairly popular comic book cartoon set in Gaul and available to French-Canadian children particularly in Quebec, most francophone children would more readily access information sources, such as the media, that more closely resemble those available to American children. As a result, there are few formal or informal information sources available to children to promote the acquisition of such knowledge.

The Vocabulary subtest, however, is the subtest where even a cursory examination of content suggested that the French version would not be directly applicable to a French-Canadian population. The initial examination of the word list lead to the conclusion that many of the words to be defined were beyond the vocabulary level of even the oldest students with whom the test could be used. This conclusion was supported by

teachers at various grade levels extending through to the high school level, and with a francophone psychologist who has extensive experience working with children within the school setting.

In addition, the Comprehension subtest contains at least one item whose content refers to a French practice in automobile licensing that does not have a Canadian equivalent.

The orders of presentation in several subtests, specifically Information, Picture Completion, Similarities, Picture Arrangement, Arithmetic, and Comprehension have been changed as a function of the performance of French children during the developmental stage of the French WISC-R. While some of the changes coincide with sequencing of items that more closely approximates the sequence of successes found by several psychologists working with Canadian children, there is no empirical evidence that the order of presentation of the French test is more appropriate for French-Canadian children than that of the American original. This decision is given additional support by the literature reviewed earlier that speaks to cognitive development as it relates specifically to bilinguals (Peal and Lambert, 1962), and the psycholinguistic findings that speak to the importance of assessment conducted in the language of instruction (Malakoff, 1988; Cummins, 1979).

As stated by Clarizio (1982), rational judgements are demonstrably unreliable without the aid of empirical evidence. Thus, rational examination of the French WISC-R does not provide a defensible basis for suggesting that the WISC-R's proposed use with Franco-Ontarian children would be either valid or invalid. However, the examination did demonstrate that there are some areas where difficulties suggest themselves, even of the basis of observation alone. The first phase, the examination of the French WISC-R, clearly suggested the need for a more objective, empirically based analysis.

Given this conclusion, the next task involved the preparation of an instrument that could be administered to Francophones, and more specifically to Franco-Ontarians. The first step of this task involved the modification of the test instructions. Some of the expressions, as well as some of the vocabulary used in the French edition of the WISC-R, are quite different from what would be considered standard usage in Canada. Since the aim of the instructions is to allow the subject to understand what is being required of him or her, as opposed to providing a test of language competence, the phrasing and the vocabulary used in questions and directions throughout the test were modified to reflect Canadian idiomatic speech and usage. A former teacher of French, who had taught at both the primary and secondary levels, and a bilingual member of the Student Services Department of the Nipissing Roman Catholic Separate School Board were consulted. Along with a francophone psychologist, they were asked to

review the completed adaptation, and their suggested changes were incorporated into the final text. Phrasing of the items was modified until 100% inter-rater agreement was reached. Finally, the items were then presented to a small group (6 students) of francophone children. These students, ranging in age from 6 to 16 years, all attend French-language schools. The first language spoken in the home is French, but each of the subjects participates in a least one community-based activity such as music lessons, the church choir, a part-time job, where the principal language of communication is English. They were asked to paraphrase items to verify their comprehension. Subjects, regardless of age, understood the tasks from the directions read by the examiner.

Instrument

The initial experimental instrument designed was much longer than either the original American version or the French adaptation. This additional length stemmed from the problems encountered in attempting to alter certain items. The elimination of American-content items, as seen in the preceding chapter, is problematic because of the conflicting evidence as to the adequacy of the proposed Canadian substitutions. As a result, the experimental test, in many instances, contained both the original American item in translation, as well as proposed Canadian substitution (Vernon, 1977). Some French items referring to questions of French history had no

American equivalent in the original test. These questions, though "Canadianized" to reflect the information to which students would have been exposed through their academic experience, were retained. Others were drawn without modification from the French version. As a result, the experimental Information subtest consisted of 41 items, as opposed to the 30 items found in the original (Appendix A).

The Vocabulary subtest presented particular problems. The several translations of the WISC-R that unofficially exist in Canada are not uniform in terms of item content. Many of the differences seem to be most directly related to differences in the translation process per se. Others are the result of differing clinical opinions as to what vocabulary items would retain the hierarchical nature of item difficulty found in the American original. The study of the French edition led to the conclusion that the item content did not reflect well the pattern of Canadian usage, and that the items would be skewed toward the high end of the subtest's difficulty distribution. The final draft of the experimental Vocabulary subtest contained 50 items, as opposed to the 32 items of the original test. Items were drawn from two unofficial but widely used translations of the WISC-R, as well as from the French version of the test. There was an overlap of seven items between the French WISC-R and most commonly used translations. From the unstandardized Canadian tests, largely made up of literal translations of the American original, nineteen items were drawn, based on their hierarchy of

difficulty as inferred from the order of presentation. In those cases where the translations differed between the two versions, the choice of one translation over the other was discussed with teachers prior to a choice being made. The balance of the items were drawn from other already existing vocabulary tests, for example, the "Test de vocabulaire Dayhaw", and the "Test du Manitoba", and from vocabulary found in textbooks currently being used within the various schools of the Nipissing Separate School Board. A total of 50 vocabulary items were included in the experimental instrument (Appendix A). The length of the experimental subtest reflects the experimenter's belief that, of all the subtests, the Vocabulary subtest would prove to be the most difficult in terms of retaining the psychometric properties of the original.

The Similarities subtest remained largely unchanged from the American original, with the exception of item 10 where metric measures were substituted for American measures. In addition, in order to retain the 2-point answer that both objects "are made of metal", the translation of item 12 was changed to "Ciseaux et Chaudron", as opposed to "Ciseaux et Casserole", which had been the more frequently used translation to the item. Though the French WISC-R presents the items in a slightly different sequence, the order of the American test was retained pending data that it no longer offered a hierarchical presentation.

The Arithmetic subtest composed of translations of the American content was used, with the addition of one of the French items, Question 17, that differs in the operations required from the last two items of the American WISC-R. These latter two problems both involve computation with the fractions given in the text read by the subject, but Question 17 requires both multiplication and division in order to arrive at a correct response. Items were presented in terms of monetary values with which the subject is familiar. The purpose of lengthening the subtest was solely to allow some flexibility in final item selection should the item analysis reveal that a pair of items was serving the same function in terms of maintaining the hierarchy of difficulty.

The Comprehension subtest consisted principally of translations of the American original. Some of the changes to be found in the French WISC-R were retained, however, as these were felt to reflect more current issues with which the subject might have had some experience. Thus, the content of Question 14 was changed from paperback books versus hard-cover books to cassettes and records. Question 17 was modified to reflect the Canadian political reality that does not include the election of senators. A final question, borrowed from the French WISC-R about the role of publicity, was added to create an 18-item experimental instrument (Appendix A). Of these, 17 items of increasing difficulty were to be retained following analysis of test responses.

The Digit Span subtest was retained unchanged but, unlike all other subtests, was discontinued after failure on two consecutive series, or four items. This ceiling was set arbitrarily, for the benefit of the younger subjects who would otherwise have had to deal with the much longer number sequences, despite having been unable to successfully deal with the shorter one that had preceded. There was concern that, given the late placement of the subtest within the overall test, the subject could be especially tired, and that repeated failure could seriously undermine rapport.

Consultation with other psychologists/psychometrists reveals that there exist serious concerns about the order of presentation of several of the Performance items, most specifically on Picture Completion and Picture Arrangement. Of the nine psychologists and psychometrists consulted, close to 80% felt that the progression from easiest to most difficult, as proposed by the WISC-R authors, did not correspond to the success and failure order obtained by children they assessed. Nevertheless, all performance items were retained as they exist in the American original, and administered according to its directions for administration.

Subjects

The experimental instrument, considerably lengthened over the original, was administered to a group of 220 students within the mid-North

area of Ontario, using the stratified sampling characteristics as defined in the test manual (Wechsler, 1974). The sample consisted of 20 subjects in each of the 11 age groups spanning the WISC-R age range, the methodology adopted in the development of the French WISC-R (Dague, 1981). The subjects were selected according to criteria of gender, ses, urban versus rural distribution, as reflected in the 1986 Canadian census (Statistics Canada, 1986). The sample was drawn from that area of the Province representing the greatest density of francophones within the general population (ACFO, 1988).

Of Ontario's population of 9,001,160, 4.3% or 392,950 are francophone. Of these, 297,055 or 63.55% are over 15 years of age and distributed as follows within the working population:

SES LEVEL DEFINED BY OCCUPATION OF HEAD OF HOUSEHOLD	TOTAL NUMBERS IN THE WORKING POPULATION	% DISTRIBUTION OF FRANCOPHONE PERCENTAGE
Agriculture	6,685	2.45%
Forests	4,220	1.42%
Hunting and Fishing	70	.02%
Mines, Quarries, etc.	7,505	2.53%
Manufacturing	48,675	16.39%
Construction	19,935	6.71%
Transportation, Communication	21,500	7.24%
Commerce	45,725	15.39%
Finance/Insurance	13,355	4.49%
Service (socio-cultural, professional, etc.)	110,890	37.33%
Public Administration	14,495	6.23%

Of the total population, another 6.3% is over 15 years of age and not employed.

Statistics Canada defines as urban any area having a population of over 1,000 inhabitants and, as rural, any area having a population of less than 1,000 and/or a population density of less than 400/sq. km. Within the francophone population of Ontario, 11,020 or 8% of the population is defined as living in a rural setting.

Each sub-group consisted of 20 subjects to be divided equally on the basis of gender: 10 girls and 10 boys. All subjects within each sub-group were selected on the basis of their birthday, selection being limited to those candidates whose age is 6 months + or - 6 weeks from the date of birth: for example, a 12 year old candidate's actual age would be between 12 years, 4 months, 15 days and 12 years, 7 months, 15 days. Selection was based on the distribution of socio-economic status, as defined by the occupation of the head of household. Representation also reflected the rural/urban distribution found within Ontario's francophone population. Given the several variables to be taken into account, distribution within subject groups was as follows:

SES AS DEFINED BY OCCUPATION OF HEAD OF HOUSEHOLD	NO. IN SAMPLE
1. Agriculture/Forests/Hunting	1
2. Mines/Quarries	1
3. Manufacturing	3
4. Construction	1
5. Transportation/Communication	1
6. Commerce	3
7. Finance/Insurance	1
8. Service (socio-cultural, professional)	7
9. Public Administration	1
10. Other (retired, unemployed, pensioned)	1
TOTAL	20

Each age group included 2 subjects living within areas defined as rural according to Statistics Canada (1986).

Those students selected for participation in testing were designated as being Francophones. The identification involved three steps. The first of these consisted of identification by school personnel, both the principal and classroom teacher of those children who, in their estimation, are from homes where French is the principal (though not necessarily the only) language spoken. The next step involved communication with the home. In addition to a letter explaining the nature of the study, the parent(s) or guardian(s) was asked, firstly, to sign a letter of consent, and secondly, to complete a questionnaire whose aim was to ascertain language usage within the home (Appendix B). In addition to the language spoken by the parents, there were questions regarding the child's language use both within and outside the

home. Also included was a question regarding the child's place of birth. For those children not born in Ontario, the criterion for selection specified that the subject must have moved to Ontario at or prior to his/her first birthday. This criterion was added because of concerns that the presence of children whose early language experience had been outside Ontario might prove to be different from Franco-Ontarians in ways not foreseen prior to the analysis of test results. This concern was especially true as it related to those children born in Quebec. Given such factors as belonging to a cultural majority as opposed to a cultural minority, access to more French-language media, the greater possibility of monolingualism as opposed to bilingualism, might prove to be significant confounding variables whose influence could be difficult to predict or control.

The final step in subject selection consisted of a short interview conducted by the examiner with each potential candidate. Those students who identified themselves as being equally at ease in both languages, and who were able to identify at least one setting, in addition to the school, where French was their primary language of communication, were retained for the study. Those students reporting a significant difference in ease of expression in favour of English were not included in the study.

The 220 subjects were selected from the twenty-one French-language schools of the Nipissing District Roman Catholic Separate School Board, and

the two French-language schools of The Nipissing Board of Education. In all these schools, extending from elementary to high school, French is the principal language of instruction, though students from Grade 3 or 4 do receive formal English instruction as one course within the school curriculum. These School Boards were selected because of their location in Ontario's mid-North, that section of the Province where there is the greatest density of Francophones in relation to the overall population.

All students, with the exception of those students enroled in classes specifically designated for Trainable and Educationally Mentally Handicapped students, were eligible for inclusion in the experimental group. While a representative sample in a norming or standardization procedure would include representation from these special needs populations, it was felt that their inclusion within the small groups representing each age level would result in extreme scores that would make the task of ordering by difficulty potentially less valid. Participation in the study sample was dependent on obtaining parental consent and having the child meet the criteria for gender, age, ses, and urban/rural distribution described above. No additional efforts were made to pre-select students either on the basis of academic achievement or perceived level of ability.

Each student was tested within his/her respective school, within regular school hours. The testing was done in whatever room is normally

designated by the school for individual testing. With the younger children, the testing period respected normal school routines such as recess. Testing was undertaken by one psychometrist with 20 years experience working with children, who is a native Franco-Ontarian fluent in both official languages. Testing complied with the directions for administration translated from the original WISC-R manual. However, because of the alterations made to the original subtests, it was not possible to adhere to either the START or DISCONTINUE criteria of the original WISC-R. Both these criteria are based on there being a demonstrable hierarchical arrangement of items. Such a characteristic is not claimed by the study version. Rather, the establishment of such a hierarchy is this study's final goal. As a result, each subject was given the study version in its entirety.

The 220 test protocols were scored by a group of experienced francophone clinicians consisting of 6 psychologists and 3 psychometrists. The performance items were scored according to the scoring criteria of the American WISC-R. Verbal items were scored either on a Pass/Fail basis, as in Information and Arithmetic, or on a 2-1-0 scale. Using the general principles outlined in the test manual, the scoring of individual items was done following group consultation and arrival at a 100% consensus about the minimum quality of response required for a 2 point or 1 point score. To reduce the study instrument such that it became consistent with both the American original and its French counterpart in terms of subtest length, all

test items were analyzed, to examine questions of hierarchical ordering, to the absence of gender bias, to the ability to discriminate between subjects on the basis of age.

Eleven percent of the subjects in the study group were left-handed. The percentage of right- to left-handed subjects is representative of the percentages found within the general population (Underwood, 1992).

3.   The study's limitations

Though there exists a variety of testing materials that purport to be for use with francophone students in Canada, few of the materials go beyond either mere translation of English material or a rational, as opposed to empirically-based content. When the population of interest is a subset of the Canadian francophone population, as is the case in this study, the body of materials from which direction can be drawn is more severely limited. Because there is a paucity of research specific to this population, there is little in terms of demonstrably effective procedures, of content or methodologies that have proven themselves to be effective in the past. Attempts to examine many of the issues that are of importance to the clinician leave the examiner, at some point, having to rely heavily on common sense, on personal experience or the experience of others as opposed to a body of research that can give empirical direction to the task

undertaken. This study does not escape having had to rely on the rational input of the examiner and others. As a result, in questions about the validity of translation, of inclusion, in particular, of certain Vocabulary items, decisions were made that were supported by consensus rather than empirical data. Consequently, some of the selections for the initial study instrument may prove to have been less than optimal and require further investigation.

The reliance on p-values for the selection of items to the final version of the test may prove, with further investigation, not to be the most effective way of choosing items for inclusion into the test. This is particularly true given that p-values were not available for all test items, but were made available for select anchor items only. The use of Rasch data, had they been available, might have resulted in different item selections.

The aim of the study was to create an instrument that would be applicable to Franco-Ontarians. The subjects, however, were not drawn from all areas of the Province. Rather, they were drawn from one area that, while having the highest density of Francophones within the general population, could, perhaps as a result of that very density, not be representative of Francophones in the larger Ontario context. To combat possible sampling bias, it is important to note that the study sample was selected in such a manner as to reflect demographic realities of

Francophones throughout the Province, and not merely the northern part of Ontario. There remains the possibility, however, that the selection of Northern Ontario subjects could present a bias that would bring the research results into question. Further empirical investigation alone can address this issue.

The decision regarding the bilinguality of subjects was based on informal rather than formal criteria. Though the identification of candidates involved several criteria, a replication of this study, or further investigation into some of the issues raised by its results, might employ more formal methods, for example, comparison of performances on the French and English Peabody Picture Vocabulary Test, or language production tasks, such as those used by Ricciardelli (1992) or Perozzi (1992).

Despite the research by Peal and Lambert (1962) that suggests that performance items could be particularly important in examining bilingual subjects, no attempts were made to modify or add to the non-verbal items of the WISC-R. As a result, the non-verbal instrument may be less flexible than necessary in providing subjects with the full range of difficulty levels available to the normative sample.

Though the WISC-R was the most recent edition at the time this study was undertaken, the Wechsler Intelligence Scale for Children III has since

been released. The impact this new instrument will have on the results to

be discussed awaits study.

CHAPTER THREE: RESULTS AND DISCUSSION

1.   Statistical analyses of items and subtests

To re-state them briefly, the research into the creation of a WISC-R that would be appropriate for use with Franco-Ontarians, a population that, by both culture and language, is different from the American normative sample, was driven by six hypotheses:

1.   that items in an experimental test would resemble the original test items when p-values served as the basis of comparison.

2.   that developing an adapted form that would be similar to the original would, for verbal items, involved the inclusion of new material beyond the mere translation of the original test.

3.   that, even with content modification, verbal subtests would not discriminate between male and female subjects.

4.   that performance subtests would not discriminate between male and female subjects.

5.   that all subtests would discriminate between subjects as a function of age.

6.   that the research results would support the conclusion that

there was a need to re-norm, specific to this population that is both

culturally and linguistically different from the original normative sample.

P-values were computed by subtest for each item. For those items,

for example, the verbal items scored 2-1-0, and the performance items that

included time bonus points, the p-value was calculated in the manner used

by the test publisher, The Psychological Corporation: items were artificially

dichotomized and p-values computed on a basis of Pass/Fail.

Data provided by The Psychological Corporation contained p-values

for anchor items on six of the twelve subtests. Anchor items are those

items within a subtest for which p-values had been computed. P-values

were not computed for each item within subtests of the original test.

Rather, several items within a given subtest were used to establish reference

points from which items were arranged as being more or less difficult.

This procedure was not used in the study version. Rather, p-values

were computed on all items, in all subtests (with the exception of Coding),

and then arranged in hierarchical order from highest to lowest p-values. P-

values were also arranged by item as a function to age, to examine how

items behaved within the different age groups. In addition, items were

examined using correlational data to learn more about the individual item's

contribution to the subtest and the total test outcome.

It was the analysis of p-value by age group that revealed that there were problems, both in terms of the subject sampling and in the way in which individual items behaved. While individual item p-values would have been expected to gradually increase as a function of age, the items were inconsistent in their performance along this dimension. In addition, the summing of verbal and performance means within age groups indicates that, while the performance subtests showed, with one exception, a steady increase in means with age, the verbal subtests did not. On three occasions, specifically ages 8 and 9, 11 and 12, and 13 through 16, verbal means did not differ significantly despite increasing age. As a result, the study falls short of the goal it had set for itself, namely the creation of subtests, most particularly verbal subtests, that would be ready for norming. Rather, this study is better seen as a item pilot study that will yield verbal items and subtests that can be further revised and refined through additional pretesting prior to standardization efforts. As a result of this modified goal, the results of item analysis will be presented in detail and efforts made to discuss principles that could be employed in making item selections.

Comparison of obtained item p-values with the Performance subtest anchor items provided by The Psychological Corporation indicates that, with one exception on the Images à Compléter (Picture Completion) subtest, the

bilingual subjects in this study significantly outperformed the norming

sample. The re-organization of items as presented in the discussion of

individual subtests will assure the hierarchy of difficulty within subtests.

However, re-norming specific to a Franco-Ontarian bilingual population

appears to be necessary before the Performance section of the test can be

said to measure non-verbal cognitive skills in this population.

INFORMATION

The p-values were computed for the forty-one experimental items

administered to each of the 220 subjects (see Table 1). Items were also

examined in terms of their correlations both to the subtest and to the total

test performance (see Table 2).

Table 1

INFORMATION Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.95	.95	1.0	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	.65	.75	.95	1.0	.90	.95	.95	.90	1.0	1.0	.95
5	.65	.45	.55	.85	.85	.80	.85	1.0	.95	.95	1.0
6	.60	.75	.80	.50	.75	.85	.80	.75	.75	.90	.95
7	.30	.50	.35	.80	.90	.85	.85	1.0	.95	.95	.95
8	.25	.70	.95	.95	.90	1.0	1.0	1.0	1.0	1.0	1.0
9	.30	.70	.90	.90	.90	.95	1.0	1.0	.95	1.0	1.0
10	.45	.60	.75	.75	.80	.90	.95	1.0	1.0	1.0	1.0
11	.15	.30	.60	.85	.80	.95	.90	1.0	1.0	1.0	1.0
12	.20	.60	.75	.90	.75	.95	1.0	1.0	1.0	1.0	1.0
13	.05	.00	.05	.10	.20	.20	.40	.55	.25	.25	.70
14	.00	.10	.55	.45	.60	.65	.55	.85	.90	.80	.85
15	.00	.05	.00	.00	.25	.20	.40	.35	.50	.55	.60
16	.00	.00	.00	.00	.00	.00	.00	.05	.15	.20	.25
17	.00	.00	.15	.05	.15	.20	.25	.65	.50	.45	.70
18	.10	.50	.40	.20	.50	.50	.55	.75	.65	.75	.75
19	.00	.00	.05	.20	.40	.40	.55	.70	.75	.60	.70
20	.05	.05	.10	.15	.25	.20	.20	.25	.50	.35	.45
21	.00	.00	.00	.00	.00	.00	.00	.10	.15	.20	.30
22	.00	.00	.05	.00	.10	.40	.15	.35	.15	.35	.75
23	.00	.00	.10	.05	.20	.20	.30	.70	.35	.60	.60
24	.00	.00	.05	.00	.20	.05	.30	.65	.45	.65	.70
25	.00	.05	.05	.10	.35	.35	.45	.55	.70	.40	.55
26	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.15
27	.00	.10	.15	.15	.40	.60	.70	.70	.75	.85	.70
28	.00	.00	.00	.00	.00	.00	.05	.10	.05	.00	.00
29	.00	.00	.00	.00	.15	.00	.00	.05	.05	.05	.15
30	.00	.00	.00	.00	.00	.00	.00	.15	.15	.10	.40
31	.00	.00	.05	.05	.05	.10	.10	.40	.55	.30	.30
32	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.10
33	.00	.00	.00	.00	.10	.00	.00	.10	.10	.20	.15
34	.00	.00	.10	.00	.15	.20	.20	.50	.55	.65	.75
35	.00	.00	.00	.00	.00	.00	.00	.00	.05	.05	.15
36	.00	.00	.00	.00	.00	.00	.00	.15	.40	.40	.55
37	.00	.00	.05	.25	.05	.20	.15	.40	.30	.30	.50
38	.00	.00	.00	.00	.00	.05	.00	.05	.10	.05	.50
39	.00	.05	.00	.00	.00	.05	.05	.05	.15	.05	.10
40	.00	.00	.00	.00	.00	.00	.05	.00	.05	.00	.10
41	.00	.00	.00	.05	.35	.60	.55	.55	.60	.65	.75

Table 2

INFORMATION Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.13	.15
2	-	-
3	-	-
4	.25	.27
5	.32	.36
6	.25	.26
7	.44	.50
8	.42	.54
9	.44	.55
10	.39	.47
11	.54	.62
12	.49	.58
13	.55	.48
14	.60	.66
15	.52	.46
16	.45	.36
17	.61	.57
18	.45	.45
19	.67	.61
20	.40	.38
21	.47	.45
22	.59	.52
23	.65	.59
24	.69	.62
25	.47	.43
26	.24	.23
27	.63	.62
28	.16	.13
29	.26	.16
30	.53	.43
31	.44	.43
32	.22	.19
33	.38	.35
34	.65	.63
35	.35	.27
36	.59	.51
37	.48	.45
38	.45	.39
39	.22	.22
40	.19	.16
41	.60	.57

Chi-squares* computed on each item indicate that the following items

discriminate on the basis of gender:

QUESTION	GENDER FAVOURED

10. A question regarding temporal measure   F
$x^2(1,N=220) = 4.02, p = .04$

13. A historical question   M
$x^2(1,N=220) = 6.20, p = .01$

24. A geographical question   M
$x^2(1,N=220) = 4.45, p = .04$

31. A question of ingredients   M
$x^2(1,N=220) = 3.85, p = .049$

Though there were findings of gender discrimination for these items,

the Manova, comparing the overall Information results based on gender,

reveals that the subtest taken globally does not discriminate between

subjects on the basis of gender, $F(1,198) = 2.60, p = .108$.

The subtest does successfully discriminate on the basis of age,

$F(10,198) = 36.82, p = .000$, thus confirming both Hypotheses 3 and 5.

Table 3 presents the items, their p-value, and the order each occupied

on the study instrument. As a review of Table 3 will confirm, the study's

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* All chi-square values discussed in this chapter involve use of the Yates correction.

second hypothesis was confirmed in the case of the Information subtest:

that is, new material beyond the mere translation of questions in the WISC-R

was needed in order to maintain the difficulty hierarchy.

Table 3

Sequence of INFORMATION Items By P-Values

Order	Order on E-WISC-R*	P-value
1	2	1.0
2	3	1.0
3	1	.99
4	4	.91
5	8	.89
6	9	.87
7	10	.84
8	12	.83
9	5	.81
10	11	.78
11	6	.76
12	7	.75
13	14	.57
14	18	.51
15	27	.46
16	19	.40
17	41	.37
18	25	.32
19	23	.28
20	24	.28
21	17	.28
22	34	.28
23	15	.26
24	13	.25
25	20	.23
26	22	.21
27	37	.20
28	31	.17
29	36	.14
30	21	.07
31	30	.07
32	38	.07
33	16	.06
34	33	.06
35	39	.05
36	29	.04
37	26	.02
38	28	.02
39	35	.02
40	40	.02
41	32	.01

*   E-WISC-R (Experimental French Language WISC-R) will be used throughout the tables to refer to the study instrument used in gathering these data.

The issues surrounding selection of items for inclusion into a 30 item subtest to conform to the structure of the original WISC-R are complex, and often entail conflicting principles that have to be weighed prior to a decision being made. For example, while the chi-square analysis done on Item 24 yields information that the item is not gender-neutral, this information must be weighed against the fact that it shows the highest item-subtest correlation of all 41 study items on this subtest. Similarly, though Item 26 shows some inconsistency in p-value across chronological age groups, it also shows a high item-subtest correlation. On the other hand, items of equal p-value, for example, Items 30 and 38, make different contributions to the subtest when correlational data are added to the data provided by the item p-values.

SIMILITUDES (SIMILARITIES)

The only modifications to the subtest were made to Item 10, where changes to the measurement system used were made to reflect Canadian usage, and to Item 12, where the word "chaudron" was used in the place of a translation of "copper pan", as found in the WISC-R. The need for these modifications is consistent with the expectations expressed in Hypothesis 2.

P-values were computed for each item (see Table 4), as were correlations of items to the subtest and the overall test (see Table 5).

Table 4

SIMILITUDES Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.70	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.55	.70	.95	.95	.95	1.0	.95	1.0	1.0	1.0	1.0
3	.45	.55	.90	.60	.80	.85	.90	.90	.90	1.0	.95
4	.65	.65	.85	.85	.85	1.0	.80	.90	.90	.95	1.0
5	.80	.95	1.0	.95	.95	1.0	1.0	1.0	1.0	1.0	1.0
6	.75	.80	.95	.90	.90	1.0	1.0	1.0	.95	1.0	1.0
7	.65	.75	.85	.85	.90	1.0	.95	.85	1.0	.95	.90
8	.45	.65	.90	.90	.95	1.0	.95	1.0	1.0	.95	1.0
9	.25	.35	.80	.55	.75	.70	.65	.75	.80	.80	1.0
10	.05	.20	.20	.35	.20	.45	.60	.75	.75	.85	.80
11	.05	.05	.10	.30	.50	.55	.60	.80	.85	.80	.90
12	.00	.15	.35	.30	.30	.30	.25	.35	.25	.70	.80
13	.00	.10	.20	.35	.50	.40	.45	.75	.55	.80	.55
14	.00	.00	.05	.00	.00	.05	.00	.15	.25	.15	.50
15	.00	.15	.05	.00	.05	.10	.10	.40	.40	.30	.40
16	.00	.00	.00	.10	.35	.30	.40	.40	.25	.35	.50
17	.00	.00	.20	.05	.30	.10	.20	.15	.30	.20	.25

Table 5

SIMILITUDES Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.33	.35
2	.45	.50
3	.45	.46
4	.41	.33
5	.55	.53
6	.52	.52
7	.43	.42
8	.57	.65
9	.62	.62
10	.55	.64
11	.65	.74
12	.28	.27
13	.56	.55
14	.38	.40
15	.38	.46
16	.35	.40
17	.32	.29

The following items were found to have gender biases, as determined by chi-square:

ITEM		GENDER FAVOURED
6.	$x^2(1, N = 220) = 6.14$, p = .04	F
14.	$x^2(1, N = 220) = 6.37$, p = .04	F
17.	$x^2(1, N = 220) = 7.23$, p = .02	M

The Manova, comparing overall subtest results based on gender, reveals that the subtest does not discriminate between subjects on the basis of gender, $F(1, 198) = 1.95$, p = .164, but discriminates successfully by age, $F(10, 198) = 24.26$, p = .000, thus supporting both Hypotheses 3 and 5.

Items were then arranged in descending order of p-value. The hierarchy based on the difficulty of the items was found to be different from that found on the original test, though all items on this subtest had been retained (Table 6).

Table 6

Sequence of SIMILITUDES Items By P-Values

Order	Order on E-WISC-R	P-value
1	1	.97
2	2	.91
3	4	.86
4	3	.80
5	5	.97
6	6	.93
7	8	.89
8	7	.88
9	9	.67
10	11	.50
11	10	.47
12	13	.42
13	12	.28
14	17	.24
15	15	.18
16	14	.16
17	16	.11

ARITHMÉTIQUE

All the original Arithmetic questions were retained in translation, though it was necessary to modify the question specific to measurements in order to reflect the metric system in use in Canada. A question that had been used in the French version of the WISC-R was added that introduced the need for new computational strategies not reflected in the original

questions. This need for changes supports Hypothesis 2, stating that translation alone would not be sufficient to create a French language WISC-R. P-values were computed for each item (see Table 7), and correlations obtained between individual items with the subtest and the total test (see Table 8).

When items were rank ordered as a function of p-values, the resulting order of presentation of items by difficulty was different from that used on the original WISC-R (see Table 9).

A comparison of p-values for the E-WISC-R with those for the original test reveals that, with the exception of one item where the difference between the two p-values exceeded .10, the other six pairs of values were within either .02 or .04 of each other. Item 16 proved to be the only item that was markedly more difficult for the study group. Hypothesis 1 can be said to have only been partially confirmed.

Only one of the individual items was found to discriminate on the basis of gender, [Question 17, $x^2(1, N = 220) = 4.51$, $p = .03$], and found to be significantly easier for boys. The entire subtest, when examined using Manova, was found not to discriminate between subjects on the basis of gender, $F(1,198) = 1.10$, $p = .296$, and able to discriminate between them on the basis of age, $F(10,198) = 38.07$, $p = .000$, in keeping with

Hypotheses 3 and 5.

Item 19 was the only addition to the subtest. Factors that would need to be weighed in deciding whether or not it should be substituted into the subtest could take into account the fact that it is not differentially difficult for boys and girls as is one of the items. On the other hand, it does have a low correlation with both the subtest and the overall test, though an examination of Table 9 reveals that several other items have r-values as low, or lower.

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Table 7

ARITHMÉTIQUE Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.95	1.0	.95	.95	.95	.95	.90	1.0	1.0	.90	1.0
2	.80	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0	1.0	1.0
3	.75	.95	.90	.90	.90	.90	.95	.95	.90	1.0	.90
4	.25	.45	.65	.75	.65	.75	.85	.95	.85	.90	.95
5	.80	.85	.90	.95	.95	1.0	.80	.95	.95	.95	1.0
6	.75	1.0	.90	1.0	1.0	1.0	1.0	.95	.95	1.0	1.0
7	.75	.95	1.0	.95	.95	1.0	1.0	1.0	.95	1.0	1.0
8	.25	.65	.75	1.0	.95	.95	.90	1.0	.80	1.0	.95
9	.05	.35	.70	.70	.85	1.0	.90	1.0	1.0	.95	.90
10	.00	.05	.35	.50	.75	.75	.90	1.0	.85	1.0	1.0
11	.10	.15	.65	.65	.80	.85	.90	.95	.90	.85	.95
12	.05	.10	.25	.65	.60	.80	.65	.70	.80	.80	.80
13	.10	.00	.00	.15	.45	.50	.70	.80	.75	.75	.90
14	.10	.10	.15	.20	.35	.20	.60	.75	.80	.55	.75
15	.00	.00	.10	.00	.05	.00	.10	.30	.35	.30	.45
16	.00	.10	.00	.00	.00	.15	.00	.40	.10	.05	.45
17	.00	.00	.05	.05	.05	.10	.05	.35	.20	.10	.30
18	.00	.00	.05	.05	.10	.10	.05	.20	.30	.35	.35
19	.05	.05	.00	.00	.10	.00	.00	.25	.15	.00	.20

Table 8

<u>ARITHMÉTIQUE Item Correlations By Subtest and Test Total</u>

Item	Item to subtest	Item to total
1	.24	.27
2	.24	.27
3	.15	.17
4	.52	.48
5	.15	.22
6	.23	.27
7	.30	.32
8	.51	.51
9	.56	.59
10	.68	.72
11	.60	.60
12	.48	.52
13	.59	.61
14	.52	.54
15	.39	.43
16	.26	.31
17	.40	.38
18	.36	.37
19	.26	.24

Table 9

Sequence of ARITHMÉTIQUE Items By P-Values

Order	Order on E-WISC-R	P-value
1	2	.98
2	1	.96
3	3	.91
4	4	.73
5	7	.96
6	6	.96
7	5	.92
8	8	.84
9	9	.76
10	11	.71
11	10	.65
12	12	.56
13	13	.46
14	14	.41
15	15	.15
16	18	.14
17	16	.11
18	17	.11
19	19	.07

VOCABULAIRE (VOCABULARY)

The fifty items of the Vocabulaire subtest were examined in terms of p-values (Table 10).

Table 10

VOCABULAIRE Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.90	1.0	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0	1.0
3	.85	1.0	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0	.95
4	.90	1.0	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	.70	.60	.90	.90	.85	1.0	.90	.90	1.0	.90	1.0
6	.85	1.0	.95	.95	.80	.95	1.0	1.0	1.0	1.0	.95
7	.70	1.0	.60	1.0	1.0	1.0	1.0	.95	.90	1.0	.95
8	.45	.85	.90	.90	.95	1.0	.95	1.0	.85	.85	1.0
9	.90	.95	.95	.90	.95	1.0	1.0	.95	1.0	1.0	1.0
10	.55	.20	.60	.50	.90	.90	.75	.90	.80	.90	1.0
11	.20	.40	.70	.65	.75	.70	.90	.85	.95	.90	.90
12	.25	.65	.75	.85	.80	.85	.85	1.0	.90	1.0	.95
13	.20	.40	.60	.75	.65	.65	.75	1.0	.90	.85	.90
14	.10	.40	.80	.85	.80	.65	.90	.85	.75	.60	.95
15	.05	.05	.10	.25	.25	.45	.50	.85	.50	.70	.90
16	.35	.70	.90	.55	.75	.85	.60	.95	.75	.90	.95
17	.05	.15	.20	.15	.30	.25	.25	.50	.55	.60	.70
18	.25	.30	.60	.60	.60	.75	.65	.75	.85	.85	.85
19	.00	.00	.00	.00	.00	.05	.05	.35	.20	.15	.45
20	.00	.40	.65	.75	.80	.85	.90	1.0	.95	.90	.90
21	.30	.55	.90	.70	.65	.90	.55	.90	1.0	.85	.85
22	.20	.10	.30	.45	.75	.60	.60	.70	.85	.80	.95
23	.10	.05	.15	.25	.25	.20	.35	.45	.55	.40	.80
24	.05	.15	.65	.50	.65	.70	.75	.85	.80	.80	.95
25	.00	.00	.00	.00	.05	.10	.45	.35	.50	.45	.60
26	.00	.00	.10	.10	.15	.65	.55	.75	.70	.70	.80
27	.00	.00	.00	.00	.00	.05	.05	.25	.15	.25	.45
28	.00	.10	.00	.00	.05	.05	.15	.55	.50	.55	.75
29	.00	.00	.00	.00	.15	.15	.20	.30	.25	.35	.50
30	.00	.00	.00	.00	.20	.15	.30	.75	.60	.35	.80
31	.00	.00	.10	.00	.15	.25	.25	.60	.70	.60	.80
32	.05	.00	.10	.10	.15	.25	.15	.40	.40	.45	.60
33	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15
34	.00	.00	.00	.00	.00	.00	.00	.10	.15	.10	.35
35	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.25
36	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.25
37	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	.10
38	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.05
40	.00	.00	.00	.00	.00	.00	.05	.05	.20	.00	.25
41	.00	.00	.05	.05	.05	.00	.00	.20	.05	.20	.55
42	.05	.10	.20	.10	.35	.35	.25	.60	.50	.65	.80
43	.20	.25	.75	.75	.65	.75	.85	.95	.90	.95	1.0
44	.15	.35	.60	.80	.75	.70	.65	.95	.85	1.0	.95
45	.00	.00	.05	.00	.10	.10	.25	.45	.60	.55	.60
46	.00	.05	.05	.05	.15	.20	.05	.45	.45	.35	.60
47	.00	.05	.30	.05	.00	.25	.20	.35	.35	.40	.55
48	.05	.15	.20	.30	.40	.45	.65	.80	.75	.85	.85
49	.00	.00	.00	.00	.10	.10	.05	.15	.30	.25	.35
50	.00	.05	.00	.00	.00	.05	.05	.40	.25	.40	.40

The fifty items were also examined in terms of the individual item's

correlation to the subtest in which it is found, as well as the overall test

(Table 11).

Table 11

VOCABULAIRE Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.01	.03
2	.25	.28
3	.22	.25
4	.20	.23
5	.45	.45
6	.29	.31
7	.51	.50
8	.37	.39
9	.13	.16
10	.43	.45
11	.44	.48
12	.55	.56
13	.61	.66
14	.47	.50
15	.69	.64
16	.53	.52
17	.53	.45
18	.58	.56
19	.51	.44
20	.59	.64
21	.37	.40
22	.51	.51
23	.57	.53
24	.58	.61
25	.63	.55
26	.73	.71
27	.45	.45
28	.67	.60
29	.60	.53
30	.71	.65
31	.70	.63
32	.70	.50
33	.21	.17
34	.43	.36
35	.35	.30
36	.26	.24
37	.20	.18
38	.23	-
39	.23	.18
40	.43	.35
41	.42	.39
42	.65	.58
43	.55	.60
44	.45	.52
45	.65	.58
46	.56	.49
47	.40	.38
48	.68	.65
49	.50	.43
50	.55	.49

Of the fifty item Vocabulaire subtest of the E-WISC-R, some were translations of the original English version of the test. Others had been drawn from the French WISC-R (Dague, 1981). Yet others were drawn from the several unofficial translations of the WISC-R that exist throughout the Province. A dozen words were added, drawn from academic textbooks and consultations with teachers in order to ensure that the list might provide, at the very minimum, the range of difficulty reflected by the p-values of the anchor items (see Table 12). This goal is felt to have been reached, and the first hypothesis confirmed.

The presence of a significant number of new words needed to maintain the hierarchy of difficulty makes it evident that, in the instance of the Vocabulaire subtest, Hypothesis 2 is supported.

Table 12

Sequence of VOCABULAIRE Items By P-Values

Order	Order on E-WISC-R	P-value
1	1	1.0
2	2	.99
3	4	.99
4	3	.98
5	9	.96
6	6	.95
7	7	.92
8	5	.88
9	8	.88
10	12	.81
11	16	.77
12	21	.74
13	20	.74
14	10	.73
15	43	.73
16	11	.72
17	44	.71
18	13	.70
19	14	.70
20	18	.64
21	24	.62
22	22	.57
23	48	.50
24	15	.44
25	26	.41
26	42	.36
27	17	.34
28	23	.32
29	31	.31
30	30	.29
31	28	.25
32	32	.24
33	45	.24
34	25	.23
35	47	.23
36	46	.22
37	29	.17
38	50	.15
39	49	.12
40	19	.11
41	41	.11
42	27	.11
43	34	.06
44	40	.05
45	35	.03
46	36	.02
47	33	.01
48	39	.01
49	37	.01
50	38	.00

Analysis by chi-square of the words contained in this subtest reveals that

the following discriminate between subjects on the basis of gender:

ITEM		GENDER FAVOURED
18.	$x^2(1,N=220) = 7.65, p = .02$	M
42.	$x^2(1,N=220) = 11.68, p = .002$	F
43.	$x^2(1,N=220) = 8.41, p = .02$	F

The results of the Manova indicate that the subtest does not

discriminate between subjects on the basis of gender, but is able to

discriminate between subjects on the basis of age; $F(1,198) = 1.64$, $p =$

.202 for gender, $F(10,198) = 35.20$, $p = .000$ for age. These results lend

support to both Hypotheses 3 and 5.

Though, in principle, items that show gender discrimination should be

avoided, in the case of the items listed above all show high correlations with

both the subtest and the total test. (.58 and .56, .65 and .58, .55 and .60,

respectively). At the same time, items such as Item 13 and Item 33, though

gender-neutral, have poor correlations both to the subtest and the total test.

In addition, the p-values across age groups show that Item 33, because of a

high degree of difficulty, was unable to distinguish well between age groups.

The inconsistent performance of items across age groups is a difficulty that

appears in many of the words in the subtest. Though some of the variability

appears to be a function of sampling error, further revising of the item

content is indicated.

JUGEMENT (COMPREHENSION)

Items were first arranged by p-values, as indicated (see Table 13).

Correlations between item and subtest, as well as item and total score, were

computed (see Table 14).

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Table 13

JUGEMENT Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.75	.85	1.0	1.0	.90	.95	.90	.95	.95	1.0	1.0
2	.45	.75	.95	.85	.90	.95	1.0	.95	1.0	1.0	1.0
3	.50	.60	.75	.80	.85	.85	.90	.95	1.0	.95	1.0
4	.30	.65	.75	.55	.75	.70	.65	.70	.75	.70	.80
5	.35	.55	.70	.65	.85	.75	.75	.80	.95	.80	.95
6	.30	.50	.65	.60	.75	.70	.80	.90	.80	.75	.80
7	.30	.45	.65	.60	.60	.70	.80	.80	.75	.85	.80
8	.00	.15	.25	.25	.35	.35	.40	.70	.55	.60	.65
9	.00	.15	.30	.30	.55	.55	.60	.75	.60	.70	.80
10	.15	.05	.15	.30	.35	.35	.25	.55	.45	.55	.65
11	.15	.15	.40	.35	.45	.40	.40	.60	.55	.65	.65
12	.05	.05	.15	.20	.35	.30	.30	.60	.40	.55	.65
13	.00	.05	.05	.05	.15	.25	.30	.45	.40	.65	.70
14	.05	.15	.35	.35	.55	.55	.40	.70	.75	.75	.70
15	.05	.05	.10	.15	.20	.10	.15	.35	.25	.40	.40
16	.00	.00	.00	.05	.10	.15	.10	.30	.30	.30	.40
17	.00	.00	.05	.05	.05	.10	.15	.15	.25	.45	.50
18	.00	.00	.10	.05	.15	.15	.20	.55	.50	.50	.55

Table 14

JUGEMENT Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.31	.31
2	.41	.45
3	.49	.53
4	.38	.38
5	.36	.37
6	.45	.43
7	.50	.49
8	.62	.63
9	.64	.64
10	.51	.54
11	.51	.49
12	.60	.59
13	.58	.59
14	.59	.61
15	.50	.51
16	.55	.52
17	.56	.60
18	.66	.69

The subtest involved inclusion of a new item concerning the role of publicity, as well as modified items, i.e. the question about congressmen and senators had to be changed to reflect the fact that the Canadian governmental structure has only one elected body, and that its members are referred to as Members of Parliament.

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The results on the Jugement items were submitted to analysis by chi-square, to determine which, if any, items discriminated between subjects on the basis of gender. Only one item was found to discriminate on the basis of gender: Item 7 $x^2(1,N=220) = 6.52, p = .04$.

When the results were submitted to analysis by Manova, it was found that the subtest does not discriminate between subjects on the basis of gender, $F(1,198) = 2.60, p = .109$, but that it did discriminate on the basis of subject age, $F(10,198) = 40.89, p = .000$.

The subtest does support the second hypothesis that indicates that new material would need to be included in the E-WISC-R. The ranking as a function of p-values reveals that only two of the items occupy the same rank in the E-WISC-R that they do in the WISC-R (see Table 15).

The new and modified items, Items 14, 17 and 18 show high correlations (.56 to .66) with the subtest and the total test. (.60 to .69). The Jugement Item 17 also functions well across age groups, showing an increase in p-value as a function of chronological age. Subtest Item 7, in addition to being the only item that discriminates on the basis of gender, distinguishes poorly between older age groups when p-values are examined across chronological age groups. However, it does not have the poorest

subtest and test total correlations of the 18 item subtest. All six items preceding it have lower item to subtest correlation, while one item appearing further in the subtest as a function of hierarchy of difficulty, has a similar item-subtest correlation.

Table 15

Sequence of JUGEMENT Items By P-Values

Order	Order on E-WISC-R	P-value
1	1	.98
2	3	.93
3	4	.91
4	7	.91
5	2	.90
6	6	.85
7	5	.80
8	11	.70
9	14	.66
10	9	.63
11	8	.59
12	12	.51
13	10	.43
14	18	.39
15	15	.35
16	13	.32
17	17	.25
18	16	.22

MÉMOIRE DES CHIFFRES (DIGIT SPAN)

The items of the Mémoire des Chiffres were administered as specified in the test manual. The only adaptation was by translation. On Digits Forward, the p-values generated by the francophone sample in the study did comply globally with expectations that increasing difficulty of items would result in lower scores (Table 16).

Table 16

MÉMOIRE DES CHIFFRES Items By P-Values

Item	P-values forward	Item	P-values backward
3-digit	1.0	2-digit	.99
4-digit	.97	3-digit	.91
5-digit	.79	4-digit	.57
6-digit	.30	5-digit	.25
7-digit	.13	6-digit	.18
8-digit	.02	7-digit	.05
9-digit	.02	8-digit	.01

However, the study group performed significantly below the levels established with the normative sample, on each of the four items compared. Differences in p-values ranged from a low of .03 to a high of .30. This outcome contradicts the expectations of Hypothesis 1. Furthermore, the

effect of increasing difficulty did not impact equally across age groups. As

had been the case in all previous subtests, there were instances where

younger subjects outperformed older students, when p-values were

examined as a function of age (Table 17).

Table 17

MÉMOIRE DES CHIFFRES Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
AVANT											
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.75	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	.35	.60	.85	.70	.80	.95	.85	.95	.95	.75	.95
4	.05	.10	.15	.20	.15	.35	.30	.45	.60	.50	.40
5	.00	.00	.10	.10	.05	.15	.05	.25	.20	.35	.15
6	.00	.00	.00	.00	.00	.00	.00	.10	.05	.05	.00
7	.00	.00	.00	.00	.00	.00	.00	.15	.05	.00	.00
A REBOURS											
1	.85	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.55	.85	.90	.95	.95	.95	1.0	1.0	.95	.95	1.0
3	.05	.30	.25	.50	.55	.60	.75	.85	.75	.80	.85
4	.00	.00	.05	.20	.15	.20	.25	.35	.40	.55	.60
5	.00	.00	.00	.10	.05	.05	.05	.30	.40	.40	.60
6	.00	.00	.00	.00	.00	.00	.00	.15	.20	.10	.10
7	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.05

Items were also correlated with the subtest and the overall test results
(Table 18).

Table 18

MÉMOIRE DES CHIFFRES Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
AVANT		
1	.18	.18
2	.44	.42
3	.52	.43
4	.48	.41
5	.37	.31
6	.31	.20
7	.33	.18
A REBOURS		
1	.31	.33
2	.43	.48
3	.49	.54
4	.33	.40
5	.49	.48
6	.42	.31
7	.32	.16

None of the 7 items of the Digit Span Forward discriminates between
subjects on the basis of gender. The Manova, $F(1,198) = 1.88$, $p = .172$,

indicates that this portion of the subtest does not discriminate between subjects on the basis of gender, but is able to distinguish between subjects on the basis of age, $F(10,198) = 7.88$, $p = .000$. The results obtained by the study group are consistent with expectations that the rate of success would decrease as the length of the items increased. They are also consistent in finding that the Backward Digits task is more difficult that the Forward Digits when rates of success are compared across digit series of the same length. In the cases of Items 2 and 5 of the Backward Digits, the study group outperformed the normative group, with differences of .01 and .05, respectively. The p-values generated on the basis of the results of the francophone group were below those reported for the normative sample on Items 3 and 4, with differences of .03 and .05. The range of differences was much narrower than had been the case with Forward Digits, and the results suggest that the subtest resembled the original Digits Backward when p-values were used as the basis of comparison. Hypothesis 1 was accepted for the Backward Digits section of the Digit Span subtest.

Similar results to those using the data on Forward Digits were obtained on the chi-square. None of the subtest items was found to discriminate on the basis of gender. The Manova for Digits Backward indicates that the Backward Digits portion of the subtest does not discriminate between subjects, either on the basis of gender, but does

discriminate by age: F(1,198 = 1.12, p = .290 for gender, and F(10,198) = 15.16, p = .000 for age. Hypotheses 3 and 5 were confirmed for both Digits Forward and Backward.

IMAGES À COMPLÉTER (PICTURE COMPLETION)

The p-values for each of the items are reported as a function of the age of the student (Table 19).

Table 19

IMAGES À COMPLÉTER Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	.90	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	.85	.90	1.0	.90	.95	.95	.90	1.0	1.0	1.0	1.0
6	.60	.75	.95	1.0	.95	1.0	.95	1.0	.95	.95	1.0
7	.70	.80	.85	1.0	1.0	1.0	1.0	.90	1.0	1.0	1.0
8	.85	.75	.90	.95	.85	.75	.95	1.0	1.0	1.0	1.0
9	.65	.80	.90	.85	.95	1.0	.90	.95	.95	1.0	1.0
10	.80	.80	.90	.95	.95	1.0	.90	1.0	.95	1.0	1.0
11	.65	.65	.70	.60	.95	.85	.85	1.0	.90	.95	1.0
12	.85	.90	.95	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0
13	.40	.85	.95	.85	.75	1.0	.90	1.0	1.0	.95	1.0
14	.40	.90	.90	.90	.70	1.0	.95	1.0	1.0	.95	1.0
15	.45	.60	.70	.75	.80	.75	.90	.90	.95	1.0	1.0
16	.10	.50	.35	.50	.60	.55	.85	.85	.75	.85	.95
17	.45	.60	.75	.90	.95	.80	.90	1.0	.90	1.0	1.0
18	.05	.45	.25	.45	.45	.65	.55	.90	.75	.80	.85
19	.10	.20	.30	.55	.60	.85	.60	.80	.65	.70	.80
20	.10	.30	.50	.35	.55	.75	.75	1.0	.95	.85	.90
21	.20	.25	.20	.50	.35	.45	.25	.25	.50	.45	.60
22	.20	.20	.15	.30	.35	.25	.50	.60	.55	.50	.50
23	.00	.15	.10	.20	.15	.30	.70	.80	.65	.75	.65
24	.05	.00	.05	.25	.15	.15	.15	.15	.35	.25	.45
25	.20	.10	.25	.15	.15	.30	.15	.35	.40	.40	.55
26	.00	.00	.00	.00	.00	.10	.10	.00	.15	.05	.25

Items were further analyzed to assess their contribution, both to the subtest and the total test score (Table 20).

Table 20

IMAGES À COMPLÉTER Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	-	-
2	-.02	-.06
3	-	-
4	.20	.18
5	.25	.18
6	.46	.39
7	.34	.35
8	.26	.24
9	.33	.33
10	.32	.32
11	.40	.36
12	.32	.25
13	.45	.41
14	.43	.41
15	.47	.41
16	.47	.49
17	.50	.47
18	.54	.56
19	.46	.51
20	.50	.58
21	.23	.21
22	.28	.27
23	.54	.54
24	.24	.33
25	.20	.28
26	.19	.22

Ranking items on the basis of p-values confirms the concerns that had

been expressed by francophone clinicians that the sequence of items, as

specified on the original WISC-R, does not conform to the order of failure

and success observed in students tested within their clinical practices (see Table 21).

When the items were examined statistically, three items were found to discriminate on the basis of gender.

<u>ITEM</u>		<u>GENDER FAVOURED</u>
16.	Fille qui court $x^2(1,N=220) = 4.80, p = .02$	F
17.	Vis $x^2(1,N=220) = 10.39, p = .001$	M
18.	Veste $x^2(1,N=220) = 4.95, p = .02$	F

However, the Manova comparing overall subtest results based on gender reveals that the subtest does not discriminate between subjects on the basis of gender, $F(1,198) = .02$, $p = .895$, and successfully discriminates by age, $F(10,198) = 28.06$, $p = .000$, thus confirming both hypotheses 3 and 5. A comparison with the p-values obtained by the normative sample indicates that, with the exception of item 26, the francophone subjects encountered more success on the Images à Compléter items, and that the differences between the sets of p-values was greater on the first half of the subtest.

Table 21

Sequence of IMAGES À COMPLÉTER Items By P-Values

Order	Order on E-WISC-R	P-value	
1	1	1.0	
2	2	1.0	
3	3	1.0	(.995)
4	4	.99	
5	12	.97	
6	5	.95	
7	7	.93	
8	10	.93	
9	6	.92	
10	8	.91	(.909)
11	9	.91	(.905)
12	14	.88	(.882)
13	13	.88	(.877)
14	17	.84	
15	11	.83	
16	15	.80	
17	20	.64	
18	16	.62	
19	18	.56	
20	19	.56	
21	23	.41	
22	22	.37	
23	21	.36	
24	25	.27	
25	24	.18	
26	26	.06	

These results do not support the first hypothesis, that p-values on the experimental WISC-R would be similar to those reported for the original instrument.

ARRANGEMENT D'IMAGES (PICTURE ARRANGEMENT)

The items were administered according to the instructions, and in the order of the original WISC-R. P-values obtained for each of the items were arranged by age for each of the eleven age groups (see Table 22). Items were further examined to go beyond the p-value in determining their function, both within the subtest in which it could be found, and within the total test result (see Table 23).

The subtest data were subjected to analysis, and the results on the Manova indicate that the subtest does not discriminate between subjects on the basis of gender, $F(1,198) = 1.55$, $p = .214$, in keeping with Hypothesis 4, though one item, Item 5, was found to discriminate by gender in favour of females: $x^2(1,N=220) = 10.92$, $p = .01$. The subtest was able to discriminate successfully between subjects as a function of age, $F(10,198) = 12.68$, $p = .000$, supporting the fifth hypothesis.

Table 22

ARRANGEMENT D'IMAGES Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	.80	.95	.90	1.0	.90	1.0	1.0	1.0	1.0	1.0	.95
4	.90	.85	.95	.75	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	.65	.60	.95	.90	.90	.85	.95	.95	.80	.90	.90
6	.25	.40	.65	.75	.60	.80	.90	.85	.70	.80	.80
7	.60	.90	.85	.80	.80	.90	1.0	.95	.85	.80	1.0
8	.60	.90	.70	.75	.80	.75	.90	.90	.85	.85	.85
9	.55	.95	.80	.90	.85	.85	.80	.95	1.0	.90	.85
10	.25	.30	.50	.40	.75	.45	.55	.60	.65	.60	.75
11	.20	.30	.40	.50	.50	.60	.55	.80	.45	.80	.65
12	.10	.30	.20	.40	.50	.40	.40	.40	.40	.60	.45

Without exception, the study group encountered more success than did the normative sample on those anchor items whose p-values had been supplied by The Psychological Corporation. Differences between p-values on both instruments varied from .04 to .20. These findings are in direct contrast to the expectation of Hypothesis 1.

Table 23

ARRANGEMENT D'IMAGES Item Correlations By Subtest and Test Total

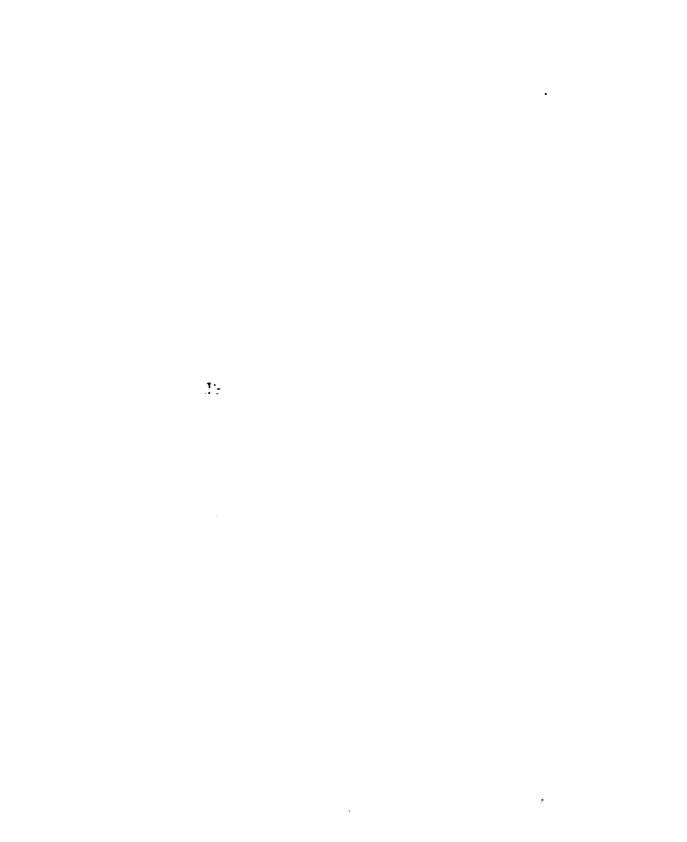| Item	Item to subtest	Item to total
1	.30	.27
2	.25	.22
3	.33	.31
4	.33	.38
5	.30	.34
6	.41	.52
7	.41	.42
8	.39	.65
9	.38	.62
10	.26	.34
11	.37	.49
12	.25	.29

In addition, when items were arranged in hierarchical order, the item sequence was found to be different from that presented in the original test (Table 24).

Table 24

Sequence of ARRANGEMENT D'IMAGES Items By P-Values

Order	Order on E-WISC-R	P-value
1.	1	1.0
2.	2	1.0
3.	3	.96
4.	4	.95
5.	7	.86
6.	5	.85
7.	8	.81
8.	6	.68
9.	9	.86
10.	10	.53
11.	11	.52
12.	12	.32

When compared to items immediately preceding and following it, the low difficulty index on item 9 undermines the premise of hierarchical difficulty, and ensures that, under normal circumstances, testing would have to be continued in spite of the fact that a subject was otherwise into a difficulty level where he would not likely encounter success. The role and content of Arrangement d'Images Item 9 need to be re-examined.

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DESSINS AVEC CUBES (BLOCK DESIGN)

The items were administered according to the instructions and in the

order of the original WISC-R. P-values obtained for each of the items were

arranged by age, for each of the eleven age groups (Table 25).

Table 25

DESSINS AVEC CUBES Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.95	1.0	1.0	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0
2	1.0	1.0	1.0	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	1.0	1.0	1.0	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	.50	.95	.90	.95	.85	.90	1.0	1.0	1.0	1.0	1.0
5	.45	.80	.90	.95	1.0	1.0	.95	1.0	1.0	1.0	1.0
6	.40	.70	.75	.95	1.0	.95	.85	.90	1.0	1.0	1.0
7	.05	.25	.35	.75	.55	.80	.75	.95	.95	.90	.95
8	.15	.30	.50	.70	.70	.90	.60	.85	.90	.95	1.0
9	.00	.25	.35	.55	.50	.70	.90	.80	.90	1.0	.85
10	.00	.00	.05	.15	.10	.40	.30	.45	.60	.75	.75
11	.00	.05	.10	.25	.20	.25	.25	.60	.65	.50	.65

Items were further examined to go beyond the p-value in determining

their function, both within the subtest in which it could be found, and within

the total test result (Table 26).

Table 26

DESSINS AVEC CUBES Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.18	.18
2	.08	.08
3	.22	.27
4	.58	.66
5	.75	.75
6	.70	.70
7	.69	.71
8	.73	.68
9	.75	.70
10	.63	.61
11	.61	.61

In all seven instances where direct comparisons were made between the E-WISC-R and the normative sample, francophone subjects obtained higher p-values. Bilingual subjects achieved greater success on all items compared. The greater degree of success was particularly evident toward the mid-range and latter parts of the subtest. As a result, rejection of Hypothesis 1 is indicated (Table 27).

Table 27

Sequence of DESSINS AVEC CUBES Items By P-Values

Order	Order on E-WISC-R	P-value
1.	2	1.0
2.	3	1.0
3.	1	.99
4.	4	.91
5.	5	.91
6.	6	.86
7.	8	.69
8.	7	.66
9.	9	.62
10.	10	.32 (.322)
11.	11	.32 (.318)

Chi-square results indicate that none of the eleven items of the subtest discriminate between subjects on the basis of gender. Manova results indicate that males and females had comparable performances on this subtest, that it does not discriminate between subjects on the basis of gender, $F(1,198) = .19$, $p = .663$, but that it does discriminate on the basis of age, $F(10,198) = 37.51$, $p = .000$, findings that support both Hypotheses 4 and 5.

ASSEMBLAGE D'OBJETS (OBJECT ASSEMBLY)

The subtest's four items were initially arranged by p-values as a function of the 11 age groups involved in the study (Table 28).

Table 28

ASSEMBLAGE D'OBJETS Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	.90	.95	.95	.95	1.0	.95	.95	.95	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	1.0	1.0	.95	.95	1.0	.95	1.0	.95	1.0	1.0	1.0

Items were individually correlated, both to the subtest score and to the overall test score (see Table 29). In two of the four items, the success patterns of students in the study did not conform to those of the normative sample (see Table 30).

The four items of the Object Assembly subtest do not discriminate between subjects on the basis of gender, according to the results of chi-square analysis.

The results subjected to Manova reveal that the subtest does not distinguish between subjects on the basis of gender, $F(1,198) = 1.12$, $p = .291$, but does discriminate between subjects on the basis of age, $F(10,198) = 23.20$, $p = .000$, in support of both Hypotheses 4 and 5.

Table 29

ASSEMBLAGE D'OBJETS Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.54	.59
2	.51	.56
3	.58	.69
4	.51	.58

Table 30

Sequence of ASSEMBLAGE D'OBJETS Items By P-Values

Order	Order on E-WISC-R	P-value
1.	1	1.0
2.	4	.98
3.	3	.97
4.	2	.96

CODE (CODING)

The subtest was administered according to the same method and with the same content as the original. In this instance, results were defined as the time required to complete the task in its entirety, to a maximum of two minutes (Codes A), or the correct number of symbols reproduced within this same time limit (Codes B). Results of analysis by Manova reveal that this subtest does discriminate significantly on the basis of gender in favour of the female subjects, $F(1,198) = 25.62$, $p = .000$). These findings are in direct opposition to Hypothesis 4. At all ages, with the exception of ages 10 and 16, the females obtained higher scores, with the greatest differences occurring in the groups aged 12, 14, and 15 years.

Statistical results further indicate that the Codes subtest is able, as had been anticipated, to discriminate between subjects on the basis of age, $F(10,198) = 38.77$, $p = .000$. Hypothesis 5 was confirmed.

LABYRINTHES (MAZES)

The Labyrinthes subtest was administered according to the procedures outlined in the WISC-R manual, though instructions for the subtest were translated for the experimental group. When p-values were

calculated for each of the nine items, the ranking from least to most difficult

followed the sequence of presentation of items 1 through 9, without

exception (Table 31).

Table 31

Sequence of LABYRINTHES Items By P-Values

Order	Order on E-WISC-R	P-value
1.	1	1.0
2.	2	.99
3.	3	.97
4.	4	.94
5.	5	.84
6.	6	.61
7.	7	.50
8.	8	.16
9.	9	.12

An examination of item p-values by age reveals that the hierarchical

ranking found in the case of the global test does not hold true when

individual items are analyzed rather than the subtest. (see Table 32)

The chi-squares done for the nine individual mazes reveal no

significant differences in performance when results are analyzed by gender.

The subtest in its entirety does not discriminate between subjects on the basis of gender, $F(1,198) = .08$, $p = .771$, but does discriminate by age of subjects, $F(10,198) = 16.61$, $p = .000$, results consistent with both Hypotheses 4 and 5.

Table 32

LABYRINTHES Items P-Values By Age

Item	6	7	8	9	10	11	12	13	14	15	16
1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	.95	1.0	1.0	1.0	1.0	.95	1.0	1.0	1.0	1.0	1.0
5	.95	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.95
6	.70	.75	.90	.90	.90	.95	.95	.95	.90	.90	.90
7	.43	.60	.80	.70	.85	.95	.85	.90	.85	.85	.75
8	.15	.25	.45	.45	.60	.70	.65	.75	.70	.75	.70
9	.05	.15	.25	.25	.50	.45	.40	.55	.60	.55	.55

Correlations were used to examine the individual items' role, both in the subtest in which it appears, and the overall test results (Table 33).

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Table 33

LABYRINTHES Item Correlations By Subtest and Test Total

Item	Item to subtest	Item to total
1	.09	.13
2	.14	.10
3	.11	.07
4	.23	.25
5	.42	.34
6	.47	.36
7	.53	.36
8	.56	.57
9	.49	.48

In summary, each of the items and subtests, with the exception of Codes, were examined statistically. Chi-squares were used to determine if items discriminated between subjects as a function of age and gender. Manova was used to determine if subtests discriminated between subjects as a function of age, a result that would have been consistent with characteristics of the original scale. It was also used to determine if subtests discriminated between subjects as a function of gender, a finding that would have been in violation of the original test. The summary of the results of both analyses are presented in tabular form, for ease of reference (Tables 34 and 35).

Table 34

Chi-squares Significant By Gender For All Items of E-WISC-R

Item	Chi-square Value	Probability
Inf 10	$x^2(1, N = 220) = 4.02$,	$p = .04$
Inf 13	$x^2(1, N = 220) = 6.20$,	$p = .01$
Inf 24	$x^2(1, N = 220) = 4.45$,	$p = .03$
Inf 31	$x^2(1, N = 220) = 3.85$,	$p = .04$
Sim 6	$x^2(1, N = 220) = 6.14$,	$p = .04$
Sim 16	$x^2(1, N = 220) = 7.23$,	$p = .02$
Sim 17	$x^2(1, N = 220) = 6.37$,	$p = .04$
Arith 17	$x^2(1, N = 220) = 4.51$,	$p = .03$
Voc 18	$x^2(1, N = 220) = 7.65$,	$p = .02$
Voc 28	$x^2(1, N = 220) = 5.86$,	$p = .05$
Voc 42	$x^2(1, N = 220) = 11.68$,	$p = .002$
Voc 43	$x^2(1, N = 220) = 8.41$,	$p = .01$
Jug 7	$x^2(1, N = 220) = 6.52$,	$p = .03$
I.Comp 15	$x^2(1, N = 220) = 4.80$,	$p = .02$
I.Comp 16	$x^2(1, N = 220) = 4.95$,	$p = .02$
I.Comp 20	$x^2(1, N = 220) = 10.39$,	$p = .001$
Arr.Im. 7	$x^2(1, N = 220) = 10.92$,	$p = .01$

Table 35

Manova Analysis By Age And Gender For All E-WISC-R Subtests

Subtest	Manova Value		Probability
Information	sex:	$F(1,198) = 2.60$	$p = .108$
	age:	$F(10,198) = 36.82$	$p = .000$
Similitudes	sex:	$F(1,198) = 1.95$	$p = .164$
	age:	$F(10,198) = 27.26$	$p = .000$
Arithmétique	sex:	$F(1,198) = 1.10$	$p = .296$
	age:	$F(10,198) = 38.07$	$p = .000$
Vocabulaire	sex:	$F(1,198) = 1.64$	$p = .202$
	age:	$F(10,198) = 35.20$	$p = .000$
Mémoire: avant	sex:	$F(1,198) = 2.60$	$p = .109$
	age:	$F(10,198) = 40.89$	$p = .000$
rebours	sex:	$F(1,198) = 1.12$	$p = .290$
	age:	$F(10,198) = 15.16$	$p = .000$
total	sex:	$F(1,198) = 2.16$	$p = .144$
	age:	$F(10,198) = 15.09$	$p = .000$
Imag A Com.	sex:	$F(1,198) = .02$	$p = .895$
	age:	$F(10,198) = 28.06$	$p = .000$
Arr. D'Images	sex:	$F(1,198) = 1.55$	$p = .214$
	age:	$F(10,198) = 12.68$	$p = .000$
Des. Cubes	sex:	$F(1,198) = .19$	$p = .663$
	age:	$F(10,198) = 37.51$	$p = .000$
Ass. Objets	sex:	$F(1,198) = 1.12$	$p = .291$
	age:	$F(10,198) = 23.20$	$p = .000$
Codes	sex:	$F(1,198) = 25.62$	$p = .000$
	age:	$F(10,198) = 38.77$	$p = .000$
Labyrinthes	sex:	$F(1,198) = .08$	$p = .771$
	age:	$F(10,198) = 16.61$	$p = .000$

Initial examination of the performance of francophone students had focused particularly on the functioning of items within subtests, on issues of hierarchy of difficulty, gender fairness, on the ability to discriminate as a function of age when placed within a subtest. However, a review of the tables reporting p-values as a function of age indicates that there is considerable variation within individual items as a function of the age of the student. While it would have been expected that, for any given item, p-values would increase for subjects between the ages of 6 and 16, a cursory review of the tables suggests that it is only in a minority of cases that this occurred. To further examine these observations, Means and Standard Deviations were calculated for each of the 11 age groups (see Tables 36 to 45). Mean scores were used as the basis of comparison, given that scaled scores for the E-WISC-R will not be available until such time as the new test is normed.

Table 36

Raw Score Means and Standard Deviations By Subtests For Age 6

Subtest	Mean	Standard Deviation
Information	6.70	1.57
Similitudes	5.65	3.17
Arithmétique	5.75	1.86
Vocabulaire	14.30	5.14
Jugement	6.35	2.72
Mémoire des Chiffres	6.15	2.38
Images A Comp.	12.55	3.55
Arr. d'Images	17.10	7.45
Dessins Avec Cubes	12.25	7.37
Ass. d'Objets	13.70	3.72
Codes	36.20	14.16
Labyrinthes	16.10	4.68

Table 37

Raw Score Means and Standard Deviations By Subtests For Age 7

Subtest	Mean	Standard Deviation
Information	9.20	2.22
Similitudes	8.20	3.36
Arithmétique	7.90	1.71
Vocabulaire	22.05	5.36
Jugement	9.95	2.91
Mémoire des Chiffres	8.15	1.77
Images A Comp.	15.45	3.72
Arr. d'Images	23.10	5.36
Dessins Avec Cubes	20.00	7.61
Ass. d'Objets	17.35	3.14
Codes	43.90	4.60
Labyrinthes	18.20	3.26

Table 38

Raw Score Means and Standard Deviations By Subtests For Age 8

Subtest	Mean	Standard Deviation
Information	11.50	2.93
Similitudes	11.75	2.49
Arithmétique	9.35	2.10
Vocabulaire	31.15	7.69
Jugement	13.95	2.81
Mémoire des Chiffres	9.30	1.82
Images A Comp.	16.60	1.84
Arr. d'Images	24.75	3.61
Dessins Avec Cubes	24.35	8.36
Ass. d'Objets	20.15	4.30
Codes	35.10	5.34
Labyrinthes	21.80	3.78

Table 39

Raw Score Means and Standard Deviations By Subtests For Age 9

Subtest	Mean	Standard Deviation
Information	12.25	2.23
Similitudes	11.35	3.22
Arithmétique	10.45	1.92
Vocabulaire	29.70	5.76
Jugement	13.90	4.07
Mémoire des Chiffres	9.75	2.57
Images A Comp.	17.85	2.13
Arr. d'Images	26.90	6.40
Dessins Avec Cubes	32.10	11.23
Ass. d'Objets	20.15	4.35
Codes	44.85	6.22
Labyrinthes	21.35	2.81

Table 40

Raw Score Means and Standard Deviations By Subtests For Age 10

Subtest	Mean	Standard Deviation
Information	15.00	5.24
Similitudes	13.60	4.78
Arithmétique	11.45	2.58
Vocabulaire	34.50	11.80
Jugement	17.15	5.78
Mémoire des Chiffres	9.70	1.69
Images A Comp.	18.15	2.76
Arr. d'Images	28.80	7.50
Dessins Avec Cubes	31.00	9.21
Ass. d'Objets	20.35	5.13
Codes	49.63	7.16
Labyrinthes	24.15	3.25

Table 41

Raw Score Means and Standard Deviations By Subtests For Age 11

Subtest	Mean	Standard Deviation
Information	16.35	3.81
Similitudes	14.50	3.45
Arithmétique	11.95	1.10
Vocabulaire	38.10	7.98
Jugement	17.30	4.08
Mémoire des Chiffres	10.85	2.07
Images A Comp.	19.45	2.57
Arr. d'Images	28.15	5.22
Dessins Avec Cubes	37.35	8.25
Ass. d'Objets	23.25	3.71
Codes	51.25	8.58
Labyrinthes	24.85	2.62

Table 42

Raw Score Means and Standard Deviations By Subtests For Age 12

Subtest	Mean	Standard Deviation
Information	17.03	3.43
Similitudes	14.55	4.18
Arithmétique	12.25	2.03
Vocabulaire	38.10	8.06
Jugement	17.55	3.94
Mémoire des Chiffres	10.70	1.93
Images A Comp.	19.70	3.02
Arr. d'Images	30.40	4.55
Dessins Avec Cubes	37.20	10.50
Ass. d'Objets	23.55	3.20
Codes	58.15	8.62
Labyrinthes	24.20	3.26

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Table 43

Raw Score Means and Standard Deviations By Subtests For Age 13

Subtest	Mean	Standard Deviation
Information	21.40	4.57
Similitudes	17.05	2.73
Arithmétique	14.50	2.01
Vocabulaire	49.90	10.99
Jugement	23.15	7.14
Mémoire des Chiffres	12.70	3.93
Images A Comp.	21.40	2.14
Arr. d'Images	33.40	6.64
Dessins Avec Cubes	43.65	8.16
Ass. d'Objets	24.95	4.20
Codes	63.40	10.69
Labyrinthes	25.90	2.96

Table 44

Raw Score Means and Standard Deviations By Subtests For Age 14

Subtest	Mean	Standard Deviation
Information	21.45	5.86
Similitudes	16.90	4.61
Arithmétique	13.60	2.85
Vocabulaire	50.55	15.20
Jugement	22.00	5.00
Mémoire des Chiffres	12.60	2.84
Images A Comp.	21.30	1.75
Arr. d'Images	30.20	5.78
Dessins Avec Cubes	47.05	10.27
Ass. d'Objets	26.55	4.14
Codes	66.15	7.93
Labyrinthes	24.90	3.22

Table 45

Raw Score Means and Standard Deviations By Subtests For Age 15

Subtest	Mean	Standard Deviation
Information	21.55	5.32
Similitudes	18.05	3.46
Arithmétique	13.45	1.97
Vocabulaire	49.35	14.01
Jugement	23.85	4.84
Mémoire des Chiffres	12.45	2.78
Images A Comp.	21.40	1.98
Arr. d'Images	31.60	5.13
Dessins Avec Cubes	47.90	6.54
Ass. d'Objets	27.25	3.85
Codes	68.10	10.92
Labyrinthes	25.30	3.42

Table 46

Raw Score Means and Standard Deviations By Subtests For Age 16

Subtest	Mean	Standard Deviation
Information	25.05	6.59
Similitudes	19.80	3.93
Arithmétique	14.85	1.78
Vocabulaire	62.05	13.76
Jugement	25.60	3.81
Mémoire des Chiffres	13.30	2.27
Images A Comp.	22.50	1.59
Arr. d'Images	33.35	6.96
Dessins Avec Cubes	50.15	9.45
Ass. d'Objets	27.10	2.85
Codes	72.80	10.26
Labyrinthes	24.50	3.75

There is evidence that the sampling, particularly of those children in the age groups 9, 11, 12, 14, and 15, may have been biased, in that verbal skills levels, in particular, did not reflect an increase with increasing age. For example, an examination of means on the Information subtest over the eleven age groups reveals that the means are virtually the same in age groups 13, 14, and 15. Similitudes, as well as Arithmétique, show a lower mean for 14 year olds when compared to that of 13 year olds. A comparison of means on Mémoire des Chiffres and Jugement show that there is little change in the mean results when 8 and 9 year olds are

compared.

This might provide an explanation for the fact that, when compared to the original WISC-R, the reliabilities for the subtests are much higher than those reported in the test manual (Wechsler, 1974, p. 47) (see Table 47). When compared to the original test, the factors measured by the E-WISC-R appear to be less distinct. Factors measured by the various subtests show greater overlap than they did on the original WISC-R.

In addition, the verbal - performance intercorrelations, with the exception of those at age 9, were lower than those reported in the test manual (Wechsler, 1974, p. 36 - 47) (see Table 48).

Table 47

Reliabilities and Intercorrelations For All Subtests

	Inf	Sim	Ari	Voc	Jug	M.C	I.C	A.I	D.B	A.O	Cod	Lab
Inf	**.92**											
Sim	.83	**.81**										
Ari	.83	.80	**.82**									
Voc	.88	.83	.78	**.94**								
Jug	.83	.81	.79	.87	**.88**							
M.C	.64	.67	.70	.67	.64	**.75**						
I.C	.69	.74	.71	.69	.71	.60	**.81**					
A.I	.61	.65	.64	.62	.62	.49	.61	**.65**				
D.B	.74	.72	.72	.72	.72	.61	.75	.63	**.87**			
A.O	.65	.66	.64	.64	.65	.56	.71	.56	.80	**.73**		
Cod	.66	.63	.64	.65	.68	.57	.60	.49	.69	.58	*	
Lab	.47	.50	.53	.49	.57	.43	.52	.50	.56	.54	.47	**.64**

Table 48

Verbal-Performance Intercorrelations By Age and Total

Age	6	7	8	9	10	11	12	13	14	15	16	All ages
	.67*	.50**	.44	.47	.68*	-.02	.45	.58***	.42	.17	.69	.84*

* $p = .001$

** $p = .05$

*** $p = .01$

These analyses have been completed on the basis of all items appearing in the E-WISC-R. There is, therefore, the possibility that the verbal subtests, in particular, will behave differently with the elimination of some of the study items. The difficulty remains, however, that the sampling of specific age groups appears to have been biased, and that any conclusions drawn from the data will have to remain tentative.

2.   Outcome of statistical hypotheses

1.   In summary, Hypothesis 1, which states the items in the study test instrument would resemble the original test items when p-values served as the basis of comparison, is only partially confirmed. Of the six verbal subtests, Information, Similitudes, Arithmétique, Vocabulaire, Compréhension, and Mémoire des Chiffres, data about p-values were available in three instances, Arithmétique, Vocabulaire and Mémoire des Chiffres. In the case of Arithmétique, one of the items, Item 16, was found to have functioned differently from the equivalent item on the WISC-R, by adding a greater degree of difficulty. Other comparison items suggest that the WISC-R and E-WISC-R served a similar function in examining the subject's computational skills.

The Vocabulary subtest, which was felt to be the subtest that would create the greatest difficulty, largely conforms to the expectation of Hypothesis 1. The words did cover the full range of difficulty, ranging from levels of 100% success rate to levels of under 1% success. Only four items were found to be differentially difficult for males and females.

The Mémoire des Chiffres Avant violated the first hypothesis, in that all four items compared showed significant differences between the performances on the WISC-R and E-WISC-R, in favour of the performance reported for the WISC-R.

Comparison of p-values on performance subtests (Arrangement d'Images, Images à Compléter, Dessins Avec Cubes) indicates that, without exception, the study sample outperformed the normative sample. In the Images à Compléter subtest, the bilingual subjects outperformed to a statistically significant degree the normative sample on 100% of the items compared. On the Arrangement d'Images subtest, bilingual subjects again outperformed the normative sample on all compared items. Identical results were found in Dessins Avec Cubes. Hypothesis 1, stating that study items would resemble the original test items when p-values served as the basis of comparison, is rejected in the case of the Performance subtests of the E-WISC-R. The findings, while unanticipated, are supported by the research of

Peal and Lambert (1962), that found higher performance outcomes for

bilingual children, when compared to monolingual children matched for age,

gender, and ses.

2.   Hypothesis 2, stating that, to remain similar to the original

WISC-R, the E-WISC-R would have to include in its verbal subtests new

material that went beyond the mere translation of the original, was

confirmed in all verbal subtests, with the exception of Digit Span. This latter

verbal subtest was the only subtest to be administered, as specified in the

WISC-R manual. The Information, Similitudes, Arithmétique, Vocabulaire

and Jugement subtests all included items that were new to the subtest (as

in Information, Arithmétique, Vocabulaire and Jugement), or modifications of

existing questions to have them better reflect the realities of this study

sample (Similitudes, Arithmétique and Jugement). All items, in translation,

were retained for Similitudes. Similitudes Item 10 required alteration in order

to reflect the metric system of measurement. On the Arithmétique subtest,

one experimental item was added in order to maintain the hierarchical order

of items. As accurately reflected by the number of experimental items

added to the subtest, Vocabulaire proved to be the most complex task to

adapt to Franco-Ontarian subjects. Though many words, in translation, were

retained in the study version of the subtest, near to 44% of the subtest

consists of new words that are unrelated to the original WISC-R. The

Jugement subtest includes one modified item (cassettes versus records, as opposed to paperback books versus hardcover books), and one new item to retain the hierarchical nature of order of difficulty. The second hypothesis, that inclusion of new items or modification of existing items beyond translation would be necessary for the verbal subtests, was supported in all instances save Mémoire des Chiffres.

3.	Hypothesis 3, stating that verbal subtests would not discriminate between subjects as a function of gender, was confirmed in all six verbal subtests.

4.	Hypothesis 4, stating that the performance subtests would not discriminate between subjects as a function of gender, was confirmed in all but one of the six performance subtests. The Codes subtest was found to have significantly discriminated between male and female subjects, in favour of females, in all but two age groups: ages 10 and 16. While the results on the performance subtests suggest that there may be a need for re-norming specific to bilingual subjects, the results on the Codes subtest suggest that, for this population and this task, it may be necessary to generate separate male/female norms not found on the original test.

5.   Hypothesis 5, that all subtests would successfully discriminate between subjects on the basis of age, was confirmed on all twelve subtests.

Very few individual items are selectively more difficult for male or female subjects. In total, only 17 of the 135 items were found to be gender-sensitive.

6.   The differences between the p-values for test items and anchor items on Images à Compléter, Arrangement d'Images, and Dessins Avec Cubes, where the test sample outperformed the norming group, and Mémoire des Chiffres (Avant), where the test group did much more poorly that the norming group, appear to lend themselves to one of two conclusions: A) that the experimental sample differed along important dimensions from the population from which it was drawn, such that it is not possible to draw any conclusions regarding the appropriateness, or lack of appropriateness, of the application of existing norms to a Franco-Ontarian population; or, B) that the differences found, particularly within the Performance subtests, suggest that this population differs in real ways from the American normative sample. Thus, the establishment of Franco-Ontarian norms is a necessity if the WISC-R is to provide a true estimate of cognitive development in this bilingual population that differs from the normative group as a function both of language and culture. Great care was taken in

drawing a representative sample of francophone Ontarians. Characteristics such as age, rural-urban distribution, ses, as determined by the principal wage-earner, were represented in the sample group, in the proportion that they appear in the broader francophone population. The sample group was made up of an equal number of boys and girls attending both the Separate and Public School systems that provide education to the children in this age group. Average, as well as above and below average achievers, made up the study sample. Given the weighting of all these factors, it is not readily apparent how a decision could be reached that the study sample differed in important, meaningful ways from the population from which it was drawn. The most reasonable conclusion appears to be one in keeping with the findings of Peal and Lambert (1962), and those researchers that have since replicated their findings (Lambert et al., 1993; Lindholm, 1991), that the bilingual learner is different from his unilingual counterpart, and that measures to assess his cognitive development and potential, if they are to examine adequately his full potential, will have to differ from tests designed principally for unilingual children. The recommendation that asserts itself on the basis of this study is that there is a need for the generation of norms specific to the Franco-Ontarian population, and supports Hypothesis 6. The creation of norms, however, will have to await further developmental work, designed to revise and refine test items in such a manner as to eliminate some of the difficulties identified in this study.

CHAPTER FOUR: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

1.   Summary

Of the 12 subtests of WISC-R, Information, Similitudes (Similarities), Assemblage d'Objets (Object Assembly), Jugement (Comprehension), and Labyrinthes (Mazes), retained, without exception, the characteristic of hierarchy of item difficulty. In some instances, this required no change, or very minor changes, in the sequence of item presentation (Labyrinthes and Assemblage d'Objets). In others, such as Similitudes, it merely involved the modification of existing items to reflect linguistic and cultural realities - the use of the metric system, for example - or the addition of one or two new items (Jugement). In yet one other instance, the subtest's content had to be changed radically in order to preserve the hierarchy of item difficulty (Information). Despite interventions, big or small, into the structure of the subtest, these subtests remained consistent with the premise of the WISC-R, of presenting items within each subtest in a rank order from least to most difficult.

A major difficulty becomes evident when p-values from the original WISC-R are compared to those obtained by the study sample. Almost without exception, the study group outperformed the normative sample when p-values were used to compare the performance of the two groups on specific test items. It would appear that the application of the norms presented in the WISC-R manual presents a risk of misrepresenting the achievement level and, therefore, the overall cognitive skills in Franco-Ontarian children.

The Mémoire des Chiffres: Forward Digits and Codes also present problems in that the performance of the study group differed significantly from that of the normative sample. In the instance of Mémoire des Chiffres, the francophone subjects performed much more poorly than had the normative sample when the p-values of items were compared. In the case of Codes, there was a highly significant difference in the subtest results when females were compared to males.

There is also evidence that the sampling in some of the age groups included a source of bias that appears to have impacted negatively on the results obtained most particularly on verbal subtests.

2.   <u>Conclusions and recommendations</u>

One conclusion is that the performance subtests will require re-norming specific to this population.

In addition, Vocabulaire will require some additional work to remove the words that do not function well in terms of correlations both to the subtest and the test as a whole. At the same time, it might be useful to replace one of the words in the list that, while having a unique p-value, is also semantically linked to the word that occupies the immediately adjacent position.

There is also a need for further investigation within the bilingual francophone population, specific to the study group's performance on the Codes and Mémoire des Chiffres subtests. Firstly, there is a need to establish whether the significantly different performance of boys and girls on the Codes subtest reflects a true difference between genders within this population, as appears to be the case within other populations (Lynn et al., 1991; Lawson et al., 1987), or, rather, is a function of this sample. Secondly, there is a need to further investigate whether or not bilingual versus monolingual subjects truly differ as a function of short-term auditory memory.

The work with the Franco-Ontarian WISC-R cannot be said to be truly completed. A second research phase is need to address the weaknesses identified in the discussion of the study's results. Specifically, future research should examine alternatives to the use of p-values as the principal basis for item selection. For example, the Rasch model could be used in examining items in a manner that is sample independent and serve as a basis for item selection.

However, one difficulty that was brought to light by this investigation is the complexity and time involved in ascertaining that testing materials used to make important decisions about francophone children in Ontario be sound. There needs to be some guarantee that there not be a repetition of the practice of using test materials that have no claim to validity other than that they have been translated. This could involve ensuring that test publishers be required to demonstrate how materials they sell for use with francophone children have been adapted for, and normed with, this particular population. It might arguably be more effective having francophone clinicians take upon themselves the creation of an institute whose mandate would be the development, the empirical validation, the distribution of test materials responsive to the needs of Franco-Ontarians.

APPENDICES

APPENDIX A

EXPERIMENTAL WISC-R

APPENDIX A: EXPERIMENTAL WISC-R

TEXT OF THE EXPERIMENTAL INSTRUMENT

DIRECTIONS* FOR ADMINISTRATION OF THE EXPERIMENTAL WISC-R

1.INFORMATION

START

The subtest consisting of 41 items is administered in its entirety to each

subject, regardless of chronological age.

DIRECTIONS

Each question is read exactly as stated. If the response is not clear, further

information can be sought: "EXPLIQUE-MOI UN PEU PLUS" or "DIS-MOI

S'EN UN PEU PLUS" or "PEUX-TU M'EN DIRE PLUS?". As per instructions

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* The WISC-R Manual contains detailed information regarding subtest
administration. Many of these details are presented in the form of
footnotes. These details were followed in the administration of the
experimental instrument. (See Wechsler, 1974; pages 65 to 112)

in the WISC-R manual, it is not permissible to ask leading questions, or to

spell words.

2.   PICTURE COMPLETION (IMAGES À COMPLÉTER)

MATERIALS

26 printed pictures bound in a booklet

START

The subtest consisting of 26 items is administered in its entirety, regardless of chronological age.

DIRECTIONS

There is an essential piece missing on each of the 26 cards. The cards are presented to the subject in numerical order, and the subject is asked to name or indicate the missing part on each card. In cases where the examiner is not certain if the child's verbal response is correct, it is permitted to say, "MONTRE-MOI CE QUE TU VEUX DIRE".

Each picture is shown for a maximum of 20 seconds.

Before presenting the first card, the examiner says, "JE VAIS TE MONTRER DES IMAGES DANS LESQUELLES IL Y A UNE PARTIE QUI MANQUE. REGARDE CHAQUE CARTE ATTENTIVEMENT, ET DIS-MOI QUELLE EST LA PARTIE QUI MANQUE." Present Card 1 and say, "MAINTENANT, REGARDE BIEN CETTE IMAGE. IL LUI MANQUE QUELLE PARTIE IMPORTANTE?"

If the subject responds correctly, proceed to the following pictures saying, "MAINTENANT, QU'EST-CE QUI MANQUE SUR CELLE-CI?" Once the child clearly understands the task, the question can be shortened or eliminated.

Should the subject fail to identify the missing part on Card 1 within the allotted 20 seconds, say, "TU VOIS" (en montrant du doigt), "IL LUI MANQUE DES DENTS." Should the subject fail on the second picture, say, "TU VOIS. IL MANQUE LA BOUCHE" (en montrant du doigt). Beginning with Card 3, no further additional help is given.

If the subject fails to indicate the missing part within 20 seconds, either by naming it, or by pointing to the correct spot, the item is scored as a failure, and the next picture is presented. If the subject provides an incorrect answer, the next item is presented, even if the full 20 seconds have not elapsed.

The following cautions should be given, if warranted, but each caution can be given ONLY ONCE during the course of the subtest:

1.   If the subject merely names the object in the picture, as opposed to the missing part, say, "OUI, MAIS QU'EST-CE QUI MANQUE?"

2.   If the subject names a part that is off the card, for example, the body of the woman in Card 2, or the body of the man in Card 12, make note of the answer and say, "IL MANQUE UNE PARTIE EN DEDANS DE L'IMAGE. QU'EST-CE QUI MANQUE?"

3.   If the subject makes mention of a non-essential missing part, for example, "La partie de l'escabeau où on peut placer le pot de peinture." on Card 9 - Ladder, - escabeau), make note of the answer and say, "OUI, MAIS QUELLE EST LA PARTIE LA PLUS IMPORTANTE QUI MANQUE?"

Sometimes, however, a child will merely point. If he points to the right place, he is given credit for a correct response. However, if the child points to the right place, but follows the non-verbal response with a verbal response that is clearly incorrect, the item is failed.

In some of the items, the child may not possess the vocabulary necessary for naming the missing part, or may not be able to retrieve the correct label

and may chose, instead, to use a synonym, or describe it in his own words. In such a case, the response is credited. The examiner must be reasonably sure that the child's verbal response is correct before giving him credit for an item. Where there is some doubt, say "MONTRE-MOI CE QUE TU VEUX DIRE." This is particularly important when the subject uses an inexact, or made-up, word to identify the missing part, for example, when the screw on Card 18 is identified by the word CLOU. It is also important on Card 14 - CARTE, or Card 24 - TÉLÉPHONE, where the subject's verbal response is frequently incomplete. For example, on Card 14, the subject must be able to point to the "centre" diamond; if he points incorrectly, despite the apparent correct verbal response, the item is failed.

3.   SIMILARITIES (SIMILITUDES)

START

All subjects, regardless of chronological age, begin with Item 1.

DIRECTIONS

Say, "DE QUELLE FAÇON UNE "ROUE" ET UNE "BALLE" SE

RESSEMBLENT-ELLES? COMMENT SONT-ELLES PAREILLES?" If the

subject responds that they are not alike, fails to respond, or gives an

incorrect answer, say, "LES DEUX SONT RONDES ET LES DEUX PEUVENT

ROULER. DIS-MOI, MAINTENANT, DE QUELLE FAÇON LA "CHANDELLE"

ET LA "LAMPE" SE RESSEMBLENT-ELLES?" If the subject fails, say, "LES

DEUX DONNENT DE LA LUMIÈRE". Proceed to item 3, but do not offer any

help on either item 3 or 4.

To assist the subject in developing a proper "set" for responding to

questions 5 to 17 along more abstract dimensions, use the following

procedure to model more complex responses: if the subject provides a more

concrete answer to item 5 or 6 (or both), for example, that apples and

bananas are both good to eat, or, beer and wine can both be drunk, say,

"C'EST VRAI, TU PEUX MANGER LES DEUX, MAIS AUSSI, LES DEUX

SONT DES FRUITS", or, in the case of item 6, "C'EST VRAI, ON PEUT

BOIRE LES DEUX. MAIS LES DEUX CONTIENNENT DE L'ALCOOL, OU

SONT DES BREUVAGES ALCOOLIQUES". This kind of assistance can be

provided only on items 5 or 6.

Items should be presented slowly. If a response is unclear or ambiguous,

say, "EXPLIQUE-MOI UN PEU PLUS CE QUE TU VEUX DIRE", ou, "DIS-MOI

S'EN UN PEU PLUS".

SCORING

As per the principles outlined in the WISC-R manual.

If a subject provides a number of scorable responses, scoring is based on the

best answer. Should he respond with differences or incorrect answers, in

addition to correct answers, ask "LAQUELLE EST TA RÉPONSE?" and score

according to the subject's selection.

4. PICTURE ARRANGEMENT (ARRANGEMENT D'IMAGES)

MATERIALS

13 sets of pictured cards contained in a box

START

All items are administered to each subject, regardless of chronological age.

DIRECTIONS

For each item, the subject is presented with a series of pictures whose order has been mixed up. He is asked to arrange them in an order that tells a story that makes sense. The NUMBERS printed on the back of the cards indicate the order in which the cards should be laid out, going from the subject's left to right. The LETTERS printed on the back of the cards indicate the code for scoring.

The order in which the subject arranges the cards on each item is entered on the Record Form. The exact time taken to complete each item is also noted on the Record Form. Timing for each item begins when the examiner has spoken the last word of the instructions for each item.

SAMPLE ITEM: SCALE (Bascule). Beginning with the card marked "1" placed at the subject's left, place the three cards in numeral order in front of the child. Say, "CES IMAGES RACONTENT L'HISTOIRE D'UNE DAME QUI SE PÈSE SUR UNE BALANCE. CES CARTES, EN CE MOMENT, NE SONT PAS DANS LE BON ORDRE. REGARDE COMMENT JE LES PLACE DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS."

After placing the cards in the correct order (ABC), point to each card in turn and say, "PREMIÈREMENT, LA DAME S'AVANCE VERS LA BALANCE. ENSUITE, ELLE SE PÈSE. PAR APRÈS, ELLE S'EN VA."

Permit the subject to examine the correct sequence for approximately 10 seconds. The cards are then put away. Proceed to the next item.

1.   FIGHT (COMBAT) Beginning with the card marked "1" placed at the subject's left, place the three cards in numerical order in front of the child. Say, "CES IMAGES RACONTENT L'HISTOIRE D'UN COMBAT - D'UN COMBAT DE BOXE. EN CE MOMENT, CES CARTES NE SONT PAS DANS LE BON ORDRE. ESSAIE DE LES PLACER DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS." Begin timing, and allow 45 seconds. If the subject arranges the cards in the correct order (OUT) within the time limit, proceed to Item 2.

If the subject fails to arrange the cards in the correct order, say, "REGARDE COMMENT JE LE FAIS". The cards are then correctly placed in front of the subject. Point to each card in turn and say, "AU DÉBUT, LES DEUX HOMMES SE BATTENT L'UN CONTRE L'AUTRE. ENSUITE, UN DES HOMMES EST ASSOMMÉ. FINALEMENT, ON DOIT LE PORTER HORS DU RING."

Allow the subject to study the correct sequence for about 10 seconds. Replace the cards in their numerical order. Say, "MAINTENANT, JE VOUDRAIS QUE TU LE RÉESSAIES. PLACE LES CARTES DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS." Begin timing, and, again, allow 45 seconds.

2.   PICNIC (PIQUE-NIQUE)   Place the 3 cards in numerical order in front of the subject. Say, "CES IMAGES RACONTENT L'HISTOIRE D'UN PIQUE-NIQUE. LES CARTES NE SONT PAS DANS LE BON ORDRE. ESSAIE DE LES PLACER DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS." Begin timing, and allow 45 seconds. If the cards are arranged in the correct order (DOG), proceed with the subject.

If the subject fails to arrange the cards in the correct order, say, "REGARDE COMMENT JE LE FAIS." The cards are then placed in the correct order in front of the subject. Point to each card in turn, and say, "PREMIÈREMENT,

LE MONSIEUR ET LA DAME SONT A MARCHER ET LE CHIEN LES SUIT.

MAINTENANT, LE CHIEN PREND LE POULET. PLUS TARD, LE MONSIEUR

ET LA DAME DÉCOUVRENT QUE LE POULET EST DISPARU."

Allow the subject to study the correct order for approximately 10 seconds,

then replace the cards in their original numerical order. Say, "MAINTENANT,

JE VOUDRAIS QUE TU LE RÉESSAIES. PLACE LES CARTES DANS LE BON

ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS."

Begin timing, and, again, allow 45 seconds.

3.   FIRE (INCENDIE)   Place the 4 cards in numerical order and say, while

the cards are being laid out, "CES CARTES RACONTENT L'HISTOIRE D'UN

FEU. PLACE-LES DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE

HISTOIRE QUI A UN SENS." Begin timing, and allow 45 seconds. If the

cards are arranged in the correct order (FIRE), go on to Item 4.

If the subject fails to arrange the cards in the correct order, say, "CE N'EST

PAS TOUT A FAIT ÇA." Replace the cards and place it below the remaining

three cards, at the subject's left. Point to the card "F" and say, "CETTE

IMAGE EST LA PREMIÈRE DE L'HISTOIRE; ELLE NOUS MONTRE UN

MAMAN QUI CHICANE SON FILS PARCE QU'IL JOUE AVEC DES

ALLUMETTES. UTILISE MAINTENANT CES CARTES (point to the remaining

3 cards) POUR COMPLÉTER L'HISTOIRE. PLACE-LES DANS LE BON

ORDRE, APRÈS LE DESSIN DU GARÇON QUI JOUE AVEC LES ALLUMETTES, POUR RACONTER L'HISTOIRE DU FEU." Again, allow 45 seconds.

4.   PLANK (PLANCHE)   Place the cards in numerical order and say, while the cards are being laid out, "CES CARTES RACONTENT L'HISTOIRE D'UN GARÇON QUI PREND UNE MARCHE. PLACE-LES DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS." Begin timing, and allow 45 seconds. If the child succeeds in placing the cards in the correct order (WALK), proceed to Item 5.

If the subject fails to arrange the cards in the correct order, say, "CE N'EST PAS TOUT A FAIT ÇA." Replace the cards in the original numerical order. Then, take card "W" from among the cards, and place it below the remaining 3 cards, at the subject's left. Point to card "W" and say, "CETTE IMAGE DOIT ÊTRE LA PREMIÈRE DANS L'HISTOIRE. ELLE MONTRE UN GARÇON QUI MARCHE VERS LA RIVIÈRE. UTILISE MAINTENANT CES CARTES (indicating the 3 remaining cards) POUR COMPLÉTER L'HISTOIRE. PLACE-LES DANS LE BON ORDRE, APRÈS LE DESSIN DU GARÇON QUI MARCHE VERS LA RIVIÈRE POUR COMPLÉTER L'HISTOIRE. Again, allow 45 seconds.

ITEMS 5-12.   Before laying out the cards for Item 5, say, "ICI, J'AI ENCORE D'AUTRES DESSINS QUE JE VOUDRAIS QUE TU PLACES EN ORDRE. A CHAQUE FOIS, JE VAIS TE LES DONNER DE FAÇON MÉLANGÉE." While laying out the cards, say, "JE VEUX QUE TU RANGES CES CARTES DANS LE BON ORDRE POUR QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS. ESSAIE DE TRAVAILLER LE PLUS RAPIDEMENT POSSIBLE, ET DIS-MOI QUAND TU AS FINI." Start timing, and allow 45 seconds.

Use a similar procedure for the remaining items. While placing the card for each item, say "PLACE MAINTENANT CES CARTES DANS LE BON ORDRE, AFIN QU'ELLES RACONTENT UNE HISTOIRE QUI A UN SENS. ESSAIE DE TRAVAILLER LE PLUS RAPIDEMENT POSSIBLE, ET DIS-MOI QUAND TU AS FINI." (These instructions may be abbreviated once it is clear that the subject understands what he is to do.) Then start timing. Allow a maximum of 45 seconds for Items 6-8, and 60 seconds for Items 9-12.

SCORING

Item		Time Limit (for trials 1 and 2)	Correct Order
1.	Fight (Combat)	45"	OUT
2.	Picnic (Pique-Nique)	45"	DOG
3.	Fire (Incendie)	45"	FIRE
4.	Walk (Planche)	45"	WALK

Items 5-12: 3 points are given for a correct arrangement completed within the time limit. A maximum of 2 bonus points can be earned for perfect performances that are completed quickly (see the table below). Items 9-12 offer the possibility of alternate arrangements, which can earn a partial credit of 2 points. These arrangements do not receive any time bonus.

SCORES FOR ITEMS 5-12 INCLUDING TIME BONUSES

ITEM	TIME LIMIT	CORRECT ORDER	POINTS WITH TIME BONUS		
			5	4	3
5. Burglar (voleur)	45"	THUG	1-10"	11-15"	16-45"
6. Sleeper (dormeur)	45"	RUSH	1-10"	11-15"	16-45"
7. Artist (Artiste)	45"	VAMP	1-10"	11-15"	16-45"
8. Lasso	45"	CASH	1-10"	11-15"	16-45"
9. Boat (bateau)	45"	CHASE	1-10"	11-20"	21-60"
		(HCASE - 2 points with no time bonus)			
10. Gardener (jardinier)	60"	WORMS	1-15"	16-25"	26-60"
		(WROMS - 2 points with no time bonus)			
11. Bench (banc)	60"	BENCH	1-15"	16-25"	26-60"
		(BECHN - 2 points with no time bonus)			
12. Rain (pluie)	60"	CLOUD	1-15"	16-25"	26-60"
		(COLUD - 2 points with no time bonus			

6.   ARITHMETIC (ARITHMÉTIQUE)

MATERIALS

A card with a row of 12 trees

A blank card

4 cards for problems 16, 17, 18 and alternate

START

All items are administered, regardless of chronological age.

DIRECTIONS

Problems 1 through 15 are read to the subject. Problems 16, 17, 18, and the alternate item are presented in a separate booklet, and are read aloud by the subject.

There is a time limit for each problem. Timing begins immediately after the problem has been read.

It is permitted to repeat a problem ONCE at the request of the subject, or, if it is apparent that he has failed to understand. However, timing is continued

from the end of the first reading of the problem.

Paper and pencil may NOT be used for any problem. However, the subject

should not be prevented from "writing" with his finger on the table.

PROBLEMS	TIME LIMITS	ANSWERS
For Problems 1-4, use the card with the row of trees.		
For Problems 2 and 3, also use the blank card.		
1. Place in front of the subject the card showing twelve trees, and say, "COMPTE CES ARBRES EN LES INDIQUANT DU DOIGT. COMPTE- LES A HAUTE VOIX POUR QUE JE PUISSE T'ENTENDRE."	30"	12 (il compte correctement de 1 à 12)
If the subject correctly counts the 12 trees, proceed to Problem 2. "REGARDE- MOI ET ÉCOUTE BIEN", and count the 12 trees for him, at a rate of about one per second. Then proceed to Problem 2.		
2. Leaving the trees in front of the subject, give him the blank card and say, "PREND CETTE CARTE (as the examiner points) ET CACHE TOUS LES ARBRES SAUF 4. LAISSE VOIR 4 ARBRES.	30"	4
Note for Problems 2 and 3 - if the subject covers up an incorrect number of trees, and the time limit has not expired, say, "COMPTE TOUS LES ARBRES QU'ON PEUT VOIR." If, on recounting, the subject spontaneously corrects the error, he receives ½ point.		

| 3. | With the trees still in front of the subject, say, "MAINTENANT, CACHE TOUS LES ARBRES SAUF 9. LAISSE VOIR 9 ARBRES." | 30" | 9 |
| 4. | Remove the blank card. Leaving the trees in front of the subject, say, "SI ON AJOUTAIT UN ARBRE A QUAQUE BOUT DE LA RANGÉE, IL Y AURAIT COMBIEN D'ARBRES EN TOUT?" | 30" | 14 |

PROBLEMS

Problems 5-15 are read aloud by the examiner.

Problems 16-18 and the alternate are presented to the subject in a separate booklet. Open the booklet to Problem 16. Hand it to the subject and say, "LIS CE PROBLÈME A HAUTE VOIX. APRÈS L'AVOIR LU, TRAVAILLE-LE DANS TA TÊTE. DONNE-MOI LA RÉPONSE QUAND TU AURAS FINI." For Problems 17, 18, and the alternate, say, "MAINTENANT, LIS CELUI-CI A HAUTE VOIX ET DONNE-MOI TA RÉPONSE QUAND TU ES PRET." Timing begins as soon as the subject has finished reading the problem aloud.

If it becomes evident that the subject is not able to read the problems himself, the examiner may read them to him.

6.   BLOC DESIGN (DESSIN AVEC CUBES)

MATERIALS

9 blocks (cubes) coloured red on two sides, white on two sides, and

red/white on two sides.

11 cards with printed designs, bound in a booklet.

START

All subjects are given the 11 items, regardless of chronological age.

DIRECTIONS

For Designs 1 and 2, the subject works directly from the models constructed

by the examiner. For Designs 3 through 11, the subject works from printed

cards.

In constructing the models and in presenting the designs, the examiner

needs to make sure that the designs are properly oriented. In the case of

the bound cards, each design is presented so that the unbound edge of the

card is toward the subject.

When constructing the models for Designs 1 and 2, be certain to use the same orientation, that is, with the edge of the model corresponding to the unbound edge of the card facing the subject. To avoid having the subject look at the sides of the block design in addition to the top, be sure to construct the model in such a way that the subject must look DOWN to it.

In presenting the blocks, the examiner needs to assure that there is a variety of surfaces face up; that only one out of the four blocks has the red/white face up, and that only three of the nine blocks used in items 9-11 have the red/white face up.

The time limits allowed are those presented in the original manual. They are indicated below, as well as on the Record Form. Timing begins as soon as the examiner gives the last word of the directions. For Designs 1, 2 and 3, timing is re-started if the subject requires a second trial. Record the exact time required to complete each design, if it is within the time limits.

Failure of an item can be due to:

1. a faulty design (one that does not match the model precisely)

2. failure to complete the design in the allotted time.

For Designs 1, 2 and 3, if the time limit expires before the subject has completed the pattern, stop him and proceed with a second trial.

Rotation of a design by 30 degrees or more is considered a failure (REFER

TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR CHILDREN -

REVISED / p. 85 (Wechsler, 1974))

A rotation occurring on any design is scored as a failure, and is corrected the

first time it occurs. Say, "TU VOIS, IL VA DE CETTE FAÇON" and turn the

blocks to the correct position. It should be noted that this correction may be

made only once during the administration of the subtest. If the rotation

occurs for the first time of the first trial of Designs 1, 2 or 3, correct the

error and ask the subject to attempt the design again. If the first rotation

occurs on the second trial of any of the first three designs, or on a later

design, make the correction, and then proceed to the next design.

DESIGN 1. Take four blocks in hand and say, "TU VOIS CES CUBES? ILS

SONT TOUS PAREILS LES UNS AUX AUTRES. ILS ONT DES FACES

TOUTES ROUGES, DES FACES TOUTES BLANCHES, ET D'AUTRES QUI

SONT MOITIÉ ROUGE, MOITIÉ BLANCHE." Show the subject the different

sides by turning the block. Then say, "JE VAIS LES ASSEMBLER POUR EN

FAIRE QUELQUE CHOSE. REGARDE-MOI BIEN."

Without exposing the card to the subject, the four blocks are arranged to

make the design shown on Card 1. Leaving the model intact, given the

subject four other blocks and say, "MAINTENANT, FAIS-EN UN PAREIL AU

MIEN." Begin timing, and allow 45 seconds. If the design is successfully completed within the time limit, continue with Design 2.

If the first attempt is failed, say, "REGARDE-MOI ENCORE UNE FOIS." Demonstrate a second time using the subject's blocks. Once the design is completed, scramble the blocks, but leave the model intact. Say, "MAINTENANT, ESSAIE ENCORE UNE FOIS. SOIS CERTAIN D'EN FAIRE UN PAREIL AU MIEN." Begin timing again, and allow 45 seconds.

DESIGN 2. Before continuing, mix the blocks. Then, assemble Design 2 behind a screen (either the manual or the Object Assembly Shield may be used for this purpose). Present the completed model to the subject, and say, "MAINTENANT, FAIS-EN UN PAREIL. FAIS-LE TOI-MÊME CETTE FOIS-CI." Allow 45 seconds.

If the subject fails on his first attempt at Design 2, mix his blocks and say, "REGARDE-MOI LE FAIRE." With the model left intact, duplicate the pattern with his blocks. After the demonstration, mix the blocks and say, "MAINTENANT, ESSAIE DE LE FAIRE." Allow 45 seconds.

DESIGN 3. Remove the blocks that have served as model. (They will not be needed until Design 9.) Mix the subject's blocks and place the card marked 3 in front of him.

Say, "CETTE FOIS, NOUS ALLONS ASSEMBLER LES CUBES POUR EN FAIRE UN DESSIN COMME CELUI QUE TU VOIS SUR CETTE CARTE (point to the card with Design 3). REGARDE-MOI PREMIÈREMENT." Slowly assemble the design, using the subject's blocks. When the design is completed, say, "TU VOIS, LE PATRON SUR LE DESSUS DE CES CUBES EST PAREIL A CE DESSIN." Mix those blocks used in the demonstration and say, "REGARD BIEN LE DESSIN ET, AVEC CES CUBES, FAIS-EN UN QUI EST PAREIL. VAS-Y." Allow 45 seconds.

If the subject is unable to complete the design, scramble the blocks and say, "REGARDE-MOI ENCORE UNE FOIS." Make the design a second time, then mix the blocks and say, "VAS-Y. ESSAIE DE LE FAIRE CETTE FOIS-CI." Once again, allow 45 seconds.

DESIGNS 4-11. Be certain that the subject has four blocks. Mix them and place Card 4 before the subject and say, "MAINTENANT, FAIS-EN UN PAREIL A CELUI-CI. ESSAIE DE LE FAIRE AUSSI VITE QUE TU PEUX. DIS-MOI QUAND TU AS FINI." Begin timing, and allow 45 seconds. When the subject has completed the design, or after the time limit has expired, mix the blocks. There are no second trials given on Designs 4-11. Present all the remaining designs by saying, "MAINTENANT, FAIS-EN UN COMME CELUI-CI. ESSAIE DE LE FAIRE AUSSI VITE QUE TU PEUX. DIS-MOI QUAND TO AS FINI." (These instructions may be abbreviated when it becomes clear

that the subject understands what he is to do.) Start timing. Allow the

number of seconds specified on the Answer Sheet.

At Design 9, take out the remaining five blocks and say, "MAINTENANT,

FAIS-EN UN QUI EST PAREIL A CELUI-CI, EN UTILISANT LES 9 CUBES."

SCORING

<u>Designs 1-3</u>:   2 points for succeeding on the first trial; 1 point for

succeeding on the second trial.

DESIGN	TIME LIMITS (trials 1 and 2)
1	45"
2	45"
3	45"

<u>Designs 4-11</u>:   4 points for each design completed within the time limit.

A maximum of 3 bonus points is awarded for <u>perfect</u> performances

completed within the time limits specified in the table below. No points are

awarded for partially correct or incomplete designs.

SCORES FOR DESIGNS 4-11 WITH TIME BONUSES INCLUDED

SCORES FOR DESIGNS 4-11 WITH TIME BONUSES INCLUDED

DESIGNS	TIME LIMIT S	POINTS WITH TIME BONUS			
		7	6	5	4
4	45"	1-10"	11-15"	16-20"	21-45"
5	75"	1-10"	11-15"	16-20"	21-75"
6	75"	1-10"	11-15"	16-20"	21-75"
7	75"	1-10"	11-15"	16-20"	21-75"
8	75"	1-10"	16-20"	21-25"	26-75"
9 (9 cubes)	120"	1-25"	26-35"	36-55"	56-120"
10 (9 cubes)	120"	1-40"	41-55"	56-75"	76-120"
11 (9 cubes)	120"	1-40"	41-55"	56-80"	81-120"

7.   VOCABULARY (VOCABULAIRE)

START

All 50 words are administered to the subject, regardless of chronological age.

DIRECTIONS

Say, "JE VAIS TE DIRE DES MOTS. ÉCOUTE BIEN, ET DIS-MOI CE QUE CHAQUE MOT VEUT DIRE."

Present the words in the order listed, saying for each one, "QU'EST-CE QU'UN(E) _____, or, "QU'EST-CE QUE _____ VEUT DIRE?" In the case of brighter, or older, subjects, it is possible to omit the formal question after the third word; just pronounce the word. Be certain to use the local pronunciation likely to be most familiar to the subject.

If the response to Item 1 is less than a 2-point response, say, "BIEN, UN COUTEAU C'EST QUELQUE CHOSE QUI COUPE." Afterwards, do not give any additional help, except as specified below.

A subject is not given credit for merely pointing to the object (e.g. the clock, a nail). Should this kind of response occur, say, "DIS-MOI EN MOTS QUE C'EST UN(E) _____.

It can occur that the subject hears a word incorrectly and responds to a different word (e.g. he may offer a definition for "faible" instead of "fable", "genre" instead of "gendre"). Should this occur, the examiner must say, "ÉCOUTE BIEN. QUE VEUT DIRE LE MOT _____?

At times, it is difficult for the examiner to decide whether or not the subject knows the meaning of a word. In such cases, it is permissible to say, "EXPLIQUE-MOI CE QUE TU VEUX DIRE" or "DIS-MOI S'EN UN PEU PLUS", or any such non-leading question. No other form of questioning may be used, however. This form of questioning may also be used when the subject's response is unclear or too vague to be scored easily. It can also be used when the examiner judges that further questioning could evoke a superior response to a marginal 0- or 1-point response. (In those cases where responses are clearly 0-point or 1-point answers, no such questioning should take place.)

All word meanings found in standard dictionaries are acceptable and scored according to the quality of the answer. Responses that are either slang, or meanings specific to a particular region, are scored 0. Should such a

response be given, or should the examiner be in doubt about the

acceptability of a subject's response, he should ask for another meaning.

8.   OBJECT ASSEMBLY (ASSEMBLAGE D'OBJETS)

MATERIALS

5 objects Assembly puzzles, each in a separate box

Shield with illustration as to how to lay out pieces

START

Begin with the Sample item. Then proceed to Item 1 for all subjects.

DIRECTIONS

The time limit for each of the items is indicated below and on the Answer

Sheet. Timing is begun when the last word of the directions have been

given. The exact time taken to complete each item must be recorded if it is

within the time limit. Accurate recording of the time taken to complete each

task is important, as the subject is able to earn bonus points for quick

perfect performance. Details about bonus points are given below.

If the subject is continuing to work beyond the time limit, the examiner may

not wish to stop him in the interest of maintaining good rapport and

motivation. In such instances, the examiner should note the number of cuts

correctly joined at the end of the time limit. This is important because scores are also given for partially assembled items.

If the subject turns a piece over, it is to be turned right side up again, as unobtrusively as possible.

SAMPLE ITEM: APPLE (POMME). Arrange the pieces behind the Layout Shield according to the pattern shown below (and on the Layout Shield). Remove the Shield and say, "SI CES PIÈCES SONT ASSEMBLÉES CORRECTEMENT, ELLES FERONT UNE POMME. REGARDE COMMENT JE FAIS." Assemble the pieces as shown below.

Permit the subject to examine the completed figure for about 10 seconds. Then store the pieces away, and proceed to Item 1.

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR CHILDREN - REVISED / p. 91 (Wechsler, 1974))

1.   GIRL (FILLE). Arrange the pieces behind the Layout Shield according to the pattern shown below (and on the Layout Shield). Remove the Shield and say, "SI CES PIÈCES SONT ASSEMBLÉES CORRECTEMENT, ELLES FERONT UNE PETITE FILLE. VAS-Y. ASSEMBLE-LES. DIS-LE MOI QUAND TU AURAS FINI." Begin timing, and allow 120 seconds. If the pieces are

not assembled perfectly, show him the correct response and say, "TU VOIS,

ÇA VA COMME ÇA." Then go on to Item 2, but give no further assistance.

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR

CHILDREN - REVISED / p. 92 (Wechsler, 1974))

2.   HORSE (CHEVAL). Behind the Layout Shield, arrange the pieces as

illustrated in the diagram below. Remove the Shield and say, "CES PIÈCES

FONT UN CHEVAL. ASSEMBLE-LES LE PLUS RAPIDEMENT POSSIBLE."

Begin timing, and allow 150 seconds.

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR

CHILDREN - REVISED / p. 92 (Wechsler, 1974))

3.   CAR (AUTOMOBILE). Behind the Layout Shield, arrange the pieces as

illustrated below. Remove the Shield and say, "ASSEMBLE CELUI-CI LE

PLUS RAPIDEMENT POSSIBLE." Begin timing, and allow 150 seconds.

(Make note of the fact that the name of the object is not given.)

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR

CHILDREN - REVISED / p. 93 (Wechsler, 1974))

4.   FACE (VISAGE). Behind the Layout Shield, arrange the pieces as illustrated in the diagram below. Remove the Shield and say, "ASSEMBLE CELUI-CI LE PLUS RAPIDEMENT POSSIBLE." Begin timing, and allow 180 seconds. (The object is not named.)

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR CHILDREN - REVISED / p. 93 (Wechsler, 1974))

SCORING

The score for Item 1 (FILLE) is 6, the number of cuts correctly joined PLUS a maximum of 2 bonus points awarded for a quick perfect performance.

The score for Item 2 (CHEVAL) is 5, the number of cuts correctly joined PLUS a maximum of 3 bonus points awarded depending on the time required to complete a perfect performance.

The scores for Items 3 and 4 (AUTOMOBILE and VISAGE) are 9 and 12 respectively, ½ the number of cuts correctly joined PLUS a maximum of 3 bonus points for speed of perfect completion.

In order to score the item, the examiner must first enter the number of correctly joined cuts in the appropriate column indicated on the Record

Form. (On the diagrams, each cut is marked with an "X" on the assembled object; an "X" appears at each place where there is a joining of two adjacent pieces.) The Record Form also indicates whether the number of cuts is to be multiplied by 1 or ½. For EACH item, all half-scores are to be rounded up to the next whole number (it should be noted that rounding should be done prior to calculating the total score for the subtest.)

Pieces are considered to be correctly assembled even if the segment thus formed is not joined to the rest of the object. As an example, on Item 4 (VISAGE), the subject may correctly put several pieces together (the chin and mouth; the two hair pieces, etc.) without combining them in such a way as to make the whole face. Credit is given for each correctly joined cut, regardless of whether or not the assemble is complete.

It is important to be completely familiar with the scoring system in order to be able to score each item as soon as the subject finishes.

SCORING OF OBJECT ASSEMBLY ITEMS (WITHOUT TIME BONUSES)

ITEM	TIME LIMITS	MAXIMUM NUMBER OF CUTS	MULTIPLY BY	MAXIMUM SCORE (WITHOUT TIME BONUS)
1. FILLE	120"	6	1	6
2. CHEVAL	120"	5	1	5
3. AUTO	150"	9	½	5
4. VISAGE	180"	12	½	6

SCORES FOR PERFECT ASSEMBLIES INCLUDING BONUS POINTS

ITEM	TIME LIMITS	POINTS INCLUDING TIME BONUS				
		9	8	7	6	5
1. FILLE	120"		1-20"	21-30"	31-120"	
2. CHEVAL	120"		1-15"	16-20"	21-35"	36-150"
3. AUTO	150"		1-25"	26-35"	36-50"	51-150"
4. VISAGE	180"	1-35"	36-50"	51-75"	76-180"	

9.   COMPREHENSION (JUGEMENT)

START

Begin at Item 1 for all subjects. Administer all items.

DIRECTIONS

Be careful to read each question slowly. Because some subjects may find it difficult to remember the entire question, it is always permitted to repeat the question. However, the question can neither be altered nor abbreviated. If no response is obtained after 10 to 15 seconds, it is good practice to repeat the question. No further urging should be offered, except as indicated below.

If a subject is hesitant at offering a response, encourage him with the following type of remarks: "CONTINUE" or "OUI". In instances where responses are unclear or ambiguous, you may say, "EXPLIQUE-MOI CE QUE TU VEUX DIRE" or "DIS-MOI S'EN UN PEU PLUS."

In those cases where the subject does not give for Item 1 what would be considered to be a 2-point answer on the original test, say, "EH, BIEN! UNE CHOSE A FAIRE SERAIT DE LAVER LA COUPURE AVEC DU SAVON ET DE

L'EAU. TU POURRAIS AUSSI METTRE UN DÉSINFECTANT OU UN PANSEMENT." Such assistance may only be given on Item 1.

For items where the original test required that the subject give two correct answers in order to receive full credit (Items 3 and 4, for example), he should be asked to provide a second response in those instances where he has given one correct answer and has not provided a second one spontaneously. Say, "DIS-MOI UNE AUTRE CHOSE A FAIRE SI TU VOIS UNE FUMÉE ÉPAISSE SORTIR DE LA FENÊTRE DE LA MAISON DU VOISIN" (or any similar reformulation of the question). A subject may be asked to provide a second response only <u>once</u> during the administration of a given <u>item</u>. If the second response offered by the subject is either incorrect or merely an elaboration of the original response, the examiner may not request an additional answer.

10.   CODING (CODE)

MATERIALS

Coding A and Coding B worksheets are printed on the last page of the

Mazes booklet.

2 red-leaded pencils, without erasers (one is used by the subject, the other

by the examiner.)

Scoring grid.

CODING (CODE) A

To be administered to ALL subjects below the age of 8 years 0 months.

DIRECTIONS

A smooth surface is essential. If the work table has a rough surface, the

worksheet should be placed on a piece of cardboard.

Give the subject one of the red crayons without eraser, and say, "REGARDE

ICI, (pointing to the Key above the test items). TU VOIS UNE ÉTOILE, UNE

BALLE, UN TRIANGLE, ET TOUTES CES AUTRES FORMES. TU VOIS,

L'ÉTOILE A UNE LIGNE QUI VA DE HAUT EN BAS COMME CECI (point); LA

BALLE A DEUX LIGNES AU TRAVERS (point); LE TRIANGLE A UNE LIGNE

AU TRAVERS COMME CECI (point); LA CROIX A UN PETIT CERCLE AU

CENTRE ET LA BOITE A DEUX LIGNES DROITES QUI VONT DE HAUT EN

BAS.

MAINTENANT, REGARDE EN-DESSOUS (point). TU VOIS DES BALLES,

DES ÉTOILES, DES BOITES, ET BIEN D'AUTRES CHOSES. ELLES SONT

TOUTES MÉLANGÉES, MAIS IL N'Y A PAS DE DESSIN DEDANS. JE

VOUDRAIS QUE TU METTES DANS CES FORMES LES MÊMES DESSINS

QUE CEUX QUI SONT DANS CETTE LIGNE AU HAUT. VOICI COMMENT

FAIRE: ICI, IL Y A UNE BALLE. REGARDE LA LIGNE DU HAUT ET TROUVE

LA BALLE (point). TU VOIS, ELLE A DEUX LIGNES QUI VONT COMME CECI

(fill in the first Sample Item, using the red pencil). L'ÉTOILE A UNE LIGNE

QUI VA DE HAUT EN BAS, ALORS TU FAIS LE MÊME DESSIN ICI (point to

the second Sample Item, and draw the line in the star). MAINTENANT, FAIT

LES AUTRES JUSQU'A CE QUE TU ARRIVES A CETTE LIGNE (point to the

line separating the last Sample item from the first test item).

The Subject works alone on the remaining sample items. Praise his success

on each Sample item by saying, "OUI" or "C'EST BIEN". Should he make an

error, or be slow to perform the task, re-explain and demonstrate the task

again. Say, "TU VOIS, CECI EST UN TRIANGLE ET A L'INTÉRIEUR DU

TRIANGLE, IL Y A UNE LIGNE DROITE. ALORS, TU VAS EN DESSINER UNE

QUI LUI EST PAREILLE ICI' (point), or "CECI EST UNE CROIX ET, PARCE

QU'IL Y A UN PETIT CERCLE DANS LA CROIX ICI (point to the Sample line),

TU VAS EN DESSINER UN DANS CETTE CROIX-CI (point).

The actual test is not begun until it is evident that the subject understands

the task.

While the subject is completing the Sample items, the examiner may notice

that the left-handed subject is blocking, or partially blocking, the Key while

he is attempting to fill in the symbols. When this occurs, a separate

worksheet should be folded in half so as to expose only Coding A, and

placed to the right of the subject's worksheet, such that the extra Key is in

line with the one that his hand is blocking. Allow the subject to complete

the Sample items, while looking at the new Key to provide him with some

practice before the actual test begins.

Once the Sample items have been completed and the subject understands

the task, say, "QUAND JE TE DIRAI DE COMMENCER, TU DOIS REMPLIR

LES FORMES SUIVANTES. COMMENCE ICI (point to the first item of the

test) ET REMPLIS-EN LE PLUS POSSIBLE, L'UN APRÈS L'AUTRE, SANS EN

SAUTER. CONTINUE TON TRAVAIL JUSQU'A CE QUE JE TE DISE

D'ARRÊTER. TRAVAILLE AUSSI VITE QUE TU LE PEUX, SANS FAIRE

D'ERREURS. QUAND TU AURAS FINI CETTE LIGNE (trace the first line with

your finger), PASSE A CELLE-CI (point to the first item of row 2).

Say, "VAS-Y", and begin timing. If an item is skipped, or if the subject

starts by filling in only one type of item (e.g. all the stars), say, "FAIS-LES

EN ORDRE. N'EN SAUTE PAS." Point to the first omitted item, and say,

"FAIS CELUI-CI LE SUIVANT."

No additional assistance is given, except to remind the subject to continue

until he is told to stop (should this be necessary).

At the end of 120 seconds, say, "ARRÊTE". Should the subject finish

before the time limit has expired, record the exact time taken to complete

the task on the Record Form. Because of the possibility of earning bonus

points for quick and perfect performances, it is essential that the recording

of time be accurate.

SCORING

1 point is awarded for each item filled in correctly (the score does not

include the five Sample items).

When a subject receives a perfect score of 45, he may earn bonus points

based on the number of seconds required to complete the task.

Using the scoring stencil, check the subject's responses. If he has obtained

a score of 45, refer to the table below for possible bonus points. The

subject's final score on the subtest is then entered on the Record Form.

A figure need only be clearly identifiable to be scored as correct. Even if the

figure is drawn imperfectly (e.g. if the somewhat parallel lines drawn in the

circle intersect the circle, are not exactly horizontal, or are not equal in

length), the subject is not penalized. Credit is also given if the subject, after

realizing a mistake, attempts to correct it (by drawing the correct figure next

to, or over, the incorrect figure).

SCORES FOR CODING A
WITH TIME BONUSES FOR PERFECT PERFORMANCE

TIME	SCORE
111-120"	45
101-110"	46
91-100"	47
81-90"	48
71-80"	49
70" or less	50

CODING (CODE) B

For all subjects 8 years of age and older

DIRECTIONS

A smooth surface is essential. If the surface of the table is rough, place the Coding worksheet over a piece of cardboard.

Give the subject one of the red pencil without eraser. Point to the key above the test items, and say, "REGARDE CES BOITES OU CARRÉS DIVISÉS. COMME TU LE VOIS, DANS CHAQUE BOITE, IL Y A UN CHIFFRE ÉCRIT DANS LA PARTIE DU HAUT (trace the line of numbers with the finger) ET UN SIGNE SPÉCIAL ÉCRIT DANS LA PARTIE DU BAS (trace the line of symbols with the finger). CHAQUE CHIFFRE A SON PROPRE SIGNE (point to the number 1 and its mark, to the number 2 and its mark). REGARDE ICI, MAINTENANT (point to the Sample items). TU VOIS, LES BOITES DU HAUT ONT DES CHIFFRES, MAIS LES BOITES DU DESSOUS SONT VIDES. TU DOIX METTRE DANS LES BOITES VIDES (point to the first of the seven Sample items) LES SIGNES QUI DEVRAIENT ÊTRE, COMME CECI. ICI, IL Y A LE "2" (point to the "2" in the first Sample item); LE "2" A CE SIGNE-CI (point out the symbol below "2" in the Key). ALORS, JE LE DESSINE DANS CETTE BOITE, COMME CECI (write in the indicated symbol, using the red pencil). VOICI LE "1" (point out the "1" in the Key).

VOICI LE SIGNE POUR "1" (point to the symbol below "1"). JE LE METS DANS CETTE BOITE (draw in the symbol). VOICI UN "4" (point to the "4" in the Key). DONC, JE LE DESSINE DANS CETTE BOITE (draw in the symbol).

After completing the first three Sample items, say, "REMPLIS, MAINTENANT, LE RESTE DE CES BOITES JUSQU'A CETTE LIGNE ROUGE (point). As each Sample item is completed correctly, offer encouragement such as "OUI" ou "C'EST BIEN", and, finally, "TU SAIS, MAINTENANT, COMMENT LES FAIRE." If an error is made on a sample item, point it out immediately to the subject, and explain once again how to use the Key. Continue to offer whatever help is needed until the seven Sample items have been filled in correctly. Do not proceed with the task until it is clear that the subject understands what is expected.

While the subject is completing the Sample exercises, the examiner may notice that a left-handed subject may block, or partially block, the Key as he is filling in the symbols. Should this be observed, fold a separate test booklet in half, in such a way as to expose only Coding B, and place the booklet to the right of the subject's worksheet. Be certain that the extra Key is aligned with the one the subject's hand is blocking. Have the subject complete the Sample items by looking at the symbols on the separate Key, to allow him some practice prior to the beginning of the actual test.

When the Sample items have all been successfully completed, say, "QUAND JE TE DIRAI DE COMMENCER, REMPLIS LES BOITES QUI RESTENT. COMMENCE ICI (point to the first test item) ET REMPLIS LE PLUS DE BOITES POSSIBLE, L'UNE APRÈS, SANS EN SAUTER. CONTINUE A TRAVAILLER JUSQU'A CE QUE JE TE DISE D'ARRÊTER. TRAVAILLE AUSSI VITE QUE POSSIBLE SANS FAIRE D'ERREURS. QUAND TU AURAS FINI CETTE LIGNE (indicate the first row), PASSE A LA LIGNE SUIVANTE (point to the first item in row 2).

Say, "VAS-Y" and start timing. If the subject skips one item, or begins to do only one type of item (e.g. all the "1"'s), say, "FAIS-LES EN ORDRE; IL NE FAUT PAS EN SAUTER." Point out the first time an item has been skipped and say, "FAIS CELUI-CI LE SUIVANT."

No further help is given, except to remind the subject to continue until he is told to stop.

At the end of 120 seconds, say, "ARRÊTE".

SCORING

1 point for each square correctly filled in (The seven Sample items are not counted in the subject's score).

Check the subject's responses, using the scoring stencil, and record the score on the Record Form.

A figure is scored as correct as long as it is clearly identifiable as the figure on the Key, even if the reproduction is imperfect, or is a spontaneous correction of an incorrect figure.

11. DIGIT SPAN (MÉMOIRE DES CHIFFRES)

(Supplementary Verbal Test)

Digits Forward and Digits Backward are treated as two separate tasks.

Digits Backwards is to be administered even when the subject obtains a

score of 0 on Digits Forward.

DIGITS FORWARD

START

All subjects begin at Item 1.

DISCONTINUE

After failure on both trials of two consecutive items.

DIRECTIONS

Say, "JE VAIS TE DIRE DES CHIFFRES. ÉCOUTE BIEN ATTENTIVEMENT ET

QUAND J'AURAI TERMINÉ, RÉPÈTE-LES IMMÉDIATEMENT APRÈS MOI."

The digits are presented at the rate of one per second. Both trials are administered for each item, even if the subject passes Trial 1.

SCORING

The subject earns 2 points if he passes both trials.

The subject earns 1 point if he passes only one trial.

The subject earns 0 points if he fails both trials.

ITEM	Trial 1	Trial 2
1.	3-8-6	6-1-2
2.	3-4-1-7	6-1-5-8
3.	8-4-2-3-9	5-2-1-8-6
4.	3-8-9-1-7-4	7-9-6-4-8-3
5.	5-1-7-4-2-3-8	9-8-5-2-1-6-3
6.	1-6-4-5-9-7-6-3	2-9-7-6-3-1-5-4
7.	5-3-8-7-1-2-4-6-9	4-2-6-9-1-7-8-3-5

DIGITS BACKWARD

START

All subjects begin with Item 1.

DISCONTINUE

After failure on both trials of two consecutive items.

DIRECTIONS

Say, "JE VAIS MAINTENANT TE DIRE D'AUTRES CHIFFRES, MAIS CETTE FOIS-CI, QUAND J'AURAI TERMINÉ, JE VOUDRAIS QUE TU LES RÉPÈTES DE RECULONS. PAR EXEMPLE, SI JE DIS 9-2-7, QUE DOIS-TU ME DIRE?" Give the subject the time needed to respond.

If he responds correctly (7-2-9), say, "C'EST BIEN" and go on to Item 1. As was done in Digits Forward, the numbers are presented at a rate of one per second. Both trials are administered for each item, even where Trial 1 has been passed.

If the subject fails the example, say, "NON, TU DIRAIS 7-2-9. J'AI DIT 9-2-7, ALORS POUR LE DIRE DE RECULONS, TU DOIS DIRE 7-2-9. ESSAIE MAINTENANT CES CHIFFRES. SOUVIENS-TOI QUE TU DOIS LES DIRE DE RECULONS. 5-6-3.

Whether the subject passes or fails this second example (5-6-3), continue to Item 1. No help is given on the second example, or on any of the following items.

SCORING

The subject earns 2 points if he passes both trials.

The subject earns 1 point if he passes only one trial.

The subject earns 0 points if he fails both trials.

ITEM	Trial 1	Trial 2
1.	2-5	6-3
2.	5-7-4	2-5-9
3.	7-2-9-6	8-4-9-3
4.	4-1-3-5-7	9-7-8-5-2
5.	1-6-5-2-9-8	3-6-7-1-9-4
6.	8-5-9-2-3-4-2	4-5-7-9-2-8-1
7.	6-9-1-6-3-2-5-8	3-1-7-9-5-4-8-2

12. MAZES (LABYRINTHES)

(Supplementary Performance Test)

MATERIALS

Mazes booklet

2 red lead pencils without erasers

1 black lead pencil, for the examiner

START

The subject, regardless of age, is given all 9 mazes.

DIRECTIONS

A smooth working surface is essential. If the table's surface is rough, place the Mazes Booklet over a piece of cardboard. All demonstrations made by the examiner are drawn using the black lead pencil. The subject works with the red lead pencil and is given two pencils in case the lead should break during the administration of the subtest.

The subtest is not to lift his pencil from the booklet, and should be reminded of this whenever it becomes necessary. If he lifts the pencil, say,

"N'OUBLIE PAS QUE LA MINE DU CRAYON DOIT DEMEURER SUR LA
FEUILLE."

Time limits for each maze are shown below and on the Record Form. The
timing begins as soon as the last word of the directions is spoken.

The following warnings should be given, if necessary. However, each
warning may be given as soon as the last word of the directions is spoken.

The following warnings should be given, if necessary. However, each
warning may be given only once during the administration of the test.

1.   If the subject crosses the line of a maze, the examiner should say, "IL
      N'EST PAS PERMIS DE TRAVERSER UN MUR."

2.   If, before the end of the time limit, the subject stops trying to solve
      the maze (e.g. if he enters a blind alley and stops because he is not
      aware that he is allowed to reverse direction), say, "N'ARRÊTE PAS.
      CONTINUE JUSQU'A CE QUE TU TROUVES LE CHEMIN POUR
      SORTIR."

3.   If the subject lifts his pencil and starts again from the centre box
      because he has crossed a line or entered a blind alley, say, "IL N'EST

PAS PERMIS DE RECOMMENCER. CONTINUE A PARTIR D'ICI (point to the last place reached) ET ESSAIE DE TROUVER LE BON CHEMIN POUR EN ARRIVER A SORTIR.

4. If the subject starts elsewhere than at the centre box, say, "TU DOIS COMMENCER ICI (point to the little boy or girl at the centre).

5. If the subject fails to completely clear the exit, say, "TU DOIS EN SORTIR COMPLÈTEMENT."

6. If the subject attempts to begin at the exit and start to solve the maze by working towards the centre, stop him and say, "TU DOIS COMMENCER ICI (pointing to the centre box).

SAMPLE: Place the maze booklet in front of the subject, making sure that the "E" printed at the top of the booklet is facing the examiner. Complete the demonstration as follows: Say, "TU VOIS CE GARÇON-CI, AU CENTRE? (point) IL VOUDRAIT SE RENDRE AU CHEMIN, ICI (point). JE VAIS TE MONTRER COMMENT IL POURRAIT LE FAIRE SANS SE TROMPER. REGARDE-MOI BIEN." Demonstrate by starting at some point within the centre box. On reaching the opening to the blind alley, pause without lifting the pencil, indicate the blind alley, and say, "NON, PAS PAR CE CHEMIN. TU VOIS, S'IL PRENAIT CE CHEMIN, IL RESTERAIT PRIS PARCE QUE LE

CHEMIN EST BLOQUÉ. IL NE PEUT PAS PASSER A TRAVERS LE MUR (point). IL DOIT DONC SUIVRE CE CHEMIN-CI POUR SORTIR." Complete the route.

MAZE 1 (LABYRINTHE 1). Having completed the above demonstration, give the subject a red pencil and indicate Maze 1, saying, "MAINTENANT, VOIS SI TU PEUX SORTIR TOI-MÊME DE CELUI-CI. COMMENCE ICI (point) ET TRACE LE CHEMIN QUE TU DEVRAIS PRENDRE AFIN DE SORTIR DU LABYRINTHE, SANS TE FAIRE BLOQUER LE CHEMIN. NE SOULÈVE PAS TON CRAYON DU PAPIER AVANT D'AVOIR TERMINÉ. VAS-Y." Begin the timing, and allow 30 seconds.

If the subject fails Maze 1, demonstrate how to trace the correct path before moving to Maze 2.

MAZE 2 (LABYRINTHE 2). Pointing to Maze 2, say, "MAINTENANT, ESSAIE CELUI-CI. COMMENCE ICI (indicating the centre) ET TROUVE LE CHEMIN POUR SORTIR. NE TE FAIT PAS PRENDRE. VAS-Y." Allow 30 seconds.

If the subject fails Maze 2, demonstrate how to trace the correct path before moving to Maze 3.

MAZE 3 (LABYRINTHE 3). Pointing to Maze 3, say, "MAINTENANT, ESSAIE CELUI-CI. COMMENCE ICI OU SE TROUVE LA FILLETTE (point to the centre) ET TROUVE LE CHEMIN POUR SORTIR. NE TE FAIT PAS PRENDRE. VAS-Y." Allow 30 seconds.

MAZE 4 (LABYRINTHE 4). Pointing to Maze 4, say, "MAINTENANT, COMMENCE ICI (indicating the centre) ET TROUVE LE CHEMIN POUR EN SORTIR. VAS-Y." Allow 30 seconds.

MAZES 5-9 (LABYRINTHES 5-9). Open the test booklet and fold the pages back, exposing only the page containing Maze 5 to the subject's view. The "E" that appears at the top of the page should be facing the examiner.

For Maze 5 and those that follow, point to the centre box and say, "MAINTENANT, COMMENCE ICI ET TROUVE LE CHEMIN POUR EN SORTIR. VAS-Y." (These instructions may be abbreviated when it becomes evident that the subject understands the task.) Begin timing, and allow the time limit specified below for each maze.

The booklet is turned over after Maze 7, to present Mazes 8 and 9. The "E" that appears at the top of the page should be facing the examiner.

SCORING

Each maze is scored according to several criteria.

Full credit is awarded for an error-free maze that is completed within the

time limit. (An error is defined as any entrance into a blind alley.)

Partial credit is awarded for the maze that is solved within the time limit, but

that contains errors made along the way (where the number of errors does

not exceed the maximum allowed for the maze).

No credit is given when the number of errors exceeds the maximum

specified for the maze OR when the subject has failed to exit the maze

within the time limit OR when he has committed an error that constitutes a

failure (see examples below).

Time limits and the scoring system are shown in the table below. Detailed

definitions of errors and of failures follow below.

SCORING OF MAZES

MAZE	TIME LIMITS				POINTS		
1	30"				0	1 error	2 or more errors
2	30"				0	1 error	2 or more errors
3	30"				0	1 error	2 or more errors
4	30"			0	1	2 errors	3 or more errors
5	45"			0	1	2 errors	3 or more errors
6	60"		0	1	2	3 errors	4 or more errors
7	120"		0	1	2	3 errors	4 or more errors
8	120"	0	1	2	3	4 errors	5 or more errors
9	150"	0	1	2	3	4 errors	5 or more errors

NOTE - In order to receive credit, the maze must be completed <u>within the specified</u> time limit. Failure to complete the maze within the allotted time is scored 0, regardless of the number of errors.

ERRORS - Entrance into a blind alley is the <u>only</u> type of error counted. An "entrance" is defined as any crossing of the imaginary line across the mouth of a blind alley.

Each entrance into a blind alley is a separate error. However, any wandering within the blind alley, or entrance into any of its branches, is considered to be part of the same error, and is not counted as an additional error. But, if after returning to the correct path, the subject then <u>re-enters</u> the same blind alley, score a second error. Any obvious entrance into a blind alley is scored

as an error, but, if it is not easy to determine whether or not a blind alley

has truly been entered, the subject is given the benefit of the doubt, and no

error is scored.

An error is <u>not</u> scored if the subject picks up his pencil, if he "cuts corners",

or deviates slightly from the path and cuts through an alley wall. However,

if cutting through the alley wall results in the subject's failure to trace a

significant portion of the maze, it is scored 0.

(REFER TO MANUAL OF WECHSLER INTELLIGENCE SCALE FOR

CHILDREN - REVISED / p. 108-109-110 (Wechsler, 1974))

FAILURES - A score of 0 is given for any one of the following faults:

1.   The subject takes more time than the maximum time limit for the

      maze.

2.   The subject makes a greater number of errors than the maximum

      number allowed.

3.   The subject begins tracing elsewhere than in the centre box, well into

      the maze (i.e. one-half inch, or more, from the centre box exit).

4. The subject fails to reach the exit (performance is not complete). Do

    not score a failure if the subject's tracing stops at the exit rather than

    going through it. However, a maze scores 0 if the tracing fails to

    reach the exit area, or if it goes beyond the exit to enter a blind alley.

5. The subject cuts through a wall to reach the goal and, in doing so,

    overlooks a significant portion of the maze.

APPENDIX B

LETTER OF INTRODUCTION, PARENT QUESTIONNAIRE, AND CONSENT

FORM

LETTER OF INTRODUCTION

Cher

Je m'appelle Suzanne Regimbal. Présentement, je termine mes études
menant au doctorat à Michigan State University, East Lansing, Michigan. La
dernière phase d'étude comprend la préparation d'une thèse qui exige un
travail de recherche entrepris sous la supervision du Dr. Harvey Clarizio,
Chef du département de School Psychology de l'Université. Aujourd'hui, je
demande votre participation à cette dernière phase de mes études.

Puisque je suis Francophone et Ontarienne, j'ai toujours désiré entreprendre
ce travail auprès de cette population qui est mienne.

Comme vous le savez, il existe peu de matériel, en particulier des
instruments psychologiques, développé spécifiquement pour les
Francophones de l'Ontario. Nous avons dû nous satisfaire de matériel
préparé soit en France ou au Québec, ou encore faire des traductions de
matériel américain. Par conséquent, ce genre d'instrumentation risque d'être
peu sensible à la langue et la culture des enfants de notre province.

Je suis à préparer une adaptation franco-ontarienne du WISC-R -- l'Échelle
d'intelligence de Wechsler pour enfants. Les questions et le langage de
l'Échelle doivent être sensibles à la langue et les connaissances normale
d'enfants québécois, américains, ou français.

C'est dans le but d'assurer que la nouvelle échelle remplisse véritablement
cette fonction que je fais appel à votre coopération.

Pour assurer que l'Échelle remplisse bien sa fonction de mesure, je vais voir
une population d'environ 220 étudiant(e)s âgé(e)s de 6 à 16 ans. Chaque
enfant sera vu pour une période d'environ 60 à 75 minutes. Chaque enfant
sera vu à son école pendant les heures de classe. Il aura à compléter douze
tâches dont certaines ressemblent beaucoup à des tâches scolaires - des
questions de mathématiques, de vocabulaire, d'informations géographiques
et historiques. D'autres tâches ressemblent plutôt à des jeux - des casse-

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tête, des reproductions de patrons avec blocs. Puisque l'Échelle n'est qu'en stage de développement, le travail complété par votre enfant <u>ne produira pas</u> un score final, par exemple I3 Q.I tel que le fait le WISC-R américain. Quoique le possibilité d'obtenir ce genre de renseignement soit le but à long terme de ce test, il ne fera pas partie de cette recherche. L'accent sera exclusivement sur l'instrument lui-même, et son efficacité.

La recherche proposée ne comprend pas une évaluation de votre enfant, mais plutôt une évaluation du matériel qui a été préparé. Il est essentiel pour moi d'obtenir votre consentement avant de pouvoir travailler avec votre enfant. Si vous permettez sa participation, je vous demande d'indiquer votre permission en signant le formulaire ci-attaché. Les résultats du travail de votre enfant seront <u>absolument confidentiels et ne seront pas communiqués à l'école</u>. Ils ne feront pas partie d'une évaluation de son rendement scolaire et donc d'un document tel que le bulletin. Les résultats ne seront utilisés qu'à l'intérieur de la thèse, sans une identification individuel(le) de l'élève. Si vous en sentez le besoin, il me fera plaisir de vous rencontrer, pour expliquer plus en détails la tâche que votre enfant aura à compléter, et l'utilisation des résultats de ce travail. Je répète que la recherche proposée est une évaluation de l'instrument de mesure, et non une évaluation de votre enfant.

Si vous me permettez de travailler avec votre enfant, veuillez signer le formulaire de consentement à la page suivante, et compléter le bref questionnaire ci-attaché. Les renseignements qu'il contient sont strictement confidentiels, et seront détruits dès que la recherche sera terminée. Ils ne serviront qu'à assurer que tous aspects de la francophonie de l'Ontario soient bien représentés à l'intérieur du groupe des 220 élèves.

Je vous remercie de l'appui que vous voulez bien m'accorder pour créer cet instrument de mesure.

Suzanne Regimbal
North Bay
472-9436

Parent Questionnaire

<u>**QUESTIONNAIRE A L'INTENTION DU(DES) PARENT(S)**</u>

PERE: NOM: _____

PLUS HAUT NIVEAU SCOLAIRE ATTEINT: _____

PROVINCE (PAYS) D'ORIGINE: _____

LANGUE(S) PARLEE(S): _____

LANGUE UTILISEE LE PLUS FREQUEMMENT: _____

PROFESSION: _____

MERE: NOM: _____

PLUS HAUT NIVEAU SCOLAIRE ATTEINT: _____

PROVINCE (PAYS) D'ORIGINE: _____

LANGUE(S) PARLEE(S): _____

LANGUE UTILISEE LE PLUS FREQUEMMENT: _____

PROFESSION: _____

ENFANT:

NOM: _____ GARCON: ____ FILLE: ____
(Veuillez cocher une réponse)

AGE: _____

DATE DE NAISSANCE: _____

EST NE(E) EN ONTARIO: OUI ____ NON ____

Si NON. depuis combien d'années vit-t-il(elle) en Ontario: ____

NIVEAU SCOLAIRE: _____

A ECHOUE UNE ANNEE SCOLAIRE: OUI ____ NON ____

Si OUI. combien de fois: _____ fois

A SAUTE UNE ANNEE SCOLAIRE: OUI ____ NON ____

Si OUI. combien de fois: _____ fois

ENFANT (suite)

LANGUE(S) PARLEE(S) PAR L'ENFANT
(S'il y a lieu, indiquer plus d'un choix)

français: _____

anglais : _____

autre(s): _____

Si "autre", veuillez spécifier: _____

FAMILLE:

LES DEUX PARENTS HABITENT-ILS AU FOYER?   OUI ____   NON ____

Si NON, avec quel parent l'enfant habite-t-il(elle)?
PERE _____   MERE _____

QUELLE EST LA LANGUE PRINCIPALE UTILISEE ENTRE PARENTS?
(si applicable)
FRANCAIS ____   ANGLAIS ____   AUTRE ____

QUELLE EST LA LANGUE PRINCIPALE UTILISEE ENTRE ENFANTS?
(si applicable)
FRANCAIS ____   ANGLAIS ____   AUTRE ____

QUELLE EST LA LANGUE PRINCIPALE UTILISEE ENTRE PARENT(S)
ET ENFANT(S)?
FRANCAIS ____   ANGLAIS ____   AUTRE ____

Consent Form

Nous soussignés. consentons à ce que notre enfant _____
(nom de l'enfant)
participe au projet de recherche entrepris par Suzanne Regimbal. Nous

comprenons que les résultats obtenus ne serviront qu'à déterminer la

valeur et l'utilité de l'instrument "Échelle d'intelligence de Wechsler

pour enfants". Les résultats ne serviront pas à définir un niveau de

fonctionnement chez mon enfant et ne seront pas communiqués au personnel

enseignant ou à la direction de l'école. Tout matériel recueilli dans

l'évaluation et dans le questionnaire à l'intention des parents sera

STRICTEMENT CONFIDENTIEL et sera détruit suite à la recherche. Aucun

résultat ne sera reproduit dans le rapport de recherche de façon à

permettre une identification de mon enfant ou de ma famille.

_____
Signature du(des) parent(s) ou tuteur(s)

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