THE RCMP
A READING COMPREHENSION MEDIATION
PROCESSES TEST: CONSTRUCTION AND VALIDITY

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While a vast amount of research has been conducted in the area of reading comprehension, there appears to be an unexplained gap between the theories dealing with reading as a linguistic process, stressing morphophonological requirements and the metacognitive and/or schema theories, concerned with the manipulation of complex organizational structure. The question then may be; what are the processes by which linguistically accessed materials move to schematic organizations? The Reading Comprehension Mediating Processes Test (RCMP) endeavors to measure the separate basic mental processes which are used in reading comprehension, rather than the reading process as a totality. By exploring directly strengths and weaknesses in these underlying mediating processes we are able to assess the processing skill levels of the reader which may cause poor overall comprehension. This assessment of processing skill levels may in fact fill the above described gap.

In designing the RCMP two basic assumptions were made. The first assumption being that the reading comprehension process is not a "magical" process. That is, nothing occurs in this process that cannot be explained. Secondly, while the processes applied in the comprehension of continuous text are greater in number, more varied in order, and produce a more complex result than are the processes involved in the comprehension of a single word, they are the same. All of the processes evaluated by the RCMP are therefore ascertainable by the examination of responses to words.

The criteria for selection of the word processes to be examined are as follows:

1. The process must have been experimentally demonstrated by more than one investigator. Thus, a sound empirical base for each process is established.
2. The process must vary systematically within the population. That is, if there is a process which everyone does equally well, it will not afford any differentiation between individuals on the basis of their reading comprehension or on the basis of any other criterion variable.
3. The measurement of the process must be reliable.
4. Performance of the individual on each of the process variables should relate in some degree to conventional measures of reading comprehension such as reading selection-question measures or cloze procedure methods.

5. The process should be such that performance would be modifiable by an appropriate procedure. This, of course, is not essential in that there may be some processes which we would find related to reading which in fact are not modifiable by teaching procedures or by other means available at the present point. These processes would serve a descriptive function only.

This leads us to a somewhat alternate definition of reading comprehension from the one which is normally used. In our terms, reading comprehension is the result of the application of a number or series of mental operations or processes which are performed thorugh the lexical access of a word stimulus or a string of words which result in the ability to repeat and to relate this information to materials already in memory. In effect, these are processes which may be involved in converting inner speech to meaning.

Categories of Reading Comprehension Processes

Examination of the literature relating to word processing seems to indicate four general cognitive processing functions or areas for investigation.

The first of these processes is imagry or the ability to generate a picture of mental image of the word or of ideas. The word or the meaning of the word is stored in the mind as a picture and a retrieval system would involve recoding the picture into a set of verbal signals. There is considerable interest in imagry as a reading process at present, although experimental results have been varied.

The second process which appears to be common is free association for the connection between items in memory. Exactly how this process occurs is not yet known, however, several hypotheses have been made. These hypotheses have involved the examination of: similarities between stimuli in terms of meaning, the occurrence of two stimuli in time and space (continuity), and paired associate learning. Free association is also affected by conditions of the individual such as anxiety, various neurotic and psychotic states, and other sources of individual variance.

The third method by which an individual may process words is on the basis of connotative meaning or the emotion ascribed to the meaning of the word. Such things as whether the word is positive or negative, strong or weak, and/or the affect generated by the sound of the word itself fall into this particular category.

The fourth area is what might be termed a word descriptor category, wherein individuals will vary in their sensitivity to the frequency or familarity of the word or will vary in their sensitivity to the number of meanings or multiordinality of the word.

These categorizations allowed us to develop 11 exploratory variables, which was reduced to nine subsequent to the initial trail of the total test. Tests for each of these eleven variables were constructed separately over a 5 year period and the resultant tests were combined into the present form of the RCMP.

The general procedure was the same for each text except free association. An initial form of about 250 items was prepared and administered to 35-50 graduate students. Items with high discrimination indices (i.e., greater than .5) moderate difficulty indices between .3 and .7 and relatively high item to total correlation (greater than .3) were selected and a se-

cond form, which varied between 80 and 127 items was developed.

This second form was administered to another group of 35-50 graduate students and using the above criteria a third form of 40 items (80 items in the imagry test) was developed selecting the best items from the second form.

The third form was then administered to another population of 35-50 graduate students and internal consistency reliabilities were developed.

The following are definitions of the eleven tests included in the initial RCMP.

Test 1: *Imagry:* Given single word stimuli the testee will be able to determine if this word commonly produces images for most people (reliability = .98).

Test 2: *Imagry Discrimination:* Given two word stimuli the testee will be able to designate the word which produces the strongest image (reliability = .92).

Test 3: *Multiordinality:* Given a two word stimulus the testee will be able to designate the word with the greatest number of meanings (reliability = .92).

Test 4A. *Word Association:* Given a one word stimulus for one minute the testee will be able to produce from long term store a number of related words (reliability = .92).

Test 4B: *Emotional Ratio:* Given a negative emotional word stimulus for one minute the testee will produce from long term store approximately 70-80 percent of the words producing a neutral word association (reliability = .96).

Test 5: *Connotative Meaning (Strong/Weak):* Given a two word stimulus the testee will be able to designate the word with the greatest emotional strength (reliability = .87).

Test 6: *Connotative Meaning (Active/Passive):* Given a two word stimulus the testee will be able to designate the word with the most active connotative meaning (reliability = .91).

Test 7: *Sonic Affect:* Given 2 CVC stimuli the testee will be able to designate the CVC which has the most positive sound (reliability = .92).

Test 8: *Connotative Mediation:* Given a two word adjective—noun stimulus the testee will be able to judge accurately on a five point scale the relative positiveness or negativeness of the combination of stimuli (reliability = .93).

Test 9: *Concept Synthesis:* Given the four words most commonly associated with a word stimulus, the testee will be able to give the initial stimulus word (reliability = .94).

*Test 10: *Connotative Meaning (Positive/Negative):* Given two stimulus words the testee will be able to designate the word with the most positive connotative meaning (reliability = .84).

*Test 11: *Word Familiarity:* Given two stimulus words the testee will be able to designate the word with the greatest frequency of occurence (reliability = .84).

*Note test 10 and 11 have been removed from the present form in an attempt to decrease the test length, they are used in the

inital validity study reported here.

As it is constructed any subtest of the RCMP may be aministered separately and in any order. Since the test assumes functional lexical access, it is designated for grade 4 pupils and above. Although some of the tests function at grade 3.

The assumption of lexical access as a precondition also allows the test to be administered orally. With the caution that the administrator produce the stimuli in a flat even voice to prevent cueing answers by inflection or intonation.

RCMP Validity Study

The following study compares results of the RCMP with the comprehensive test of basic skills for an elementary school population.

Sample: The present preliminary validity study uses the total population of grades 3 (N = 41) and grades 5 (N = 51) in a school located in a small city in Connecticut. The students were administered the Comprehensive Test of Basic Skills (CTBS) in October and the RCMP in February.

Results: Table 1 presents the means, standard deviations and reliabilities for the total sample computed with Kuder-Richardson Formula-21. In general, these reliabilities are relatively satisfactory for individual prediction and are similar to the reliabilities obtained during test construction with graduate student populations.

TABEL 1. MEANS & STANDARD DEVIATIONS & RELIABILITIES OF RCMP

Subtests for Grades 3 and 5 (N = 92)

	X	S.D.	KR-21 Reliability
Positive/Negative	32.52	5.08	.97
Strong/Weak	28.12	5.09	.89
Active/Passive	30.03	5.08	.64
Sonic Affect	16.78	5.08	.65
Image 1	28.41	7.11	.86
Image 2	26.47	5.30	.86
Familarity	26.43	7.00	.84
Multi Ordinality	24.61	5.54	.84
Imagry Discrimination	30.77	8.71	.93
Connotative Mediation	15.50	8.72	.89
Association Mean	5.40	3.20	.94
Imagry Total	54.88	11.64	.90
Concept Synthesis	14.65	12.19	.96

Table 2 presents the correlations of the RCMP variables with the CTBS criterion variables and with age. In general, correlations of the RCMP variables with age, language IQ, nonlanguage IQ and language mechanics are lower than the correlations of RCMP variables with vocabulary reading, language expression and language total as would be predicted from the basic design of the RCMP to reflect mediating processes in language comprehension.

TABEL 2. RCMP - PRELIMINARY VALIDITY STUDY, CORRELATIONS OF RCMP WITH CTBS CRITERION VARIABLE (N = 92*).

NAME	AGE	Language I.Q.	Non-Language I.Q.	Vocabulary	Read Comp	Lang. Total	Lang. Mech.	Express	Lang. Spell	Total
Positive/Negative	-.22	.48	.35	.30	.32	.32	.25	.26	.21	.26
Strong/Weak	.15	.23	.26	.32	.37	.38	.23	.32	.27	.32
Active/Passive	.17	.41	.39	.63	.59	.63	.44	.62	.47	.57
Sonic Affect	-.18	-.18	-.31	-.32	-.26	-.29	-.33	-.34	-.28	-.32
Imagry Total	.41	-.00	.15	.41	.38	.41	.19.	.40	.34	.38
Familarity	.11	.12	.16	.29.	.15	.23	.24	.27	.16	.25
Multi Ordinality	.06	.13	.30	.24	.27	.26	.40	.25	.18	.27
Imagry Disc.	.15.	.36	.22	.42	.45	.46	.30	.22	.37	.42
Association	.29	.29	.20	.42	.38	.41	.05	.42	.39	.33
Emot. Anger	.08	-.06	.05	-.15	-.10	-.12	-.18	-.13	-.27	-.24
Consynth	.42	.43	.34	.70	.72	.73	.49	.74	.58	.70

r.05 = .159

r.01 = .208

This position is confirmed by the use of multiple regression to predict CTBS scores. The RCMP variables produced multiple R's of .80, .81 and .83 for reading comprehension, vocabulary and total reading, respectively accounting for 64, 65 and 69 percent of the variance. Similarly, the multiple R's for two other criterion measures, language expression and total language, were .84 and .83 respectively. The CMP accounted for 70 and 68 percent of the respective variance. It is clear that mediating processing variables can account for a large portion of the variance in reading and language measures.

By the same token we would expect that spelling and language mechanics would be somewhat less influenced by comprehension processing variable in that these tests are considerably less influenced by comprehension. This expectation is confirmed by Mult R's of .73 for spelling and for language mechanics accounting for 53% of the variance. More than 20 percent less than for the comprehension related test scores.

There has been some concern as to whether IQ and reading comprehension are the same. If IQ and reading comprehension are different, one would expect lower relationships between RCMP and IQ variables than with reading comprehension and language variables. Further non-language IQ should be less related than language IQ to RCMP variables. These expectations are also confirmed with Multiple R's of .69 and .64 for language and nonlanguage IQ scores with the RCMP. The RCMP accounts for some 27% more variance in reading comprehension than does intelligence.

There was a general pattern to the regression equations for language and reading comprehension related variables that was different from the pattern for IQ. With all the language comprehension dependent variables, concept synthesis entered the equation first and acounted for approximately 50% of the variance. One of the connotative meaning variables entered second accounting for 8-10% of the variance, the third variable was generally one of the imagry variables accounting for 2 to 4% of the remaining variance.

This pattern for the IQ dependent measures was somewhat different. For language IQ, a connotative meaning variable accounted for about 23% of the variance and concept synthesis entered second with about 10% of the variance and three imagry scores accounted for most of the remaining variances.

The equation for non-language IQ shows three connotative meaning variables entering first and concept synthesis entered last.

Conclusion

Results of this present preliminary study are very encouraging. It appears that these measurements of the mediating cognitive processing variables are able to explain a good portion of the variance in reading comprehension and may allow us to investigate further the reading process by being able to examine its component processes. With further study and analysis, it appears feasible to construct a functional model of reading comprehension which would explain the "Black Box" of reading comprehension as well as provide a tool for diagnosis and a guide to treatment of reading difficulties.

Preliminary results of other studies with the RCMP are equally encouraging. The test is able to discriminate students in remedial services from pupils in regular classes with 84% accuracy, and to discriminate good readers from poor readers with 81% accuracy. Multiple regression with the Iowa test of Basic Skills, and the Gates McGinitie are at the same level as those in the present study and hierarchieal analysis indicates that the RCMP accounts for 37% additional variance over the variables: letter knowledge, phonics knowledge, blending, visual short term memory, and seriation.

In summary, the RCMP appears to have considerable potential as a theoretical research tool as well as application to the practice of diagnosing and teaching reading.