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AUTHOR Lowry, Dennis T.; Marr, Theodore J.
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ABSTRACT

Clozentropy procedure is a method whereby researchers pretest messages to determine their levels of comprehensibility among given audience members. It is often used to measure the English language proficiency of foreign students. The procedure utilizes a passage of prose from which words are deleted on either a random or systematic basis and replaced with blanks. Subjects fill in the blanks with what they feel are the words the author used, and their responses are compared with those agreed upon by a standard criterion. In one experiment the subjects were Filipinos with both low-level and high-level education and both low and high degrees of familiarity with the subject of the message. The content variables were difficulty level and idiosyncrasy level. Results indicated that the level of education accounted for more variance in comprehension than did the idiosyncrasy level. Results of the study support the premise that the clozentropy procedure is a valid and sensitive method of measuring communication comprehension. (RN)

A TWO-CULTURE VALIDATION STUDY OF CLOZENTROPY AS A MEASURE OF INTERCULTURAL COMMUNICATION COMPREHENSION

by

Dennis T. Lowry
School of Journalism
Southern Illinois University
Carbondale, IL 62901

and

Theodore J. Marr*
Department of Speech Communication
University of Virginia
Charlottesville, VA 22903

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*Presently on leave to: Department of Journalism, New Asia College, Chinese University of Hong Kong, Shatin, N.T., Hong Kong. The authors are grateful to Far East Broadcasting Company, Manila, Philippines, and in particular to Priscilla R. Calica, for invaluable assistance in collecting the Philippine data. The views expressed herein are those of the authors and not necessarily those of FEBC.

ABSTRACT

"A Two-Culture Validation Study of Clozentropy as a Measure of Intercultural Communication Comprehension"

by

Dennis T. Lowry and Theodore J. Marr

The present study was designed to test the validity of Darnell's clozentropy procedure as a measure of communication comprehension in general and intercultural communication comprehension in particular. The study investigated two major subject (audience) variables and two major content variables. The two subject variables were education level and prior familiarity level with the specialized (idiosyncratic) content with which the subjects were presented. The two content variables were difficulty level and idiosyncrasy level.

Four 500-word passages were purposively selected because of the known characteristics they contained. Likewise, four groups of Filipino Ss with known group characteristics were recruited. The criterion group consisted of American Ss with known group characteristics.

Ten a priori hypotheses concerning intercultural communication comprehension were tested using multiple linear regression. All ten hypotheses were supported by the data---at p value levels ranging from .0000008 to .0000001.

The results of the study strongly supported the position that the clozentropy procedure is both a sensitive and a valid measure of communication comprehension.

It is axiomatic that for an individual to be able to communicate his intended meaning to a second individual there must be some degree of similarity in the way the two individuals use and understand signs. In the case of verbal communication, there must be some degree of similarity in the way the two individuals use a given verbal system of signs.

For example, a letter written in Mandarin Chinese will communicate zero intended meaning to an English-speaking American who has never before even seen written Mandarin. An English-speaking American who has taken a one-year course in Mandarin might be able to understand a good portion of the intended meaning in the letter. An English-speaking American who also happens to be fluent in Mandarin would probably understand the vast majority of the intended meaning.

Thus, communication comprehension is related to (among other things) the degree of similarity in the way individuals use and understand a given language. If there is no similarity there will be no comprehension. If there is a great deal of similarity there may be a high level of comprehension.

The Mandarin/English example is an extreme case. However, the position taken in this paper is that the same principle applies on a reduced scale to the way different cultural groups or sub-groups (e.g., Americans and English-speaking Filipinos) use the same language (e.g., English). Furthermore, this paper investigates the relationships between a specialized form of English (containing religious jargon), prior familiarity with this specialized form, and communication comprehension.

Clozentropy Theory and Method

The term "clozentropy" was coined by Darnell[1] to indicate a merging of Taylor's[2] cloze procedure and an entropy measure derived from Shannon and Weaver's[3] information theory. Darnell's goal in developing clozentropy was to build an improved test to measure the English language proficiency of foreign students. Some of his assumptions were:

1. The primary function of language is communication.
2. This function is best served within any group by compliance with the group norms of language usage.
3. A measure of proficiency in language should index one's ability to conform to existing group norms of language rather than to some prescriptive model or idealized language pattern.
4. If language norms vary from group to group, the best measure of proficiency for an individual is in terms of the group or groups with whom he needs to communicate.[4]

As developed by Taylor, the basic cloze procedure consists of

deleting words on either a random or a systematic basis from the test passage of prose. The deleted words are replaced with underlined blanks of identical size. Administration of a cloze test of this kind is easy. Subjects are simply given the passage and asked to fill in the word they think best fits the writer's original statement. A subject's score is the total "correct" words he fills in the blanks---i.e., those that are identical to the author's original word choices. As Taylor states, the cloze procedure "assumes that (a) the more readable a piece of writing is, the better understood it will be even if some words are left out, and (b) the better the writing is understood, the more likely it is that a reader can guess what words are missing."[5] Readability and comprehensibility are assumed to be synonymous. The scores produced may be summed across passages and/or across subjects, depending on the type of design used.

The scoring procedure used in Darnell's clozentropy procedure is different than used in Taylor's cloze procedure---and more complicated. Instead of comparing a subject's response against the writer of the passage, and scoring it "correct" or "incorrect", each subject's response to a given blank is compared against all of the responses placed in the same blank by the members of some criterion group of interest who have taken the same test. Thus, a subject's response is "correct" to the degree that members of the criterion group agree that it is. This follows from the pragmatic view that "good" language usage is whatever a defined group agrees it should be---and whatever is functional for group communication. In a word: "Good" language usage is relative to group consensus.

Darnell explains the clozentropy scoring procedure as follows: Considering the array of responses from some specific group of Ss to a particular cloze item, determine the number of different responses and the relative frequency of each one. Taking the relative frequency as an estimate of the probability of each different response, calculate the "average surprise value" of responses to that item ($H = -\Sigma p_i \log_2 p_i$). This value may be called the entropy of the blank; it is a measure of the freedom of choice available to respondents. Next, calculate the "surprise value" or "information value" of each of the different responses ($I = \log_2 1/p$). Obtain the difference (D) between the I value for each response and the H value for each blank ($H - I = D$). Repeat this procedure for each item and sum the D scores for each S across all items in the test. The total D score is an indication of the extent to which the individual tends to give responses that are unusual in the context of the group's responses . . . ."[6]

The present study uses Reilly's[7] simplified scoring procedure:

Step 1. Compute for each blank the frequency, n_{ij}, of individuals in the criterion group choosing each response and record $\log_{10} n_{ij}$, which will be the scoring weight for that response.

Step 2. For each examinee in the new sample compute

$$T_k = \sum_{j=1}^{m} \log_{10} n_{ijk}$$

where the $\log_{10} n_{ijk}$ are weights associated with each response, obtained in Step 1. A zero weight is given to new responses since $\log_{10} 1 = 0$.[8]

Reilly's T score, while computationally simpler, is perfectly correlated with Darnell's D score and has the same reliability, validity, and correlation with other variables.

As mentioned above, Darnell's goal in developing clozentropy was to build an improved test for measuring the English language proficiency of foreign students. However, he did not point out in his original article that the same methodology and scoring procedures have exceedingly important implications for a different but related area of communication research. The same clozentropy procedures which can be used to measure the English language proficiency of foreign students coming to this country can also be used to measure (a) the comprehension level of any defined audience in country X and also (b) the comprehensibility level of any defined verbal communication Y for the defined audience in question. Furthermore, it will permit a researcher to test the relative effectiveness of several communications (Y_1,Y_2,Y_3, etc.) to find the optimum comprehensibility level for his defined audience in country X.

The implications of being able to do this are obvious: A communicator now has a new tool at his disposal to help him measure the comprehensibility (difficulty) level of his messages---not in a general sense, but relative to the specific audience to which he is interested in communicating---and then to modify his messages as needed to attempt to match the comprehension level of his audience.

If the government of Mexico, for example, wanted to inform its

people about a new government public health program, one of the things it might do would be to prepare an information booklet for free public distribution. For purposes of this paper, there are two major ways in which the booklet could be "off target" and therefore ineffective. It could be written at too high a level of difficulty and/or it could contain a specialized form of jargon unfamiliar to the audience (e.g., medical jargon or "bureaucratese"). The present writers believe that clozentropy research might fruitfully be used in this and numerous related situations to pretest messages on a sample of the population before disseminating them to the entire population.

In recommending this course of action, the writers begin with the following four assumptions (which are somewhat parallel to Darnell's assumptions presented above):

1. The basic objective of most communicators most of the time is to maximize the amount of intended meaning that is successfully communicated to their audiences. (There are times, of course, when this is not the case---e.g., in some political rhetoric.)
2. This basic objective is best achieved when a communicator constructs his message at a level of difficulty which is at or below the mean comprehension level of his defined audience.
3. Regardless of difficulty level, this basic objective is likewise best achieved when a communicator chooses a form or type of communication content which is familiar to his audience.
4. Since comprehension levels and content familiarity vary from group to group, a communicator must (a) measure the compre-

hension level of his defined audience, (b) measure the present content familiarity of his audience, and then (c) construct his message(s) accordingly.

From the foregoing introduction to this relatively new communication research tool, clozentropy, and from the examples given, it can be seen that clozentropy holds great potential in a number of areas dealing with communication comprehension. However, like all new research tools, clozentropy must undergo a period of rigorous validity and reliability testing before it can be widely accepted by the research community. Very little clozentropy validation research has been published to date. In addition to Darnell's original article, the present authors are aware of only one other published study investigating the validity of clozentropy.

Connally and Knabe[9] compared the responses of Catholic priests (the criterion group) against the responses of a group of laymen on two types of content---sermon material and social-ecological material. As hypothesized, there was a significant difference in the way the priests and laymen responded to the sermon material. However, the study is complicated by the finding that the priests and laymen also responded significantly differently to the social-ecological material ---where no difference was expected. Unfortunately, it is impossible to tell from the published article if this unexpected finding is due to the heterogenous nature of the group of laymen (drawn from university students, the staffs of two hospitals, one Roman Catholic parish, and a Lutheran adult education class), whether the difference is due to a possible overall difference in education levels between the criterion

group and the test group, or whether it is due to still other variables.

The present study, which began in the spring of 1971, is a clozentropy instrument validation study which attempts to (1) provide a much more controlled and rigorous test of the clozentropy procedure than did the Connally and Knabe study, and also (2) serve as a demonstration study of how the procedure might be used in "applied" field settings.

Variables and Hypotheses Used

This study investigates two major subject (audience) variables and two major content variables. The two subject variables are education level and prior familiarity level with the specialized (idiosyncratic) content with which the subjects were presented. The two content variables are difficulty level and idiosyncrasy level. Exactly how these variables were operationalized will be explained below.

Since the subjects were drawn from known groups, and since the communication content presented them had known characteristics, the researchers were in a position to hypothesize what the comprehension levels "should" be if indeed the clozentropy procedure is as valid as it is claimed to be.

Hypothesis 1: Comprehension for the Hi Education Ss should be significantly higher than comprehension for the Lo Education Ss. Reason: The higher an individual's education level, the higher his message decoding and processing skills are likely to be. If the clozentropy procedure is valid, this difference in education levels of the Ss should be reflected in the comprehension scores.

Hypothesis 2: Comprehension for the Hi Prior Familiarity Ss should be significantly higher than comprehension for the Lo Prior Familiarity Ss. Reason: People generally perform better when they are familiar with a task than when they are unfamiliar. If the clozentropy procedure is valid, this difference in prior familiarity levels of the Ss should be reflected in the comprehension scores.

Hypothesis 3: Comprehension on the Lo Difficulty passages should be significantly higher than comprehension on the Hi Difficulty passages. Reason: Understanding a Lo Difficulty passage is, by definition, an easier task than understanding a Hi Difficulty passage. If the clozentropy procedure is valid, this difference in difficulty levels of the passages should be reflected in the comprehension scores.

Hypothesis 4: Comprehension on the Lo Idiosyncrasy passages should be significantly higher than on the Hi Idiosyncrasy passages. Reason: Lo Idiosyncrasy passages are, by definition, more similar to general everyday language usage, and are thus more familiar to the Ss. If content familiarity is important to comprehension, and if the clozentropy procedure is valid, this difference in idiosyncrasy levels of the passages should be reflected in the comprehension scores.

Hypothesis 5: The multiplicative effect of Education Level X Prior Familiarity Level should be positively and significantly related to comprehension. Reason: Comprehension itself is theorized by the writers to be a complex phenomenon equal to more than the sum of its parts. Since Education Level and Prior Familiarity Level are considered to be two of the most important intra-subject variables relating to comprehension, they should produce an interaction effect greater than

the sum of their separate effects. If this is so, and if the cloz-entropy procedure is valid, this interaction should be reflected in the comprehension scores.

Hypothesis 6: The multiplicative effect of Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension scores.[10] Reason: Same as for hypothesis 5.

Hypothesis 7: The multiplicative effect of Education Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension scores. Reason: Same as for hypothesis 5, except this is a three-way interaction.

Hypothesis 8: The multiplicative effect of Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension scores. Reason: Same as for hypothesis 5, except this is a three-way interaction.

Hypothesis 9: The multiplicative effect of Education Level X Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension scores. Reason: Same as for hypothesis 5, except this is a four-way interaction.

Hypothesis 10: The multiplicative effect of Education Level X Difficulty Level X Idiosyncrasy Level is significantly greater than the multiplicative effect of Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level. Reason: Education Level is theorized as being fundamentally more important (when interacting with Difficulty Level and Idiosyncrasy Level) to comprehension than is Prior Familiarity Level (when also interacting with Difficulty Level and Idiosyncrasy Level), because as a person's education level increases he is more likely to

be able to master the idiosyncrasy problem in addition to the difficulty problem. However, on the contrary, as his prior familiarity level increases he is not as likely to master both the difficulty problem and the idiosyncrasy problem.

METHOD

Four 500-word passages were purposively selected because of the known characteristics the passages contained. A one-page example of each of these passages is reproduced as Appendices A through D.

Passage 1: Lo Difficulty/Lo Idiosyncrasy---a children's story taken from a fourth grade Filipino reader. Flesch reading ease score: 94.1 ("very easy").

Passage 2: Lo Difficulty/Hi Idiosyncrasy---taken from the New Life Testament, a version of the New Testament written for new literates and using a vocabulary of about 800 words. Flesch reading ease score: 94.0 ("very easy").

Passage 3: Hi Difficulty/Lo Idiosyncrasy---taken from Semantics and Communication, a college level monograph. Flesch reading ease score: 58.8 ("fairly difficult").

Passage 4: Hi Difficulty/Hi Idiosyncrasy---taken from the King James Bible. Flesch reading ease score: 59.6 ("fairly difficult").

The passages were typed triple-spaced with every 10th word deleted and replaced with a standard-size underlined blank. Thus, for each passage there were 50 blanks. The passages were reproduced and assembled into test booklets in a random order to eliminate any possible order effects.

Likewise, four groups of Ss with known group characteristics were

selected.

Group 1: Lo Education/Lo Prior Familiarity---students from Manuel Roxas High School, a public high school in Manila; students who were not known to the test administrator and the school guidance counselor to be active in any evangelical Protestant student groups and/or churches. Mean age: 15.9. Mean years of education: 9.0. (N = 23)

Group 2: Lo Education/Hi Prior Familiarity---students from Manuel Roxas High School who were personally known to the test administrator and the school guidance counselor to be active in evangelical Protestant student groups and/or churches. Mean age: 14.2. Mean years of education: 7.9. (N = 25)

Group 3: Hi Education/Lo Prior Familiarity---students from the University of the Philippines who were not known to the test administrator to be active in any evangelical Protestant student groups and/or churches. Mean age: 21.0. Mean years of education: 14.0. (N = 24)

Group 4: Hi Education/Hi Prior Familiarity---students from the University of the Philippines who were members of Inter-Varsity Christian Fellowship, an evangelical Protestant student group. Mean age: 20.4. Mean years of education: 14.0. (N = 24)

The criterion group (N = 40), against which the responses of the Filipino Ss were compared, was defined as Hi Education/Hi Prior Familiarity/American. All criterion group members had at least four years of college, and all had been active in evangelical Protestant churches for at least a year.

Members of the criterion group and the test Ss were permitted a maximum of 15 minutes to fill in the 50 blanks in each passage. Most members of the criterion group did not need the full 15 minutes, while some members of the Lo Education test groups were not able to insert even guesses in all 50 blanks in 15 minutes. It was the judgment of the test administrator and the researchers that they would not have been able to finish even if the time had been doubled. Therefore, the 15-minute time limit was adhered to for the sake of test administration efficiency, and because their not being able to finish does provide some information about their comprehension level.

Test Ss were paid 3 pesos for their time and to insure a high level of motivation. This amount was equivalent to about 46 cents (US), but was worth considerably more than this in terms of buying power, and therefore incentive, in the Philippines. Members of the criterion group were not paid. Test Ss took the tests either individually or in groups of varying size, depending upon whatever arrangements could be made.

Variant spellings of the same words were cleaned up to bring them into agreement (e.g., armour to armor). The justification for doing this is that two subjects obviously have the same meaning in mind, and have simply used two different spellings of the same word to express it. All data were punched for computer analysis. The clozentropy scoring was performed by an original computer program written in PL1 by Theodore J. Marr. This program provides both printed and punched output of the T scores for each subject on each passage. This punched output was then used as the data input in an hypothesis-testing multiple linear regression program to test the ten hypotheses stated above.

RESULTS

Figure 1 provides an overview of the results. As expected, the criterion group had the highest comprehension scores on all four passages. This top curve, then, serves as a ceiling for the four test groups. In other words, they have the potential of going as high as the ceiling, but cannot go higher. In the opposite direction, a zero comprehension score is possible.

As would be expected, the criterion group and the four test groups all had their highest comprehension on the Lo Difficulty/Lo Idiosyncrasy passage. Then, when they came to the Lo Difficulty/Hi Idiosyncrasy passage (which was equivalent to passage 1 in terms of Flesch score), the comprehension scores for all groups dropped. However, it is important to note that the drop was not as great for the three Hi Prior Familiarity groups as for the two Lo Prior Familiarity groups.

The same pattern is evident on the two Hi Difficulty passages as on the two Lo Difficulty passages, except that all of the comprehension scores are lower because the content is more difficult. In moving from passage 2 to passage 3, the two Hi Education curves and the two Lo Education curves converge somewhat. However, in moving from passage 3 to passage 4, the two Hi Education curves and the two Lo Education curves diverge sharply. In both instances they diverge because the Hi Prior Familiarity curves go up and the Lo Prior Familiarity curves go down.

As an indication of how important prior familiarity is to comprehension, it should be noted that on passage 4 the Lo Education/Hi Prior Familiarity group (with a mean age of 14.2 and a mean years of education

of 7.9) scored higher than the Hi Education/Lo Prior Familiarity group (which had a mean age of 21.0 and a mean years of education of 14.0).

Each of the variables represented in hypotheses 1 through 9 was tested in a linear regression model against the unit vector. The following full and restricted models were used:

Full Model: $Y_1 = a_0U + a_1X_1 + E_1$

Restricted Model: $Y_1 = a_0U + E_2$

Where: Y_1 = the criterion variable, comprehension

U = the unit vector

X_1 = the predictor variable being tested

E_1 and E_2 = the error terms for the two models

a_0 and a_1 = the least squares weighting coefficients calculated so as to minimize the sum of squared values in the error terms.

Results for Hypothesis 1: Comprehension for the Hi Education Ss should be significantly higher than comprehension for the Lo Education Ss. As Table 1 indicates, the education variable alone accounted for .14 of the variance in comprehension. The F ratio between the full and restricted models was 64.14, and the p value was highly significant at less than .0000001. Therefore, hypothesis 1 was supported by the data.

Results for Hypothesis 2: Comprehension for the Hi Prior Familiarity Ss should be significantly higher than comprehension for the Lo Prior Familiarity Ss. Prior Familiarity accounted for .08 of the variance in comprehension and produced an F ratio of 34.93 and a corresponding p value of less than .0000001 (See Table 2). Therefore, hypothesis 2 was supported by the data.

Results for Hypothesis 3: Comprehension on the Lo Difficulty

passages should be significantly higher than comprehension on the Hi Difficulty passages. The results in Table 3 show that difficulty level alone accounted for .35 of the variance in comprehension. The F ratio was 205.00 and the p value less than .0000001. Therefore, hypothesis 3 was supported by the data.

Results for Hypothesis 4: Comprehension on the Lo Idiosyncrasy passages should be significantly higher than on the Hi Idiosyncrasy passages. As reported in Table 4, idiosyncrasy accounted for .06 of the variance in comprehension. The F ratio for this variable was 23.77 and the corresponding p value was less than .0000008. Therefore, hypothesis 4 was supported by the data.

Results for Hypothesis 5: The multiplicative effect of Education Level X Prior Familiarity Level should be positively and significantly related to comprehension. Table 5 presents the results of this statistical test. Education X Prior Familiarity accounted for .23 of the variance in comprehension and produced an F ratio of 112.32. The corresponding p value was less than .0000001. Therefore, hypothesis 5 was supported by the data.

Results for Hypothesis 6: The multiplicative effect of Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension. The data in Table 6 indicate that Difficulty X Idiosyncrasy accounted for .41 of the variance in comprehension, an amount almost double that of Education X Prior Familiarity. The F ratio is 264.98 and the p value is less than .0000001. Therefore, hypothesis 6 was supported by the data.

Results for Hypothesis 7: The multiplicative effect of Education

Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension. Table 7 shows that this three-way interaction accounted for .26 of the variance in comprehension. The F ratio was 130.90 and the corresponding p value was less than .0000001. Therefore, hypothesis 7 was supported by the data.

Results for Hypothesis 8: The multiplicative effect of Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension. As Table 8 indicates, this three-way interaction accounted for .21 of the variance in comprehension and produced an F ratio of 98.85 with a corresponding p value of less than .0000001. Therefore, hypothesis 8 was supported by the data.

Results for Hypothesis 9: The multiplicative effect of Education Level X Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level should be positively and significantly related to comprehension. Table 9 contains the results of this four-way interaction and shows that .15 of the variance in comprehension was accounted for. The F ratio was 67.95 and the corresponding p value was less than .0000001. Therefore, hypothesis 9 was supported by the data.

Results for Hypothesis 10: The multiplicative effect of Education Level X Difficulty Level X Idiosyncrasy Level is significantly greater than the multiplicative effect of Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level. The thrust of this hypothesis is that the three-way interaction effect involving Education Level is greater than the three-way interaction effect involving Prior Familiarity Level. The following full and restricted linear regression models were used to test this hypothesis:

Full Model: $Y_1 = a_0U + a_1X_1 + a_2X_2 + E_1$

Restricted Model: $Y_1 = a_0U + a_2X_2 + E_2$

Where: Y_1 = the criterion variable, comprehension

U = the unit vector

X_1 = Education Level X Difficulty Level X Idiosyncrasy Level

X_2 = Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level

E_1 and E_2 = the error terms for the two models

a_0, a_1, and a_2 = the least squares weighting coefficients calculated so as to minimize the sum of squared values in the error terms.

Table 10 shows that the amount of variance accounted for by the full model was .33 and the amount of variance accounted for by the restricted model was .21. The F ratio was 67.71 and the corresponding p value was less than .0000001. Therefore, hypothesis 10 was supported by the data.

DISCUSSION AND CONCLUSIONS

The results of this study strongly support the position that the clozentropy procedure is both a sensitive and a valid measure of communication comprehension. The data supported all ten hypotheses---and all at highly significant p value levels. The "main effects" for Education Level, Prior Familiarity Level, Difficulty Level, and Idiosyncrasy Level were all significant.

Comparing the two intra-subject variables, it can be seen that Education Level accounted for more variance in comprehension than did Prior Familiarity Level. This is shown in the results to hypotheses 1, 2, and 10. When comparing the results of the two intra-content

variables, it can be seen that Difficulty Level accounted for more variance than did Idiosyncrasy Level. The single variable which accounted for the most variance when tested against the unit vector was Difficulty Level (R^2 = .35), and the interaction which accounted for the most variance when tested against the unit vector was Difficulty Level X Idiosyncrasy Level (R^2 = .41).

Some post hoc data analysis indicated that a single linear regression model with the four main predictor variables accounted for .64 of the variance in comprehension. (See Table 11.) Adding two two-way interaction variables to the model increased the R^2 to .74. Adding two three-way interaction variables to the model increased the R^2 to .76. Thus, it is possible to account for .76 of the variance in comprehension with a single linear regression model containing eight variables.

This study also provides some insight into the <u>complex interactive nature</u> of the intercultural communication comprehension process. As reported above, there were significant intra-subject interactions, intra-content interactions, and subject/content interactions. The implication of this is that since the process under investigation is so complex, future studies of intercultural communication comprehension will have to use theories, research methods, and data analysis techniques capable of coping with the complexities inherent in the process.

It should be pointed out that the ten hypotheses tested in this study in no way exhaust all of the possibly significant questions which might have been asked. In deciding which hypotheses to test the authors were guided, first, by a desire to study the validity of the clozentropy

procedure in an intercultural setting and, second, by a desire to test some possible explanations of the interactive processes underlying comprehension. It is hoped that other researchers in the future will retest the present hypotheses and go on to test additional or competing hypotheses.

The results of this study should be of great interest to communication practitioners who work in intercultural communication in applied settings. The clozentropy procedure does indeed appear to make it possible for the intercultural communicator to do a better job of matching his messages to his audience than he ever could before.

It goes almost without saying that the entire area of intercultural communication comprehension, and the clozentropy procedure in particular, deserve considerable research attention in the years ahead. First, there is a need to study variables other than Education Level, Prior Familiarity Level, Difficulty Level, and Idiosyncrasy Level. The present study has demonstrated that these four variables have a major influence on comprehension, but certainly there must be other important intra-subject and intra-content variables as well. Second, the cost/payoff efficiency of the clozentropy procedure must be compared with some of the older, but easier, measures of message difficulty, such as the Flesch formula and Dale-Chall formula. The clozentropy procedure may be more precise, but is the extra precision worth the extra cost? Third, researchers interested in intercultural communication can immediately see the need to test the clozentropy procedure in other cultures, in other non-English languages, and on other types of content.

FOOTNOTES

[1]Donald K. Darnell, "Clozentropy: A Procedure for Testing English Language Proficiency of Foreign Students," Speech Monographs, 37:36-46 (1970).

[2]Wilson L. Taylor, "'Cloze' Readability Scores as Indices of Individual Differences in Comprehension and Aptitude," Journal of Applied Psychology, 41:19-26 (1957).

[3]Claude E. Shannon and Warren Weaver, The Mathematical Theory of Communication (Urbana: University of Illinois Press, 1949).

[4]Darnell, op. cit., p. 36.

[5]Taylor, op. cit., p. 19.

[6]Darnell, op. cit., pp. 37-38.

[7]Richard R. Reilly, "A Note on 'Clozentropy: A Procedure for Testing English Language Proficiency of Foreign Students'," Speech Monographs, 38:350-353 (1971).

[8]Ibid., p. 351.

[9]Patrick R. Connolly and William E. Knabe, "Assessing Inter-group Differences in the Use of Langage: A Method and a Case Study," Central States Speech Journal, 14:43-47 (1973).

[10]Note: Difficulty Level and Idiosyncrasy Level were re-scored (Hi changed to Lo, Lo changed to Hi), so that this hypothesis and the following hypotheses could be stated in a positive form. This re-scoring in no way changes any of the statistical results of this study. It simply makes it easier to state the research hypotheses.

FIGURE 1

Mean Comprehension (T) Scores of the Criterion Group and Four Test Groups on Four Types of Communication Content

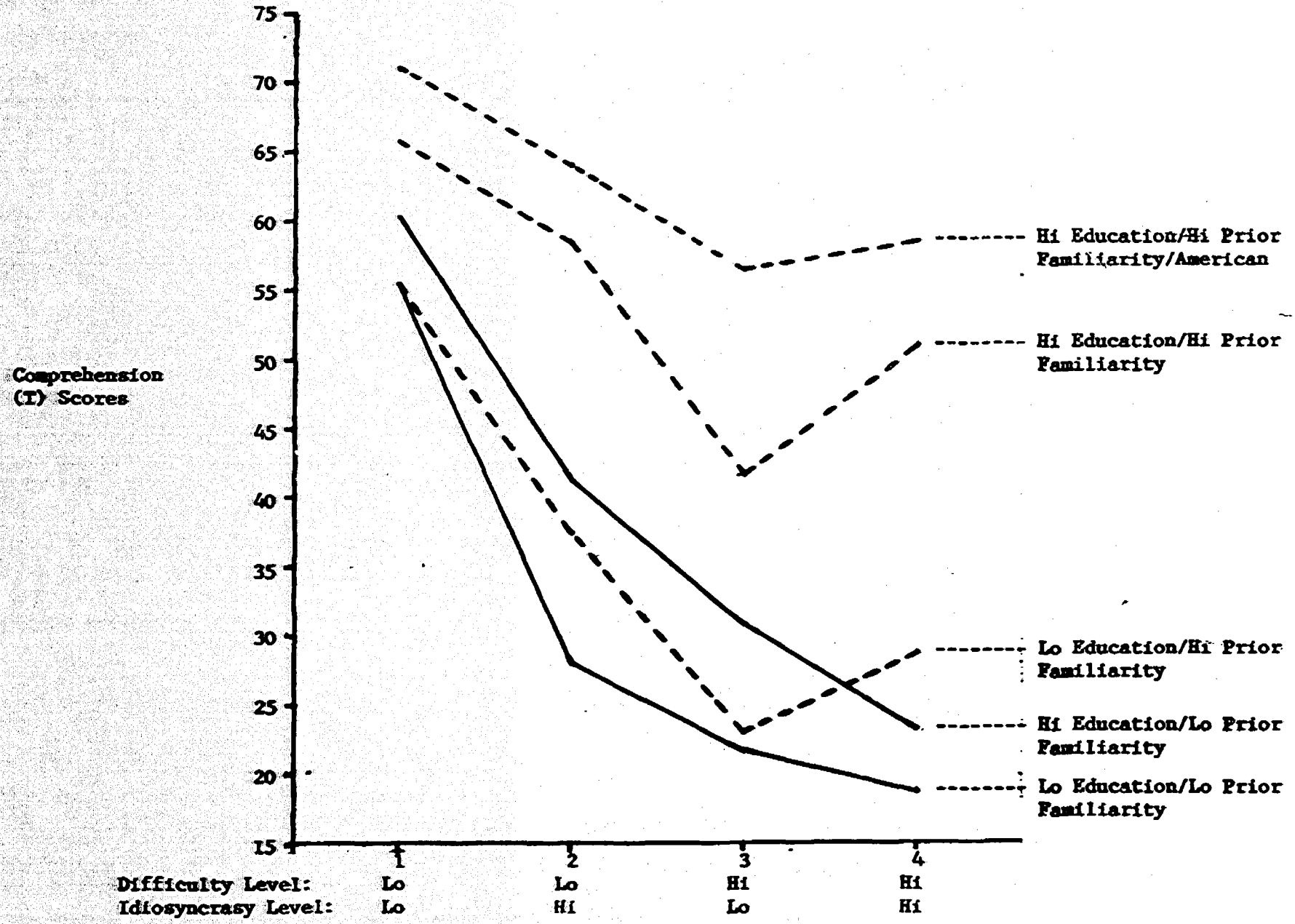


TABLE 1

Education Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.14	1, 382	64.14	.0000001

TABLE 2

Prior Familiarity Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.08	1, 382	34.93	.0000001

TABLE 3

Difficulty Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.35	1, 382	205.00	.0000001

TABLE 4

Idiosyncrasy Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.06	1, 382	23.77	.0000008

TABLE 5

Education Level X Prior Familiarity Level as the Predictor Variable, Comprehension Level as the Criterion Variable

R^2	df	F	p<
0.23	1, 382	112.32	.0000001

TABLE 6

Difficulty Level X Idiosyncrasy Level as the Predictor Variable, Comprehension Level as the Criterion Variable

R^2	df	F	p<
0.41	1, 382	264.98	.0000001

TABLE 7

Education Level X Difficulty Level X Idiosyncrasy Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.26	1, 382	130.90	.0000001

TABLE 8

Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.21	1, 382	98.85	.0000001

TABLE 9

Education Level X Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level as the Predictor Variable, Comprehension as the Criterion Variable

R^2	df	F	p<
0.15	1, 382	67.95	.0000001

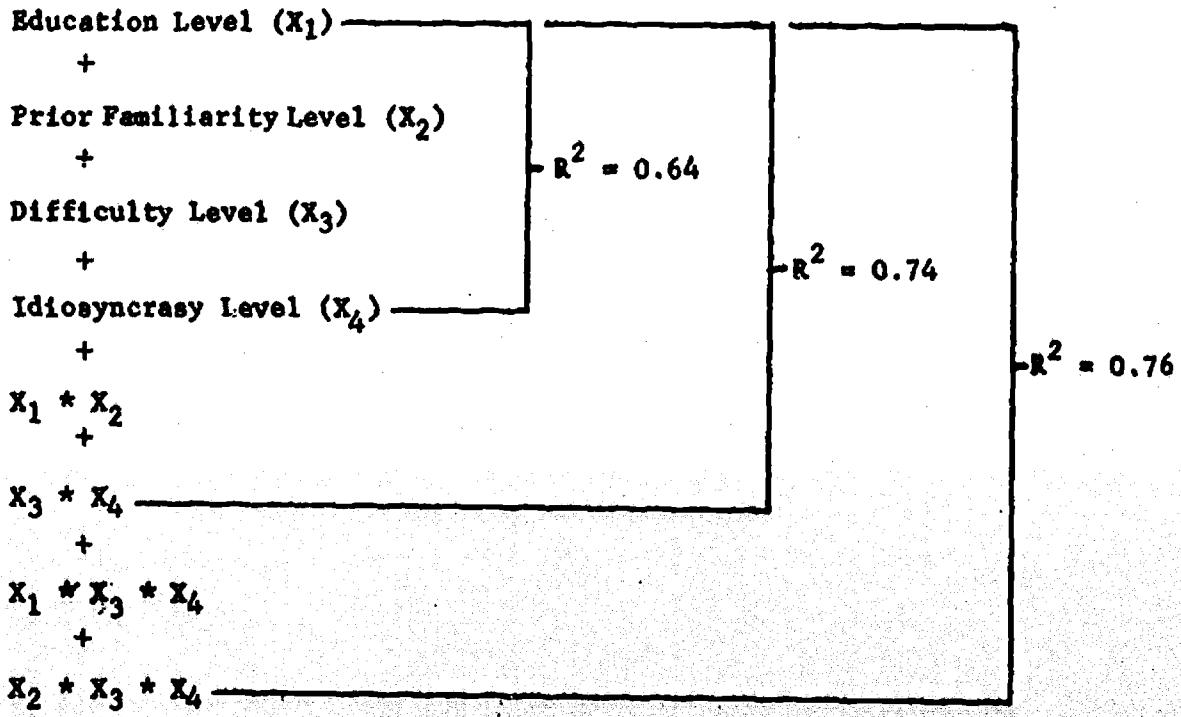
TABLE 10

Education Level X Difficulty Level X Idiosyncrasy Level vs. Prior Familiarity Level X Difficulty Level X Idiosyncrasy Level as Predictor Variables, Comprehension as the Criterion Variable

R^2_{full}	$R^2_{rest.}$	df	F	p
0.33	0.21	1, 381	67.71	.0000001

TABLE 11

A Comparison of the Amount of Variance Accounted for by Three Different Linear Regression Models



Where * stands for multiplication

APPENDIX A

(Example of Lo Difficulty/Lo Idiosyncrasy Content)

THE DIPPER

A long time ago there lived a kind little _____(1)_____. The little girl and her mother lived alone in _____(2)_____ small house near a forest.

One day her mother _____(3)_____ sick. She was very ill with fever. She needed _____(4)_____ so badly. The well and the brook were dry. _____(5)_____ was no rain for a long time. The hot _____(6)_____ dried up all the water. The little girl could _____(7)_____ get any water.

One night the mother called the _____(8)_____ girl. "I am very thirsty. I am afraid that _____(9)_____ shall die. Please get me a drink of water."

"_____(10)_____ will get some water for you, mother," said the _____(11)_____ girl. She took a coconut shell that she used _____(12)_____ a dipper. The dipper had a handle.

The little _____(13)_____ was soon on her way to the well. But _____(14)_____ found it was dry. "Mother is very thirsty. She _____(15)_____ have a drink of water tonight. She must get _____(16)_____," said the little girl.

APPENDIX B

(Example of Lo Difficulty/Hi Idiosyncrasy Content)

RIGHT WITH GOD

Now that we have been made right with God _____(1)_____ putting our trust in Him, we have peace with _____(2)_____. It is because of what our Lord Jesus Christ _____(3)_____ for us. By putting our trust in God, He _____(4)_____ given us His loving favor and has received us. _____(5)_____ are happy for the hope we have of sharing _____(6)_____ shining greatness of God. We are glad for our _____(7)_____ also. We know that troubles help us learn to _____(8)_____ give up. When we have learned to not give _____(9)_____, it shows we have stood the test. When we _____(10)_____ stood the test, it gives us hope. Hope never _____(11)_____ us ashamed because the love of God has come _____(12)_____ our hearts through the Holy Spirit Who was given _____(13)_____ us.

We were weak and could not help ourselves. _____(14)_____ Christ came at the right time and gave His _____(15)_____ for all sinners. No one is willing to die _____(16)_____ another person, but for a good man someone might _____(17)_____ willing to die. But God showed His love to _____(18)_____. While we were still sinners, Christ died for us.

APPENDIX C

(Example of Hi Difficulty/Lo Idiosyncrasy Content)

ANIMAL

Because no animal possesses the more fully developed forebrain _____(1)_____ makes language possible, the communication skills of an animal _____(2)_____ rather limited. In nature, animals have many ingenious (to _____(3)_____) ways of warning of danger or of flirting with _____(4)_____ mate or of passing on useful information. Bees give _____(5)_____ to each other by dancing. Porpoises seem to have _____(6)_____ small vocabulary of meaningful noises that they burble at _____(7)_____ other. In captivity, animals can be taught some new _____(8)_____; parrots are accustomed to saying a few words in _____(9)_____ and even old dogs can learn a few new _____(10)_____. The young ape can be taught to out-perform the _____(11)_____ infant. One ape has been taught to mouthe a _____(12)_____ words. Recently, too, some chimpansees have learned to perform _____(13)_____ arithmetic exercises, using a machine constructed for this purpose. _____(14)_____ only the lowest level of what could be called _____(15)_____ "verbal skill" can be learned by any creature besides _____(16)_____. Anything sophisticated, such as the linking together

APPENDIX D

(Example of Hi Difficulty/Hi Idiosyncrasy Content)

MERCIES

I beseech you therefore, brethren, by the mercies of _____ (1),

that ye present your bodies a living sacrifice, holy, _____ (2)

unto God, which is your reasonable service.

And be _____ (3) conformed to this world: but be ye

transformed by _____ (4) renewing of your mind, that ye may prove

what _____ (5) that good, and acceptable, and perfect, will of God.

_____ (6) I say, through the grace given unto me, to

_____ (7) man that is among you, not to think of _____ (8)

more highly than he ought to think; but to _____ (9) soberly,

according as God hath dealt to every man _____ (10) measure of

faith.

For as we have many members _____ (11) one body, and all

members have not the same _____ (12):

So we, being many, are one body in Christ, _____ (13) every

one members one of another.

Having then gifts _____ (14) according to the grace that

is given to us, _____ (15) prophesy, let us prophesy according to