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ABSTRACT

In a study conducted to examine the impact of language choice on cognitive complexity (the number of constructs in a person's interpersonal construct system), 93 undergraduate students completed a role category questionnaire that asked each subject to write a description of two people they knew. In one case that description was to be of a well-liked person; in the other, however, the stimulus person was to be someone they disliked. Subjects were asked to include characteristics of that person that were both distinguishable and unique. Results showed that as the number of clauses, the amount of perceptual cognitive activity, and the frequency of unsensed modifiers referring to qualities or quantities increased, so too did cognitive complexity. Cognitively complex subjects saw people and described their environment and those within it in finer degrees of distinction, used more language units to describe what they saw, and used more modifiers that cannot be sensed. On the other hand, cognitive complexity was inversely related to tense verbs, the qualification of verbs, the subjective mood, and the relative frequency of nouns and pronouns referring to negative others. (HOD)

PREDICTIVE MODELS OF COGNITIVE COMPLEXITY AND LANGUAGE USE

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ABSTRACT

Predictive models of cognitive complexity were generated using syntactic language choice as independent variables. Two models were obtained. The first suggested that several variables might have been confounding the relationship between complexity and language choice. A second model, this time blocking on number of words, number of clauses, and sex of respondent yielded a significantly different model. In the second model (R^2 = .72) seven variables predicted cognitive complexity, including one of the blocking variables (number of clauses). Results were discussed in terms of relationship of language choice to cognitive complexity and social perception.

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PREDICTIVE MODELS OF COGNITIVE COMPLEXITY AND LANGUAGE USE

Scholars concerned with the relationship between social cognition and communication have devoted substantial time and attention to the theoretical construct we label as "cognitive complexity." Cognitive complexity refers to the number of constructs in a person's interpersonal construct system and is viewed as reflective of relatively stable individual differences in adults.

The most commonly used measure of cognitive complexity is the two-peer version of Crockett's (1965) Role Category Questionnaire (RCQ) in which respondents are asked to write descriptions of two people they know well. One person described is to be a liked other; the other person is a disliked other. These impressions are scored for cognitive complexity by counting the number of constructs contained in the two impressions.

This two-peer version of the RCQ has been shown to be a reliable index of interpersonal construct differentiation (O'Keefe, Shepherd, and Street, 1979). Likewise, despite controversy concerning possible confounding influences (c.f., Powers, Jordan, and Street, 1979), the measure has been interpreted as being independent of indices of verbal loquacity, verbal complexity, and intelligence (Burleson, Applegate, O'Keefe, and Neuwirth, 1981).

Given the confidence that researchers place in cognitive complexity as an independent dimension of social cognition, there is an impressive body of research which demonstrates an association between cognitive complexity and other social cognition measures and between cognitive complexity and sophisticated communicative behavior. O'Keefe and Sypher (1981)

provide a detailed review of such relationships.

This paper is a report on a study designed to extend our understanding of cognitive complexity by examining the relationships between it and a form of language use. Specifically, this study sought to find predictive models of cognitive complexity based on respondents' syntactic language use.

Rationale

In studies designed to explore the relationship between cognitive complexity and other social cognition measures, the RCQ measure has been found to be significantly associated with the "This I Believe" test (Delia, Kline, and Pelias, 1968). The "This I Believe" test is regarded as an index of the relative concreteness-abstractness of interpersonal functioning (Harvey, Hunt, and Schroeder, 1961). Furthermore, the RCQ was significantly associated with construct comprehensiveness (B. O'Keefe and Delia, 1978, 1979) in adults and with construct abstractness (Burke, 1979; Applegate, Kline, and Delia, 1980). Additionally, the RCQ has been associated with higher levels of impression organization (Crockett, Gonyea, and Delia, 1970; Delia, Clark, and Switzer, 1974; Nidorf and Crockett, 1965; B. O'Keefe Delia, and O'Keefe, 1977; Rosenkrantz and Crockett, 1965).

Social perspective-taking is another social cognitive ability believed to underlie communication. The RCQ has been shown to be significantly related ($r = .61$) to the social perspective-taking ability of adults (Hale and Delia, 1976). These findings were replicated by Losee (1976) and by Sarver (1976). Children have also shown significant correlations between cognitive complexity and social perspective-taking (Clark and Delia, 1977; Burleson, 1980).

In view of the above, cognitive complexity, as measured by RCQ, is thought to be a significant variable in the determination of sophisticated communicative behavior. That is, the cognitive complexity measure should be associated positively with communication that reflects differentiated understanding of the perspectives of others.

Such has been the case with children whenever second- to ninth-graders were asked to perform a listener-adapted persuasive communication task. Clark and Delia (1977) found significant correlations between the RCQ and the listener-adapted communication index. Furthermore, Delia and Clark (1977) reported that complex children out performed noncomplex children on a listener-adapted communication task. Similarly, various criterion tasks have been used to examine the relationship of the RCQ to the communication behavior of children. For first- and third-graders, the RCQ was significantly related to Clark and Delia's (1976) listener-adapted persuasive communication task, to Delia and Clark's (1977) feeling-centered communication task, and to referential communication tasks (Baldwin and Garvey, 1973; Kraus and Glucksberg, 1969). The correlations ranged from .46 to .67 and from .36 to .52 with age partialled.

Burleson (1980) found the RCQ measure to be a good predictor across age spans ranging from first- to twelfth-grades. Delia, Kline, and Burleson (1979) found the RCQ to be significantly associated with the highest level of Clark and Delia's (1976) persuasive message task in children ranging from kindergarten to twelth-grade. It is the case, however, that the RCQ has less predictive power as age increases. At the same time, construct abstractness increases in predictive power as the age of the subjects increases.

The communicative behavior of adults also has been the focus of research investigating the RCQ as an index of developed communicative behavior. For

example, Applegate, Kline, and Delia (1980) found the RCQ to be significantly correlated to the highest level of the feeling-centered index of communicative strategy, to the dominant strategy on a regulative task, and to the dominant feeling-centered strategy. Burleson (1980) also found listener-adaptation in feeling-centered messages to be significantly associated with the RCQ ($r = .24$). Moreover, B. O'Keefe and Delia (1979) found that the RCQ was significantly correlated with the number of arguments and to degree of strategic adaptation on persuasive communication tasks. In addition, Hale (1980) reported the RCQ to be significantly related to referential communication abilities such as communicative efficiency and effectiveness.

Despite the strong evidence favoring the RCQ as an index of the developmental status of an individual's construct system, and as an important determinant of communicative behavior in a variety of situations, much remains to be learned regarding cognitive complexity as a social cognition variable. O'Keefe and Sypher (1981) argue, for example, that because communication researchers have used the RCQ as a "litmus test for the existence of relationships between construct system development and communicative functioning," the researchers, until recently (e.g., Delia, Kline, and Burleson, 1979; Burleson, 1980; B. O'Keefe and Delia, 1979), have neglected studying "the particular contributions of construct differentiation. . ." (p. 86). There is reason to believe that both quantity and quality of interpersonal constructs affect communicative functioning. O'Keefe and Sypher (1981) argue that "additional research is mandated to pin down the specific contributions of differentiation, abstractness, etc. . . ." (p. 87).

The research reported here is an initial response to the charge by O'Keefe and Sypher. Specifically, we sought to examine the relationship between cognitive complexity (construct differentiation) and language

use by developing predictive models of language use by people ranging from being cognitively complex to noncomplex. Generally, we wanted to know how cognitive processes organize language use. We reasoned that construct system development ought to be related to the differential language usage among people who ranged in differing degrees of complexity. Since, we reasoned, language is one of our major ways of determining social cognition, the complex and noncomplex should differ in their language use.

The theoretic basis for language use analysis was developed by Cummings and Renshaw (1979). They argue that language behavior can be regarded as an indicator of perception and cognition. They further argue that perception and cognition can be operationalized as eight language "qualities" as derived from the incidence of three categories of language behavior: information units (nouns), qualitative-quantitative units (adverbs and adjectives), and relations (verbs). Relative "densities" are calculated for each category as the ratio of the number of particular units divided by the total number of units in each message. Each of the eight qualities, and an additional measure of perceptual cognitive activity (total number of the three categories of language behavior) are provided by a computerized language analysis program, Syntactic Language Computer Analysis, or SLCA (third edition, c.f., Cummings and Renshaw, 1979).

One measure of language quality is social perception. Cummings and Renshaw argue that the social perception measure can be "useful in identifying perception sets of the users of language, both in cognitive complexity and personality" (1979, p. 295). Social perception is divided into five measures including inanimate perception, audience perception, self-perception, generalized-other perception, and authority-other perception. The analysis of the above perceptual sets is based on information unit density which

is defined as "the relative frequency of nouns which function as subjects and objects of verbs in a message corpus" (Cummings and Renshaw, 1979, p. 295).

A second language quality measured by SLCA is sensation. "Sensed information is the relative frequency of occurrence of subjects and objects of verbs which refer to persons, places, or things that can be seen, tasted, smelled, heard, or touched" (Cummings and Renshaw, 1979, p. 295). Unsensed information, on the other hand, refers to "the relative frequency of subjects and objects of verbs which cannot be sensed" (Cummings and Renshaw, 1979, p. 295). Likewise, sensed qualifiers and unsensed qualifiers refer to qualities which can and cannot be sensed. Apparently, some language users rely more on sensation for their perceptual information. How cognitive complexity and language use fit into this scheme is one issue of interest in this study.

A third language quality analyzed is perception of positive versus negative existence, as expressed by positive or negative information and positive or negative qualification. Motion is the fourth language quality which differentiates verb relations of the form "to be" and verbs and verb phrases which are motion oriented.

The fifth language quality measured is labelled as disposition language and assertion language. Here, the subjunctive mood is contrasted with the indicative mood. Cummings and Renshaw (1979) speculate that "such measures may indicate a language user's ability to construct what could or ought to be a language of unreality and what is a language of fact" (p. 296).

Time is the sixth language quality which can be measured. Relations of verbs are analyzed in terms of their reference to either past, present, or future time. Measures of symmetry constitute the seventh langauge

quality. The analysis focuses on symmetrical relations and asymmetrical relations. "Such measures may indicate a cognitive skill similar to the logic of similiarity discussed by Guilford (1967). Intents of the language user may also be indicated" (Cummings and Renshaw, 1979, p. 296).

Finally, measures of conditionality are based on "the presence or absence of qualifiers associated with information units and relations" (Cummings and Renshaw, 1979, p. 297). The use of qualifiers might indicate a person's refined perception of nuances of meaning. Likewise, such qualification might be indicative of cognitive complexity.

The language qualities obtained from the SLCA analyses should provide a means of examining functional indices of cognitive complexity. Since the RCQ measure is based in part on the verbal message provided by the respondent, it follows that differences in language use should provide us with detectable differences in degrees of cognitive complexity. The notion of degrees of difference also suggests that cognitive complexity may also be approached in the same manner. That is, like other variables that have been dichotomized, trichotomized, or quartiled, much information may be lost by the method of distinguishing between having or not having the quality under consideration. Even with the RCQ there appears to be different operationalizations of complex versus noncomplex scores. In one instance we may find the upper and lower thirds of the sample represented as "complex" and "noncomplex," respectively. In other instances a simple median split has been used. The use of the total RCQ score may provide us with a more sensitive measure of complexity and one representing the total sample, rather than a bifurcation by median split or upper and/or lower third difference.

Method

Subjects. Subjects were 93 undergraduates enrolled in two southeastern universities. Subjects completed the RCQ measure of cognitive complexity as part of a regular class assignment.

Procedures. Subjects were instructed to complete the Role Category Questionnaire (RCQ) measure developed by Crockett (1965). This instrument asks that each subject write a description of two people they know. In one case that description is to be of a well-liked person; in the other, however, the stimulus person is someone they dislike. Subjects were asked to develop a description of each person as fully as possible; additionally, they were also asked to include characteristics of that person that were both distinguishable and unique. Subjects were provided five minutes to write each description. Initially, 171 subjects completed the RCQ measure. However, 78 subjects did not follow the instructions for either the liked or disliked description and were removed from the analysis leaving a sample size of 93.

The dependent measure was the number of constructs generated over the two descriptions. A check on coding reliability for 54 randomly selected protocals indicated high reliabilty between coders ($r = .93$).

The independent measures in this study were the SLCA-generated language qualities and their related densities. Additionally, the perceptual cognitive activity (PCA) score was included in the initial model stage. In all, 36 language choice variables, ranging from a value of 0.00 to a possible 1.00 were used (with the exception of the PCA score, which took on an interger value).

Data Analysis. The data were analyzed via a multiple regression procedure, the Maximum R^2 Improvement technique, developed by Goodnight (1979):

> This is a method superior to stepwise regression procedures. This method looks for the "best" one-variable model, then the best two-variable model and so forth. It finds the one-variable model producing the highest R^2 statistic (variance accounted for). Then another variable, the one which would yield the greatest increase in R^2, is added. Once this two-variable model is obtained, each of the variables in the model is compared to each variable not in the model. For each comparison, the procedure determines if removing the variable would increase R^2. The two-variable model thus settled on is considered the "best" two-variable model the technique can find. The technique then adds a third variable to the model, according to the criteria used in adding the second variable. The comparing-and-switching process is repeated, the "best" three-variable model is discovered, and so forth. This technique differs from the STEPWISE technique in that here all switches are evaluated before any switch is made. In the STEPWISE technique, removal of the "worst" variable may be accomplished without consideration of what adding the "best" remaining variable would accomplish (pp. 391-392).

To select the best multiple regression model, the overall F due to regression had to be significant ($p < .05$) and a minimum increase of 1% in R^2 had to occur by the addition of an additional item. All analyses of the relationship between dependent and independent variable were then done by analyzing the beta weights of each predictor in the model (Draper and Smith, 1966, pp. 86-103; Kerlinger and Pedhazur, 1973, pp. 63-65).

To summarize, the multiple regression models regressed the 36 syntactic language choice measures on the cognitive complexity (RCQ) measure. In this investigation the RCQ measure was allowed to take upon its full continuous nature. Because of the exploratory nature of this research, no specific entry order was included; the independent variable with the highest F-ratio was entered first.

Results

Results of the initial multiple regression models yielded a two-variable model which accounted for 29 percent of the variance (see Table 1). The two predictor variables were perceptual cognitive activity and a measure of sensation (non-sensation information unit density). In this model the beta for PCA was positive and the relationship linear: as cognitive complexity (as measured by the RCQ) increased, so too did the total perceptual cognitive activity. For the measure of sensation, however, a negative beta was obtained. Analysis indicated the relationship between RCQ and non-sensation information unit density was linear: as RCQ increased, the relative frequency of subjects and objects of verbs that cannot be sensed decreased.

Insert Table 1 About Here

Although this finding was not unexpected it did suggest that other variables might contribute to best model. The PCA finding suggested, for instance, that complexity may be confounded by loquacity and sex of the respondent. Since the PCA score is a total number of unit analysis, it followed that total number of words and total number of clauses may be confounding the relationships between syntactic language choice and cognitive complexity (c.f., Powers, Jordan, and Street, 1979). Additionally, because

sex differences have been observed in verbal behavior (c.f., Eakins and Eakins, 1978), sex of the respondent might also be a confounding feature in the analysis. Because of these possible confounding features, it was decided to run the multiple regression models with the three potential confounding variables first, to have them serve as blocking variables and remove any variance due to their effect. To be in the model, however, the blocking variables had to obtain an F-ratio of 1.0 or more (c.f., Snedecor and Cochran, 1967).

Insert Table 2 About Here

Table 2 presents the second analysis. The best model of cognitive complexity (RCQ) had seven variables that accounted for 72 percent of the variance. The following summarizes the obtained variables and their relationship to RCQ (in order of their entry into the model).

Variable	Relationship
1. Number of Clauses	Positive, Linear. As the number of clauses found in the protocals increased, so too did RCQ scores.
2. Social Perception (Negative Authority)	Negative, Linear. As the frequency of proper nouns which refer to specific other negative persons or groups of persons increased, RCQ scores decreased.
3. Disposition (Conditional Density)	Negative, Linear. As the frequency of verbs that are of the subjunctive mood or in the sentence form of a question increased, RCQ scores decreased.

Variable	Relationship
4. Sensation (non-quality-quantity)	Positive, Linear. As the relative frequency of modifiers which refer to qualities or quantities which cannot be sensed increased, so too did RCQ scores.
5. Perceptual Cognitive Activity	Positive, Linear. As the total amount of informative units, qualitative-quantitative units, and relations increased, so too did RCQ scores.
6. Time (Past Time)	Negative, Linear. As the frequency of simple past tense verbs and verb phrases increased, RCQ scored decreased.
7. Definitional (Defined Relational)	Negative, Linear. As the relative frequency of relations (verbs or verb phrases) which have one or more qualifiers associated with them increases, RCQ scores decreased.

Discussion

This study sought to identify what language use choice variables affected differing degrees of cognitive complexity (as measured by the RCQ). In general, two basic issues seemed to come to the fore; first, what is the contribution of quantitative aspects of language? and, second, what syntactic language variables predicted cognitive complexity? To find answers to these questions the RCQ instrument was used as the writing model. Since the degree of cognitive complexity--or the state-like treatment of complex versus non-complex people--is affected by the verbal (written) statements made by respondents, we felt that the RCQ responses would provide a reliable and

theoretically interesting basis for the syntactic language analysis. Using the RCQ protocals, from which the construct differentiation scores came from, also should provide some form of content and construct validity as well as indicate the contribution of language choice to complexity.

The initial analysis suggested two things. First, language use--syntactic languauge choice--did not predict to any great degree cognitive complexity. That is, the model which met the selection criteria consisted of only two predictors: perceptual cognitive activity (PCA) and one of the measures of sensation (non-sensation information units). The analysis suggested that as the total number of "units" and "relations" increased, so too did cognitive complexity. The sensation quality, however, yielded a negative function; as information that dealt with unsensed things increased, RCQ scores decreased. Although the PCA finding fit with the notion that cognitively complex people would see things, or describe things in finer "shades of grey" than would the noncomplex, the sensation finding did not make sense and seemed to run counter to the positive function obtained for PCA.

This lead to a second question. Since the PCA score represented the total number of units and relations associated with the SLCA analysis, did it not somehow also resemble a more quantitative than qualitative function? In this regard the analysis might fall prey to Powers, Jordan, and Street's (1979) criticism that cognitive complexity, as measured by the RCQ, is not independent of message length. To correct for this and other possible confounding variables a second analysis was run, this time blocking on the total number of words in each protocal, the total number of clauses in each protocal, and the sex of the respondent. The first blocking variable would, if found significant, lend strength to Powers, Jordan, and Street's criticism. Entering the number of clauses in the analysis we felt would provide a slightly different interpre-

tation. Since a clause can contain any number of words, this variable, if found to block in the analysis might be indicative of the constructs themselves; that is, a construct is more than merely a word, it is a perception. Since we tend to think in terms of clauses rather than sentences, such a measure might affect the contributions of language choice. Finally, because females and males have been demonstrated to differ in terms of their language use (c.f., Eakins and Eakins, 1978), sex was also entered as a blocking variable.

The second analysis produced a seven-variable model. This model accounted for 72 percent of the variance (as opposed to 29 percent for the two-variable model). The only blocking variable found to be significant (or to even have met the minimum inclusion criteria) was the number of clauses in the message. Therefore, a new model was run with number of clauses entered as the blocking variable and the SLCA-generated variables were allowed to enter by the strength of their F-ratios. The resulting model produced a fairly clear picture of what language variables predicted cognitive complexity; one that seems to fit within the current conceptualization and research findings.

Three variables in this model produced positive, linear effects. As the number of clauses, the amount of perceptual cognitive activity, and the frequency of unsensed modifiers referring to qualities or quantities increased, so too did cognitive complexity. These findings fit well with the positive relationships obtained in previous research cited earlier. Cognitively complex people see and describe their environment and those within it (1) in finer degrees of distinction, (2) use more language "units" to describe what they see (much like Miller and Steinberg's, 1975, notion of stimulus discrimination versus stimulus generalization; the cognitively complex person perceiving society in a more discriminating way), and (3) uses more modifiers

which cannot be sensed.

Four variables produced negative, linear effects. This finding suggests that as the number of simple past tense verbs increased, as the qualification of verbs increased, as subjunctive mood increased, and as the relative frequency of nouns and pronouns referring to negative others increased, cognitive complexity decreased. It would appear that the more noncomplex person uses more past tense verbs than the more cognitively complex person. It would also appear that the more noncomplex person finds it easier to describe differences that are more negative than positive in others; this may be associated with more stereotypical perceptions of others rather than perceptions based on comparison of both good and bad qualities and on more refined qualities that may not be so obvious. Finally, it would seem that the cognitively noncomplex qualify their language more so than their more complex counterparts.

A finding of interest here is that only one social perception variable predicted cognitive complexity. Cummings and Renshaw (1979) suggested that the social perception quality might be useful in "identifying perpection sets of the users of language, both in cognitive complexity and personality" (p. 295). It would appear that more than just social perception must be taken into account when examining cognitive complexity. The model generated here suggests that cognitive complexity is influenced by a number of language qualities, to include the total perceptual cognitive activity of the person. This finding, taken with the research cited earlier, suggests that the RCQ measure is a significant predictor of sophisticated communicative behavior. It also suggests that the way we perceive our environment, describe it and those within it through language, influences the degree of cognitive complexity possessed.

One final finding of interest was the apparent independence of the RCQ measure to message length. Message length in this analysis was associated more with the total number of words than anything else. Although the number of clauses in the message was a significant predictor of RCQ scores, it represented less a message length variable than a construct differentiation measure; that is, a clause can consist of a number of words, but the fewer the number of clauses, regardless of number of words, the lower the RCQ score. This we believe suggests that the number of clauses is more closely related to cognitive complexity and independent of message length. Finally, the sex of the respondent failed to predict cognitive complexity.

Summary. This study sought to examine the impact of language choice on cognitive complexity. In so doing it also attempted to examine the concept of construct differentiation as the principle modality of deriving complexity. The findings suggest that construct differentiation, as measured by the Role Category Questionnaire, is independent of message length, although the number of clauses in the message corpus does affect complexity. The seven-variable model obtained accounted for a large portion of the variance in cognitive complexity scores and seemed to make sense theoretically. The model suggests that social perception is but one language quality which predicts cognitive complexity. In this regard, this research is but one test of the impact of language on complexity; both situational and dispositional tasks and factors need further attention. Future research might examine both as they affect language use and cognitive complexity.

TABLE 1

SUMMARY OF SIGNIFICANT PREDICTOR VARIABLES: INITIAL MULTIPLE REGRESSION MODEL

Source	df	SS	MS	F	P
Regression	2	1093.86	546.93	18.57	.0001
Error	90	2650.26	29.45		
Total	92	3644.12			

R^2 = .29

Variable	Beta	p
1. Perceptual Cognitive Activity	.535	< .0001
2. Non-sensation Information	-.167	< .01
INTERCEPT	10.347	

TABLE 2

SUMMARY OF SIGNIFICANT PREDICTOR VARIABLES: BLOCKED MULTIPLE REGRESSION MODEL

Source	df	SS	MS	F	P
Regression	7	2692.33	384.62	31.08	.0001
Error	85	1051.80	12.37		
Total	93	3743.13			

R^2 = .72

Variable	Beta	p
1. Number of Clauses	.424	< .0001
2. Social Perception (Neg. Authority)	-.148	< .0001
3. Disposition (Conditional)	-.209	< .0001
4. Sensation (Non-QQ)	.342	< .01
5. Perceptual Cognitive Activity	.404	< .05
6. Time (Past Time)	-.125	< .05
7. Definitional (Relational)	-.141	< .001
INTERCEPT	-.041	

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