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EXPERTISE IN CAUSAL REASONING

AND THE ATTRIBUTIONAL COMPLEXITY SCALE:

AN EVALUATION OF CONSTRUCT VALIDITY

Dissertation

Presented in Partial Fulfillment of the Requirements for the

Degree of Doctor of Philosophy in the Graduate School

of the Ohio State University

by

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* * * * *

The Ohio State University

1996

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Dedicated with love to Mom & Dad
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CHAPTER I

INTRODUCTION

Many attribution researchers have treated the process of attribution as similar to that of scientific hypothesis testing (see especially, Kelley's ANOVA model, 1971). Information is gathered and considered, and a rational analysis of the information is conducted (e.g., consensus and distinctiveness of a behavior combined with the absence of consistency leads to the attribution of an unstable, external cause). The average person then, is viewed from this perspective as a fairly literal example of Heider's (1958) "naive scientist," going about the business of causal reasoning in a logical, deductive fashion.

Research into basic processes in social cognition, on the other hand, have revealed that we humans often rely on simpler, less rational cognitive processes. For example, researchers have identified a number of cognitive biases (Nisbett & Ross, 1980) and heuristics (Tversky & Kahneman, 1974) that are commonly used in the processing of social information. Salient examples of these "cognitive shortcuts" in the area of causal attribution include the actor-observer bias (Jones & Nisbett, 1972), and the fundamental attribution error (Ross, 1977). Based on this
evidence, the average person is considered a "cognitive miser" by some (Fiske & Taylor, 1991), relying on simplistic processing styles in an effort to conserve precious mental energy.

Empirical research in the area of attribution has provided evidence for both views of the process of causal attribution. Some research shows that people are thoughtful about causal judgments, making complicated attributions involving multiple causes and chains of events (e.g., Brickman, Ryan & Wortman, 1975). Other research has provided evidence for the use of more simple attributional processes, including various biased attribution processes, or the use of similarity to past events as a heuristic cue (Read, 1981).

One explanation for the apparent disparity between classic attribution theory and the cognitive miser views of the nature of causal processing was provided by Harold Kelley (1973). Kelley (1973) has argued that attributional schemata may vary in their complexity. Based on the ANOVA model, Kelley suggested that simple schemas generally consist of "main-effects" (e.g., good people do good things) while complex schemas entail "interactions" (e.g., attributions to person-situation combinations). Additionally, Kelley suggested that people may prefer to use simple over complex schemas provided that the demands of the situation do not overrule this preference. Specifically, he has suggested that
time and motivation are necessary for the use of more complicated attributional schemata. Others suggest (e.g., Fiske & Taylor, 1991) that the goal of information processing determines the nature of the schema used. The need for accuracy in a given situation may determine the complexity of the schema.

Another solution to these two contradictory views of attribution processes has been suggested by Fletcher, Danilovics, Fernandez, Peterson, & Reeder (1986). Fletcher, et al. (1986) examined the literature pertaining to the nature of the attributional process. They found compelling evidence suggesting that perceivers are capable of very complex causal reasoning (e.g., Wimer & Kelley, 1982), as well as evidence suggesting attributional principles often involve simple causal heuristics and shortcuts (e.g., Tversky & Kahneman, 1974). As one solution to these contrasting findings, Fletcher et al. proposed the existence of individual differences in the complexity of attributional schemata.

Scale Development

Fletcher et al. (1986) developed a scale intended to differentiate those with greater attributional schema complexity from those with less complexity. Instead of basing the qualities of their measure on previous research methodologies (e.g., cognitive complexity, Vannoy, 1965), the authors opted for a
"less abstract analysis (that would) provide a more useful, fine-grained theoretical base for the ... scale" (Fletcher et al., 1986; p. 876). They postulated seven aspects of attributional complexity, each denoting a quality that the authors deemed was theoretically related to the construct of complexity in attributional schemas. The Attributional Complexity Scale (ACS) was designed to reflect these seven dimensions.

The ACS consists of 28 items divided into seven interrelated subscales representing the seven dimensions. The seven dimensions of complexity, as described by Fletcher et al. (1986) are as follows: 1) level of interest or motivation in causal explanations of behavior; 2) preference for complex explanations; 3) metacognition concerning attributional processes; 4) awareness of the extent to which behavior is a function of social interaction; 5) tendency to infer abstract or complex internal attributions; 6) tendency to infer abstract and contemporary external causal attributions; and 7) tendency to infer external causes based in the past. The scale contains four items for each of the seven specific attributional dimensions (See Table 1).

Although the scale consists of 7 interrelated subscales, the original factor analysis (Fletcher et al., 1986) revealed only a single factor. Subsequent attempts to analyze the factor structure of the scale (e.g., Flett, Pliner, & Blankstein, 1989)
Table 1: ACS Scale items grouped by underlying attributional dimension.

**Dimension 1: Motivation or interest**
1. I don't usually bother to analyze and explain people's behavior.
8. I don't enjoy getting into discussions where the causes for people's behavior are being talked over.
15. I really enjoy analyzing the reasons or causes for people's behavior.
22. I am not really curious about human behavior.

**Dimension 2: Preference for complex explanations**
2. Once I have figured out a single cause for a person's behavior I don't usually go any further.
9. I have found that the causes for people's behavior are usually complex rather than simple.
16. I usually find that complicated explanations for people's behavior are confusing rather than helpful.
23. I prefer simple rather than complex explanations for people's behavior.

**Dimension 3: Metacognition**
3. I believe it is important to analyze and understand our own thinking processes.
10. I am very interested in understanding how my own thinking works when I make judgments about people or attach causes to their behavior.
17. I give little thought to how my thinking works in the process of understanding or explaining people's behavior.
24. When the reasons I give for my own behavior are different from someone else's, this often makes me think about the thinking processes that lead to my explanations.

**Dimension 4: Awareness of behavior as a function of interactions**
4. I think a lot about the influence that I have on other people's behavior.
11. I think very little about the different ways that people influence each other.
18. I think very little about the influence that other people have on my behavior.
25. I believe that to understand a person you need to understand the people who that person has close contact with.

**Dimension 5: Tendency to infer abstract or complex internal attributions**
5. I have found that the relationships between a person's attitudes, beliefs, and character traits are usually simple and straightforward.
12. To understand a person's personality/behavior I have found it is important to know how that person's attitudes, beliefs, and character traits fit together.
19. I have thought a lot about the way that different parts of my personality influence other parts (e.g. beliefs affecting attitudes, or attitudes affecting character traits).
26. I tend to take people's behavior at face value and not worry about the inner causes for their behavior (e.g. attitudes, beliefs, etc.).

**Dimension 6: Tendency to infer abstract contemporary external attributions**
6. If I see people behaving in a strange or unusual manner I usually put it down to the fact that they are strange or unusual people and don't bother to explain it further.
13. When I try to explain other people's behavior I concentrate on the person and don't worry too much about all the existing external factors that might be affecting them.
20. I think a lot about the influence that society has on other people.
27. I think a lot about the influence that society has on my behavior and personality.
Table 1 cont.

**Dimension 7: Tendency to infer external causes based in the past**

7. I have thought a lot about the family background and personal history of people who are close to me in order to understand why they are the sort of people they are.
14. I have often found that the basic cause for a person's behavior is located far back in time.
21. When I analyze a person's behavior I often find the causes form a chain that goes back in time, sometimes for years.
28. I have thought very little about my own family background and personal history in order to understand why I am the sort of person I am.

similarly conclude that the scale reflects a single factor and not 7 separate dimensions.

**Correlates and Consequences of the ACS**

In the following section I proffer a review of the research findings involving the Attributional Complexity Scale. Although all of the findings are not directly relevant to the current predictions, the amount of literature in this area is minimal, and I have chosen to present it all.

In their initial paper, Fletcher et al. (1986) found that the ACS did not correlate significantly with Social Desirability (Crowne & Marlowe, 1964) or Internal-External Locus of Control (Rotter, 1966). The scale did however, correlate significantly ($r=.36$) with Need for Cognition (Cacioppo & Petty, 1982), suggesting a commonality between these scales. In a separate study, Fletcher et al. (1986) found that psychology students were more complex than mathematics and engineering students. An additional study showed evidence that complex subjects were more
likely to spontaneously generate causes in their personality
descriptions of friends than were less complex subjects, and a
final study showed that complex subjects preferred complex
attributions over simple attributions for a behavioral event.

Since the original construction of the ACS, several
researchers have further investigated the nature and implications
of attributional complexity. One research direction was
suggested by Fletcher and his colleagues (Fletcher et al., 1986).
Fletcher et al. offered the prediction that complex individuals
may be less prone to underestimate the role of external
(situational) factors in making causal attributions. Using an
essay attribution paradigm, Fletcher, Reeder, and Bull (1990)
found (contrary to expectation) that attributionally complex
persons were indeed susceptible to a correspondence bias, and
were, in fact, even more extreme in their judgments than low
complexity persons. In addition, Fletcher et al. (1990) found
that complex persons who were allowed to carefully examine the
essays (no time constraints) were more accurate in their
judgments. Fletcher et al. concluded that, "under conditions
that encouraged in-depth processing, subjects with
attributionally complex schemata were significantly more accurate
than subjects with simple schemata" (1990, p. 284).

In a similar experiment, Devine (1989) also found the
traditional overattribution bias among high complex persons (as
well as low complex persons). Again, high complex subjects were even more extreme in their attitude attributions. Devine also discovered differences in the confidence levels of high complex subjects (but not low complex subjects) as a function of external constraint and the normative nature of the essay. This finding demonstrates that, although attributionally complex persons are susceptible to the overattribution effect, they may temper their judgment with knowledge of the external factors (e.g., constraint, social norms) acting upon the person being judged.

In a study by Fletcher, Grigg and Bull (1988), the researchers focused more directly on the influence of attributional complexity on the accuracy of interpersonal judgment. Fletcher, Grigg and Bull (1988) found that attributionally complex persons directed to form an impression gave more complex and accurate personality appraisals than did less attributionally complex persons. The authors concluded that, when there is both time and motivation to carry out in-depth processing of information, attributionally complex subjects may more effectively integrate that information.

A more recent paper from Fletcher and colleagues (Fletcher et al., 1993) suggests that complex subjects are better able to adjust their level of effort depending on the complexity of the attributional situation. In this study, subjects were given consensus, distinctiveness, and consistency information and were
then asked to select the most probable cause for a target behavior. Attributionally complex subjects, showed longer response times when presented with a relatively large number of response options (including interactions of person x stimulus, person x circumstance, etc.) than when presented with only 3 response options (person, stimulus, or circumstance). Attributionally simple subjects did not differ in response times.

A separate area of research on attributional complexity encompasses the relationship between depression and attributional complexity. This relationship has been described in research articles by Marsh & Weary (1989) and by Flett, Pliner and Blankenstein (1989). Both research groups found evidence for the idea that depressed subjects are more attributionally complex than nondepressed subjects. Marsh & Weary suggested that attributional processing increased among depressed subjects as a reaction to perceived loss of control. This interpretation provides the implication that depressed persons (and attributionally complex persons) may experience a substantial motivation for control over future events, leading to continued complex processing of social information. Flett et al. (1989), on the other hand, proposed that higher levels of attributional complexity in depressed persons may reflect an attempt to reaffirm an efficacious self-image. In effect, what Flett et al.
are suggesting, is that depressed persons are trying to protect self-esteem by increasing attributional ambiguity.

A final area of research involving attributional complexity involves accuracy and complexity of attributions in intimate relationships. Fincham & Bradbury (1989) have found that attributional complexity is a predictor of marital dissatisfaction on the part of the complex spouse. The results of this study demonstrate that attributionally complex persons may be prone to make specific types of attributions in intimate relationships, and so may be at risk for relationship dysfunction.

The Meaning of Attributional Complexity: Structure vs. Process

This research project directly concerns the construct validity of the Attributional Complexity Scale (not the validity of the construct per se). While it has been reasonably well demonstrated (see above) that the ACS reflects differences in the way people think about and use causal information, the degree to which the ACS reflects differences in the underlying structure or organization of causal knowledge (e.g., the complexity of attributional schemata) is unclear.

Fletcher and his colleagues (1986) conceived of their individual difference measure as directly reflecting differences in structure. They suggested that, "some people possess more
complex attributional schemata than others" (Fletcher et al., 1986, p. 875). In describing the underlying construct of attributional complexity, the authors drew on a number of different literatures which are outlined below.

In making direct connections to the attribution literature, Fletcher et al. (1986) compare differences between complex and simple attributional schemata to the distinction between multiple necessary and multiple sufficient causal schema (Kelley, 1972). Multiple necessary causal schemas involve a number of causes working in conjunction to produce the effect of interest, while multiple sufficient schemas suggest a number of causes, only one of which is necessary to produce the effect. The authors of the ACS (Fletcher et al., 1986) contend that a schema in which a number of causes are necessary determinants of the outcome is more complex than one in which only a single cause is needed for the outcome to occur.

Another simple/complex distinction from attribution theory is drawn by Kelley (1973) in the comparison of "main effects" and "interactions" in attributional schemata. This analysis suggests that simple attributions involve only a single cause (e.g., the person or the situation), while more complex attributions identify a conjunction of causal factors.

Fletcher et al. (1986) also conceived of attributional complexity as a domain-specific instance of cognitive complexity
(Beiri, 1955; Crockett, 1965). Differences in cognitive complexity have been traditionally defined in two ways. Complexity is indicated in part by the number of constructs (or dimensions, concepts, attributes) necessary to describe the domain of interest (differentiation). Complexity can also be defined by the organization of information within a domain (integration). Typically, those exhibiting greater complexity should be more likely to consider alternative judgments, and should exhibit more uncertainty in their judgments (Schroeder et al., 1967).

A third conception of attributional complexity offered by Fletcher et al. (1986) suggests that attributionally complex subjects can be considered experts while more simple subjects are referred to as attributional novices or neophytes (see also Fletcher et al., 1992). This description of individual differences in attributional complexity suggests that complex individuals are more knowledgeable about causal relations and more accurate in their attributions. Additionally, a consideration of the expert processes literature suggests that experts have more abstract and hierarchically organized representations of information (Herren, 1988). In addition, experts process relevant information more quickly (Herren, 1988) and exhibit better memory for relevant information (Chase & Simon, 1973).
Although these conceptions of complexity seem very similar, there are some basic differences. For example, expert processors should exhibit higher levels of certainty about their judgments (Herren, 1988). Notions of cognitive complexity on the other hand (e.g., Schroeder et al., 1967), suggest that complexity is related to decreased certainty.

In addressing the meaning of attributional complexity, one theoretical approach to the ACS is to treat the scale not as a direct reflection of structural differences (defined here as differences in the organization of domain-relevant information), but as an indication of differences in the level of attributional processing (e.g., making simple vs. complex attributions for an observed behavior). A surface examination of the scale items and the theoretical underlying dimensions may further serve to illustrate this point (refer to Table 1).

The seven attributional dimensions which were used in constructing the ACS refer not to structural dimensions, but to attributional tendencies and preferences. For example, dimensions 5 and 6 tap the extent to which subjects attribute behavior to abstract, complex causes, and dimension 7 involves the tendency to infer causes based on the past. The scale also taps a dimension of motivation or interest in explaining behavior (dimension 1) and one involving the preference for complexity in attribution (dimension 2).
In no sense does the scale provide an assessment of the nature of the representation of causal information, but instead uses the report of attributional tendencies and preferences as a reflection of the assumed underlying structural differences. So, although the scale clearly taps differences in the process of attribution, the validity of the scale as a measure of differences in the structure of attributional knowledge has not been established. The true test of the degree to which a measure of individual differences in processing reflects differences in underlying structure is an empirical one.

The identification of differences in the complexity of causal knowledge structure requires a clear notion of what one should expect from complex vs. simple knowledge structure. Fletcher et al. (1986) have suggested a number of historical conceptions of complexity that are the basis for their theoretical conceptualization of attributional complexity. Among these are the concept of cognitive complexity (Beiri, 1955), and the distinction between the expert and novice in information processing (e.g., Chase & Simon, 1973).

Theoretical Basis for Study Design

Cognitive Complexity

The notion of cognitive complexity was first advanced by Beiri (1955). Cognitively complex persons were described as
possessing a highly differentiated system of constructs (from personal construct theory: Kelly, 1955) and therefore the ability to differentiate other persons into a greater number of categories. For instance, cognitively simple persons might categorize others on a single dimension (e.g., good-bad), while complex persons are able to use a number of dimensions in assigning others to categories (e.g., trust-distrust, like me-unlike me, intelligent-unintelligent).

The idea of cognitive complexity was the focus of a good deal of research during the 1950's and 1960's (see Crockett, 1965, for review), and a number of methods of measuring complexity were derived (Vannoy, 1965, Scott, Osgood, & Peterson, 1979). Across these measures however, the defining features of cognitive complexity were generally considered to be differentiation (the number of dimensions or categories involved in perception of the stimuli) and integration (the degree of overlap among dimensions reflecting "connectedness" or organizational complexity in the dimensions).

If the underlying construct of the ACS is assumed to have properties that are similar to cognitive complexity, specific predictions about the structural differences reflected by the scale can be made. This approach to defining complexity of structure (knowledge organization) suggests that those who score
high on the ACS should exhibit greater differentiation of causal information, as well as greater integration.

Schema Complexity

A different approach to studying individual differences in complexity has focused on the notion of *schema complexity* (e.g., Fiske Kinder & Larter, 1983), which suggests that the organizational structure of schemas can be relatively simple or relatively complex in a particular domain. For example, a child's schema for truck may be very basic, containing few propositions (carries stuff, big, makes noise), while an adult's schema for truck may involve hierarchically organized information of a very complex nature (some trucks are big, some are small; big trucks are used in construction, moving, interstate commerce; small trucks are used by farmers, plumbers; some are tow trucks; some are family cars).

Fiske & Dyer (1985) suggest that social knowledge "lies along the continuum of development from aschematic novice to intermediate to schematic expert" (p. 851). This conception of schematic experts versus aschematic novices is the subject of a great deal of research (e.g., Chase & Simon, 1973; Egan & Schwartz, 1979; Murphy & Wright, 1984) on domain specific differences in schematic complexity. Those with more complex schemata in a particular domain (e.g., chess, politics) are
referred to as experts, while those lacking a sophisticated
schema are known as novices.

Experts have well-developed and easily accessible schemas
(Fiske & Taylor, 1991). Experts can evaluate schema-consistent
information more quickly than non-experts (Lurigio & Carroll,
1985).

Additionally, a curvilinear relationship between expertise
and memory for schema-inconsistent information has been suggested
(Fiske & Taylor, 1991). On the one hand, those with highly
developed schemas (experts) may access these schemas rather
easily, as the knowledge contained in the schema is "compact" and
"unitized" (Fiske & Dyer, 1985). Thus, experts use less
cognitive capacity in retrieving schematic information, and have
greater cognitive capacity remaining to devote to the task of
integrating inconsistent information with the existing schema-
based expectations.

Aschematic novices, too are thought to be better able to
incorporate inconsistent information, but for very different
reasons. Those who do not possess existing schemas have no need
to reconcile inconsistent information because their expectations
are not strong.

Those with moderately well developed schemas, however, must
try to reconcile the inconsistent information with their stored
expectations, but lack the added cognitive capacity bestowed upon the expert in the domain.

Thus, both experts and novices may more easily incorporate schema-inconsistent information, while those with more moderately developed schemas find it more difficult to integrate inconsistent information with their existing schemas (Fiske & Taylor, 1991).

Conceiving of attributional complexity as a reflection of expertise provides another means of assessing the underlying structure of the scale. This approach suggests that those who score high on the ACS should exhibit a wide range of schematic processing effects associated with expertise.

Summary of Research Design

The focus of this project is a series of studies designed essentially as a construct validation of the Attributional Complexity Scale (ACS) as a measure of individual differences in the structure of causal cognitions. The broader goal of this research is to identify the nature of the structural differences reflected by scores on the ACS, and to form predictions for future research based on a clearer understanding of the structural properties underlying the scale.

The research studies discussed herein were designed to determine the relationship of ACS scores to two different types
of structural measures. "Direct" measures are attempts to measure variables which define differences in structure. "Indirect" measures refer to the use of measures which are known to be responsive to structural differences, thus showing the influence of structure rather than measuring structure directly.

Direct measures of structure used in this research include measures of differentiation and integration. Greater complexity of structure is thought to be related to greater differentiation (more dimensions along which information is stored), and greater integration (more interconnections among the dimensions).

Indirect measures of structure in this research involve differences in schematic processing which are known to be associated with differences in structure. These predictions are based on previous research on differences in schematic processing in experts and novices (see Herren, 1988). Greater expertise, by definition, requires more well-developed (complex) schemas. The literature suggests that greater "expertise" will be related to less effortful schematic processing, quicker organization of schema-consistent information, and faster evaluation of schema-consistent information. In addition, novice and expert subjects may exhibit better memory for schema inconsistent information as compared to those with moderately developed schemas. Thus, a curvilinear ("U") relationship between complexity and memory for inconsistent information can be predicted.
Direct Measurement

The authors of the Attributional Complexity Scale (Fletcher et al., 1986) refer heavily to the research on cognitive complexity (e.g., Crockett, 1965; Vannoy, 1965) as a theoretical base for the proposition that individuals may differ in the complexity of causal schemas. One approach to measurement of complexity in the current research then, is to use the same structural properties that have been linked to Cognitive Complexity (Scott et al., 1979) as a starting point in assessing the structural properties reflected by the ACS.

Cognitive Complexity has been defined by the concepts of differentiation and integration (e.g., Scott et al., 1979). Differentiation refers to the extent to which a domain is perceived using large number of distinct categories, dimensions, or concepts. Integration refers to the extent to which there exist "flexible interrelations" among the dimensions (Scott et al., 1979).

Differentiation

One approach to assessing the extent of differentiation of a cognitive domain is to measure dimensionality. Dimensionality is defined by Scott et al. (1979), as "the number of dimensions required to represent objects for the person" (p 104). In the current research, two measures of dimensionality will be
employed. The first measure is a statistic $H$, which is based on data acquired through a sorting task. This measure was initially offered in information theory (Attneave, 1959), as a reflection of the "bits" of information present in an information sort. Scott et al. (1979) suggest that the statistic reflects "the number of dimensions of information implicit in the respondent's grouping system" (p 105). A more thorough discussion of this measure is offered in later chapters.

An additional measure of dimensionality is provided through the technique of Multi-dimensional scaling. This technique estimates the number of independent dimensions defining the domain. This approach to measuring complexity was first suggested by Scott et al. (1979) as a means of measuring cognitive complexity. By using a MDS technique, it is possible to generate an estimate of the number of dimensions subjects use to think about the information provided. By examining the MDS solutions for groups of subjects scoring high or low in attributional complexity, an estimate of the dimensional organization reflected by the scale may be obtained.

Integration

The measurement of integration has historically been less objective than the measurement of dimensionality. Harvey, Hunt & Schroeder (1961) developed the "This I Believe" Test in which
subjects complete sentences which are then coded into four levels of abstractness by trained coders. Similarly, Schroeder, Driver & Streufert (1967) used a Paragraph Completion Test in which subjects' responses are coded for the rule structures underlying them. In the current project, an attempt to use more objective, quantitative measures of integration is made. One measure of integration that provides a more objective measure is image comparability. Image comparability is defined by Scott et al. (1979) as "the tendency to conceive of all objects of a domain in terms of the same large set of attributes" (p. 121-122). This index can be derived from the same sorting task that produces the statistic $H$ (this measure will be discussed in more detail in later chapters).

Another measure which may provide information on integration of information is centralization. Centralization is "the degree to which all cognitive objects in a given domain are assigned to a single, dominant attribute" (Scott et al., 1979; p. 66). Centralization can also be derived from the sorting task (as will be discussed).

**Predictions**

It is hypothesized that those who score higher on the ACS (and theoretically have a more complex underlying structure) will demonstrate greater differentiation and integration scores. More
specifically, higher scores on the ACS are expected to be related to greater dimensionality as measured by the statistic $H$ and by the multi-dimensional scaling technique. In addition, higher scores on the ACS should be related to higher scores on the image comparability measure, and lower centralization scores.

**Indirect Measures: Experts vs. Novices**

The authors of the ACS (Fletcher et al., 1986) propose that the scale measures differences in the complexity of schemata in the domain of attribution. They believe that "some people are simpletons and others are experts" with regard to attribution processes (Fletcher et al., 1986, p. 882). In subsequent work (Fletcher, Grigg, & Bull, 1988; Fletcher et al., 1993) Fletcher and his colleagues continue to make clear the point that they believe that the ACS somehow reflects expertise in attribution and social judgment.

As mentioned previously, there is a large body of research on the structural differences in the organization of domain-specific information in experts and novices (e.g., Chase & Simon, 1973, Murphy & Wright, 1984). The current research program takes advantage of these known differences in the effects of schematic processing among experts and novices to validate the notion that the ACS reflects differences in attributional expertise.
There are a number of findings in the literature on experts vs. novices that can be used to form predictions regarding processing differences as function of the complexity of attributional schemata. Experts have been shown to exhibit better memory for relevant information (Chase & Simon, 1973), and have been shown to organize schema-relevant information more quickly (Pyror & Merluzzi, 1985). Experts also have been found to evaluate schema-consistent information "quickly, consistently, and confidently" (Fiske & Taylor, 1991, p. 149; Lurigio & Carroll, 1985). Experts have shown a greater ability to process schema-inconsistent information compared to novices (Fiske, Kinder, Larter, 1983; Borgida & DeBono, 1989), although some researchers (e.g., Stangor & Ruble, 1989; Fiske & Taylor, 1991) have suggested that a curvilinear relationship exists between expertise and memory for inconsistent information.

One possible explanation for experts' better memory for schema-inconsistent information revolves around the notion of cognitive capacity. Memory for inconsistent information can be affected by processing demands (Stangor & McMillan, 1992). Recall of inconsistent information is poorer when subjects are confronted with a cognitively demanding situation. It has been suggested that integrating inconsistent information is a more effortful task than integrating consistent information (Stangor & McMillan, 1992). Further, it is thought that experts have a greater
cognitive capacity within their domain of expertise (Fiske & Taylor, 1991, Fiske & Dyer, 1985) because concepts within that domain are more accessible. In addition, Fiske & Dyer (1985) suggest that "well-learned schemata are unitized and therefore relatively compact in memory" (p. 851), causing experts to have "expanded capacity to use more of the information available" (p. 851). Thus the increased ability of experts to process (and remember) inconsistent information (e.g., Borgida & DeBono, 1989; Fiske, Kinder & Larter, 1983) has been linked to their increased cognitive capacity (Fiske et al, 1983).

Novices, on the other hand may be able to process inconsistent information as easily as consistent information because they lack the domain-specific knowledge that leads to schema-based expectations (Fiske & Taylor, 1991).

Predictions

The same predictions should hold for complexity in attributional schemata as for other expert schemata. Complex or "expert" subjects should process relevant information more efficiently (faster). That is, they should spend less time examining information when involved in causal analysis. Complex subjects should have better memory for relevant information, and should also be better able to integrate schema inconsistent information (better memory for inconsistent information).
Although overall, a curvilinear relationship between complexity and memory for inconsistent information is predicted, it is also predicted that increased cognitive load should lead to a greater memorial advantage for inconsistent information in complex subjects.

**Summary of Main Hypotheses**

The Attributional Complexity Scale is assumed to be a reflection of differences in the structure of attributional schemata. Attributionally Complex persons are considered "experts" and are thought to have causal knowledge structures (or schemata) that are more complex in organization than those of attributionally simple "novices". Because there is no direct evidence of differences in the organization of information for attributionally complex versus simple individuals, a closer examination of the construct validity of the Attributional Complexity Scale is warranted. The following major hypotheses were derived from the theoretical assumptions about the construct that is being measured by the ACS:

* High ACS scores are related to greater differentiation of concepts in the attributional domain.
* High ACS scores are related to greater integration of concepts in the attributional domain.
* High ACS Scores are related to more efficient processing of information relevant to the attributional domain.
* ACS Scores are related to better memory for schema-inconsistent attributional information in a curvilinear fashion.
* Under conditions of cognitive load, High ACS scores are related to better memory for inconsistent information.

To the extent that these hypotheses are confirmed, they support the idea that the ACS reflects differences in the complexity of attributional schemata or in the organization of causal information. In order to test these hypotheses, the following experiments were conducted.

Research Studies

A total of three experimental studies (and supporting research) were conducted to test the above hypotheses. The purpose of these studies was to examine the degree to which scores on the Attributional Complexity Scale reflect complexity in the organization of causal knowledge and information. The research followed two basic routes in attempting to answer this question. First, the degree to which ACS scores reflect the traditional measures of complexity (differentiation and integration) was assessed (Study 1). Secondly, the ability of scores on the ACS to predict information processing differences reflective of expert vs. novice processing was tested (Study 3).

Study 1 Method

Subjects in Study 1 were asked to sort (using labeled cards) causes for academic and relationship outcomes into groups. These
causes were obtained in a preliminary, materials generation study to be discussed later. In addition, subjects were asked to complete the Attributional Complexity Scale (ACS) and the Need for Cognition Scale (NCS) and to complete a short questionnaire addressing ancillary issues. It was expected that scores on the ACS would be related to greater differentiation and integration as indicated by the relevant measures.

Study 2 Method

Using the same sorting task as in Study 1, Study 2 tested the stability of the direct measures derived from the sorting task. Subjects completed the sorting tasks in an initial experimental session and returned to the experiment one week later to complete the sorting tasks again. Although this study is not a direct test of the hypotheses, its importance as a supporting study is clear. The stability of the measurement techniques is critical to clear conclusions regarding the relationship of the direct measures of structure to scores on the Attributional Complexity Scale.

Study 3 Method

Study 3 examines the construct validity of the ACS using indirect measures. Pretesting results identified causes as consistent with, inconsistent with, or irrelevant to a particular
causal outcome. This information was presented to subjects in the context of a description of a couple having problems with their relationship. For half of the subjects the information was presented at a moderately fast standard pace, while the other half of the subjects were allowed to proceed at their own pace. Subjects were then asked to make a judgment regarding the probable outcome of the scenario, and to indicate confidence in their judgment. Following the judgment task, subjects were asked to perform a free-recall task. In addition, the direct measures of differentiation and integration were included in Study 3 in order to provide a look at the relationship between the direct and indirect measures of complexity and expertise.
PRELIMINARY STUDY: SYNTHESIS OF SORTING TASK MATERIALS

The sorting task approach to measuring complexity requires that subjects sort into categories a set of attributes that reflect the domain of interest. A sorting measure of causal complexity should treat discrete causal factors as the relevant attributes. In order to arrive at a naturally occurring set of causal factors, the majority of the factors were derived from a preliminary experimental session in which subjects were asked to generate causes for outcomes in two specific domains - academic outcomes and intimate relationship outcomes.

In the past, attribution research in which subjects engage in the spontaneous generation of causes has attempted to place the specific causal factors into categories for ease of analysis. Examples of categories used to organize attributions in the academic domain include those proposed first by Heider (1958; ability, effort, task difficulty, and luck) as well as categories based on a dimensional approach to attribution (e.g., Weiner, 1978; locus, stability, globality).

In the current study, a naturalistic approach toward item generation was pursued, rather than a categorical one. Members
of the subject population were used to generate the causal factors in order to create a pool of items that will be familiar to the subjects. The existing literature on causal factors in achievement and intimate relationship was searched for additional items to provide depth to the range of items selected.

Method

Subjects

25 male and female subjects (in approximately equal proportion) participated in generating the causal factors for the item pool. Subjects received class credit for their participation.

Procedure

Subjects were given the following instructions in the cause-generation task for the academic items:

"We want you to think about the causes for particular outcomes. First we want you to think about the causes for an outcome in a course. Think about all the things that might affect the grade a person receives in a course. The grade could be a good grade, or a bad grade, so consider causes for each kind of outcome.

Using the index cards in front of you, write down each particular cause that you can think of on a separate card. Generate as many causes as you can, and be as specific as possible."

The same subjects were given the following instructions for item-generation in the relationships domain:
"For this portion, we want you to use a new set of index cards and write down causes that affect the outcome of relationships. Sometimes relationships work out, and sometimes they don't, so write down causes for both kinds of outcomes of a relationship. Generate as many causes as you can, and be as specific as possible."

Subjects were also asked to rate the importance of each cause in determining the outcome. They were told to sort the cards from most to least important. Subjects then numbered the cards, assigning the most important causes a value of 1. The upper limit for the least important causes was determined by the number of causes generated. If two causes were determined by the subject to be equally important, the same number was assigned to each cause.

A sorting task was included as a pilot testing opportunity. Subjects were asked to sort causes from each domain into groups or categories. Subjects also completed a short judgment task as a filler to prevent the ranking task from influencing the sorting task.

Selecting the Causal Items

The items generated by the subjects were examined and identified as belonging to specific categories without regard to the valence of the outcome (for instance, good study habits and bad study habits would be identified as belonging to the same category of cause—study habits). Categories that were
<table>
<thead>
<tr>
<th>Authors</th>
<th>Causal factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weiner, Russell and Lerman (1978)</td>
<td>Ability, Unstable effort, Stable effort, Task difficulty, Mood, Personality, Other's effort, Others motivation and personality, Luck, Intrinsic motivation, Fatigue-Illness</td>
</tr>
<tr>
<td>Frieze (1976)</td>
<td>Ability, Effort, Task, Luck, Other Person, Mood, Stable effort, other</td>
</tr>
<tr>
<td>Frieze &amp; Snyder (1980)</td>
<td>Stable effort, Unstable effort, Interest, Ability, Mood, Personality, Physical factors, Others motives, Other's unstable effort, Task factors, Luck, Personality of others, Other activities, Personality interactions, Ability x Task interaction</td>
</tr>
<tr>
<td>Deiner &amp; Dweck (1978)</td>
<td>Ability, Effort, Luck, Experimenter not fair, Task harder</td>
</tr>
</tbody>
</table>
Table 3: Relationship causal factors based on past research
Based on: Harvey, Wells, Alvarez (1978)

<table>
<thead>
<tr>
<th>Authors/sources</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levinger (1966)- 600 Cleveland divorces</td>
<td>Neglect of home or children</td>
</tr>
<tr>
<td></td>
<td>Financial problems</td>
</tr>
<tr>
<td></td>
<td>Physical abuse</td>
</tr>
<tr>
<td>(mandatory interviews with marital counselors)</td>
<td>Verbal abuse</td>
</tr>
<tr>
<td></td>
<td>Infidelity</td>
</tr>
<tr>
<td></td>
<td>Sexual incompatibility</td>
</tr>
<tr>
<td></td>
<td>Drinking</td>
</tr>
<tr>
<td></td>
<td>In-law trouble</td>
</tr>
<tr>
<td></td>
<td>Mental cruelty (jealousy suspicion deceit)</td>
</tr>
<tr>
<td></td>
<td>Lack of love</td>
</tr>
<tr>
<td></td>
<td>Excessive demands</td>
</tr>
<tr>
<td>Levinger (1976)- theoretical</td>
<td>Attractations</td>
</tr>
<tr>
<td></td>
<td>Barriers</td>
</tr>
<tr>
<td></td>
<td>family income</td>
</tr>
<tr>
<td></td>
<td>financial expenses</td>
</tr>
<tr>
<td></td>
<td>home ownership</td>
</tr>
<tr>
<td></td>
<td>obligation toward</td>
</tr>
<tr>
<td></td>
<td>companionship</td>
</tr>
<tr>
<td></td>
<td>marital bond</td>
</tr>
<tr>
<td></td>
<td>esteem</td>
</tr>
<tr>
<td></td>
<td>religious constraints</td>
</tr>
<tr>
<td></td>
<td>sexual enjoyment</td>
</tr>
<tr>
<td></td>
<td>pressures from primary and community groups</td>
</tr>
<tr>
<td></td>
<td>feelings toward dependent children</td>
</tr>
<tr>
<td>Hill et al (1976)- longitudinal relationships</td>
<td>Unequal involvement in the relationship</td>
</tr>
<tr>
<td>(dating among college students)</td>
<td>dissimilarity with respect to age,</td>
</tr>
<tr>
<td></td>
<td>educational aspirations, intelligence, and</td>
</tr>
<tr>
<td></td>
<td>physical attractiveness.</td>
</tr>
<tr>
<td>Weiss (1975)- interviews in Boston w/ marital</td>
<td>Infidelity &amp; betrayal</td>
</tr>
<tr>
<td>separation (case histories)</td>
<td>Desire for new things in life</td>
</tr>
<tr>
<td></td>
<td>Perceived overreactions to activities (such</td>
</tr>
<tr>
<td></td>
<td>as various degrees of extramarital</td>
</tr>
<tr>
<td></td>
<td>intimacy)</td>
</tr>
<tr>
<td></td>
<td>Freedom from constraints imposed by the</td>
</tr>
<tr>
<td></td>
<td>partner</td>
</tr>
<tr>
<td>Harvey &amp; Alvarez (1978)- based on coded responses</td>
<td>Romantic involvement outside of marriage</td>
</tr>
<tr>
<td>from telephone survey</td>
<td>Insensitivity-lack of affection and warm</td>
</tr>
<tr>
<td></td>
<td>sexual intimacy</td>
</tr>
<tr>
<td></td>
<td>Quest for freedom from constraints of</td>
</tr>
<tr>
<td></td>
<td>marriage and desire for new lifestyle</td>
</tr>
<tr>
<td></td>
<td>Different personal values and habits</td>
</tr>
<tr>
<td></td>
<td>Different religious orientation</td>
</tr>
<tr>
<td></td>
<td>Alcoholism and physical abuse</td>
</tr>
<tr>
<td></td>
<td>Escalation of conflict and commitment to</td>
</tr>
<tr>
<td></td>
<td>separation</td>
</tr>
<tr>
<td>Table 3 cont.</td>
<td>Orvis et al (1976)- 41 couples (not separating)</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Actor criticizes or places demands upon the partner</td>
<td></td>
</tr>
<tr>
<td>Actor is too involved in outside relationships</td>
<td></td>
</tr>
<tr>
<td>and activities (with family or other close relationships)</td>
<td></td>
</tr>
<tr>
<td>Actor's behavior inconveniences others (e.g., inconsiderate, late for appointments)</td>
<td></td>
</tr>
<tr>
<td>Actor has distorted view of self or others (inflated self, poor attitude toward others)</td>
<td></td>
</tr>
<tr>
<td>Actor behaves emotionally or aggressively</td>
<td></td>
</tr>
<tr>
<td>Actor has undesirable practices (drinks, smokes)</td>
<td></td>
</tr>
<tr>
<td>Actor engages in or wants to engage in activity (often activity in which partner was not involved - e.g., educational or recreational)</td>
<td></td>
</tr>
<tr>
<td>Actor avoids activity (wont try new things or avoids serious discussions)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
mentioned by 25% or more of the subjects were selected for inclusion in the item pool. The list of categories (for both achievement and relationship domains) is presented in Appendix A, along with the number of subjects who generated members of the category and the average importance ratings given by those subjects.

The item pool was then supplemented with items based on previous research on the causal factors that are commonly used in both achievement and relationship domains. Those factors identified by previous researchers are listed in Tables 2 and 3 along with the authors who conducted the research.

The final item pool was constructed from 21 item categories in the academic domain and 22 item categories in the relationship domain. From each category, two causal factors were composed, one factor likely to have a positive impact on outcome and one factor likely to have a negative impact on outcome. The final item pool is presented in Appendix B. Each item was transcribed on to a 2" x 4" (approximate) card for use in the sorting task. The cards were numbered on the back for ease of recording & analysis.
STUDY 1: DIRECT MEASURES OF STRUCTURE

Study 1 was designed to test the notion that the ACS reflects complex structure as defined by the concepts of differentiation and integration. Subjects were asked to perform a series of sorting tasks in which they were asked to separate concepts into meaningful groups. These sortings were then analyzed to provide the established statistical indices of differentiation and integration.

Measures of Differentiation

Grouping. One simple measure of differentiation is a simple count of the number of categories used in each sorting task. To the extent that this accurately reflects complexity, it can be predicted that those who score higher on the ACS will sort the items into a greater number of categories.

Statistic $H$. A more complicated sort-based measure of differentiation based on information theory (Attneave, 1959) is suggested by Scott et al. (1979) as a measure of differentiation. One way to interpret the $H$ statistic, is as a reflection of the number of "bits" of information conveyed by the sort. This
measure ranges from 0 (if all items are sorted into a single category) to \( \log_2 n \) (where \( n = \) number of items). This measure has been used frequently as an index of complexity (Linville, 1982, 1985, 1987; Niedenthal, Setterlund, & Wherry, 1992).

\( H \) is calculated for each individual sort from the following formula:

\[
H = \log_2 n - \left( \sum n_i \log_2 n_i \right) / n \quad [1]
\]

where \( n \) is the total number of items being sorted, and \( n_i \) is the number of items that appear in a particular group combination. Group combinations are composed of items that are sorted into the same group or into the same set of groups. For example, a sort in which 3 groups are formed has a total of 8 possible group combinations consisting of items sorted into the following individual groups and multiple group sets: 1, 2, 3, 1-2, 2-3, 1-3, 1-2-3, and no group. Therefore, if 2 particular items from the list of concepts are sorted into both group 2 and group 3 (and no other group), and there are no other items sorted into both group 2 and group 3 (and no other), the \( n_i \) for group combination 2-3 is equal to 2. Items not used at all in the sort belong to a separate group combination. Examples of two subjects' sorts are provided in Appendix C.
Measures of Integration

Image comparability. Two measures of integration are also adapted from Scott et al.'s (1962) measures of cognitive complexity. The first measure, Image Comparability, "the tendency to conceive of all objects of a domain in terms of the same large set of attributes" (Scott et al., 1979; p. 121-122). This measure reveals the degree to which the categories created in the sorting task share members with other categories. The following formula is used to calculate Image comparability from the sorting task data:

\[
IC = \frac{n \sum p_j - k}{(n-1)(k+1)} \tag{2}
\]

where \(n\) is the number of items to be sorted, \(k\) is the number of categories, and \(p_j\) is the proportion of \(n\) items listed in the \(j^{th}\) category. Higher scores on this index can be considered to reflect greater degrees of integration, and thus are related to greater complexity.

Centralization. The second measure of integration, Centralization, provides an index of the degree to which categories have a large or small proportion of the items to be sorted (see Scott et al., 1979). The category having the most items is the most central category. The average proportion of items in the remaining categories is subtracted from the proportion of items in the most central category. Scott et al.
(1979) also offer a correction to account for subjects who use a small number of categories. The resulting formula is as follows:

\[ C = P_h - M_p(k/k+1) \]  

where \( P_h \) is the highest proportion of items assigned to any category, \( M_p \) is the mean proportion of items in the remaining categories, and \( k \) is the number of categories. Greater scores on this measure indicate more centralization, and less integration, therefore less complexity.

**Obtaining Complexity Measures**

In order to extract the necessary information from the sorting task data, a QuickBASIC computer program was created to calculate \( H \), image comparability, and centrality based on the entry of the raw data. Additionally, the program converts raw sorting data to a similarity matrix (based on formulas provided by Burton, 1975) which can be submitted to multidimensional scaling analyses. A printout of the computer program is presented in Appendix D.

**Other Measures**

Study 1 also includes an examination of the relationships between the ACS and several theoretically relevant variables. It has been suggested (Fletcher et al., 1986) that attributional complexity may be related to experience or level of interest in a
particular domain. Several questions were created to assess domain-specific interest and experience.

Finally, subjects were asked to complete the Need for Cognition Scale (Cacioppo & Petty, 1982). By looking at the relationship between this scale and the complexity measures, we may be able to rule out the possibility that these measures are tapping a more general motive to engage in effortful cognitive processing.

Method

Subjects

62 male and female undergraduates participated in an experiment for credit in their introductory psychology class. Subjects participated in an initial 1-hour session, and a 1-hour follow-up session 1 week later. The bulk of the relevant data was collected at the first session. The relevant data from the second session consists of a single measure, the Attributional Complexity Scale. Four subjects failed to return for the second session, and their data are missing from some analyses. Subjects were brought into the experimental session in groups of 2 to 5. In all cases, subjects were separated from each other by portable partitions.
Procedure

In the initial experimental session, subjects were told they were taking part in a project investigating the way people think about and use information about the causes for particular events. Subjects were then given the first of three sorting tasks (the instructions for the tasks are given in full in Appendix E).

Sorting task. Subjects were given a group of cards containing the list of causal items (cards were numbered on the back for recording purposes) and told to sort them into "meaningful groups". It was explained that subjects could form as many groups as they desired, and that not all of the cards had to be used. Subjects were allowed to place the same item into more than one group and were provided with blank slips of paper to copy items that they felt belonged in more than one group. Following each sorting task, subjects were given a recording sheet and asked to record the sorts by writing the number for each card into the appropriate box on the sheet provided.

Task order. Subjects were randomly assigned to complete either the academic or relationship causal sort first. Following the first sort, subjects completed a background questionnaire (see Appendix F) designed to assess experience and interest in academic and relationship domains. Subjects then completed the cognitive complexity sort (trait sort) using the same trait items as Neidenthal et al. (1992). Following the trait sort, subjects
were asked to fill out the Need for Cognition Scale (Cacioppo & Petty, 1982).

To summarize, subjects performed three sorting tasks and were given the same basic instructions for each task. Each subject completed two causal complexity sorts (one academic, one relationship) and one cognitive complexity sort (33 items taken from the materials used by Niedenthal et al., 1992). The academic causal sort was based on the 42 items created in the preliminary study. The relationship causal sort was based on the 44 items also derived in the preliminary study. Following the final sorting task, subjects were asked to sign up for the second session and were dismissed. Scores on the Attributional Complexity Scale were collected during the subsequent session.

Results

It is possible to come up with good reasons for conducting analyses that treat individual differences measures either as continuous or as categorical variables. To the extent that a particular construct has been established theoretically as either continuous or categorical, analyses involving that scale should reflect that theoretical perspective. Because the current project seeks to examine the construct validity of the ACS, it seems appropriate to consider the theoretical nature of the construct as still under debate. For that reason, analyses that
treat attributional complexity as both a continuous and as a categorical variable are reported.

**Correlational and Regression Analyses**

**Relationship Among Measures of Differentiation and Integration**

**Number of groups.** The number of groups established by each subject in the sorting task correlated very strongly with Scott's (1965) $H$ for the academic ($r=.85$, $p<.001$), relationship ($r=.94$, $p<.001$), and trait ($r=.85$, $p<.001$) sorts. Because these two measures are so highly related, only the $H$ statistic will be used in further analyses.

**The $H$ statistic.** The measures of causal item differentiation ($H_a$ and $H_r$) were found to be strongly and significantly related, $r=.68$, $p<.001$ (note: all correlations among sort measures are presented in Table 4). In addition, the differentiation of the trait items ($H_t$) was also significantly correlated with both differentiation of academic causes ($H_a$), $r=.50$, $p<.001$, and differentiation of relationship causes ($H_r$), $r=.53$, $p<.001$ (see Table 4).

**Image comparability.** The measures of image comparability for the academic sort ($IC_a$) correlated strongly and significantly with the image comparability for the relationship items ($IC_r$), $r=.71$, $p<.001$. Also, image comparability for the trait items ($IC_t$) correlated significantly with both $IC_a$, $r=.58$, $p<.001$, and
Table 4: Relationship among measures of complexity derived from the sorting task.

<table>
<thead>
<tr>
<th></th>
<th>$H_a$</th>
<th>$H_r$</th>
<th>$H_t$</th>
<th>$IC_a$</th>
<th>$IC_r$</th>
<th>$IC_t$</th>
<th>$C_a$</th>
<th>$C_r$</th>
<th>$C_t$</th>
</tr>
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<tbody>
<tr>
<td>$H_a$</td>
<td></td>
<td>.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
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<td>.53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$H_t$</td>
<td></td>
<td>-.74</td>
<td>-.59</td>
<td>-.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$IC_a$</td>
<td></td>
<td>-.64</td>
<td>-.85</td>
<td>-.47</td>
<td>.71</td>
<td></td>
<td></td>
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<tr>
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<td>-.78</td>
<td>.58</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$IC_t$</td>
<td></td>
<td>.16</td>
<td>.10</td>
<td>.15</td>
<td>-.37</td>
<td>-.19</td>
<td>-.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_a$</td>
<td></td>
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<td>.02</td>
<td>.06</td>
<td>.05</td>
<td>-.17</td>
<td>-.01</td>
<td>.22</td>
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</tr>
<tr>
<td>$C_r$</td>
<td></td>
<td>-.46</td>
<td>-.38</td>
<td>-.53</td>
<td>.43</td>
<td>.46</td>
<td>.50</td>
<td>.02</td>
<td>.25</td>
</tr>
<tr>
<td>$C_t$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

ACS: -.17 -.03 -.01 .25 .02 .06 -.08 .10 .19
NCS: -.05 -.01 .10 .24 .18 .04 -.15 .18 -.07

correlations greater than |.26| are significant at the $P<.05$ level.

$IC_r$, $r=.66, P<.001$ (see Table 4). Further, image comparability in general was negatively related with differentiation (as measured by $H$), and all correlations between image comparability and $H$ measures were significant (see Table 4).

**Centralization.** The measures of centralization for academic ($C_a$) and relationship ($C_r$) items were not significantly correlated. However, a weak but significant relationship between $C_r$ and centralization for the trait items ($C_t$) was shown, $r=.25, P<.05$. Centralization in the sorts of causal information was unrelated to other measures of causal complexity with one exception. centralization and image comparability for academic items were negatively correlated, $r=-.37, P<.005$. Centralization
for the trait items \((C_i)\), on the other hand, was significantly
and negatively correlated with the measure of differentiation \((H)\)
for all sorts, and significantly and positively correlated with
image comparability for all sorts (see Table 4).

**Relationships with the ACS**

**Distribution of ACS scores.** Scores on the ACS ranged from -
7 to 79, with an average of 36.4 and a standard deviation of
22.4. This distribution of scores is comparable to previous
research by the current author (Flaherty, 1991) finding standard
deviations of 22.59 and 21.2 in two separate studies. However,
average ACS scores in these same previous studies differed
somewhat \((M's=26.38 \text{ and } 33.70, \text{ respectively})\) from current
findings. It might be useful to compare the distributions found
in this current study with the initial data on the ACS reported
by Fletcher et al. (1986). Unfortunately, the authors did not
include the distribution of scores in their report. In fact,
simple averages of ACS scores are not reported in the Fletcher et
al. (1986) paper, and can be deduced from the reports of only 2
of the 5 reported studies. The average ACS scores for those two
studies, however, do compare favorably with the current averages.
The means for Fletcher et al.'s (1986) Study 1 and Study 3 are,
respectively, 36.65 and 35.23. This data is presented in Table 5
Table 5: Distribution of ACS scores in previous and current research.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>STD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current research</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td>36.40</td>
<td>22.40</td>
<td>-7</td>
<td>79</td>
</tr>
<tr>
<td>Study 2</td>
<td>33.02</td>
<td>23.30</td>
<td>-23</td>
<td>75</td>
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<td>Study 3</td>
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<td>18.21</td>
<td>-23</td>
<td>70</td>
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<tr>
<td><strong>Past research</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Flaherty (1991)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td>26.38</td>
<td>22.59</td>
<td>-47</td>
<td>72</td>
</tr>
<tr>
<td>Study 2</td>
<td>33.70</td>
<td>21.20</td>
<td>-22</td>
<td>83</td>
</tr>
<tr>
<td>Fletcher et al. (1986)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1</td>
<td>36.65</td>
<td>Not available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>35.23</td>
<td>Not available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fletcher et al. (1990)</td>
<td>Not available</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

along with the distribution of ACS scores for all studies reported in this document.

The $H$ statistic. There were no significant correlations between the measures of differentiation and scores on the Attributional Complexity Scale (all $r$'s < |.18|). An examination of the plot of the data indicated the possibility of a curvilinear relationship between attributional complexity scores and differentiation of academic items, $H_a$ (see Figure 1). Using multiple regression techniques, the significance of the quadratic component of the relationship between these two variables was tested by examining the significance of the overall model.
\( y = B_0 + B_1x + B_2x^2 \) as well as testing the significance of the regression coefficient \( B_2 \) for the quadratic component. The quadratic model for predicting of \( H_4 \) from attributional complexity scores was marginally significant \( (F(2,49)=2.87, p < .067) \) and the regression coefficient for the quadratic component was also significant \( (F(1,49)=5.24, p < .03) \). An examination of the plot in Figure 1 shows an inverted U relationship between attributional complexity and \( H_4 \), with moderate levels of complexity relating to higher levels of differentiation. Similar analyses of the relationship between scores on the ACS and differentiation of the relationship items \( (H_4) \) did not show a quadratic trend.

Image comparability and centralization. Scores on the ACS were moderately correlated with ICa, \( r=.25, p<.06 \). All other measures of integration were not significantly related to ACS scores (all \( r \)'s < .20). Image comparability and centralization scores were also examined for a quadratic trend in their relationship to ACS scores. The quadratic model was significant for ICa, \( F(2,54)=3.76, p<.03 \), and the regression coefficient for the quadratic component was marginally significant, \( F(1,54)=3.65, p<.065 \). There was no significant quadratic relationship between ACS and the other integration measures.

Relationships with the Need for Cognition Scale. Scores on the Need for Cognition Scale (NCS) were not significantly related
to any of the complexity measures derived from the sorting task (see Table 4). Scores on the NCS did correlate (as expected from previous research) with scores on the ACS, $r = .51$, $p < .001$.

**Additional variables.** In addition to measures of complexity, a questionnaire was administered to subjects. Subjects were asked to report information including the following: Year in school, cumulative GPA, high school GPA, age, major, number of romantic relationships, number of long-term relationships, etc. Subjects were also asked to make ratings of academic and relationship domains on three 7-point Likert scales that assessed: 1) the overall importance subjects placed on these domains, 2) the importance they placed on positive outcomes in these domains, and 3) the degree to which subjects felt it was important to know the causes for outcomes in these domains.

**Differentiation.** Correlational analysis examined the relationship between the various questionnaire responses and the measures of differentiation. There were no significant relationships (all $r$'s $< |.20|$) between $H_s$ and the related questionnaire responses (e.g., age, GPA, academic ratings items). Similarly, no significant relationships were found between responses to demographic items (age, GPA, etc) and $H_r$. There was a significant correlation between $H_r$ and the response to the item assessing the importance of knowing the causes of outcomes in relationships, $r = -.29$, $p < .02$. This finding indicates, contrary
to expectations, that greater differentiation with respect to causes in relationships (as reflected by $H_r$) is related to lower ratings of the importance of causal knowledge in relationships.

Integration. Age and year in school were found to be significantly and positively correlated ($\tau = .30$, $p < .02$ and $\tau = .25$, $p < .05$ respectively) with image comparability scores for the academic sort ($IC_a$). In addition, year in school was significantly and positively correlated ($\tau = .34$, $p < .01$) with centralization for the trait sort ($C_t$). No other significant relationships between demographic variables and measures of integration were found.

Subjects' ratings of the importance of achieving positive academic outcomes was found to be positively related to $IC_a$, $\tau = .30$, $p < .05$. No other relevant relationships were found.

ACS scores. ACS scores were marginally correlated with a number of variables including: age ($\tau = .25$, $p < .065$), year in school ($\tau = .23$, $p < .09$), the number of important romantic relationships subjects reported having had ($\tau = .24$, $p < .08$), and ratings of the importance of positive academic outcomes ($\tau = .25$, $p < .065$). A significant correlation between ACS scores and ratings of the importance of understanding academic causes was also found, $\tau = .34$, $p < .01$. 
Effects of Task Order

The pattern of correlational relationships among the key variables was examined to determine if the order of the sorting tasks had any effect on strength or quality of these relationships. There was, in fact, an impact of task order on the relationship between \( H_s \) and \( H_c \) such that the correlation was stronger when subjects performed the relationship causal sort first (\( r = .75, \ p < .05 \)) than when they performed the academic causal sort first (\( r = .43, \ p < .05 \)). Additionally, the relationship between \( H_a \) and \( H_t \) was also affected by task order. The correlation between \( H_a \) and \( H_t \) was stronger when subjects performed the relationship causal sort first (\( r = .52, \ p < .05 \)), and nonsignificant when subjects first sorted the academic causal factors (\( r = .22, \ p > .20 \)).

A final note regarding the influence of order on the correlational relationships between variables concerns the relationship between differentiation of the relationship items (\( H_r \)) and the questionnaire item assessing subjects ratings of the importance of understanding the causes for outcomes in relationships. Analysis showed that this relationship was significant only when the relationship causal sort (R-sort) was completed first (before the questionnaire), \( r = -.44, \ p < .02 \), and was not significant when the A-sort was completed first, \( r < |.20| \).
**Categorical Analyses.**

Based on the quadratic nature of the relationship between ACS and $H_a$, and previous research that demonstrates the informational value of discriminating between high, low and moderate scores on the ACS (Flaherty, 1991), a tertiary split of ACS scores was used in categorical analyses involving the ACS data.

The measures of differentiation and integration were subjected to a 3 (level of ACS) x 2 (gender) ANOVA. A significant main effect of ACS was found for $H_a$, $F(2,51)=4.02$, $p < .025$, and a marginal effect of ACS was found for $H_r$, $F(2,51)=2.56$, $p < .087$. The means for these two effects are depicted in Figures 2 and 3, and demonstrate a curvilinear relationship between the $H$ statistic and ACS categories.

In addition, a significant main effect of ACS was found for $ZCa$, $F(2,51)=5.26$, $p < .009$, and a similar but nonsignificant trend for $IC_r$, $F(2,51)=1.98$, $p < .15$. Again, an examination of the means (see Figures 4 and 5) shows a curvilinear trend, but this time with moderate ACS scores showing less image comparability than high or low ACS scores (indicating less integration). The main effect of ACS on $IC_a$ was qualified by a significant ACS by gender interaction, $F(2,51)=3.65$, $p < .035$. This finding shows that High ACS men, but not women, exhibited elevated $IC_a$ scores (greater integration; see Figure 6). Low ACS
women, compared to moderate ACS women showed greater image comparability. There were no differences between low and moderate ACS men.

A marginal effect of gender on $C_t$ was also found, $F(1,51)=3.55, p < .07$, indicating that men showed greater centrality in their sortings of trait terms than did women.

**Task Order**

There were no significant differences between task orders on the average scores for $H_a$, $H_r$, or $H_t$ ($p$'s > .05 in all cases). Nor were there significant differences between orders for measures of integration. However, there was a significant difference in attributional complexity scores between the two task order conditions, $F(1,51)=6.09, p < .02$. The ACS scores were higher for subjects who received the academic causal sort first ($M=44.19$) compared to those who received the relationship causal sort first ($M=29.88$).

The influence of task order on measures of complexity derived from the sort task was examined (in conjunction with ACS scores). A 3(ACS level) x 2 (task order) ANOVA was performed on these measures. A marginal ACS*order interaction was found for $H_a$, $F(2,51)=2.23, p < .12$, and a significant ACS*order interaction was found for $H_r$, $F(2,51)=3.41, p < .041$.

Post-hoc examination of the means for $H_a$ suggests that low and moderate ACS subjects exhibited higher differentiation of
academic items than high ACS subjects when the first sort was the academic sort. In contrast, it was only the moderate ACS subjects (compared to both high and low ACS scorers) who exhibited high levels of differentiation when the first sort was the relationship sort (see Figure 7).

The impact of order on differentiation of the relationship sort items was more straightforward. There were no differences between subjects when the academic sort was completed first. However, when the relationship sort was completed first, high and moderate ACS subjects showed more differentiation in their sortings of relationship items than did low ACS subjects (see Figure 8).

A marginal interaction effect of ACS and order was found for IC_r, F(2,51)=2.66, p < .08, but not for IC_s, F(2,51)=1.79, p < .18. Again, examination of the pattern of the interaction (see Figure 9) indicates that there are no differences among subject groups when the academic sort was completed first. When the relationship sort was completed first, both high and moderate ACS subjects exhibit reduced integration of the relationship items compared to low ACS subjects.

There were no significant effects of order for the trait sort statistics.
Other Findings

There was a significant main effect of ACS on Need for Cognition Scale (NCS) scores, \( f(5,51)=5.74, p < .005 \). Examination of the mean NCS scores at different levels of ACS indicates a linear relationship with high ACS subjects exhibiting higher NCS scores (M=48.45) than moderate ACS subjects (M=46.39), and low ACS subjects having the lowest NCS scores (M=35.89).

ACS was also found to be significantly related to subjects responses to the item "how important is it to you to understand the causes of your academic or scholastic outcomes", \( F(2,51)=4.67, p < .02 \). Examination of the means (see Figure 10) indicates that high ACS subjects endorsed this item more strongly than either low or moderate subjects.

Results Summary

Measures of Complexity

The measures of complexity (differentiation and integration) were found to be highly related (with the exception of the centralization measure) for both academic and relationship causal sorting tasks. In addition, the measures of cognitive complexity (trait sort) correlated significantly with measures of causal complexity (academic and relationship sorts). Differentiation, as measured by the \( H \) statistic, was inversely related to image comparability, due in part to the mathematical calculation of
these measures and the reluctance of subjects to create substantially overlapping categories.

Causal Complexity and the Attributional Complexity Scale

Contrary to expectations, there was not a clear linear relationship between scores on the Attributional Complexity Scale and measures of complexity derived from the sorting tasks. However, some evidence supported the notion of a quadratic relationship between ACS and measures of differentiation and integration. For both measures, extreme (high and low) scores on the ACS appeared to differ from more moderate scores, with the moderate scores showing a tendency towards greater differentiation and less integration of the sorting task items.

Influence of Task Order

Further analyses showed an impact of task order on the relationship between ACS scores and measures of differentiation and integration. For the academic items, the curvilinear relationship between ACS and differentiation seemed most pronounced when subjects first completed the relationship sort, but post hoc comparisons identified only the comparison between low and moderate ACS subjects as significantly different (with moderate subjects exhibiting the highest differentiation scores).
When subjects completed the academic sort first, only high scores on the ACS seemed to reflect lower levels of differentiation.

For the relationship items, level of differentiation did not change as a function of ACS scores when the academic sort was completed first. When the relationship sort was completed first, moderate and high ACS subjects showed greater differentiation than low ACS subjects. Similarly for the measure of image comparability, there were no differences when subjects completed the academic sort first, but lower levels of image comparability were found for moderate and high subjects when the relationship sort was completed first.

Task order also influenced the strength of the relationship between measures of differentiation. When the relationship sorting task was completed first, the measures of differentiation were more strongly correlated.

Finally, subjects who completed the relationship sort first showed a negative relationship between differentiation and ratings of the importance of understanding causes in relationships.

Study 1 Discussion

Relationship between ACS and direct measures of complexity

Fletcher et al. (1986) declined to use the concepts of differentiation and integration in constructing the Attributional
Complexity Scale, but the underlying construct of attributional complexity is clearly linked to these earlier concepts. The current study attempted to apply the concepts of differentiation and integration to the attributional domain, and further, to determine the extent to which these measures are related to differences in ACS scores.

The results indicate clearly (although contrary to predictions) that the ACS is not linearly related to differentiation or integration measures based on this type of sorting task. In fact, an apparent curvilinear relationship exists between ACS and measures of differentiation and integration.

Despite the mismatch between findings and predictions, these results offer some support for the overall hypothesis. That is, although higher scores on the ACS are not directly (linearly) related to more complex underlying structure, scores on the ACS do distinguish to some extent those whose sortings contain a greater degree of structure. This result could be interpreted as support for the notion that differences in attributional schemata are reflected by scores on the ACS. However, there is no direct evidence that the imposition of structure in the sorting task reflects an existing internal knowledge structure (i.e., attributional schema). In fact, differences in the differentiation and integration of the sorting task items may
reflect "on-line" effort to impose structure on a set of stimuli. That is, rather than drawing upon more complicated existing knowledge structures, those subjects with more differentiated sortings may have simply been more motivated by the situation to impose a more differentiated (perhaps more complex) structure on the information provided.

In addition to this problem with the conceptual interpretation of the results, there are some difficulties in interpretation of the measures used to reflect complexity. In all cases in this study, greater differentiation goes hand-in-hand with less integration. Thus, identifying "causally complex" persons becomes difficult and problematic. For instance, looking only at measures of differentiation leads to the conclusion that moderate scores on the ACS are indicative of a more complex underlying structure. However, moderate level scores are also related to less image comparability (indicative of less complex structure by definition). Without referring to complexity then, the only clear statement of the findings is that moderate, compared to low ACS subjects show a greater tendency to sort the items into a larger number of discrete categories. Thus, the findings do not directly reflect differences in the complexity of internal knowledge structures, but differences in the organization of the information provided.
Task order

The pervasive influence of task order on the relationships among the measures also appears to be problematic. It seems evident that the subjects' sorting behavior is different when the relationship sort is accomplished first compared to when the academic sort is accomplished first. In fact, the differences among ACS score categories appears to be accentuated when subjects deal with the relationship information first. High and moderate ACS subjects appear to be showing greater differentiation of the information and produce less image comparability compared to low ACS subjects (in both sorts, but stronger effects for relationship items).

One interpretation of the task order findings is that the sorting task is inadequate as a measure of the complexity of cognitive organization of causal information. Although this task has been used extensively (e.g., Linville, 1985) as a measure of cognitive complexity, it has not been used in conjunction with causal information prior to this study. Testimony to the reliability of the sorting measure (Neidenthal, 1993) therefore, may only be valid for the sorting of trait items as in prior studies. In the current study, the obvious and pervasive effects of task order on the results may indicate instability in the sorting measure for causal items. This issue is addressed in a
follow-up study designed to examine the stability of the sorting measure for the causal items.

A second interpretation of the task order findings involves subjects' motivation. Informal observations of the subjects (not scientifically collected or examined) during the experiment provide anecdotal evidence that subjects were more engaged and involved overall in the relationship sorting task. This increased level of involvement may be one explanation for the task order findings. If subjects were strongly engaged in the first sorting task (relationship first condition) they may have put more effort into all of the tasks in the experiment. This interpretation of the findings also casts doubt on the efficacy of the sorting task measures as an indication of structural differences in the complexity of attributional knowledge. If the measures of differentiation and integration are influenced by the level of subject engagement, then differences in these measures may reflect simply differences in the motivation of subjects rather than differences in cognitive structure.

In conclusion, the results of Study 1 do not eliminate the possibility that ACS scores reflect true differences in the complexity of attributional schemata. Still, strong conclusions about the meaning of the differences uncovered in this study are difficult to support. Study 2 is designed as a follow-up study to Study 1. The object of Study 2 is to assess the stability of
the sorting task. It has been suggested above that sorting task
stability may be responsible for some of the effects of task
order on the relationship between ACS scores and measures of
complexity derived from the sorting task. Evidence regarding the
stability of the sorting task measures will aid in the
interpretation of the current findings.
CHAPTER IV
FOLLOW-UP STUDY (STUDY 2)

This follow-up study was designed primarily to provide information on the stability of the sorting task measures. Although the reliability of the trait-sorting task as measure of causal complexity (trait sort) was established by Niedenthal et al. (1992), the sorting of causal information has not been previously subjected to tests of reliability. Further, in light of the impact of task order on the results found in Study 1, the stability of the causal information sorting task is suspect. Therefore, it is important to establish whether the sorting task reflects transitory motivations or represents a more stable cognitive organization. A simple test-retest design is implemented in this follow-up study to shed light on the issue of stability in the sorting task.

In addition to the sorting tasks, a number of ancillary questionnaires were administered which have no direct bearing on the reliability of the sorting measures. These measures were included to provide further data on the correlates of the ACS and measures of differentiation and integration. Rationale for inclusion of ancillary measures follows.
Ancillary Measures

As in Study 1, subjects completed a background questionnaire which provided information on the following: subject demographics (year in school, age), interest in causal explanation in academic and relationship settings, and relationship experience. These items address the notion suggested by Fletcher et al. (1986) that complexity might be related to interest in and experience with a particular domain.

Also paralleling Study 1, subjects completed the Need for Cognition Scale (Cacioppo & Petty, 1982). The inclusion of this scale again allows a test of the possibility that the sorting task measures are indicative of a general tendency to engage in effortful cognitive processing.

Two further scales were administered to subjects. The Causal Uncertainty Scale (CUS; Edwards & Weary, 1993) reflects uncertainty in the attribution of causes. This scale may indicate whether greater complexity (as reflected by differentiation and integration) is related to greater or lesser uncertainty about causes. The Personal Need For Structure Scale (PNS; Neuberg & Wilson, 1993) taps a general preference for structure in one's life. This scale may indicate the degree to which the sorting measures reflect a general need to impose clear structure.
Finally, 10 items were created to tap causal uncertainty with regard to academic and relationship settings. It was thought that the CUS might be too general to predict differences in the organization of domain specific information. Inclusion of these items can be regarded as pilot testing. The individual items were designed to tap academic and relationship causal uncertainty and motivations concerning domain specific causal processing. Additional items assessed the anxiety associated with the confrontation of causal complexity in academic and relationship domains (see Appendix G).

Again, these ancillary questionnaires were not the focus of this follow-up study, nor do they impact on the design or hypotheses of the final study in this project.

Method

Subjects

A total of 44 undergraduates participated in a 2-hour experiment for credit for their introductory psychology class. Subjects participated in an initial 1-hour session, and a 1-hour follow-up session 1 week later. One subject failed to return for the second session, and the data for this subject are missing from some analyses. Some individual difference measures were not completed by all subjects. Subjects participated in groups of 1
to 4. In all cases, individual subjects were separated from the other participants by portable partitions.

**Procedure- Session 1**

In the initial experimental session, subjects were told they were taking part in a project investigating the way people think about and use information about the causes for particular events. Subjects were then given the first of three sorting tasks as in Study 1. Following each sorting task, subjects were given a recording sheet and asked to record the sorts by writing the number for each card into the appropriate box on the sheet provided.

Subjects were randomly assigned to one of four different sorting task orders, such that an equal number of subjects completed the academic (sort A), relationship (sort R), or trait (sort T) sorting tasks as the first sorting task (and an equal number completed each sort as the last sorting task) in session 1.

Following the first session (as in Study 1), subjects completed a background questionnaire (see Appendix F) designed to assess some demographic information as well as experience and interest in academic and relationship domains. Subjects were also asked to fill out the Need for Cognition Scale (Cacioppo &
Petty, 1982) and the Causal Uncertainty Scale (Edwards & Weary, 1993) during the first session.

**Procedure- Session 2**

Upon arrival for the second session of this study, approximately one week later, subjects were again asked to perform the card sorting tasks for the academic and relationship domains. The instructions for the sorting task were repeated for all subjects. Subjects who had completed the academic sort (A sort) last in session 1 were asked to complete the A sort first in session 2 (and vice versa). Subjects were also asked to complete the Attributional Complexity Scale (Fletcher et al., 1986), the Personal-Need-for-Structure Scale (Neuberg & Wilson, 1993) and the 10 items created to assess causal uncertainty in relationship and academic settings.

**Results**

**Correlations and Reliabilities**

**Measures of Complexity**

**Differentiation.** As in Study 1, the differentiation measures for academic and relationship domains (as defined by the \( H \) statistic) correlated significantly with each other, both at Time 1 (\( r = .69, p < .001 \)), and at Time 2 (\( r = .80, p < .001 \)). In addition, the domain-specific measures (\( H_a \) and \( H_r \)) correlated
significantly with the measure of cognitive complexity \( (H_t) \) at Time 1: \( H_rH_t - r=.51, p<.001 \); \( H_rH_t - r=.62, p<.005 \) (The trait sort was not performed at Time 2). Test-retest reliability coefficients (correlations) were also calculated for differentiation of causal items as measured by \( H \). The test-retest correlations were strong and significant for both the academic \( (r=.85, p<.001) \) and relationship \( (r=.78, p<.001) \) measures \( H_a \) and \( H_r \) (see Table 6).

**Integration.** Two measures of integration were derived from the sorting tasks: image comparability and centralization. The image comparability statistics for academic and relationship items \( (IC_a \text{ and } IC_r) \) correlated significantly with each other, both at Time 1 \( (r=.68, p<.001) \), and at Time 2 \( (r=.83, p<.001) \).

Centralization scores for the academic and relationship sorts \( (C_a \text{ and } C_r) \) were not significantly correlated at Time 1 or at Time 2 (see Table 6). Test-retest reliability coefficients (correlations) were also calculated for both measures of integration. The test-retest correlations were significant for image comparability measures for both academic \( (r=.79, p<.001) \) and relationship \( (r=.76, p<.001) \) sorts. Test-retest correlations for centralization scores did not reach significance (see Table 6).

**Correlations with ACS.** The ACS correlated significantly with centralization scores for the academic sorting \( (C_a) \) task at
Time 2 only, \( r = .31, p < .05 \). There were no other significant relationships found between any of the measures derived from the sorting task and scores on the ACS.

**Ancillary Measures**

There were no consistent (over time) relationships between measures of differentiation/integration and any of the ancillary individual difference scales. Some correlations, however, neared significance at both Time 1 and Time 2.

**Need for cognition.** Scores on the Need for Cognition Scale (NCS) correlated significantly with \( IC_r \) at Time 1, \( r = .30, p < .05 \), and showed a marginal relationship with \( IC_r \) at Time 2, \( r = .29, p < .07 \). Also, scores on NCS were marginally correlated with \( C_s \) at Time 1, \( r = .26, p < .09 \), and significantly correlated with \( C_s \) at Time 2 \( r = .41, p < .05 \).

**Need for structure.** Scores on the Personal Need for Structure Scale (PNS) correlated significantly with \( IC_r \), \( r = -.37, p < .05 \), and nonsignificantly but similarly with \( IC_s \), \( r = -.23, p < .20 \), at Time 1. The relationship between PNS scores and \( IC_r \) at Time 2, however, was similar but nonsignificant, \( r = -.25, p < .18 \), while the relationship between PNS scores and \( IC_s \) at Time 2 reached a significant level, \( r = -.30, p < .05 \) (see Table 6).
Table 6: Basic correlations and reliabilities for Study 2.

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Correlations in bold face type are significant at the $p < .05$ level.

Correlations among Individual Difference Scales

The ACS was significantly correlated with the Need for Cognition Scale, $r = .60, p < .001$, as expected from previous research findings (e.g., Fletcher, 1986). The ACS did not, however, show significant correlations with any of the other individual difference scales included in this study. The ACS was found to correlate with a number of other ancillary measures including cumulative GPA ($r = .43, p < .005$), and the additional items assessing: 1) importance of understanding academic causes ($r = .30, p < .05$), 2) a great desire to know why things happen in
academic settings (r=.63, p<.005), and 3) anxiety associated with complicated academic causes (r=.60, p<.005).

The Causal Uncertainty Scale (CUS; Edwards & Weary, 1993) correlated significantly with the Need for Cognition Scale (Cacioppo & Petty, 1982; r=.32, p<.05), but did not exhibit relationships with any of the other established individual difference measures, including the ACS. However, a strong relationship was discovered between the CUS and the additional items designed specifically to tap causal uncertainty in the current study. In the academic domain, the CUS was correlated with uncertainty about negative (r=.60, p<.01) and positive (r=.56, p<.01) outcomes and with a great desire to know the causes for things (r=.35, p<.05). In the relationships domain, CUS was correlated with uncertainty about negative (r=.55, p<.005) and positive (r=.60, p<.005) outcomes only.

In addition to correlations with the ACS and CUS, the Need for Cognition Scale exhibited significant correlations with cumulative GPA (r=.34, p<.05), and items assessing: 1) the importance of understanding academic causes (r=.31, p<.05), and 2) a great desire to know why things happen in academic settings (r=.36, p<.05).
Other Analyses

Tests of Curvilinearity

The nature of the relationship between the sorting measures and scores on the ACS was again closely examined. Regression analyses were conducted to test for a possible curvilinear relationship. The quadratic model was not a significant predictor of differentiation or integration (image comparability) scores. However, the regression coefficient for the quadratic model approached significance for $H_s$ at Time 1, $F(1,40)=2.79$, $p < .11$, and for $IC_s$ at Time 1, $F(1,40)=2.50$, $p < .15$.

Categorical Analyses

Scores on the ACS ranged from -23 to 752, with an average of 33.02 and a standard deviation of 23.30. Subjects were assigned to ACS categories based on a tertiary split (upper, lower, and middle thirds).

The measures of differentiation and integration were subjected to a 3 (level of ACS) by 2 (task order) ANOVA. There were no significant main effects of ACS score on measures of differentiation and integration. However, a marginal effect of task order on $H_r$ at Time 2, $F(1,40)=3.29$, $p < .08$, was qualified by a near marginal interaction of ACS and order, $F(2,40)=2.05$, $p < .15$. The pattern of means presented in Figure 11 suggest a curvilinear relationship between $H_r$ and ACS scores at Time 2 for
subjects who completed the relationship sort first at Time 2. Post hoc comparisons indicate that moderate ACS subjects in this condition showed greater differentiation (M=2.89) compared to low ACS subjects (M=1.65) (see Figure 11). When subjects completed the academic sort first at Time 2, on the other hand, there were no differences in differentiation of items as a function of ACS scores.

Additionally, a near significant effect of order on IC_r at Time 1, F(1,40)=3.87, p<.06, was qualified by a marginal interaction of ACS and order, F(2,40)= 3.07, p<.06. Again, the pattern of means shows (see Figure 12) that when subjects completed the relationship sort first (this time at Time 1) the sort task measure varied as a function of ACS score. In this instance, post hoc comparisons indicated that IC_r was greater for moderate ACS subjects (M=.28) than for low ACS subjects (M=.16) who completed the R-sort first. There were no differences in relationship image comparability (IC_r) among subjects who completed the A-sort first.

Finally, a significant effect of order on image comparability for the Time 2 academic sort, F(1,38)=6.43, p<.02, was found. Subjects who completed the academic sort first at Time 2 exhibited greater image comparability scores (M=.23) than those who completed the relationship sort first (M=.17) at Time 2.
Study 2 Discussion

Reliability of Sorting Task Measures

Although a number of intriguing findings are provided by this follow-up study, the most important results concern the reliability of the sorting measures. The test-retest correlations suggested that the sorting task provides some moderately stable indices of differentiation and integration. Specifically, the measure of image comparability and the statistic $H$ were relatively stable across testing times. Centralization, on the other hand, is clearly not a stable measure, as evidenced by the lack of a significant reliability coefficient for either sort.

In addition to information regarding the stability of the sorting task measures, Study 2 also provides additional information about the relationship between ACS scores and the sorting task measures. A comparison of the findings between these two studies may yield clarification of the nature of this relationship.

Comparing Study 1 and Study 2

Relationship Between Sorting Task Measures and ACS Scores

The relationship between sorting task measures and scores on the ACS was not a focus of Study 2. Regardless, the fact that the quadratic relationship between ACS scores and measures of
differentiation and integration (suggested by the results in Study 1) was not found in Study 2 is notable. Not only was the test of the quadratic model nonsignificant, but the categorical analyses also failed to support a quadratic relationship.

There may be a number of reasons for this discrepancy between Study 1 and Study 2. It should be pointed out that the results from Study 1 did not lend themselves to a strong prediction regarding the shape of the relationship between the ACS and the sorting measures. Although the curvilinear trend was apparent from an examination of the means, the only statistical conclusions that can be drawn about the relationship between ACS scores and measures of differentiation and integration in Study 1 indicate simply that low ACS subjects have lower differentiation and higher integration scores compared to moderate ACS subjects. That is, Study 1 establishes the non-linearity of the relationship between ACS and the complexity measures derived from the sorting task.

Task Order

Another point of comparison between these two studies is the effect of the order of presentation of tasks. Although the effect of task order in both studies is disconcerting, there are patterns of results in Study 2 that are remarkably similar to those found in Study 1. For example, the pattern of means
presented in Figure 11 (the effects of order and ACS score on $H_r$ at Time 2) mirrors the pattern of means for a similar effect in Study 1 (see Figure 8). In both cases, subjects who completed the academic sort first (at the time of the sort represented in Study 2) showed no differences as a function of ACS scores. Also in both cases, among the subjects who completed the relationship sort first, subjects with moderate ACS scores exhibited greater differentiation in their sorts of the relationship data than those with low ACS scores.

The influence of task order on image comparability for the relationship sort, on the other hand, did not parallel the Study 1 results. Although subjects who completed the academic sort first in both studies showed no significant differences as a function of ACS scores, the influence of ACS scores on the responses of those subjects in Study 2 who completed the relationship sort first was almost completely opposite that found for subjects in Study 1 (see Figure 9). Among these subjects in Study 2, moderate scores on the ACS were related to higher levels of image comparability than low scores. There was a similar directional trend among high ACS subjects that was nonsignificant; whereas in Study 1, both moderate and high ACS subjects exhibited lower levels of image comparability than low ACS subjects (when completing the relationship sort first).
This finding is perplexing, but even here one can find some similarity between Study 1 and Study 2. These results (in both studies) show again that the influence of individual differences in attributional complexity are apparent when subjects first sort information about causes in relationships, but not when subjects are required to sort information about academic causes first.

There may be a number of reasons why task order influences the relationship between ACS scores and the sorting measures in both studies. It seems unlikely, however, that systematic error in assignment to conditions is responsible for the effect because of the similarity in findings across studies. One possible explanation concerns the level of intrinsic interest in the task on the part of the subjects. Involvement or motivation may be a necessary condition for the expression of any differences in cognitive structure. For example, many current models of information processing (e.g., Fiske & Neuberg, 1990; Petty & Cacioppo, 1986) propose that effortful cognitive processing of information requires a motivational component. If subjects are involved in the task, they may be more likely to demonstrate the effects of more complicated structure in their information sortings. Lack of motivation or interest, on the other hand, may eliminate the distinctions between those with more or less complexity in causal schemas. From an anecdotal perspective, it
does appear to be the case that subjects are often more involved in the relationships tasks than in the academic tasks.

**Supplementary analyses: Combined data from studies 1 and 2**

Another approach to the reconciliation of the disparities between studies 1 and 2 is to combine the results from both studies, thereby increasing the overall $n$ for the analyses. This approach would also tend to illuminate the commonalities of the two studies, rather than their disparities (only those effects supported by the entire data may prove to be significant).

The data from studies 1 and 2 were combined and the relationship between ACS scores and measures of complexity derived from the sorting task was re-examined using the combined data. In order to assure that comparable data were being combined, only data from the first session (Time 1) of Study 2 were used in these analyses.

ACS scores for the combined sample exhibited a mean of 34.88 and a standard deviation of 22.74. Scores ranged from -23 to 79. Correlational analyses for the combined data again revealed no significant relationship between ACS scores and any of the complexity measures derived from the sorting task (all $r$'s $<.15$).

Regression analyses were performed to test for a possible quadratic relationship between ACS scores and measures of differentiation and integration. In all cases the regression
weight for the quadratic component of the model was not significant (all $F$'s < 1.0).

Finally, categorical analyses of the combined data were conducted. Subjects were divided into three categories based on the distribution of ACS scores for the combined data. A one-way ANOVA revealed a marginally significant effect of ACS scores on $F_{x, E(2,106)}=2.09, p<.13$ and a nonsignificant effect of ACS scores on $F_{z, E(2,106)}=1.95, p<.20$. This effect is presented in Figure 13, and indicates a curvilinear relationship between differentiation and ACS scores. Post-hoc comparisons revealed that moderate ACS subjects exhibited greater differentiation of the academic items than did low ACS subjects. No other significant differences were found.

In addition to providing information regarding the general relationship between ACS scores and the sorting task measures, the combination of studies 1 and 2 provides the opportunity to examine the influence of task order in the broader context of the combined studies.

Across the two studies, subjects completed the sorting tasks in a total of six different orders. These six orders were collapsed into three task order conditions to simplify analyses. Although there are many ways of simplifying the task orders, the following method was used to increase the relevance of the task order manipulation to the analyses being conducted.
For each sorting task (academic, relationship, trait), a different set of three task order conditions was used in analyses of the sorting task measures derived from that task. The task order conditions for each analysis were selected to reflect the position in the experimental procedures of the sorting task being examined (first, second, or last). For example, in the analysis of the relationship sorting task measures, the three order conditions are as follows: relationship sort first, relationship sort second, relationship sort last. Similarly, the task order conditions for analyses involving the academic sort are academic first, academic second, and academic last.

Using this approach, the task order condition is directly related to the sorting task being examined, and the positions of the other sorting tasks are not relevant to (and do not influence) the analyses. For example, in analyses involving the relationship sort, the analyses of the influence of ACS score on differentiation in that task are not dependent on which sort task precedes or follows the relationship sort. Interpretation of the relationship between ACS scores and sorting task measures on that particular task are then simplified because all effects are dependent on the positioning of the task being examined, regardless of the positions of the other tasks.

A 3 (level of ACS) x 3 (order of relevant sorting task: first second last) ANOVA was conducted on measures of differentiation
and integration for both the relationship and academic sorting tasks. No significant effects were discovered for the academic sorting task measures. A marginal interaction of ACS and order was found for differentiation of the relationship items, $F(4, 95) = 1.76$, $p < .15$, and a significant interaction of ACS and order was found for image comparability for the relationship items, $F(4, 95) = 2.92$, $p < .03$.

Examination of these findings shows that, among those who completed the relationship sort first, moderate ACS subjects showed greater differentiation than low ACS subjects. Those who completed a different sorting task as the first task (relationship second, relationship last) showed no differences in differentiation as a function of ACS scores (see figure 14).

For the measure of image comparability, among those who completed the relationship sort first, low ACS subjects showed the greatest image comparability, although the differences were not significant (see Figure 15). This pattern is consistent with the pattern for relationship differentiation, and indicates again that meaningful differences in the sorting task measure as more likely when the relationship sort is completed first. It should be noted that the highest image comparability scores were found among the moderate ACS subjects who completed the relationship sort second in the experimental procedures. Although significantly different from the other means, the cell size for
the moderate subjects completing the relationship task second is the smallest of all the cells (n=5) and reflects two different task orders (academic first with relationship second, and trait first with relationship second). Because of these features of data, it is difficult to make strong conclusions about the differences among those who completed the relationship sort second.

Although not completely conclusive, the analysis of the combined data from studies 1 and 2 provide support for a curvilinear relationship between ACS scores and differentiation (H). Further, there is some evidence to support the idea that differences among ACS groups on the relationship sorting task measures are more prevalent when the relationship task is the first sorting task completed.

Additional Findings in Study 2

A number of other results found in Study 2 are not central to this research project, but may be of some interest in stimulating future research. For that reason, they deserve some brief mention.

ACS scores in this study were positively related to grade point average. This relationship was not significant in Study 1, however, and may not be reliable. If the relationship between grades and attributional complexity is found to be genuine, on
the other hand, it may shed light on the role of attributional schema complexity in achievement settings.

In addition, ACS scores were found to be related to several measures dealing with knowledge and concern about academic causes. Overall, higher ACS scores were related to a greater desire for understanding of causes and a greater anxiety about causes in the academic domain. Again, these results speak to the attribution-achievement relationship, indicating the possibility that attributional complexity could be an important aspect of achievement motivation.

Some significant correlations were also found between the ancillary individual difference scales and the sorting task measures. For example, the Personal-Need-for-Structure Scale was shown to be negatively related to image comparability. Although not predicted, this finding indicates that the greater desire for structure is related to less integration of information. Apparently, personal structure needs are at odds with conceptual overlap. This suggests that those with a high need for structure may prefer to use clearly discrete conceptual categories. These findings may provoke further research ideas, but are not pursued further in the context of this research program.
Conclusions

Some support was provided in Study 2 for the treatment of the sorting task measures as stable measures of individual differences. It was additionally shown that situational constraints such as task order can affect the relationship between ACS scores and the structure imposed on the causal factors in the sorting tasks. These two results are somewhat contradictory, indicating both the stability and the malleability associated with the sorting task. It is plausible that the sorting task both provides information about stable characteristics in the way people deal with attributional information, and also indicates temporary motivations that may direct the behaviors shown by the sorting. Thus the interpretation of differences in the sorting task measures may be ambiguous.

Although Study 2 does provide some evidence regarding differences in differentiation and integration among levels of ACS, the combined data including both Study 1 and Study 2 provide a larger, more stable sample from which to draw conclusions. Analyses of the combined data provide continued support for the curvilinear relationship between ACS scores and the sorting task measures of complexity. Interpretation of this result, however, is complicated by the fact that the sorting task is not a direct measure of internal knowledge structure.
It is possible that the curvilinear relationship between ACS and differentiation may reflect true differences in the underlying structure of attributional schemata. That is, among moderate ACS subjects, attributional information may be stored in a more highly differentiated fashion (more categories) compared to both high and low ACS subjects. We might conclude from this, that moderate ACS subjects have more complex attributional knowledge structures than high or low ACS subjects.

On the other hand, it may be that these differences in the sorting task measures simply reflect differences in the effort expended in the processing of attributional information. That is, moderate ACS subjects may have put more effort into processing the information and thus imposed a more complex structure on the sorting task items.

A third possibility is that the complexity of the underlying structural differences in attributional knowledge increases linearly with scores on the ACS. That is, high ACS subjects may actually have the most complex underlying structure, and yet exhibit a less complicated sorting. There is no reason that a complex internal structure must result in a complex external solution. It is possible that a well-developed attributional schema may facilitate a simplified organization of the information, while those with only moderately developed schemas
exhibit a more complicated structure because they are unable to synthesize the information to achieve a more simple solution.

In conclusion, although the results of Study 2 and the combined analysis with Study 1 show that the Attributional Complexity Scale is related to differences in the level of differentiation and integration as measured by the sorting task, the interpretation of these findings is not straightforward. The results are consistent with structural differences underlying the ACS, but they do not conclusively establish that such differences exist. Further, it may be that differences in schematic complexity may not map directly onto observed complexity of the sorting measure, thus the shape of the relationship between ACS scores and schema complexity is also indeterminate.
CHAPTER V

STUDY 3: INDIRECT MEASURES OF STRUCTURE

Study 3 tests the influence of attributional complexity on schematic information processing. Fletcher et al. (1986) propose that subjects who score high in attributional complexity possess more complex attributional schemata. Schematic complexity in a variety of domains has been shown to be related to specific differences in the processing of schema-relevant information (e.g., Chase & Simon, 1973; Fiske, Kinder & Larter, 1983; Higgins & Bargh, 1987). Study 3 is designed to provide information about differences in the processing of schema-relevant information that may be related to differences in scores on the Attributional Complexity Scale.

Specific Predictions

Based on the literature on expert vs. novice processing discussed in Chapter I, a number of schematic processing differences are expected to occur as a function of ACS scores. In general, higher levels of complexity in attributional schemata should be related to more efficient processing of schema relevant material. In particular, high scores on the ACS are thought to be
likely to be related to: 1) better memory for schema-relevant information; 2) faster processing of schema-relevant information; 3) better memory for schema-inconsistent information under the time pressure (cognitive load) condition.

An additional prediction from Chapter I suggested that a curvilinear relationship might exist between ACS scores and memory for inconsistent information in the no load condition. High and low ACS subjects are expected to have a better memory for inconsistent information than moderates. These predictions are again based on the literature on the influence of schema development (novice vs. expert schemas) on information processing. In particular, it has been suggested (Fiske & Dyer, 1985; Stangor & Ruble, 1989) that those with highly developed schemas (experts) have a greater capacity (by virtue of more compact information storage) to integrate inconsistent information with existing schema-based expectations. Those with very undeveloped schemas (novices), on the other hand, may be able to encode schema-inconsistent information more easily because they have no strong, conflicting expectations. Only those with moderately developed schemas will have difficulty remembering inconsistent information because the process of integrating that information with their existing expectations requires a great deal of cognitive effort.
Choice of Attributional Domain

In order to test these hypotheses, subjects were asked to consider a relationship scenario and were presented with attributionally relevant information (causal factors based on the sorting task materials). There were a number of reasons for selecting the relationships domain for this experiment. First, the demands on subject time, and the predominance of order effects in the earlier studies suggested that a single domain (and a single sorting measure) should be used in this study. As demonstrated in Study 1 (and Study 2) the sorting measures for relationship and academic domains are highly correlated, therefore either domain seemed a reasonable candidate for this study.

Second, the relationships domain may be a domain more suited to interpersonal attribution processes rather than to introspective attribution processes. Students, in particular, may be likely to consider their own academic experiences when thinking about academic causes. This is particularly important as many items on the ACS tap the tendency to think complexly about the behavior of others.

Third, there may be a greater variability in the experiences of subjects in examining causes with regard to intimate
relationships. Academic causal experience, on the other hand may be quite comparable across the (mainly college sophomore) subjects in this study.

Finally, upon observing subjects reactions to the causal tasks in this experimental project, it is fairly evident (anecdotally) that subjects were more involved in causal tasks that related to relationships than those relating to academics.

Scaling

In addition to the measures of information processing, data were collected in Study 3 for analyses using multidimensional scaling. The collection and analysis of these data will be discussed in a separate chapter. Analysis of the multidimensional scaling data involves an examination of the influence of complexity on the dimensional representation of causal information. It was predicted that the data of subjects with higher ACS scores would be best represented by multidimensional scaling solutions with a greater number of dimensions.

Overview

Subjects in this study were presented with a short scenario about a couple having trouble in a relationship. They were then presented with information that was consistent with, inconsistent
with, or irrelevant to the fact that the couple was having relationship difficulties. Following the presentation of information, subjects were asked to make judgments about the likely outcome of the scenario, and were then given an unanticipated recall task. Subjects were also asked to complete a relationship causal sorting task and to make judgments of similarity between causal factors for the multidimensional scaling analyses.

Initial Pretesting Session

In order to present consistent and inconsistent information to subjects, the degree to which information is consistent or inconsistent with schema-based expectations must be ascertained. In a pretesting session, subjects were asked to rate causes on their consistency with a particular outcome and their relevance to a particular outcome. Subjects also provided general evaluations (positive/negative) of each cause.

Method. As part of a separate, unrelated study, 69 male and female subjects rated the causal items to be used in Study 3. Subjects responded to a QuickBASIC computer program (see Appendix H for a hard copy of the program) that presented the causes and recorded subjects' ratings. The causes rated by these subjects included: 1) the 44 causes for relationship outcomes constituting materials for the sorting task, and 2) sixteen additional causes
constructed (based on face value) to be irrelevant to relationship outcomes.

Subjects were told to consider a situation in which a couple is having problems with their relationship. They were asked to respond to the following questions (as shown) for each cause presented:

1) How CONSISTENT or INCONSISTENT is this cause with the situation? For this question, consider if you think the statement makes sense or "fits with" the situation described.

2) How RELEVANT (related) or IRRELEVANT (unrelated) is this cause to the situation? For this question consider if you think the cause might have some influence on the situation.

3) Is the cause describing a generally POSITIVE or a generally NEGATIVE behavior or quality? For this question, consider if you think the cause seems to be a good thing or a bad thing.

For use in Study 3, 24 causes were chosen based on pretest ratings. Consistent items were selected that were rated high in consistency and relevance to the negative relationship outcome. Inconsistent items were selected that were rated low in consistency and high in relevance to the negative relationship outcome. Irrelevant items were selected that were rated low in relevance to relationship outcomes and moderate in terms of positivity (neither strongly positive nor strongly negative).

The final group of items selected as stimulus materials for Study 3 is presented in their final form in Table 7 along with average
ratings (on a scale from 1-9) for consistency, relevancy, and positivity.

Method

Subjects

A total of 120 male and female subjects participated in Study 3 and were given class credit for their participation. Subjects arrived at the experimental sessions in groups of 2 to 6 and were seated at computer terminals separated by portable partitions.

Procedure

Subjects first completed the Attributional Complexity Scale and answered some basic demographic questions (e.g., age, sex, year in school, etc.). Next, they were seated at the computer to begin the memory and judgment task. On the computer screen, subjects were given the following instructions:

"A couple is seeing a relationship counselor because of some problems in their relationship. During a series of interviews, the counselor finds out a great deal of information about the couple's behaviors and qualities. In this task, you will be asked to view the information that the counselor has, and try to come to judgment regarding the causes of the couple's problems. After the computer task, you may be asked to discuss your assessments of the causes for the couple's relationship problems."
### Table 7: Pretest ratings of stimulus materials for Study 3

<table>
<thead>
<tr>
<th>Causal factor</th>
<th>Consistent/ Inconsistent</th>
<th>Relevant/ Irrelevant</th>
<th>Positive/ Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both partners had an affair</td>
<td>8.1</td>
<td>8.7</td>
<td>1.5</td>
</tr>
<tr>
<td>There are alternative love interests</td>
<td>7.4</td>
<td>8.5</td>
<td>2.3</td>
</tr>
<tr>
<td>They have financial problems</td>
<td>7.1</td>
<td>7.4</td>
<td>2.7</td>
</tr>
<tr>
<td>There is a lack of trust in the relationship</td>
<td>7.9</td>
<td>8.5</td>
<td>1.7</td>
</tr>
<tr>
<td>There is a lack of honesty in the relationship</td>
<td>7.8</td>
<td>8.4</td>
<td>1.4</td>
</tr>
<tr>
<td>They are often insensitive to each other's needs</td>
<td>7.4</td>
<td>8.0</td>
<td>1.9</td>
</tr>
<tr>
<td>There is selfishness in the relationship</td>
<td>7.8</td>
<td>7.9</td>
<td>2.0</td>
</tr>
<tr>
<td>One or both feel constrained by the relationship</td>
<td>7.3</td>
<td>7.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Not enough quality time together</td>
<td>7.4</td>
<td>8.1</td>
<td>2.4</td>
</tr>
<tr>
<td>They are equally involved in the relationship</td>
<td>4.5</td>
<td>6.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Flexibility/ ability to compromise</td>
<td>4.5</td>
<td>6.3</td>
<td>7.1</td>
</tr>
<tr>
<td>There is no alcoholism or drug abuse</td>
<td>4.9</td>
<td>5.9</td>
<td>7.1</td>
</tr>
<tr>
<td>They love each other</td>
<td>4.2</td>
<td>5.8</td>
<td>8.6</td>
</tr>
<tr>
<td>They don't usually fight or argue</td>
<td>3.9</td>
<td>5.8</td>
<td>6.5</td>
</tr>
<tr>
<td>They communicate well</td>
<td>3.9</td>
<td>4.9</td>
<td>7.9</td>
</tr>
<tr>
<td>They have similar views and attitudes</td>
<td>5.4</td>
<td>5.2</td>
<td>7.4</td>
</tr>
<tr>
<td>There is no physical abuse</td>
<td>4.6</td>
<td>5.1</td>
<td>7.9</td>
</tr>
<tr>
<td>They have similar educational and career goals</td>
<td>4.3</td>
<td>4.8</td>
<td>7.1</td>
</tr>
<tr>
<td>They live in the country</td>
<td>3.8</td>
<td>3.4</td>
<td>5.2</td>
</tr>
<tr>
<td>They work out regularly</td>
<td>4.2</td>
<td>3.2</td>
<td>6.5</td>
</tr>
<tr>
<td>Both partners have allergies</td>
<td>3.7</td>
<td>3.2</td>
<td>4.3</td>
</tr>
<tr>
<td>They often contribute to charity</td>
<td>3.9</td>
<td>3.2</td>
<td>6.8</td>
</tr>
<tr>
<td>They are not American Citizens</td>
<td>3.4</td>
<td>3.1</td>
<td>3.8</td>
</tr>
<tr>
<td>They have a dog or a cat</td>
<td>4.1</td>
<td>3.0</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Note: higher numbers indicate greater consistency, greater relevance, and greater positivity.
After these initial instructions, the subjects were presented with the causal factors. Each factor was presented individually on the computer screen.

**Cognitive load.** Cognitive load was manipulated by time pressure. Subjects in the high time pressure condition were presented each piece of information for a fixed period of time controlled by the computer program (2.5 seconds). Pilot testing showed that subjects could read and understand the phrases within the fixed time limit. Subjects in the no time pressure condition were allowed to proceed at their own pace through the information. The amount of time spent with each item was monitored for those subjects in the no time pressure condition.

**Judgment task.** Following presentation of the information, subjects were asked to make judgments about the likely conclusion of the scenario (i.e., how well will the relationship work out), and their liking for the couple described in the scenario. They were also asked to indicate confidence in these judgments. Response times were collected for each of these judgments.

**Recall task.** Immediately following the presentation of the information, subjects were asked to recall as many of the causal factors as possible. They were instructed to type the phrases directly into the computer as prompted on the screen.

**Sorting Task.** Following the recall task, subjects were given a deck of cards containing the 44 causal factors for
outcomes in relationships as used in Studies 1 and 2. Subjects were given the same instructions as in previous studies and were told to notify the experimenter when they had completed the sorting task.

Similarity judgment task. Following the sorting task, subjects were again seated at the computer for the paired comparisons task. A computer program (see Appendix J) presented subjects with pairs of causal factors. Subjects were asked to indicate the similarity of the two causes presented on the screen. At the start of the paired comparisons task, all subjects completed the same 10 comparisons as a warm-up exercise to familiarize them with the required judgment process. A more detailed description of the methods used to develop the multidimensional scaling materials is presented in a following section.

Results

Coding of Recall Data

Two trained raters conducted the coding of the recall data. Both raters coded all responses for all subjects. Following Fiske et al. (1983) a "lenient gist criterion" was used in the coding of recall protocols. That is, subjects' responses were not required to be verbatim reproductions of the information in
order to be scored as a correct recall. Recall responses were separated into the following categories:

- Correct recall of consistent information (C)
- Correct recall of inconsistent information (IC)
- Correct recall of irrelevant information (IRR)
- Incorrect recall - item is consistent with scenario (WC)
- Incorrect recall - item is inconsistent with scenario (WIC)
- Incorrect recall - item is irrelevant to scenario (WIRR)

In addition, the following variables were calculated from the recall codings for use in the analyses:

- Total number of recall responses
- Proportion of (total) responses correct & consistent with scenario
- Proportion correct and inconsistent with scenario
- Proportion correct and irrelevant to scenario
- Total number of incorrect responses
- Proportion of (total) responses incorrect

Inter-rater reliabilities were calculated and are presented in Table 8.

**Distribution of ACS scores.**

Scores on the ACS ranged from -23 to 70, with an average of 30.36 and a standard deviation of 18.21. For use in the categorical analyses, subjects were assigned to ACS categories based on a tertiary split.

**Basic Relationships Among Measures of Complexity**

As before, ACS scores were found to be uncorrelated with measures of differentiation and integration. The relationship
Table 8: Inter-rater reliabilities for recall data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reliability coefficient (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # recalled</td>
<td>1.000</td>
</tr>
<tr>
<td># Consistent items</td>
<td>.938</td>
</tr>
<tr>
<td># Inconsistent items</td>
<td>.913</td>
</tr>
<tr>
<td># Irrelevant items</td>
<td>.895</td>
</tr>
<tr>
<td>Total # incorrect recalled</td>
<td>.804</td>
</tr>
<tr>
<td>Incorrect consistent</td>
<td>.639</td>
</tr>
<tr>
<td>Incorrect inconsistent</td>
<td>.608</td>
</tr>
<tr>
<td>Incorrect irrelevant</td>
<td>.604</td>
</tr>
</tbody>
</table>

between ACS scores and the differentiation measure ($H$) was positive and marginally significant, $r = .14$, $p < .14$. The relationship between ACS scores and the integration measure ($IC$), did not approach significance, $r = -.09$, $p < .33$. As in the previous studies, measures of differentiation and integration were negatively correlated, $r = -.75$, $p < .001$.

An examination of a possible quadratic relationship between ACS and $H$ was conducted using regression analyses as in Study 1. There was no evidence for a quadratic relationship between ACS scores and $H$ or $IC$. 
Recall data

Correlations

Correlational analyses investigated the relationship between the measures of complexity (ACS scores, H, and IC) and recall measures. These correlations are presented in Table 9.

Categorical Analyses

A 3 (level of ACS; high/moderate/low) x 2 (cognitive load condition; time pressure/no time pressure) ANOVA was performed on all the relevant recall measures. A marginal main effect of ACS scores was found for the total number of recall responses, \( F(2,106)=2.29, p<.11 \). This effect was qualified by a marginal interaction of ACS and time pressure, \( F(2,106)=2.59, p<.08 \). Post hoc comparisons indicated that high ACS subjects in the no time pressure condition produced the greatest number of recall responses (see Figure 16).

A marginal main effect of ACS was also found for the number of consistent items correctly recalled, \( F(2,106)=2.77, p<.07 \). Examination of the means suggests a linear trend with high ACS subjects recalling the most consistent items on average (\( M=3.38 \)), followed by moderate (\( M=2.93 \)) and low (\( M=2.68 \)) ACS subjects.

A marginal main effect of ACS on the number of inconsistent items, \( F(2,106)=2.34, p<.11 \) (see Figure 17), was qualified by a
Table 9: Correlations between recall measures and complexity measures.

<table>
<thead>
<tr>
<th></th>
<th>ACS</th>
<th>H</th>
<th>IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>0.147</td>
<td>0.137</td>
<td>-0.220*</td>
</tr>
<tr>
<td># consistent</td>
<td>0.218*</td>
<td>0.100</td>
<td>-0.167+</td>
</tr>
<tr>
<td># inconsistent</td>
<td>-0.171+</td>
<td>0.108</td>
<td>-0.072</td>
</tr>
<tr>
<td># irrelevant</td>
<td>0.142</td>
<td>-0.031</td>
<td>-0.065</td>
</tr>
<tr>
<td>Total incorrect</td>
<td>0.084</td>
<td>0.060</td>
<td>-0.089</td>
</tr>
<tr>
<td># incorrect consistent</td>
<td>-0.010</td>
<td>0.076</td>
<td>-0.082</td>
</tr>
<tr>
<td># incorrect inconsistent</td>
<td>0.119</td>
<td>0.001</td>
<td>-0.029</td>
</tr>
<tr>
<td># incorrect irrelevant</td>
<td>0.063</td>
<td>0.052</td>
<td>-0.078</td>
</tr>
</tbody>
</table>

Note: correlations significant at the p<.05 level are indicated by (*). Correlations marginally significant at the p<.10 level are indicated by (+).

Marginal interaction of ACS and time pressure, $F(2,106) = 2.73$, p<.07 (see Figure 18).

Examination of the means in Figure 18 suggests a (nonsignificant) curvilinear trend in the no time pressure condition (Post hoc comparisons showed no difference among the means in that condition) and a distinct disadvantage for memory of inconsistent information for both moderate and high ACS subjects in the time pressure condition. Note that high and low ACS subjects recalled equivalent numbers of inconsistent items (means: $M = 2.82$ and $M = 2.85$ respectively) when there was no time pressure, but under time pressure, high ACS subjects' memory for this information was significantly poorer ($M = 1.68$) than low ACS subjects' memory ($M = 2.60$).

Another measure derived from the recall data is the proportion of total items recalled that are correct and
inconsistent with the scenario. A significant main effect of ACS
was found for this measure, $F(2,106)= 4.98$, $p<.01$. Examination
of the means indicated that lower ACS subjects' recall protocols
had a greater proportion of inconsistent items than high or
moderate ACS subjects (see Figure 19).

Recall protocols were also scored for the total number of
incorrect responses, and for the number of incorrect consistent,
inconsistent, and irrelevant responses. Analysis of these
measures revealed a marginally significant effect of time
pressure on incorrect consistent responses, $F(1,106)=2.52$, $p<.12$,
and a significant effect of time pressure on incorrect irrelevant
responses, $F(1,106)=7.24$, $p<.01$. Subjects in the time pressure
condition made more incorrect consistent responses on average
($M=.34$) than those in the no time pressure condition ($M=.20$), and
made fewer incorrect irrelevant responses on average ($M=.31$) than
subjects in the no time pressure condition ($M=.63$).

Influence of Sorting Task Measures on Recall

Because the measures of differentiation and integration are
thought to be continuous measures, regression analyses were
conducted to test the influence of these variables on recall.
All recall measures were subjected to two separate regression
analyses. In the first analysis, the influence of $H$, time
pressure, and the interaction of $H$ and time pressure were
examined. The second analysis tested the influence of IC, time pressure and the interaction of IC and time pressure. None of these analyses produced significant interactions between the sorting task measures and the time pressure condition (Note: main effects of the sorting measures are provided in the correlational analyses). In fact, these regression analyses were performed on all of dependent measures in study 3, but did not contribute any additional information beyond that found in correlational analyses. Thus, the results of regression analyses examining the influence of the sorting task measures will not be reported in any other sections of this chapter.

**Processing Time**

Subjects' response times to the individual causal items (i.e., the amount of time each item was on the screen) was recorded by the stimulus presentation program (see Appendix I). For ease of analyses, the time subjects spent looking at consistent, inconsistent, and irrelevant items was totaled. These measures were subjected first to correlational analyses, and subsequently to ANOVA (and regression) analyses, to determine the relationship between measures of complexity and processing time for consistent versus inconsistent information. Because only the subjects in the no time pressure condition were able to
control their processing time, all analyses reported in this section are conducted only on those subjects.

**Correlations.** A significant correlation between ACS scores and time spent looking at consistent information was found, $r = .282$, $p < .04$. No other correlations with processing of causal information were found.

**Categorical analyses.** A one-way ANOVA (level of ACS: high/moderate/low) was conducted. A marginal main effect of ACS score was found for the amount of time spent processing consistent information, $F(2,52) = 2.97$, $p < .07$. Examination of the means shows a linear trend, supporting the correlational finding ($M_{low} = 30.93$, $M_{mod} = 34.46$, $M_{high} = 40.43$).

**Other Results**

Subjects were asked to judge the likelihood of the relationship's success and to indicate their degree of liking for the couple. In addition, subjects rated their confidence in these judgments. Response time measures were collected as well for both the basic ratings (success, liking) and for subjects' ratings of their confidence in their judgments.
Correlations

Subjects were asked to make two judgments following the presentation of the causal information. Judgements of the likely success of the relationship were not significantly correlated with any of the measures of complexity (ACS, $H$, $IC$). Liking for the couple was found to correlate negatively with image comparability, $r=-.25$, $p<.05$. There were no significant correlations between measures of complexity and subjects' ratings of confidence in their judgments. However, the amount of time required to make the initial judgment regarding the outcome of the relationship was marginally related to ACS scores, $r=.15$, $p<.11$, and significantly related to $H$, $r=.19$, $p<.05$, and to $IC$, $r=-.25$, $p<.02$.

Categorical Analyses

A 3 (level of ACS score: high/moderate/low) by 2 (time pressure condition: time pressure/no time pressure) ANOVA was conducted on the measures identified above. A marginal interaction of ACS score and time pressure condition was found for liking judgments, $F(2,101)= 2.57$, $p<.09$. Examination of the means (see Figure 20) indicates no differences in liking in the no time pressure condition. However, low ACS subjects in the time pressure condition expressed lower liking for the couple compared to moderate and high ACS subjects. In addition, a
marginal main effect of ACS was found for subjects' ratings of confidence in their liking judgments, $F(2,105)=2.83$, $p<.07$. Post hoc comparisons indicated that high ACS subjects exhibited lower levels of confidence in their liking judgments compared to moderate ACS subjects (see Figure 21).

Another measure of interest is the response time for making judgments about the couple in the scenario. Analyses of the response times for making the judgment about the outcome of the relationship indicated a significant main effect of ACS, $F(2,105)=4.53$, $p<.02$, and a significant main effect of time pressure, $F(2,105)=4.50$, $p<.04$. These effects were subsumed by a significant 2-way interaction of ACS and time pressure condition, $F(2,101)=12.37$, $p<.001$. Examination of the means (see Figure 22) shows that high ACS subjects took more time to make their judgment (compared to both low and moderate ACS subjects) in the no time pressure condition. Among subjects subjected to time pressure, however, a significant curvilinear effect was found. High and low ACS subjects were faster than moderate ACS subjects in responding to the judgment following the quickly presented information. In addition, the time to make confidence judgments was also influenced by ACS and time pressure. Examination of the two-way interaction, $F(2,105)=2.50$, $p<.09$, showed that high ACS subjects in the no time pressure condition took longer to respond
(compared to moderates) to judgments of their confidence in liking ratings for the couple (see Figure 23).

**Similarity Data**

Finally, as part of the portion of the experiment that involved data collection for the multi-dimensional scaling analyses, further data was collected which may be useful. In this portion of the study, all subjects completed the same set of 10 warm-up judgments in which they were asked to make similarity judgments. The average similarity judgments (averaged across the 10 warm-up items) were subjected to correlational, ANOVA, and regression analyses.

A significant correlation between ACS scores and average similarity ratings on the warm-up judgments was found, $r=-.23, p<.02$. In addition, image comparability correlated with the average similarity judgment as well, $r=-.24, p<.02$. These results taken together indicate that lower levels of attributional complexity and lower levels of image comparability are related to increased judgments of similarity.

This measure was also subjected to a 3-way (level of ACS) analysis of variance. A marginally significant main effect of ACS score was found, $F(2,111)= 2.24, p<.12$, indicating a trend toward greater similarity ratings among lower levels of
attributional complexity (see Figure 24), as suggested by the correlational analyses.

**Study 3 Discussion**

**Memory for Consistent Information**

It was predicted that ACS scores would be related to better memory for overall schema-relevant information. This prediction was supported by a significant positive correlation between ACS scores and the number of correct consistent responses. In addition, categorical (ANOVA) analyses revealed that high ACS subjects recalled significantly more items (of all types) in the no time pressure condition. ANOVA results also indicated a linear relationship between the number of consistent items recalled and ACS scores.

This result is consistent with a good deal of research (e.g., Stangor & Ruble, 1989) that suggests that those with more developed schemas may focus more strongly on schema-consistent information.

**Memory for Inconsistent Information**

Predictions regarding memory for inconsistent items included an interaction between time pressure condition and complexity. Specifically, a curvilinear relationship was predicted for the no-time pressure condition (high and low ACS subjects having a
memorial advantage over moderates), and an overall advantage for high ACS subjects in the time pressure condition.

Correlation analyses revealed that ACS scores were negatively correlated with the number and proportion of inconsistent items correctly recalled, indicating that higher ACS scores were linked to poorer memory overall for the inconsistent items (contrary to predictions). An ACS main effect (from ANOVA analyses) also showed an advantage for low ACS subjects in the memory for inconsistent information, but was qualified by an interaction with time pressure. The interaction (of ACS and time pressure) showed that, among those in the high time pressure condition, both high and moderate ACS subjects exhibited poorer memory for the inconsistent items than did low ACS subjects. There was a slight trend towards a curvilinear relationship in the no time pressure condition in support of the prediction, but the effect was not significant.

Although these results are not a clear support for the predictions, they are consistent with the idea that ACS scores reflect complexity of attributional schemas. In the no time pressure condition, it was expected that those without well defined schemas would have no difficulty with the inconsistent information because it would not conflict with existing expectations (Higgins & Bargh, 1987). Those with complex schemas should have more cognitive capacity for dealing with
inconsistent information (Fiske & Dyer, 1985). Thus, only those with moderately defined schemas would have trouble integrating the information with their existing expectations. This pattern of data was found for the no time pressure condition, but did not reach significance.

It was expected that the increase in time pressure would hamper the ability of subjects to adequately integrate inconsistent information into existing schemata (thus affecting even further the memory of moderately complex subjects). Those with more complex schemas would not be as affected by the time pressure because of their greater cognitive capacity. The results indicate that both high and moderate subjects' memories for the inconsistent information was hampered by the time pressure condition, while low ACS subjects were not affected.

This finding does not indicate any "greater capacity" to deal with the inconsistent information on the part of the high ACS subjects. It seems likely that time pressure interfered with the integration of inconsistent information into existing schema structures for both high and moderate ACS subjects. There was no advantage conferred on high ACS subjects, suggesting that their schemas may not be as well developed as "expert" schemas are generally. The low ACS subjects may have been less affected by this manipulation because their attributional schemas were not
fully formed. In fact, a comparison of the means for consistent and inconsistent items for low ACS subjects shows that low ACS subjects recalled roughly the same number of consistent and inconsistent items (means; $M = 2.64$ and $M = 2.85$, respectively) in the time pressure condition.

**Processing Time**

Processing time was predicted to be related to ACS scores. It was thought that higher ACS scores should be related to increased ability to process schema-relevant information. ACS was found to be positively related to time spent looking at consistent information. This finding goes against predictions and suggests that those higher in attributional complexity spent more time processing the schema consistent information. Previous research on attributional complexity (Flaherty, 1991) found that high attributionally complex subjects spent more time with negative information. In this study, schema consistent information is also fairly negative in content (e.g., having affairs, no trust, etc.). One explanation for this finding then, is that the motivation to explain negative events led complex subjects to consider the consistent information longer.
Judgment Response Time

ACS was also predicted to be related to the speed of schema relevant judgments. The correlational results suggested that higher ACS scores were related to slower judgments. Similarly, both \( H \) and \( IC \) were positively related to judgment response time. ANOVA results showed that high ACS subjects had longer response times in the no time pressure condition, and that both high and low ACS subjects responded quicker than moderate ACS subjects following timed presentation of the information (see Figure 22).

These results are consistent with some of the earlier findings. High ACS subjects in the time pressure condition exhibited a poorer memory for inconsistent information. These same subjects made fairly quick judgments. High ACS subjects in the no time pressure condition, on the other hand, remembered more inconsistent information and took longer in making their judgments about the outcome of the scenario. It is possible that these slower judgments reflect the attempt to reconcile the inconsistent information with the expectations provided in the scenario.

Liking and Confidence Results

There were no specific predictions made regarding ratings of liking or of confidence judgments. Low ACS subjects in the time pressure condition showed less liking for the couple than high or
moderate subjects. However, overall, high ACS subjects showed the lowest confidence in their liking ratings for the couple. In addition, high ACS subjects also took longer to make confidence judgments about their liking for the couple in the no time pressure condition (see Figure 23).

Recall that high ACS subject in the no time pressure condition remembered more inconsistent items than in the time pressure condition. It may be that considering conflicting (inconsistent and consistent) information decreased their overall confidence ratings, and increased the deliberative process involved in making confidence ratings (increased response time).

Similarity

Again, no predictions were made regarding the warm-up items from the paired comparisons task. High ACS subjects rated these items on average as less similar to each other than did low or moderate ACS subjects. This finding can be explained in connection with the notion that ACS scores are related to more complex processing of information. Using this approach, those with more complicated schemas (higher ACS scores) are less likely to see the causal factors as similar to each other. This finding is analogous to the ingroup heterogeneity effect (e.g., Linnville et al., 1989), in which our more complex understanding of our own group (Linnville 1982) leads us to see more variability with our
group than among members of other groups. In this case, a more well developed schema causes greater differentiation (less similarity) of the schema-relevant items.

**Other Analyses**

There was an effect of time pressure on recall, showing that the manipulation did influence the processing of information. Subjects in this condition made more incorrect consistent responses (that is, they misremembered information consistent with expectations). Subjects in this condition also made fewer errors that were irrelevant to the scenario, indicating perhaps that subjects were general more focused on schema-relevant information when under time pressure.

**Conclusion**

The findings regarding memory for schema-relevant information tend to support the notion that ACS scores are related to the level of attributional schema development. First of all, higher ACS scores were shown to be related to better memory for consistent information. Based on the idea that more developed schemas lend themselves to better encoding of schema-relevant information, we might conclude that this finding supports the possibility that higher ACS scores are related to more well developed attributional schemas.
Secondly, high and moderate ACS subjects' memories for inconsistent information was adversely affected by the time pressure manipulation, while low ACS subjects' memories were not affected by time pressure. The fact that time pressure interfered with memory for the inconsistent items among high and moderate ACS subjects suggests that the encoding of inconsistent information into memory was a more effortful process for those subjects than for low ACS subjects. That is, high and moderate subjects required more cognitive capacity to encode the inconsistent information than did low ACS subjects. Again, one explanation involves differences in the level of schema development. It is possible that high and moderate ACS subjects' schemas are more well developed than low ACS subjects. Thus, the process of combining inconsistent information with existing schemas becomes effortful and takes more capacity (e.g., Fiske & Dyer, 1985).

Both of these findings may be interpreted as supporting the notion that higher levels of ACS are related to more well developed schemas. However, these results do not lend support to the idea that high ACS subjects have extremely well developed (or expert) schemas as was predicted based on Fletcher et al.'s treatment (1990, 1992). Expert schemas are thought to unitized (Fiske & Dyer, 1985) and thus take less capacity in working memory. This reduced burden on the capacity of working memory
should enhance experts' abilities to deal with effortful information processing such as integrating inconsistent information. If high ACS subjects were truly experts in the area of attribution, we might expect them to easily deal with the inconsistent information, even under time pressure conditions. Further, experts are considered to be more efficient in their processing of schema-relevant information, yet no differences were found among levels of ACS in the amount of time spent with the stimulus information.

These findings might also be interpreted as reflecting differences in information processing that are not directly tied to differences in structure. For example, high and moderate ACS subjects might be more motivated to explain the causes for the relationship problems in the scenario. Level of motivation may influence subjects' attempt to integrate the consistent and inconsistent items. That is, while, low ACS subjects might not be concerned with integrating the consistent and inconsistent information, and so require little effort to process the information, high and moderate ACS subjects may be attempting to reconcile the consistent and inconsistent information by engaging in more effortful processing. Thus the ability of high and moderate ACS subjects to integrate the inconsistent information would be more likely to be influenced by the time pressure condition.
Overall, it is clear that there are differences in information processing that are associated with level of ACS. These findings are consistent with the notion that higher levels of ACS are associated with greater schema development. However, the possibility remains that these differences in processing are not the result of underlying structure, but merely the effect of differences in the motivation to process the attributional information.
A separate aspect of Study 3 involves the use of multidimensional scaling techniques to examine differences in dimensionality that are related to differences in ACS scores. Dimensionality is a measure of differentiation, and thus greater complexity in the organization of information should be related to greater dimensionality. The multidimensional scaling (MDS) approach to measuring complexity was first suggested by Scott et al. (1979) as a means of measuring cognitive complexity. By using MDS techniques, it is possible to generate an estimate of the number of dimensions subjects use to think about causal information. In this study, the dimensional solutions of groups of subjects (high, moderate, and low ACS scores) are compared to determine if there are differences between groups in the number of dimensions utilized in thinking about causal information (with respect to relationships).

In order to implement MDS techniques, it is first necessary to establish a matrix of distances (similarities or dissimilarities) among the attributes to be scaled. In this study, two separate methods were used to create similarities
matrices for scaling. In both methods, an final average matrix was created for each level of ACS score (high, moderate, low) and submitted to MDS analyses using ALSCAL.

Obtaining Scaling Data from the Sorting Task

The sorting task may be examined to provide a matrix of similarities for each subject as discussed by Burton (1975). Because these analyses generally involve mutually exclusive sorting groups, overlap between groups will be ignored in developing the similarities matrices in Study 3. Burton's (1975) formula involves an evaluation of the height of a partition (Boorman & Arabie, 1972) which Burton defines by the following formula:

\[
H_{ij} = \frac{\sum_{j=1}^{\left| P_i \right|} \frac{(N_{ij})!}{2!(N_{ij}-2)!}}{N! / [2!(n-2)!]},
\]

Where \( N_{ij} \) equals the number of attributes in cell \( j \) for subject \( I \), and \( N \) equals the total number of attributes.

The distances (similarity) between grouped attributes are based in part on the number of objects in the group. Those attributes appearing in more than one group, then, are assigned a distance from members of each group based on the number of items in that group. Thus, overlapping attributes (as well as exclusive attributes) are seen as more similar to members of smaller groups that they belong to than to members of larger
groups that they belong to. That similarity is calculated using the formula:

\[ S = -\log_2 H_{ij} \]  

[5]

where \( H_{ij} \) is the proportion of pairs of elements found within the cell \( c_{ij} \). A common distance (similarity) is established between all objects existing in separate groups and is defined by the formula:

\[ S = \log_2 Q_i \]  

[6]

(for \( Q_i = 1 - H_i \)) is the proportion of pairs of elements which are not in the same cell.

**Cyclic Missing Data Design**

Another method for obtaining similarities data involves obtaining paired comparisons data from the subjects. A drawback to this method is that the task of judging similarities among all possible comparisons \([n*(n-1)/2]\) is not practically possible (due to subject fatigue, etc.) when dealing with a large set of attributes. In this study, the judgment of similarity between all possible pairs would involve some 946 comparisons.

One solution to this problem is to employ a cyclic missing data design (Spence, 1982) which allows subjects to make a
smaller number of comparisons sampled from the entire pool of comparisons. Full matrices then are a made up of the responses from several different subjects.

To test the notion that attributional complexity reflects the property of differentiation, separate MDS analyses will be conducted using the similarity matrices of subjects with high, moderate, and low ACS scores. It is predicted that populations of subjects with greater ACS scores will generate similarities matrices that fit MDS solutions with a larger number of dimensions.

Method

Similarities Based on Sorting

A modification was made to the QuickBASIC program used to create the measures of differentiation and integration from the sorting data. A similarity matrix was calculated for each subject based on the raw sorting data. These subject matrices were then divided into three groups based on ACS scores (high, moderate, low).

An average similarities matrix was then calculated for each group and submitted to MDS analyses using the MDS program ALSCAL. A general Euclidian distances model was fitted to the data for 1 to 6 dimensions.
Similarities Based on Paired Comparisons

A QuickBASIC computer program was created to obtain the paired comparisons data for the cyclic missing data design (see Appendix J). The item pool for paired comparisons was constructed based on an ordering of all possible comparisons. This pool was then divided into 6 equal portions. Each portion of the matrix to be completed by an individual subject was constructed to ensure that each subject made similarity judgments involving every attribute in the matrix. Further, 22 comparisons were completed by all subjects to provide overlapping ratings within the matrix.

Each subject was assigned (random block design based on ACS scores) to make paired comparisons for 1 of the 6 matrix portions. Subjects were shown pairs of the causal items on the computer monitor. For each pair, subjects were instructed to rate the similarity of the items on a 9-point scale (1=not at all similar; 9=extremely similar). The same set of 10 warm-up comparisons were presented before the actual comparisons task for all subjects. Including the warm-up items, each subject made a total of 186 similarity judgments.

The individual subjects' judgments for high, low, and moderate ACS subjects were combined into a number of full matrices. An average similarities matrix was then calculated for each group (high, low, or moderate) and submitted to MDS
analyses using the MDS program ALSCAL. A general Euclidian distances model was fitted to the data for 1,2,3,4,5, and 6 dimensions.

Results & Discussion

Evaluation of the dimensionality of MDS data often involves subjective interpretations as well as statistical ones (Kruskal & Wish, 1978). In the current study, the interpretation of the dimensions used by subjects is not very relevant to issues under investigation. It is probably most appropriate in this project to examine the "fit" of the various dimensional solutions to the data as a means of illuminating differences in the treatment of attributes by those with different ACS scores.

Again, there are several methods for assessing "fit" of a model in MDS. In this research, two separate methods are used to assess "fit". Using the first method, the fit indices of stress (see Kruskal, 1964, for a complete definition) and S-stress (see Kruskal & Wish, 1978, for a discussion) are examined at different dimensional levels for an "elbow" (Kruskal & Wish, 1978). That is, a plot of stress (or S-stress) is examined for a large drop in the value of stress.

A second method compares the fit indices for the data with the fit for a similar data set that consists only of random data. In this study, a total of 30 similarity matrices were
randomly generated and averaged. This average matrix was then subjected to the same analyses as the actual data. A comparison between the actual data fit indices and the indices for the random data may further indicate which solutions are better representations of the actual data.

**The Elbow Method**

Figure 25 shows the plot of S-stress against the number of dimensions for high low and moderate ACS subjects for scaling solutions based on the sorting task. Figure 26 shows the same relationships for the fit index stress.

Figure 25 demonstrates that S-stress correlates with ACS scores for all dimensional solutions. That is, the low ACS subjects also show the lowest levels of S-stress, indicating a better fit of the model to their data. In addition, low ACS subjects don't have as strong an "elbow" in this graph as do high and moderate subjects. Based on this criterion, one might select a two-dimensional solution for all three groups, with reservations about the low ACS subjects.

Figure 26, on the other hand indicates that low ACS subjects show a slight increase in stress with more than 1 dimension. In general, stress should always decrease as the number of dimensions increases. However, the ALSCAL program minimizes the value of S-stress (not stress) and so the stress fit index
provided by the ALSCAL program may not always represent a minimum value of stress for a particular dimensional solution (see MacCallum, 1981). Still, the pattern of data suggests that a single dimension adequately represents the data for low ACS subjects. Measures of stress for moderate subjects show an obvious elbow at the three dimensional solution, and high subjects seem to have their largest drop in stress between dimensions 1 and 2.

From these two graphs (Figures 25 and 26), it seems reasonable to conclude that there are differences in the similarities data from the sorting task that are influenced by individual differences in attributional complexity. There is some evidence to suggest that higher ACS scores result in poorer model fit to MDS analyses. There is also some suggestion that moderate and high subjects' data are best fit by a multidimensional (2 dimensional) solution, while low ACS subjects' data are fit no better by a multidimensional solution than by a unidimensional one.

Figures 27 and 28 depict the relationship between the fit indices (stress and S-stress) and the dimensional scaling solutions based on the paired comparisons method. These solutions have extremely high (poor) indices of fit, and show no clear differences between dimensional solutions or between levels of complexity. It may be that the similarities judgment task
using paired comparisons is not amenable to ratings of causal information in this manner. A different explanation involves the cyclic missing data design. Because not all subjects' responses are represented for each comparison, it may be difficult to get a reasonable average matrix (i.e., one that would have good fit) without a much larger sample size.

**Comparison to Random data**

Figure 29 and 30 show comparisons of the indices of fit for the sorting task similarities data and the random data. Clearly, in all cases the model solutions for the actual data are far superior to the random data.

Figures 31 and 32 show comparisons of the indices of fit for the paired comparisons similarity data and the random data. These graphs, on the other hand, show that the fit of the paired comparisons data is no better than that for random data. In this case, it might be wise to conclude that the paired comparisons task is not suited for this type of analysis. Perhaps the judgment of the similarity of causal factors does not lead to clear systematic judgments on the part of subject. Simply adding more subjects to the design seems unlikely to make a great difference in the fit of the data to any multidimensional scaling model.
Conclusion

Although the scaling data did not indicate clear differences in the number of dimensions used by subjects in the sorting task, there was evidence of some structural differences in the sorting tasks that can be assessed through the method of multidimensional scaling. In particular, the fact that higher levels of complexity were linked to poorer fit of the models indicates a tangible difference across levels of complexity in the process involved in the sorting task. Further, the lack of obvious differences in S-stress for the low ACS subjects, and the increase in stress from the 1 to the 2 dimensional solution does suggest that these subjects' sorts generally don't reflect a multidimensional structure. Changes in S-stress and stress for the high and moderate subjects, on the other hand, indicate the possibility of a multidimensional quality in their sorting data.

Because the MDS data are based on subjects' sortings, differences in the dimensional structure of the information are subject to the same criticisms as the measures of complexity reported in studies 1 and 2. The findings do not provide direct evidence for the existence of differences in the complexity of the cognitive organization of attributional knowledge (schemas). That is, although scores on the ACS clearly influence the dimensional structure of the sorts produced by the subjects, it remains unclear whether those sorts are the reflection of
internal knowledge structure or are the result of differences in the motivation to process attributional information.
CHAPTER VI
GENERAL DISCUSSION

Summary

Study 1 and Study 2 together provided information on the relationship of scores on the ACS to direct measures of differentiation and integration (measures used in previous research on cognitive complexity). Study 3 provided information on the degree to which differences in ACS scores were related to differences in the processing of schema-relevant information. In addition, multidimensional scaling analyses of data collected in Study 3 provided information on the relative differences in the dimensional structure of causal information at different levels of attributional complexity.

Studies 1 and 2 showed that ACS scores were indeed related to differences in differentiation and integration scores. In addition, the combined analysis of Study 1 and Study 2 provided support for a curvilinear relationship between ACS scores and the measures of complexity, in which moderate ACS subjects exhibited the highest levels of differentiation.

A separate aspect of these first two studies concerns the predominance of the effects of task order. The clearest findings
regarding task order indicate that, the influences of ACS scores on the sorting task measures were most likely to be found among those subjects who completed the relationship sorting task first. In general, the predominance of order effects in these first two studies raises concerns about the influence of motivation on the outcome of the sorting task.

The results of Study 3 indicate that ACS scores were related to differences in information processing. High ACS subjects remembered more consistent information overall, consistent with a greater level of schema development. Also, low ACS subjects' memory for inconsistent information was unaffected by time pressure, while high ACS subjects' memory for this information was disturbed by an increase in time pressure - again consistent with a greater level of schema development.

Finally, the results of the multidimensional scaling analyses show differences in the dimensional solutions for high and moderate vs. low ACS subjects. Low ACS subjects' data do not seem to fit much better with multidimensional solutions than they do with a unidimensional one. High and moderate ACS subjects' data, on the other hand show an increase in fit for multidimensional (2 dimensions) solutions. Additionally, the overall level of fit of the data to any MDS model is better at lower levels of ACS, indicating the possibility of qualitative
differences in the data of high vs. moderate vs. low ACS subjects.

Conclusions

Fletcher et al. (1986) developed the ACS as a measure of individual differences in the complexity of attributional schemata. The underlying construct of attributional complexity was modeled on the previous concepts of cognitive complexity (e.g., Beiri, 1955) and schema complexity (e.g., Fiske et al., 1983). The current project was designed to reassess the construct validity of the ACS, and in particular, to test the extent to which scale scores comported with measures derived from cognitive complexity measures and from measures of schema complexity.

Methodological issues

A number of different methodologies were used to assess the underlying structure of the ACS. Following is a discussion and evaluation of some of these methods as well as some suggestions for future research.

Sorting

The sorting methodology was used to construct a number of critical measures in this research. While the sorting method does provide useful information, a major drawback of this
approach with respect to the goals of this research project is the inability of the sorting method to detect differences in the internal (schematic) organization of the subjects' attributional knowledge. Differences in the organization of information in the sorting task as a result of situational factors (e.g., task order) were found in studies 1 and 2, suggesting the susceptibility of the task to temporary motivations. Differences in the sorting measure might also be attributed to individual differences in the motivation to engage in higher levels of information processing. The sorting task, then, may be a useful indication of level of processing, but is not a particularly good tool for identifying differences in the internal organization of knowledge.

Measures of complexity

Three measure of complexity ($H$, Image Comparability, and Centralization) were examined in this research project. These measures were intended as objective measures of differentiation and integration, suggested by Fletcher et al. (1986) as the defining features of cognitive complexity. The $H$ statistic is the most commonly used measure of complexity for the analysis of sorting task data (e.g., Linville, 1982, Neidenthal et al., 1993). It has been shown (Neidenthal et al., 1993) to be a reliable measure with respect to the sortings of
descriptive traits. It has not been used in connection with attributional factors prior to this research. This measure proved to be useful in the current study, providing a relatively meaningful descriptive statistic for the sorting task. Note, however, that the $H$ statistic is based on subjects' sortings, and so should not be considered a direct measure of structure (following the arguments above).

Integration. The two measures of integration, image comparability and centralization, were less useful measures in this project. The measure of centralization proved to be unreliable as a measure of the integrative complexity of the information sorts. In addition, the other measure of integration, image comparability, was consistently shown to be inversely related to differentiation ($H$). That is, greater differentiation was linked to less image comparability. This relationship is disconcerting as cognitive complexity has been consistently been defined (e.g., Scott, 1965) by both integration and differentiation (high levels of differentiation and high levels of integration are thought to be related to complexity). Still, the image comparability measure did provide a second (and slightly different) descriptive index for the sorting task, thereby adding to depth to the sorting task analyses. The IC measure did not, however, provide a clear measure of "integrative complexity" as was hoped. In fact, neither measure of
integration proved to be a useful measure of the complexity of the sorting tasks. It should be noted that previous research on integrative complexity (e.g., Schroder et al., 1967) has generally employed more subjective methods of assessing integration, such as the sentence completion and paragraph completion tasks. It may be that integrative complexity is not easily translated into an objective measure. Future research may need to use more subjective judgments of integration in examining differences in the organization of attributional information.

Multidimensional scaling

An additional attempt to obtain direct measures of subjects' complexity of organization of attributional information involves the multidimensional scaling analyses. Two separate approaches were used to derive data for the MDS analyses. First, similarities data were obtained from the subjects' sortings. This approach was useful, and provided a well-conditioned data set that was suited to a multidimensional scaling solution. The second approach to obtaining MDS data involved the use of a paired-comparisons task in which subjects were asked to judge the similarity of causal factors. This approach was decidedly unsuccessful, with the MDS solutions proving to be no better than random data. This suggests that the paired comparisons approach may not be an appropriate way of generating distances among
causal factors. It may be that subjects are unable to systematically compare the causal factors because they do not have a set of attributes that are easily amenable to comparison for a judgment of similarity. Perhaps subjects are simply unaccustomed to thinking about causal factors as being similar or dissimilar. Clearly, the data do not represent a systematic treatment of the similarity among the causal factors, and so this method is unlikely to prove fruitful.

Recall measures

A final method used in this research project used differences in the recall of schema relevant information as a means of determining the complexity of individual subjects' schemas. In addition, the influence of time pressure during information presentation on subsequent recall was examined.

This approach was perhaps the most revealing of all the measures used in this research project. Differences in memory are thought to indicate differences in the way information is processed. In particular, information that is inconsistent with schema-based expectations may be more difficult to process when individuals are using schema-based processing of the information. The manipulation of time pressure increases the likelihood of schema-based processing, and therefore the likelihood of differences in the memory for schema-relevant information.
Although this procedure is intended to provide information on existing structures (level of schema development), it is possible that subjects may develop "on-line" expectations rather than retrieving existing schemas. Regardless of the theoretical interpretation (discussed in more detail below), the recall measure was useful in revealing differences in the way subjects processed attributional information.

**Future research directions**

**MDS analyses.** Although the goals of the MDS analyses in this research project were to discover possible "quantitative" differences in the organization of the information (i.e., differences in the number of dimensions), further research might examine more "qualitative" differences reflected by MDS solutions (i.e., differences in the nature of the dimensions). Data provided by the sorting task could be subjected to cluster analyses, which might provide information about differences in the types of groupings made by subjects at different ACS levels. Also, plots of the dimensional solutions from the ALSCAL analyses might provide information about differences in the types of dimensions used in organizing the information.

**Analyses using existing populations.** Fletcher et al. (1986) used existing groups considered to have existing differences in the complexity of attributional schemata as a means of validating...
the scale under construction. They found that natural science majors scored lower on the ACS than did psychology majors. The authors conclude that these findings offer support for the construct validity of the scale. However, these findings do little to support the notion that attributional "expertise" is reflected by ACS scores. The groups used by Fletcher et al. do not appear to represent extremes of attributional sophistication. College students (even natural science majors) may show a greater attributional sophistication than would be expected from "neophytes" or novices in the realm of attribution. In addition, college students (even psychology majors) may not possess the understanding of causal relationships that would classify them as "experts" in attribution. Still, the examination of existing populations is one way of assessing the extent to which ACS scores reflect attributional expertise. Further research might attempt to isolate populations that more closely represent the extremes of attributional experts and novices (e.g., marriage counselors vs. adolescents) and assess the extent to which their scores on the scale comport with their level of expertise. Uncovering structural differences between such populations may be difficult, however. First of all, it may be noted that some college sophomores score at the highest levels possible on the ACS. This may indicate a "ceiling effect" with respect to the scales ability to measure differences in the level of expertise,
and may make it difficult to show that attributional experts score substantially higher on the scale than all other groups. Secondly, if differences in ACS scores were uncovered between extreme populations, those differences might still reflect simply the motivation to engage in effortful processing of attributional information rather than the existence of more complex attributional schemas.

**Response time analyses.** In the current research, processing time and judgment response time were measured. These measures did not provide a great deal of useful information. However, response times may be a useful means of gathering data regarding cognitive structure. If a schema is activated, concepts contained within the schema should be more accessible than concepts that are not a part of that schema. Further, expert schemas are thought to be unitized (Fiske & Dyer, 1985), and may be activated as a whole, whereas less expert schemas may be activated a portion at a time, through associations among the elements. Thus, for experts, all components of the schema should be equally (and readily) accessible, whereas those with less developed schemas may show differential accessibility of schema elements. The result of these differential levels of accessibility, combined with the fact that experts should have more knowledge stored in their schemas, suggests that
subjects whose attributional schemas developed to the point of expertise might be expected to respond faster in making judgments across a wider range of attributional factors.

Theoretical issues

The purposes of this research project are to resolve questions about the meaning of the Attributional Complexity Scale. Although the authors of the scale (Fletcher et al., 1986) determined to create a measure of individual differences in the structure of attributional schemata, the result of that determination does not clearly present itself as a measure of underlying structure. To pursue the issue of structure with regard to the ACS, the current project focused on two separate notions offered by the scale authors. First of all, the authors suggested that the scale tapped into a domain specific aspect of cognitive complexity (Fletcher et al., 1986). Thus measures of cognitive complexity were employed in the current project to assess this claim. Secondly, in subsequent studies (Fletcher et al., 1990; Fletcher et al., 1992), the authors refer to subjects scoring low and high on the ACS (based on a median split of the data) as attributional simpletons (or neophytes) and attributional experts, respectively. Again, one intention of the current research was to examine the degree to which "attributional expertise" is a construct reflected by the scale.
ACS as a domain specific measure of cognitive complexity. The current data are consistent with the idea that the Attributional Complexity Scale reflects differences in the complexity of organization of causal information and. However, the data are not sufficient to constitute evidence for the conclusion that the ACS does, in fact, reflect these structural differences. Further, if structural differences in attributional complexity do exist and are adequately and accurately measured by the methods employed in this research, the findings suggest that there is not a linear relationship between ACS scores and measures of complexity (e.g., differentiation, integration). The conclusions of this aspect of the current research project then, are that ACS scores reflect differences in the processing (organization by sorting) of attributional information, but that these processing differences do not necessarily imply structural differences in the cognitive organization of attributional information. Further, there is some evidence that the level of processing of attributional information does not increase uniformly (linearly) with ACS scores. Thus, the use of the ACS as a continuous measure of the level of attributional processing is suspect.

ACS as a measure of attributional expertise. The current data are again consistent with the idea that differences in ACS scores are related to differences in the development of
attributional schemata. However, the data may also be interpreted as providing evidence only for differences in information processing, not for differences in the organization of stored information (schemas). If, however, the data are a consequence of differences in the level of development of attributional schemata, it appears that higher ACS subjects have more well-developed schemas. The position of Fletcher and his colleagues (1990; 1992) is that higher scores on the ACS scale are associated with "expert" schemas. I do not believe that the current data supports such a claim. Experts are thought to have highly developed organizations of information. Their schemas contain greater amounts of information that is more closely interconnected (Fiske & Taylor, 1991). The current research did not assess the amount of information contained in subjects' schemas. Experts are highly efficient in processing domain relevant information (Fiske & Taylor, 1991). The current research did not find substantial differences in the speed of information processing. Experts schemas are thought to be unitized (activated as a whole), and condensed so as to take up less capacity in working memory (Fiske & Dyer, 1985). The current research found that high ACS subjects' ability to process schema relevant information was hampered by time pressure. This is inconsistent with the idea that high ACS subjects are "experts" with regard to the complexity of their attributional
schemata. The conclusions of this aspect of the research project then, are that differences in ACS scores are related to differences in the processing of attributionally relevant information. While the evidence is consistent with notion that higher ACS scores are related to more well developed schemas, direct support for structural differences underlying the ACS is not shown. Further, to the extent that the data reflects schematic development differences, the evidence does not support the idea that high ACS subjects function as attributional experts. Overall, the data support the notion that those higher in attributional complexity (as measured by the ACS) exhibit information processing styles that are consistent with more developed schemata than those who are low in attributional complexity.

Final conclusions

The Attributional Complexity Scale is an individual difference measure that purports to measure differences in the complexity of attributional schemata. From the data collected in the current research project it seems clear that scores on the ACS are related to information processing differences that are consistent with differences in underlying structure. However, these processing differences are not consistent with the specific structural differences supposed by the scale authors.
The ACS is not linearly related to the complexity with which subjects organize attributional information. Researchers should be aware of the fact that high and low ACS subjects differ qualitatively from moderate ACS subjects in this and in previous research (e.g., Flaherty, 1991). Further research using the scale may need to account for these differences and for the unique character of the moderate ACS subjects.

In addition, although the results are consistent with differences in the development of attributional schemata, those differences are probably not best characterized as differences in "expertise". Although research on schema complexity has often used the term "expertise" in a more relative manner (e.g., subjects with more well developed schemas are sometimes considered "more expert"), the term "expert" implies a depth of knowledge and sophistication in a particular domain that is not likely to be found in the average college sophomore. Further, information processing effects found in this research are not consistent with expert level schemas as described above.

An additional point made within this research project echoes the point made by the original scale authors (Fletcher et al., 1986). These authors suggest that, although the ACS may reflect differences in the schemas that may be brought to bear in a given situation, whether those schemas are used or not may be determined by the motivations inherent in the situation.
Findings in the current project also suggest that situational factors may influence the degree to which differences in information processing are shown between those of different levels of complexity.

The Attributional Complexity Scale is a potentially useful tool for social psychological research. The findings of the current research project confirm that scale scores are reflective of differences in attributional information processing. The exact nature of those differences, however, needs to be more clearly delineated. Current evidence suggests that the differences reflected by the scale are not completely compatible with the construct as defined by the original authors. For example, the scale should not be used as a direct measure of the level of attributional expertise unless further research (e.g., using existing extreme populations) supports such a conclusion. In addition, the level of attributional information processing may not increase directly with scale score (i.e., the relationship is not linear), thus the use of the scale as a continuous measure of processing differences is not pratical.

Further research into the nature of the Attributional Complexity Scale should be concerned with the qualitative differences evident among those at different levels of the scale. That is, although some evidence presented in the current research points to the similarities in the information processing styles
of high vs. low ACS subjects (e.g., sorting styles), other evidence suggests that high and low subjects engage in very different cognitive processes (e.g., with regard to processing schema-relevant information). The resolution of these findings may be contained in a deeper examination of the attributional processes that characterize high, low and moderate ACS subjects.

In conclusion, although the Attributional Complexity Scale has the potential to explain differences in the way people process attributionally relevant information, the current understanding of the construct underlying the scale limits the usefulness of the scale as a research tool. This project does begin to illuminate the nature of the differences underlying the Attributional Complexity Scale, but further research is necessary to reach a deeper understanding of the structural and motivational differences in the attributional processes that are described by the construct of attributional complexity.


ENDNOTES

1. These same methods, including copying items onto blank cards for sorting into multiple groups and utilizing subjects to record their own sorts were used by Linville and colleagues (1982, 1985, and 1987), and by Niedenthal et al. (1992). In the current study, an attempt is made minimize the effort required of subjects in the sorting task without diverging too far from established methods. Toward this end, subjects were told to simply copy a number (rather than the entire item) onto a blank piece of paper if they felt an item should be sorted into more than one group. In all other respects, the sorting methodology is identical to established methods (e.g., Linville, 1982, 1985, 1987).

2. Means with different subscripts differ at the p<.05 level based on post hoc comparisons using the Fisher's LSD test. This test gives a fairly liberal estimate of significant differences based on the overall significance of the effect (there is no correction for family wise error). It should be noted that because of the way the test is constructed, differences between means for marginal or nonsignificant effects cannot be considered significant at the p<.05 level. Regardless, identifying the differences responsible for marginal effects is important in full understanding of the data.

3. As mentioned earlier, the inverse relationship between differentiation and image comparability may be a consequence of the calculation of these variables and the lack of overlapping groups in the subjects sorts.

4. In order to reduce demands on subjects participating in this separate experiment, all subjects did not rate all causal factors.

5. The phrasing of some of the causal factors was slightly altered from the original. This change was minor and was intended to enhance the realistic quality of the
information, and enhance the "fit" of the information to the scenario depicted in Study 3. Examples of such changes are the following: 1) "Partners love each other" was changed to "They love each other"; 2) "One or both partners see possible alternative partners" was changed to "There are alternative love interests".
Figure 1: Scatter plot of ACS scores by academic differentiation
Figure 2: Main effect of ACS scores on academic differentiation
Figure 3: Main effect of ACS scores on relationship differentiation
Figure 4: Main effect of ACS scores on academic image comparability
Figure 5: Main effect of ACS scores on relationship image comparability
Figure 6: Interaction of ACS and gender on academic image comparability
Figure 7: Interaction of ACS and task order on academic differentiation
Figure 8: Interaction of ACS and task order on relationship differentiation
Figure 9: Interaction of ACS and task order on relationship image comparability
Figure 10: Main effect of ACS scores on ratings of the importance of understanding academic causes
Figure 11: Interaction of ACS and task order at Time 2 on relationship differentiation at Time 2
Figure 12: Interaction of ACS and task order at Time 1 on relationship image comparability at Time 1
Figure 13: The relationship between differentiation measures and ACS scores for the combined data from Study 1 and Study 2
Figure 14: Interaction of ACS scores and task order on relationship differentiation for the combined data form Study 1 and Study 2
Figure 15: Interaction of ACS scores and task order on relationship image comparability for the combined data form Study 1 and Study 2
Figure 16: Interaction of ACS and time pressure on total number of recall responses
Figure 17: Main effect of ACS scores on the number of inconsistent items correctly recalled
Figure 18: Interaction of ACS scores and time pressure on the number of inconsistent items correctly recalled
Figure 19: Main effect of ACS scores on the proportion of inconsistent items recalled
Figure 20: Interaction of ACS and time pressure on ratings of liking for the couple
Figure 21: Main effect of ACS scores on confidence in liking judgments
Figure 22: Interaction of ACS and time pressure on response time for judgments of the outcome of the relationship.
Figure 23: Interaction of ACS and time pressure on response time for ratings of confidence in liking judgments.
Figure 24: Main effect of ACS scores on the average similarity rating for items in the warm-up for the paired comparisons task.
Figure 25: Plot of S-stress by dimensions for the sorting data
Figure 26: Plot of stress by dimensions for the sorting data
Figure 27: Plot of S-stress by dimensions for the paired comparisons data
Figure 28: Plot of stress by dimensions for the paired comparisons data
Figure 29: Comparison of S-stress for random and sorting data
Figure 30: Comparison of stress for random and sorting data
Figure 31: Comparison of S-stress for random and paired comparisons data
Figure 32: Comparison of stress for random and paired comparisons data
Appendix A

Causal factors generated by student sample

Part 1: Achievement causal factors

<table>
<thead>
<tr>
<th>Type of cause</th>
<th>Frequency of occurrence</th>
<th>Average Importance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) study habits</td>
<td>37</td>
<td>3.65</td>
</tr>
<tr>
<td>general studying habits</td>
<td>(21)</td>
<td>(3.19)</td>
</tr>
<tr>
<td>amount of studying</td>
<td>(10)</td>
<td>(3.00)</td>
</tr>
<tr>
<td>other</td>
<td>(6)</td>
<td>(5.33)</td>
</tr>
<tr>
<td>2) understanding concepts</td>
<td>8</td>
<td>5.63</td>
</tr>
<tr>
<td>Not memorizing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) completing homework</td>
<td>13</td>
<td>5.31</td>
</tr>
<tr>
<td>starting early</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) complete reading assign</td>
<td>13</td>
<td>3.91</td>
</tr>
<tr>
<td>starting early</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) cramming &amp; procrastination</td>
<td>8</td>
<td>5.86</td>
</tr>
<tr>
<td>6) class attendance</td>
<td>28</td>
<td>2.78</td>
</tr>
<tr>
<td>7) interest in subject</td>
<td>17</td>
<td>4.78</td>
</tr>
<tr>
<td>8) motivation/effort</td>
<td>8</td>
<td>3.00</td>
</tr>
<tr>
<td>9) paying attention in class</td>
<td>8</td>
<td>4.57</td>
</tr>
<tr>
<td>10) note taking</td>
<td>12</td>
<td>4.56</td>
</tr>
<tr>
<td>quality of notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) qualities of the class</td>
<td>11</td>
<td>9.63</td>
</tr>
<tr>
<td>size, time, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) asking for help when needed</td>
<td>10</td>
<td>5.75</td>
</tr>
<tr>
<td>tutoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) family problems</td>
<td>8</td>
<td>5.57</td>
</tr>
<tr>
<td>14) relationship troubles</td>
<td>7</td>
<td>7.33</td>
</tr>
<tr>
<td>15) illness or accident</td>
<td>9</td>
<td>4.63</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---</td>
<td>------</td>
</tr>
<tr>
<td>16) outside activities</td>
<td>7</td>
<td>4.57</td>
</tr>
<tr>
<td>job, etc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Academic causes cont.**

| 17) partying, drinking, drug abuse | 11 | 5.00 |
| partying                           | (5) | (7.8) |
| drugs                              | (6) | (2.66) |
| 18) food and exercise              | 8  | 7.00 |
| 19) proper sleep                   | 10 | 6.71 |
| 20) quality of instructor          | 13 | 4.36 |
| 21) relationship with instructor   | 7  | 7.28 |
| 22) nervousness & stress           | 6  | 4.25 |
| 23) required course in major area  | 6  | 6.20 |
| 24) difficulty of the material     | 6  | 3.60 |
| 25) ask questions in class         | 5  | 7.00 |
| 26) financial troubles             | 5  | 3.8  |
| 27) attend office hours            | 4  | 7.25 |
| 28) understanding the instructor   | 4  | 5.50 |
| foreign instructor                |   |      |
| 29) course load (easy/hard)        | 4  | 5.75 |
| 30) sleeping in class              | 4  | 5.33 |
| 31) pressure to perform            | 4  | 4.67 |

The following are less frequent in occurrence (frequency in parentheses)

- weather (3)
- goal setting (3)
- intelligence (3)
- being prepared for class (3)
- outside readings (3)
- previous performances (2)
- background (2)
- confidence (2)
- distraction (2)
- discussion (2)
concentration (2)
taking the class seriously (2)

37 items were not conducive to categorization. (average rating for these items was 7.49; range 1-21)

Part 2:
Relationship causal factors

<table>
<thead>
<tr>
<th>Type of cause</th>
<th>Frequency of occurrence</th>
<th>Average Importance rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) love</td>
<td>13</td>
<td>2.09</td>
</tr>
<tr>
<td>2) feelings, concern, emotional bond</td>
<td>16</td>
<td>6.15</td>
</tr>
<tr>
<td>compassion sensitivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) caring</td>
<td>6</td>
<td>5.6</td>
</tr>
<tr>
<td>4) friendship</td>
<td>9</td>
<td>3.57</td>
</tr>
<tr>
<td>5) cheating/fidelity</td>
<td>14</td>
<td>3.53</td>
</tr>
<tr>
<td>6) honesty/integrity -lying/deception</td>
<td>24</td>
<td>2.14</td>
</tr>
<tr>
<td>7) trust</td>
<td>10</td>
<td>1.78</td>
</tr>
<tr>
<td>8) communication</td>
<td>20</td>
<td>2.10</td>
</tr>
<tr>
<td>9) listening &amp; understanding</td>
<td>8</td>
<td>3.88</td>
</tr>
<tr>
<td>10) openness &amp; tolerance</td>
<td>5</td>
<td>4.00</td>
</tr>
<tr>
<td>11) flexibility &amp; compromise</td>
<td>8</td>
<td>5.50</td>
</tr>
<tr>
<td>12) similar/different interests -views, goals, background</td>
<td>36</td>
<td>6.72</td>
</tr>
<tr>
<td>13) religious differences</td>
<td>6</td>
<td>8.33</td>
</tr>
<tr>
<td>14) spending time together</td>
<td>10</td>
<td>5.67</td>
</tr>
<tr>
<td>15) sex</td>
<td>15</td>
<td>4.71</td>
</tr>
<tr>
<td>16) physical attraction</td>
<td>6</td>
<td>6.4</td>
</tr>
<tr>
<td>17) fighting or abuse</td>
<td>7</td>
<td>6.14</td>
</tr>
<tr>
<td>18) relationship with in-laws</td>
<td>9</td>
<td>8.14</td>
</tr>
<tr>
<td>19) financial issues</td>
<td>10</td>
<td>3.25</td>
</tr>
</tbody>
</table>
20) sharing/selfishness 8 5.00
21) compatibility 5 6.25
22) respect 5 2.25

Relationship causes cont.
23) conversations/discussion 5 5.80
24) jealousy 6 7.00
25) need for space/growth 4 7.00
26) laughter/fun/sense of humor 4 5.00
27) responsibilities 4 2.00

The following are less frequent in occurrence (frequency in parentheses)
giving (3)
another love interest (2)
forgiveness (3)

66 items were not conducive to categorical representation. (average rating 5.80; range 1-17)
Appendix B

List of causal factors for sorting tasks

Academic causal factors

Has good study habits
Sends a great deal of time on studying
Completes homework assignments
Keeps up on reading assignments
Avoids last-minute studying
Attends class regularly
Finds class material interesting
Takes good notes in class
Pays attention in class
Asks for or gets help as needed
No family problems or relationship troubles
Rarely gets sick or injured
Avoids excess alcohol or drugs
Proper diet, regular exercise and a proper amount of sleep
Course instructor is a good teacher
Looks along with the instructor -no personality conflict
Course material is not too difficult
Has good luck
Has a great deal of natural ability in this subject
Works hard to do well in the class
Is interested in learning for its own sake

Has poor study habits
Doesn't spend much time studying
Doesn't complete homework
Doesn't do reading assignments
Procrastinates homework & studying until the last minute
Poor class attendance
Not interested in class material
Doesn't take notes, or notes are poor
Doesn't pay attention in class
Refuses to ask for help
Has family problems or problems with boyfriend/ girlfriend relationship
Experiences illness or injury
Too much partying or use of drugs and alcohol
Improper diet, lack of exercise or not enough sleep
Instructor is a bad or incompetent teacher
Has a personality conflict with instructor
Course material is difficult
Has bad luck
Doesn't do well (low natural ability) in this subject
Doesn't put any effort into the class
Is not interested in learning- only in the grade
Relationship causal factors
Love
Compassion and emotional sensitivity
Partners are faithful to each other
Honesty
Trust
Good communication between partners
Flexibility/ability to compromise
Similar religions
Similar views or attitudes
Relationship based on friendship
Spending time together
Sexual compatibility
Good relationship with both partner's parents
Financially secure
Absence of physical abuse
Couple doesn't usually fight or argue
Relationship involves sharing
Similar educational aspirations or career goals
Partners have an equal level of involvement in the relationship
There is no alcohol abuse
Don't feel constrained by the relationship
Possible alternative partners are not being considered

Lack of love
Lack of compassion or emotional sensitivity
One or both partner(s) is cheating (extra relationship affair)
Dishonesty in the relationship
Lack of trust
Poor communication (in general)
Inability to compromise
Religious differences
Attitudes and views of the two partners are not the same
Relationship not based on friendship
Not enough quality time together
Sexual problems in general or sexual incompatibility
Poor relationship with in-laws (either partner's parents)
Financial problems
Physical abuse
Fighting or arguing
Selfishness in the relationship
Dissimilarity in educational aspirations and career or occupational goals
Unequal involvement in the relationship
One or both partners are heavy drinkers
Feeling constrained by the relationship
One or both partners see possible alternative partners
Appendix C
Examples of simple and complex sorts

<table>
<thead>
<tr>
<th>Relationship sort for subject 12:</th>
<th>Group 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couple doesn't usually fight or argue</td>
<td>Religious differences</td>
</tr>
<tr>
<td>Partners are faithful to each other</td>
<td>Dissimilarity in educational aspirations and career or occupational goals</td>
</tr>
<tr>
<td>Flexibility/ability to compromise</td>
<td>Sexual problems in general or sexual incompatibility</td>
</tr>
<tr>
<td>Good communication between partners</td>
<td>Attitudes and views of the two partners are not the same</td>
</tr>
<tr>
<td>Spending time together</td>
<td></td>
</tr>
<tr>
<td>Partners have an equal level of involvement in the relationship</td>
<td></td>
</tr>
<tr>
<td>Don't feel constrained by the relationship</td>
<td></td>
</tr>
<tr>
<td>Relationship based on friendship</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group 7</td>
</tr>
<tr>
<td>Sexual compatibility</td>
<td>Lack of trust</td>
</tr>
<tr>
<td>Similar views or attitudes</td>
<td>Lack of love</td>
</tr>
<tr>
<td>Similar educational aspirations or career goals</td>
<td>Lack of compassion or emotional sensitivity</td>
</tr>
<tr>
<td>Similar religions</td>
<td>Selfishness in the relationship</td>
</tr>
<tr>
<td></td>
<td>Group 8</td>
</tr>
<tr>
<td>Group 3</td>
<td>One or both partner(s) is cheating (extra relationship affair)</td>
</tr>
<tr>
<td>Compassion and emotional sensitivity</td>
<td>One or both partners see possible alternative partners</td>
</tr>
<tr>
<td>Honesty</td>
<td>Fighting or arguing</td>
</tr>
<tr>
<td>Trust</td>
<td>Dishonesty in the relationship</td>
</tr>
<tr>
<td>Relationship involves sharing</td>
<td>Relationship not based on friendship</td>
</tr>
<tr>
<td>Love</td>
<td>Poor communication (in general)</td>
</tr>
<tr>
<td>Possible alternative partners are not being considered</td>
<td>Inability to compromise</td>
</tr>
<tr>
<td></td>
<td>Feeling constrained by the relationship</td>
</tr>
<tr>
<td></td>
<td>Unequal involvement in the relationship</td>
</tr>
<tr>
<td></td>
<td>Not enough quality time together</td>
</tr>
<tr>
<td>Absence of physical abuse</td>
<td>Group 9</td>
</tr>
<tr>
<td>There is no alcohol abuse</td>
<td>One or both partners are heavy drinkers</td>
</tr>
<tr>
<td>Good relationship with both partner's parents</td>
<td>Physical abuse</td>
</tr>
<tr>
<td>Financially secure</td>
<td>Group 10</td>
</tr>
<tr>
<td></td>
<td>Financial problems</td>
</tr>
<tr>
<td></td>
<td>Poor relationship with in-laws (either partner's parents)</td>
</tr>
</tbody>
</table>

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Relationship sort for subject 10:

**Group 1**
- Good communication between partners
- Possible alternative partners are not being considered
- Flexibility/ability to compromise
- Relationship involves sharing
- Partners have an equal level of involvement in the relationship
- Compassion and emotional sensitivity
- Sexual compatibility
- Love
- Spending time together
- There is no alcohol abuse
- Partners are faithful to each other
- Good relationship with both partner's parents
- Honesty
- Similar views or attitudes
- Don't feel constrained by the relationship
- Trust
- Absence of physical abuse

**Group 2**
- Dissimilarity in educational aspirations and career or occupational goals
- Financially secure
- Poor relationship with in-laws (either partner's parents)
- Relationship not based on friendship
- Similar educational aspirations or career goals
- Similar religions
- Financial problems
- Attitudes and views of the two partners are not the same
- Relationship based on friendship
- Religious differences
- Couple doesn't usually fight or argue

**Group 3**
- Selfishness in the relationship
- Lack of compassion or emotional sensitivity
- Sexual problems in general
Appendix D:

Hard copy of the computer program for calculating \( H \), \( IC \), and centralization, and for the creation of similarities matrices from the sorting data

DECLARE SUB pr (trh!, z!, a!, r!)
DECLARE SUB prnew (Zz!, Aa!, match!)
RANDOMIZE TIMER
CLS

DIM item(30, 44)
DIM gc(50)
DIM pj(44)
DIM p(44)
DIM ni(44)
DIM tm(50)
DIM match(30, 30)
DIM tmat(1000)
DIM gp(44)
DIM trh(24, 24, 24)
DIM mac(44)
DIM ind(44)

LOCATE 10, 15
PRINT " Computing similarity from sorting data and calculating complexity"
LOCATE 20
PRINT "Please enter the following information:"
PRINT
INPUT "subject #"; sn
INPUT "sort type"; sort$
more:
INPUT "number of groups"; ng

IF sort$ = "r" THEN n = 44
IF sort$ = "a" THEN n = 42
IF sort$ = "c" THEN n = 33
IF sort$ = "t" THEN n = 9

CLS
FOR a = 1 TO ng
PRINT "Enter the NUMBER of items in group "; a;
INPUT ; ni(a)
CLS
PRINT "Now, enter the individual item numbers for group"; a
FOR b = 1 TO ni(a)
PRINT
PRINT "enter item"; b
INPUT item(a, b)
CLS
NEXT b
NEXT a

FOR j = 1 TO ng
pj(j) = ni(j) / 44
ptot = ptot + pj(j)
NEXT j
icomp = ptot / (ng + 1)

FOR ct = 1 TO ng
IF ni(ct) >= ph THEN ph = ni(ct)
p(ct) = ni(ct) / n
mp = mp + p(ct)
NEXT ct
mp = mp - (ph / n)
cent = (ph / n) - (mp / (ng - 1))
PRINT "largest group size is "; ph
INPUT c$

OPEN "a:hsatfin" FOR APPEND AS #1
PRINT #1,
PRINT #1, sn; "ic ="; icomp; "cn=";
PRINT #1, USING "#.#####"; cent
CLOSE #1

OPEN "a:\hstat" FOR APPEND AS #1
PRINT #1, sn
CLOSE #1

PRINT "ic="; icomp
PRINT "cent="; cent

PRINT "checking for missing items"
FOR Xx = 1 TO n
FOR z = 1 TO ng
FOR b = 1 TO ni(z)
IF Xx = item(z, b) THEN count = count + 1
NEXT b
NEXT z
IF count = 0 THEN PRINT Xx; " --not found"
count = 0
NEXT Xx

INPUT "now, hit enter and get the data"; enter$
w = 1
v = 1
CLS
FOR z = 1 TO (ng - 1)
FOR a = (z + 1) TO ng
FOR b = 1 TO ni(z)
MIS1 = 0
MAT1 = 0
trip = 0

FOR Y = 1 TO w
IF item(z, b) = tm(Y) THEN MIS1 = 1
IF item(z, b) = tm(Y) THEN EXIT FOR
NEXT Y

DO WHILE MIS1 = 0
FOR c = 1 TO ni(a)
IF item(z, b) = item(a, c) THEN MAT1 = 1
IF item(z, b) = item(a, c) THEN EXIT FOR
NEXT c
EXIT DO
LOOP

DO WHILE MAT1 = 1
FOR u = 1 TO v
IF item(z, b) = mac(u) THEN trh(z, a, gp(u)) = trh(z, a, gp(u)) + 1
IF item(z, b) = mac(u) THEN trip = 1
IF item(z, b) = mac(u) THEN tm(w) = item(z, b)
IF item(z, b) = mac(u) THEN w = w + 1
IF item(z, b) = mac(u) THEN EXIT FOR
NEXT u

DO
IF trip = 1 THEN EXIT DO
gp(v) = a
mac(v) = item(z, b)
v = v + 1
trip = 1
LOOP

EXIT DO
LOOP

NEXT b

FOR r = (z + 1) TO 24

\...
IF z >= 24 THEN EXIT FOR
IF a >= 24 THEN EXIT FOR
t = t + trh(z, a, r)
NEXT r
NEXT a
NEXT z

CLS
LOCATE 5
PRINT "t="; t

FOR z = 1 TO (ng - 1)
FOR a = (z + 1) TO ng
FOR r = (z + 1) TO 24
IF z >= 24 THEN EXIT FOR
IF a >= 24 THEN EXIT FOR
trh = trh(z, a, r)
CALL pr(trh, z, a, r)
NEXT r
    NEXT a
NEXT z

FOR Zz = 1 TO (ng - 1)
FOR Aa = (Zz + 1) TO ng
FOR Bb = 1 TO ni(Zz)
FOR l = 1 TO w
IF item(Zz, Bb) = tm(l) THEN GOSUB nexbb
    NEXT l
FOR Cc = 1 TO ni(Aa)
IF item(Zz, Bb) = item(Aa, Cc) THEN match(Zz, Aa) = match(Zz, Aa) + 1
    NEXT Cc
nexbb:
    NEXT Bb
m = m + match(Zz, Aa)
match = match(Zz, Aa)
CALL prnew(Zz, Aa, match)
    NEXT Aa
    NEXT Zz

FOR z = 1 TO ng
FOR a = 1 TO ng
IF a > z THEN x = x + match(z, a)
IF z > a THEN x = x + match(a, z)
    NEXT a
FOR O = 1 TO ni(z)
FOR e = 1 TO w
IF item(z, O) = tm(e) THEN trm = trm + 1
    NEXT e
    NEXT O
\text{ind}(z) = n_i(z) - x - \text{trm}

x = 0
\text{trm} = 0
q = q + \text{ind}(z)

\text{OPEN} "a:\hstat" \text{FOR APPEND AS} \#1
\text{PRINT} \#1, "independent in group "; z; "="; \text{ind}(z)
\text{CLOSE} \#1
\text{NEXT} z

\text{PRINT} "q="; q
\text{PRINT} "m="; m
\text{PRINT} "t="; t
\text{INPUT} "enter\"; ex$

\text{IF} \text{sort}$ = "test" \text{AND} q + m + t = 9 \text{THEN} \text{GOSUB endac}
\text{IF} \text{sort}$ = "z" \text{AND} q + m + t = 44 \text{THEN} \text{GOSUB endrl}
\text{IF} \text{sort}$ = "a" \text{AND} q + m + t = 42 \text{THEN} \text{GOSUB endac}
\text{IF} \text{sort}$ = "t" \text{AND} q + m + t = 33 \text{THEN} \text{GOSUB endtr}

\text{PRINT} "check your data for items appearing in more than two categories."
\text{PRINT} "or items not used at all."
\text{PRINT}
\text{PRINT} "this program indicates "; q + m + t; " items used."
\text{INPUT} x$
\text{GOSUB errr}

\text{endac:}
\text{PRINT} "A OK"
\text{endrl:}
\text{PRINT} "R OK"
\text{endtr:}
\text{PRINT} "trait OK"

\text{INPUT} "enter to continue\"; ent$
\text{CLS}
\text{FOR} g = 1 \text{TO} ng
\text{PRINT} "independent group "; g; "items: "; \text{ind}(g)
\text{IF} \text{ind}(g) > 0 \text{THEN} s = s + 1
\text{IF} \text{ind}(g) > 0 \text{THEN} gc(s) = \text{ind}(g)
\text{NEXT} g
\text{PRINT}
\text{PRINT}
\text{PRINT}
\text{FOR} f = 1 \text{TO} (ng - 1)
\text{FOR} k = (f + 1) \text{TO} ng
\text{IF} \text{match}(f, k) > 0 \text{THEN} s = s + 1
\text{IF} \text{match}(f, k) > 0 \text{THEN} gc(s) = \text{match}(f, k)
\text{NEXT} k
\text{NEXT} f
FOR p = 1 TO ng - 1
FOR k = (p + 1) TO ng
FOR g = (p + 1) TO 24
IF p >= 24 THEN EXIT FOR
IF k >= 24 THEN EXIT FOR
IF trh(p, k, g) > 0 THEN s = s + 1
IF trh(p, k, g) > 0 THEN gc(s) = trh(p, k, g)
NEXT g
NEXT k
NEXT p

PRINT "there are "; s; " group combinations"
OPEN "a:hstat" FOR APPEND AS #1
PRINT #1, "there are "; s; "group combos"
CLOSE #1

CLS

FOR m = 1 TO s
sum = sum + (gc(m) * (LOG(gc(m)) / LOG(2)))
NEXT m

INPUT x$
LOCATE 25
h = (LOG(n) / LOG(2)) - (sum / n)
PRINT "complexity for sort "; sort$; " for subject "; sn; ":
PRINT LOCATE 25
PRINT "H="; (LOG(n) / LOG(2)); "-"; sum; "/"; n; "; "="; h

OPEN "a:hsatfin" FOR APPEND AS #2
PRINT #2, sn; sort$; ng;
PRINT #2, h
CLOSE #2

FOR a = 1 TO ng
FOR b = 1 TO ni(a)
IF item(a, b) = 49 THEN LET item(a, b) = 44
IF item(a, b) = 48 THEN LET item(a, b) = 43
IF item(a, b) = 47 THEN LET item(a, b) = 42
IF item(a, b) = 46 THEN LET item(a, b) = 41
NEXT b
NEXT a

DIM h(40)
FOR j = 1 TO ng
h(j) = (ni(j) * (ni(j) - 1)) / (n * (n - 1))
h = h + h(j)
NEXT j
PRINT hi
INPUT e$
Qi = 1 - hi
Bi = LOG(Qi) / LOG(2)

CLS

DIM mtx(50, 50)

FOR p = 1 TO ng
FOR q = 1 TO (ni(p) - 1)
FOR r = q + 1 TO ni(p)
    mtx(item(p, q), item(p, r)) = (-1) * (LOG(h(p)) / LOG(2))
    IF mtx(item(p, r), item(p, q)) = 0 THEN mtx(item(p, r), item(p, q)) =
        mtx(item(p, q), item(p, r))
NEXT r
NEXT q
NEXT p

FOR Y = 1 TO (n - 1)
FOR z = (Y + 1) TO n
    IF mtx(Y, z) = 0 THEN mtx(Y, z) = Bi
    IF mtx(z, Y) = 0 THEN mtx(z, Y) = Bi
NEXT z
NEXT Y

OPEN "d:\basic\simsort" FOR APPEND AS #1
PRINT #1, sn; sort$; ng
FOR v = 1 TO n
FOR w = 1 TO n
    PRINT #1, USING "##.##"; mtx(v, w);
NEXT w
PRINT #1,
NEXT v
CLOSE #1

LOCATE 20
GOSUB ecksit
errr:
PRINT "this program will not compute an H for this subject."

ecksit:
PRINT "that's all for now"
END

SUB pr (trh, z, a, r)
DIM trh(z, a, r)
IF trh > 0 THEN GOSUB print1
GOSUB noprint
print1:
OPEN "a:hstat" FOR APPEND AS #1
PRINT #1, "TRIPLE MATCHES including ("; z; ","; r; ","; a; ");"; trh
CLOSE #1
noprint:
END SUB

SUB prnew (Zz, Aa, match)
IF match > 0 THEN GOSUB pfil
GOSUB nopfl
pfil:
OPEN "a:hstat" FOR APPEND AS #1
PRINT #1, "MATCHES between groups ("; Zz; ","; Aa; ");"; match
CLOSE #1
nopfl:
END SUB
Appendix E
Instructions for subjects in Study 1

Hi, my name is ___________. The research experiment you are taking part in is part of a project investigating the way people think about and use information about the causes for particular events. You will be asked to perform a series of tasks that will provide us with information about the way that you, as individuals, think about and use causal information.

As you know, this experiment consists of two separate one-hour sessions. When you are done with the experiment today, I will ask you to sign up for a second session next week. It is important to this project that you complete both parts of the study.

Sorting
One of the main things you will be doing today is to complete some sorting tasks. For each sorting task I will give you a number of cards or slips of paper. Your job will be to think about the items on the cards and sort them into a number of groups or piles representing those items that you think belong together. Because it often occurs that people think some items belong in more than one group, a number of blank cards are provided on your desks. If you feel that one of the cards in the set I will give you belongs in more than one group or pile, simply copy the item onto a blank card or several cards and place the new cards into the appropriate groups.

This sorting task is designed to show us how people organize information mentally. It provides a model of how certain concepts are grouped together in peoples minds.

Academic causal sort
The first set of cards involves a series of factors that might cause good or bad outcomes in an academic setting. These factors were adapted from the responses of subjects in a previous study who indicated that they thought these factors were important in leading to positive or negative events such as passing or failing a class. You will notice that some of the cards are very similar, but one appears to be the negative of the other. For example, good mood/bad mood. It is important that you consider each card individually because the negative aspect of a particular cause may have a different meaning to some people than the positive aspect. As an example, good mood may seem to be a "normal" state to some people, and bad mood the absence of that; whereas other people may see good and bad moods as equally distant from a "neutral" state.

So, take these cards that refer to factors in an academic setting, and sort them into groups or piles that you feel belong together. Use the blank cards to duplicate those factors that you feel belong to more than one group (a factor can be in as many of the different groups as you
want). You may form as many groups as you want, and you are instructed to keep forming groups until you think you have formed all of the important or meaningful groups. You do not have to use every card.

**Relationship causes sort**

This set of cards involves a series of factors that might cause good or bad outcomes in a relationship. These factors were adapted from the responses of subjects in a previous study who indicated that they thought these factors were important in leading to positive or negative outcomes such as staying together for a long time or breaking up. You will notice that some of the cards are very similar, but one appears to be the negative of the other. For example, good mood/bad mood. It is important that you consider each card individually because the negative aspect of a particular cause may have a different meaning to some people than the positive aspect. As an example, good mood may seem to be a "normal" state to some people, and bad mood the absence of that; whereas other people may see good and bad moods as equally distant from a "neutral" state.

So, take these cards that refer to factors in a relationship setting, and sort them into groups or piles that you feel belong together. Use the blank cards to duplicate those factors that you feel belong to more than one group (a factor can be in as many of the different groups as you want). You may form as many groups as you want, and you are instructed to keep forming groups until you think you have formed all of the important or meaningful groups. You do not have to use every card.

**Cognitive complexity sort**

This set of cards contains a series of personality traits that might describe a person. The goal for this sorting task involves "finding out which personality traits you think are likely to go together". Sort the traits into groups or piles representing traits that belong together. Remember to use the blank cards to duplicate traits that belong with more than one group of traits. You do not have to use every card.

**Day #1 debriefing**

The experiment is over for today. Please sign up for a second session on the sign up sheet. After you have completed the second session, I will tell you more about the research project and answer any of your questions. I will also sign your experiment cards during the second session so please bring your cards when you return.
Appendix F

Background questionnaire

Subject #__________________

Sex: Male Female (circle one) Age _____

Year in school: ____

Academic information: ____________________________________________

What is your major area of study? ________________________________

What is your current cumulative GPA? ______________

What was your cumulative High-school GPA? ______________

Please report the following information about your college entrance exam scores as well as you can remember. (note: this item provided no usable data)

Quantitative- math skills score______

Verbal-language skills score______

TOTAL score _____________ Percentile Rank _____

In general, how important is education to you?

1 2 3 4 5 6 7
Not at all Important Extremely Important

How important is it to you that you receive good grades and do well in your studies?

1 2 3 4 5 6 7
Not at all Important Extremely Important
How important is it to you to understand the causes of your academic or scholastic outcomes?

1 2 3 4 5 6 7
Not at all Important Extremely Important

Relationship information
How many romantic relationships (with different people) would you say that you have had in your life? ______

For how many years have you been involved in romantic relationships? ______

How many long-term relationships have you had in your life? ______

How many relationships (short or long term) would say you were very involved in, or emotionally invested in? ______

In general, how important are relationships to you?

1 2 3 4 5 6 7
Not at all Important Extremely Important

How important are positive outcomes in relationships to you?

1 2 3 4 5 6 7
Not at all Important Extremely Important

How important is it for you to know the causes of your relationship outcomes?

1 2 3 4 5 6 7
Not at all Important Extremely Important
Appendix G:
Domain specific items assessing causal uncertainty

Indicate your level of agreement with the following items based on the scale below:

-3 Extremely disagree
-2 Strongly disagree
-1 Mildly disagree
0 Neither agree nor disagree
+1 Mildly agree
+2 Strongly agree
+3 Extremely agree

1) I am often uncertain about the causes of the positive things that happen in academic settings.

2) I am often uncertain about the causes of the negative things that happen in academic settings.

3) I have a great desire to know WHY things happen in academic settings.

4) I prefer it when the causes in academic settings are simple and easy to understand.

5) The more complicated the causes for different events are (in academic settings), the more anxious I get about them.

Part II.

1) I am often uncertain about the causes of the positive things that happen in relationships.

2) I am often uncertain about the causes of the negative things that happen in relationships.

3) I have a great desire to know WHY things happen in relationships.

4) I prefer it when the causes in relationships are simple and easy to understand.

5) The more complicated the causes for different events are (in relationships), the more anxious I get about them.
Appendix H

Hard copy of the computer program for obtaining pretesting values for consistent and inconsistent factors.

RANDOMIZE TIMER
CLS

DIM phr$(34)
DATA Financial problems
DATA Poor relationship with in-laws (either partner's parents)
DATA Physical abuse
DATA Selfishness in the relationship
DATA Dissimilarity in educational aspirations and career or occupational goals
DATA Partners have an equal level of involvement in the relationship
DATA There is no alcohol or drug abuse
DATA Absence of physical abuse
DATA Don't feel constrained by the relationship
DATA Possible alternative partners are not being considered
DATA Unequal involvement in the relationship
DATA Similar educational aspirations or career goals
DATA Relationship involves sharing
DATA Financially secure
DATA Good relationship with both partner's parents
DATA One or both partners are heavy drinkers
DATA Feeling constrained by the relationship
DATA One or both partners see possible alternative partners
DATA Sexual compatibility
DATA Spending time together
DATA Attitudes and views of the two partners are not the same
DATA Similar views or attitudes
DATA Not enough quality time together
DATA Sexual problems in general or sexual incompatibility
DATA They own a home computer
DATA They don't own a home computer
DATA Neither partner has allergies
DATA Both partners have allergies
DATA They are renting an apartment
DATA They own a home (mortgage payments)
DATA They vacation in Europe
DATA They have never vacationed in Europe
DATA They are both American Citizens
DATA They are not American Citizens
FOR a = 1 TO 34
    READ phr$(a)
NEXT a

DIM cox$(50)
DIM zx(50)
DIM cor(50)
r = 1
DO UNTIL r = 35
  v:
i = INT(RND * 34) + 1
  IF zx(i) = 1 THEN GOSUB v
  zx(i) = 1
cor(r) = phrl$(i)
cor(r) = i
  r = r + 1
LOOP

CLS
oops:
  PRINT "PLEASE ENTER the last 4 digits of YOUR social security #"
  INPUT " this will serve as your subject number for this experiment"; sn
  IF sn = 0 THEN GOSUB oops
  PRINT
  PRINT "Please enter 'm' if you are male, or 'f' if you are female"
nocont:
  INPUT sex$
  IF sex$ = "M" OR sex$ = "F" OR sex$ = "m" OR sex$ = "f" THEN GOSUB nocont
cont:
  PRINT
  PRINT " please enter your year in school (1, 2, 3, 4, 5, etc)"
c2:
  INPUT yr
  IF yr = 0 THEN GOSUB nc2
  IF yr > 5 THEN GOSUB nc2
CLS
PRINT
PRINT
PRINT "what is your major?: enter according to the following scale"
  PRINT " 0= undecided"
  PRINT " 1= sciences (biology, chemistry, physics, premed,etc.)"
  PRINT " 2= social sciences (psychology, sociology, etc.)"
  PRINT " 3= finance (business, economics, etc)"
  PRINT " 4= fine arts (music, sculpture,etc.)"
  PRINT " 5= classics (english, history, etc.)"
  PRINT " 6= other"
c3:
  INPUT maj
  IF maj > 6 THEN GOSUB c3
  IF maj = 6 THEN GOSUB M
GOSUB c
M:
  PRINT "type in your major here"
  INPUT maj$
c:
  OPEN "a:\d5r2dat" FOR APPEND AS #1
  PRINT #1, "sn="; sn;
Causal factors

In this experiment, we are interested in how you think about the causes for certain events. You will indicate your answers to questions by typing a number and pressing the <enter> key. For the first task, you will see a number of descriptions about a couple in a relationship. For each description, you will be asked to make several judgments as described below.

1) How consistent or inconsistent is this cause with the situation? for this question, consider if you think the statement makes sense or 'fits with' the situation described.

2) How relevant (related) or irrelevant (unrelated) is this cause to the situation? for this question, consider if you think the cause might have some influence on the situation.

3) Is the cause describing a generally positive or negative behavior or quality? for this question, consider if you think the cause seems to be a good thing or a bad thing.

Please do not go on until you clearly understand these questions. Ask the experimenter if you need clarification.

Input "enter to continue:"; ent$
FOR p = 1 TO 34
CLS
LOCATE 5
PRINT "The situation: A couple is having problems in their relationship."
V = cor(p)
LOCATE 9
PRINT "Cause "; p; ":"
LOCATE 11
PRINT cos$(p)

LOCATE 15
PRINT "1) How CONSISTENT or INCONSISTENT is this cause with the situation? "
PRINT PRINT
PRINT "1 2 3 4 5 6 7 8 9"
PRINT "very neither very "
PRINT "INCONSISTENT | CONSISTENT "
PRINT one:
LOCATE 22
PRINT ""
LOCATE 22
timel = TIMER
INPUT ci(v)
IF ci(v) > 9 OR ci(v) < 1 THEN GOSUB one
time2 = TIMER
ci(v) = time2 - timel
LOCATE 15
PRINT "2) How RELEVANT (related) or IRRELEVANT (unrelated) is this cause "
PRINT "to the situation?"
PRINT PRINT
PRINT "1 2 3 4 5 6 7 8 9"
PRINT "very neither very "
PRINT "IRRELEVANT | RELEVANT "
PRINT two:
LOCATE 22
PRINT ""
LOCATE 22
timel = TIMER
INPUT ir(v)
IF ir(v) > 9 OR ir(v) < 1 THEN GOSUB two
time2 = TIMER
irt(v) = time2 - timel
LOCATE 15
PRINT "3) Is the cause describing a generally POSITIVE or "
PRINT "a generally NEGATIVE behavior or quality?"
PRINT PRINT
PRINT "1 2 3 4 5 6 7 8 9"
PRINT "very Neutral very "
PRINT "NEGATIVE | POSITIVE "
PRINT three:
LOCATE 22
PRINT ""
LOCATE 22
timel = TIMER
INPUT pn(v)
IF pn(v) > 9 OR pn(v) < 1 THEN GOSUB three
time2 = TIMER
pnt(v) = time2 - timel

CLS
timel = TIMER
DO
time2 = TIMER
LOOP UNTIL time2 - timel > 2
NEXTP

CLS
FOR y = 1 TO 34
OPEN "a:\d5r2dat" FOR APPEND AS #1
PRINT #1, ci(y); ir(y); pn(y), cit(y), irt(y), pnt(y)
CLOSE #1
NEXT y

CLS
LOCATE 5, 5
PRINT "This portion of the experiment is now completed."
PRINT "Please tell the experimenter that you are done."
fin:
INPUT fin$ = "x" THEN GOSUB bye
GOSUB fin
bye:
END
Appendix I

Hard copy of the computer program for presenting stimuli and collecting data for Study 3

RANDOMIZE TIMER
CLS
DIM phr$(24)
DATA Both partners had an affair
DATA There are alternative love interests
DATA They have financial problems
DATA There is a lack of trust in the relationship
DATA There is a lack of honesty in the relationship
DATA They are often insensitive to each other's needs
DATA There is selfishness in the relationship
DATA One or both feel constrained by the relationship
DATA Not enough quality time together
DATA They are equally involved in the relationship
DATA Flexibility/ability to compromise
DATA There is no alcoholism or drug abuse
DATA They love each other
DATA They don't usually fight or argue
DATA They communicate well
DATA They have similar views and attitudes
DATA There is no physical abuse
DATA They have similar educational and career goals
DATA They live in the country
DATA They work out regularly
DATA Both partners have allergies
DATA They often contribute to charity
DATA They are not American Citizens
DATA They have a dog or a cat
DATA They don't own a home computer
DATA They have never vacationed in Europe
FOR a = 1 TO 24
    READ phr$(a)
    phr$(a)
NEXT a

DIM coz$(50)
DIM zx(50)
DIM cor(50)
r = 1
DO UNTIL r = 25
V:
i = INT(RND * 24) + 1
IF zx(i) = 1 THEN GOSUB V
zx(i) = 1
coz$(r) = phr$(i)
cor(r) = i
r = r + 1
LOOP

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bacq:
INPUT "rush"; rush$
IF rush$ = "y" OR rush$ = "Y" OR rush$ = "n" OR rush$ = "N" THEN GOSUB ford
GOSUB bacq

ford:

CLS
snover:
PRINT "PLEASE ENTER the last 4 digits of YOUR social security #"
INPUT " this will serve as your subject number for this experiment"; sn
PRINT
IF sn = 0 THEN GOSUB snover
OPEN "a:\rexp.dat" FOR APPEND AS #1
PRINT #1, sn; "rush="; rush$
PRINT #1,
CLOSE #1

CLS
PRINT " Social Judgment "
PRINT
PRINT " This experiment concerns how we make judgments of other people. "
PRINT "You will be asked to think about a particular situation and to "
PRINT "make judgments about some persons who will be described to you."
PRINT "Please follow the instructions carefully, and pay close attention to "
PRINT "the task. "
PRINT
PRINT " Ask the experimenter if you need more explanation."
PRINT
nocon:
INPUT " enter 'x' to continue"; ent$
IF ent$ = "x" THEN GOSUB conl
GOSUB nocon

conl:

CLS
LOCATE 7, 5
PRINT " Problem 1: Causes for problems in a relationship"
PRINT
PRINT " A couple is seeing a counselor because of some problems"
PRINT "in their relationship. During a series of interviews, the"
PRINT "counselor finds out a great deal of information about the "
PRINT "couple's behaviors and the qualities of the relationship. "
PRINT " You will be asked to view some of the information that the"
PRINT "counselor has gathered and try to form a judgment regarding"
PRINT "the causes of the couple's problems. "
PRINT " As you view the information, consider what things might have "
PRINT "have caused the relationship problems. After this computer task"
PRINT "you may be asked to discuss your thoughts about the causes for"
PRINT "the couple's problems with the other subjects in the experiment."

LOCATE 25
INPUT "enter to continue"; ent$
CLS
PRINT " The counselor has reduced the information into a series of "
PRINT "short phrases. You should use these phrases to form your judgments."
PRINT "Pay close attention to the information provided."
PRINT
INPUT "If you are ready to begin this problem, press the enter key twice"; ent$
INPUT ent$

DIM resp(35)

IF rush$ = "y" THEN GOSUB rush

norush:
FOR p = 1 TO 24
CLS
LOCATE 5
v = cor(p)
LOCATE 11
PRINT coz$(p)
LOCATE 22
timel = TIMER
INPUT "enter for the next phrase"; tm$
time2 = TIMER
resp(v) = time2 - timel
CLS
timel = TIMER
DO
time2 = TIMER
LOOP UNTIL time2 - timel > .5
NEXT p
GOSUB recal

rush:
CLS
LOCATE 7
PRINT "Watch this screen carefully."
PRINT "The information will be presented to you."
PRINT ""
timel = TIMER
DO
time2 = TIMER
LOOP UNTIL time2 - timel > 4

FOR p = 1 TO 24
CLS
LOCATE 11
PRINT coz$(p)
timel = TIMER
DO
time2 = TIMER
LOOP UNTIL time2 - timel > 2.5
NEXT p
recall:
CLS
PRINT " Now that you have seen the information provided by the counselor, "
PRINT " what do you think is the main cause for the couple's problems?"
INPUT " type answer here"; coz$
CLS
PRINT " Please answer the following questions about the couple by using the "
PRINT " scale provided."
PRINT
PRINT noon:
INPUT " enter 'c' to continue"; ent$
IF ent$ = "c" THEN GOSUB con
GOSUB noon
con:

CLS
LOCATE 5
PRINT " How well do you think the relationship will work out?"
PRINT " 1 2 3 4 5 6 7 8 9"
PRINT " Not at Moderately Very"
PRINT " All Well Well "
timel = TIMER
INPUT " enter the number that reflects your overall judgment"; judge
time2 = TIMER
jdgtime = time2 - timel

LOCATE 18
PRINT " How confident are you concerning this judgment?"
PRINT " 1 2 3 4 5 6 7 8 9"
PRINT " Not at all Moderately Very"
PRINT " Confident Confident Confident"
timel = TIMER
INPUT " enter the number that reflects your confidence"; conf
time2 = TIMER
conftime = time2 - timel

CLS
LOCATE 5
PRINT " How much do you think you would like the couple if you met?"
PRINT " 1 2 3 4 5 6 7 8 9"
PRINT " Not at Moderately Very"
PRINT " all Much "
timel = TIMER
INPUT " enter the number that reflects your overall judgment"; liking
time2 = TIMER
liktme = time2 - timel
LOCATE 18
PRINT "How confident are you concerning this judgment?"

PRINT " 1  2  3  4  5  6  7  8  9"
PRINT "Not at all          Moderately          Very"
PRINT "Confident          Confident          Confident"
timel = TIMER
INPUT "enter the number that reflects your confidence"; lconf
time2 = TIMER
lconftm = time2 - timel

OPEN "a:\rexp.dat" FOR APPEND AS #1
PRINT #1, judge; jdgtime; conf; confitime; liking; liketime; lconf; lconftm
PRINT #1,
CLOSE #1

CLS
LOCATE 5
PRINT "We also want to know how much of the information you can remember."
PRINT "Below, type the phrases that you remember. Try to be as complete and"
PRINT "as accurate as possible. After each phrase, press the enter key."
PRINT "When you cannot remember any additional phrases, let the experimenter"
PRINT "know you are finished with this problem."

PRINT
PRINT
PRINT
PRINT "Type as much of the phrase as you can remember, and press enter"
LOCATE 15
OPEN "a:\recalrl.dat" FOR APPEND AS #1
PRINT #1, sn
CLOSE #1

morec:
INPUT recall$
PRINT
IF recall$ = "qt" THEN GOSUB finale
OPEN "a:\recalrl.dat" FOR APPEND AS #1
PRINT #1, recalls
CLOSE #1
GOSUB morec

finale:
IF rush$ = "y" OR rush$ = "Y" THEN GOSUB noprint
FOR y = 1 TO 24
OPEN "a:\rexp.dat" FOR APPEND AS #1
PRINT #1, resp(y);
CLOSE #1
NEXT y

nopr:
CLS
LOCATE 5, 5
PRINT " This portion of the experiment is now completed."
PRINT " Please tell the experimenter that you are done. 
PRINT
fin:
INPUT fin$
  IF fin$ = "x" THEN GOSUB bye
  GOSUB fin
bye:

END
Appendix J
Hard copy of the computer program for gathering similairites data for a cyclic missing data design

RANDOMIZE TIMER
CLS
DIM rp$(44)
DATA Good communication between partners
DATA Flexibility/ ability to compromise
DATA Similar religions
DATA Similar views or attitudes
DATA Relationship based on friendship
DATA Love
DATA Compassion and emotional sensitivity
DATA Partners are faithful to each other
DATA Honesty
DATA Trust
DATA Couple doesn't usually fight or argue
DATA Relationship involves sharing
DATA Similar educational aspirations or career goals
DATA Lack of love
DATA Spending time together
DATA Sexual compatibility
DATA Good relationship with both partner's parents
DATA Financially secure
DATA Absence of physical abuse
DATA Religious differences
DATA Attitudes and views of the two partners are not the same
DATA Relationship not based on friendship
DATA Not enough quality time together
DATA Sexual problems in general or sexual incompatibility
DATA One or both partner(s) is cheating (extra relationship affair)
DATA Dishonesty in the relationship
DATA Lack of trust
DATA Poor communication (in general)
DATA Inability to compromise
DATA Dissimilarity in educational aspirations and career or occupational goals
DATA Partners have an equal level of involvement in the relationship
DATA There is no alcohol abuse
DATA Don't feel constrained by the relationship
DATA Possible alternative partners are not being considered
DATA Poor relationship with in-laws (either partner's parents)
DATA Financial problems
DATA Physical abuse
DATA Fighting or arguing
DATA Selfishness in the relationship
DATA Unequal involvement in the relationship
DATA Lack of compassion or emotional sensitivity
DATA One or both partners are heavy drinkers

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DATA Feeling constrained by the relationship
DATA One or both partners see possible alternative partners
FOR a = 1 TO 44
    READ rp$(a)
NEXT a
DIM x(206)
DIM y(206)
INPUT "ross condition"; r
IF r = 1 THEN GOSUB rssl
IF r = 2 THEN GOSUB rss2
IF r = 3 THEN GOSUB rss3
IF r = 4 THEN GOSUB rss4
IF r = 5 THEN GOSUB rss5
rssl:
OPEN "a:\ross1" FOR INPUT AS #1
FOR d = 1 TO 206
    INPUT #1, x(d)
    INPUT #1, y(d)
NEXT d
CLOSE #1
PRINT "Ross order is "; r; "; ".
INPUT q$
GOSUB stimulus

rss2:
OPEN "a:\ross2" FOR INPUT AS #1
FOR d = 1 TO 206
    INPUT #1, x(d)
    INPUT #1, y(d)
NEXT d
CLOSE #1
PRINT "Ross order is "; r; "; ".
INPUT q$
GOSUB stimulus

rss3:
OPEN "a:\ross3" FOR INPUT AS #1
FOR d = 1 TO 206
    INPUT #1, x(d)
    INPUT #1, y(d)
NEXT d
CLOSE #1
PRINT "Ross order is "; r; "; ".
INPUT q$
GOSUB stimulus

rss4:
OPEN "a:\ross4" FOR INPUT AS #1
FOR d = 1 TO 206
    INPUT #1, x(d)
    INPUT #1, y(d)
NEXT d
CLOSE #1
PRINT "Ross order is "; r; "; ".
INPUT q$
GOSUB stimulus

rss5:
OPEN "a:\ross5" FOR INPUT AS #1
FOR d = 1 TO 206
INPUT #1, x(d)
INPUT #1, y(d)
NEXT d
CLOSE #1
PRINT "Ross order is "; x; "."
INPUT q$
GOSUB stimulus

stimulus:
INPUT "bypass"; bp
IF bp = 1 THEN GOSUB twohundred

standard:
DIM w(10)
DATA 40,19,3,6,12,35,28,17,41,23
FOR c = 1 TO 10
READ w(c)
NEXT c
DIM u(10)
DATA 44,28,37,9,37,35,22,5,33,14
FOR cb = 1 TO 10
READ u(cb)
NEXT cb
DIM sim(45, 45)
CLS

newsoc:
PRINT "PLEASE ENTER the last 4 digits of YOUR social security #"
INPUT " this will serve as your subject number for this experiment"; sn
IF sn = 0 OR sn > 9999 THEN GOSUB newsoc
PRINT
PRINT
PRINT "Please enter 'm' if you are male, or 'f' if you are female"
nocont:
INPUT sex$
IF sex$ = "M" OR sex$ = "F" OR sex$ = "m" OR sex$ = "f" THEN GOSUB cont
GOSUB nocont
cont:
PRINT
PRINT
PRINT " please enter your year in school (1, 2, 3, 4, 5, etc)"
nc2:
INPUT yr
IF yr = 0 THEN GOSUB nc2
IF yr > 5 THEN GOSUB nc2
CLS
PRINT
PRINT
PRINT "what is your major?: enter according to the following scale"
PRINT "  0= undecided"
PRINT "  1= sciences (biology, chemistry, physics, premed, etc.)"
PRINT "  2= social sciences (psychology, sociology, etc.)"
PRINT "  3= finance (business, economics, etc.)"
PRINT "  4= fine arts (music, sculpture, etc.)"
PRINT "  5= classics (english, history, etc.)"
PRINT "  6= other"
nc3:
INPUT maj
IF maj > 6 THEN GOSUB nc3
IF maj = 6 THEN GOSUB m
GOSUB c
m:
PRINT "type in your major here"
INPUT maj$

OPEN "a:\findis.dat" FOR APPEND AS #1
PRINT #1, "sn=", sn;
PRINT #1, sex$; yr; maj; maj$
CLOSE #1
CLS
PRINT "TITLE"
PRINT "In this part of the experiment, we want to know how you view information"
PRINT "about causes. You will be asked to indicate how similar you think these"
PRINT "causes are."
PRINT "You will see a pair of causes, and will be asked to rate the pair on"
PRINT "a scale of similarity."
PRINT "Let the experimenter know if you have any difficulties."
PRINT PRINT PRINT PRINT
INPUT "enter to continue:"; ent$
CLS
LOCATE 5, 5
PRINT "The factors you will be seeing will be taken in part from the task that"
PRINT "you have just completed, and should be familiar to you."
PRINT "In this case, the causes are related to outcomes in personal relationships."
PRINT "It is important that you get a sense of the type of judgments you will"
PRINT "be making. To start you off, the first few items are considered to"
PRINT "be warm-up items. Follow the instructions carefully, and let the"
PRINT "experimenter know if you have questions."
PRINT PRINT
INPUT "enter to continue:"; ent$
REM Warm-up session here
FOR f = 1 TO 10
p = w(f)
q = u(f)
CLS
LOCATE 5, 15
PRINT "How similar are these factors?"
LOCATE 10, 1
PRINT rp$(p)
timel = TIMER
DO
LOCATE 16, 1
PRINT rp$(q)
timel = TIMER
DO
LOCATE 22
PRINT " 1 2 3 4 5 6 7 8 9"
PRINT " very neither very"
PRINT " dissimilar similar"
PRINT
PRINT
PRINT rewarm:
INPUT " enter the number that best reflects your reaction."; wmup(f)
IF wmup(f) > 9 OR wmup(f) < 1 THEN GOSUB rewarm
NEXT f

PRINT "Now that you have a sense of the judgment task, are there any questions"
PRINT " that you want to ask? (see the experimenter)."
PRINT
PRINT "You may start the rest of the task whenever you are ready. There are"
PRINT "a lot of judgments for you to make, but try to approach each judgment "
PRINT "thoughtfully. "
INPUT "press the enter key if you are ready to go on"; ent$
CLS

twohundred:
FOR j = 1 TO 206
r = x(j)
s = y(j)
LOCATE 5, 15
PRINT "How similar are these factors?"
LOCATE 10, 1
PRINT rp$(r)
timel = TIMER
DO
  time2 = TIMER
LOOP UNTIL time2 - time1 > 0.5

LOCATE 16, 1
PRINT rp$(s)

time1 = TIMER
DO
  time2 = TIMER
  LOOP UNTIL time2 - time1 > 0.5

LOCATE 22
  PRINT "1 2 3 4 5 6 7 8 9"
  PRINT "very neither very"
  PRINT "dissimilar similar"
  PRINT

doover:
  INPUT sim(r, s)
  IF sim(r, s) > 9 OR sim(r, s) < 1 THEN GOSUB doover
  CLS
  LET sim(s, r) = sim(r, s)
NEXT j

OPEN "c:\rossim" FOR APPEND AS #1
FOR l = 1 TO 44
  FOR m = 1 TO 44
    PRINT #1, sim(l, m);
  NEXT m
  PRINT #1,
NEXT l
CLOSE #1

fin:
  INPUT fin$
  IF fin$ = "x" THEN GOSUB bye
  GOSUB fin
bye:
END