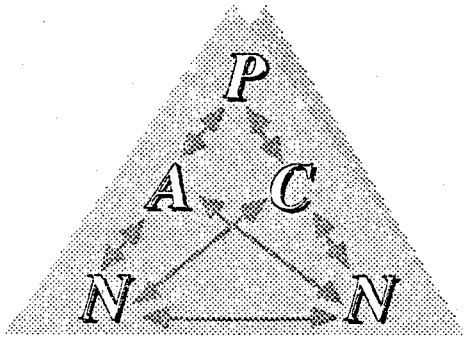

Banff Conference Centre,
Banff, Alberta, Canada
Friday 6th—Sunday 8th June 1986

Proceedings of North American Personal Construct Network Second Biennial Conference

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North American Personal Construct Network
Second Biennial Conference
Banff, Alberta, Canada, June 6-8 1986

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North American Personal Construct Network
Second Biennial Conference
Banff, Alberta, Canada, June 6-8 1986
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SOME BASIC STRUCTURES IN INTERPERSONAL JUDGMENT

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ABSTRACT

This discussion is concerned with several possible interpretations of three basic proportions observed in a series of repertory grid experiments: (1) people assign themselves to the positive poles of about 75% of constructs, (2) they assign others to the negative poles of constructs approximately 37% of the time, and (3) they also assign themselves and others to the opposite poles of constructs about 37% of the time. Implications of these findings, together with those of some related repertory grid data, are elaborated within the framework of personal construct psuchology and other models of interpersonal judgment.

INTRODUCTION

Personal construct theory, as formulated by George Kelly (1955) and summarized by Adams-Webber (1984a), assumes that we commonly use bipolar distinctions (termed 'constructs'), such as generous/stingy, to evaluate our own behaviour and that of others. Kelly's (1955) repertory grid test (described by Adams-Webber, 1984b) has played an integral role in the development of this theory. It is essentially a complex sorting task in which a list of people ('figures'), which usually includes the self, are categorized successively on the basis of several bipolar constructs. We can either elicit a sample of 'personal constructs' from every subject individually, or supply the same 'standard' set of constructs to all subjects alike. The data generated by each subject are entered into a separate two-dimensional table, or 'grid', in which there is a column for every figure and a row for every construct. Each row-column intersect in this grid contains either a '1' or '0' indicating which pole of a given construct was applied to a particular figure.

The structural analysis of repertory grid data to be discussed here assumes also that all of the constructs in a given subject's grid can be mapped onto the fundamental distinction between positive and negative (see Adams-Webber, 1982). For instance, generous designates behaviour that typically is regarded as 'positive' in Western culture, and the opposite pole of this distinction, referred to here as stingy, typically is considered to be 'negative'. Although, our model contains no general assumptions about what kinds of behaviour will be evaluated positively or negatively in any particular culture (see Rapoport, 1982), specific assumptions of this kind were made in many of the experiments that I will mention.

REPERTORY GRID ANALYSIS

Given a repertory grid in which **n** figures (columns), including the self, have been categorized dichotomously on the basis of **m** bipolar constructs (rows), we can let **Sp** represent the number of constructs on which the self is assigned to the positive poles (these are designated as **Type 1** constructs), **P** the total frequency of positive judgments concerning others, **LS** the overall frequency with which others are assigned to the same poles of constructs as the self, **LSP** the frequency of positive judgments concerning others when the self also is judged positively, **USP** the frequency of positive judgments concerning others on constructs where the self is assigned to the negative poles (these are designated as **Type 2** constructs), **LSN** the frequency of negative judgments about others on the same (Type 2) constructs, and **USN** the frequency of negative judgments about others on (Type 1) constructs where the self is positive. If the values **Sp**, **P** and **LS** are specified, we can calculate **LSP**, and then, **USP**, **LSN**, and **USN**.

Since, by definition, $P = LSP + USP$ and $LS = LSP + LSN$
It follows that, $P + LS = 2LSP + USP + LSN$
Therefore, $P + LS - (USP + LSN) = 2\,LSP$
Since, $LSP + USP + LSN + USN = m(n - 1)$
and, $LSP + USN = Sp(n - 1)$
By subtraction, $USP + LSN = (m - Sp)(n - 1)$
By substitution, $(P + LS) - (m - Sp)(n - 1) = 2\,LSP$
Conclusion: $LSP = 1/2\ [(P + LS) - (m - Sp)(n - 1)]$

Under the 'null hypothesis' that this grid may have been generated by a purely random process, such as tossing an unbiased coin m(n) times and recording a P for each head and a N for each tail, the expected values of each of these indices would be as follows: $Sp = m/2$; $P = LS = m(n-1)/2$; $LSP = USP = LSN = USN = m(n-1)/4$.

THREE HYPOTHESES BASED ON PREVIOUS FINDINGS

(1) P = 5m(n-1)/8 {i.e., .625 m(n-1)}. The first experimental finding that is relevant to this method of repertory grid analysis is that when subjects categorize themselves and other persons dichotomously on the basis of bipolar constructs such as generous-stingy, they tend to assign other persons, on average, to the positive poles (e.g., generous) approximately 62.5% of the time. This finding has been replicated by several investigators, using elicited and provided constructs, with adults and children of every age between 8 and 22, with English, French, and Polish speaking subjects, in Canada, England, Poland, Trinidad and the United States (Adams-Webber, 1978, 1979, 1985a; Adams-Webber & Benjafield, 1973; Adams-Webber & Rodney, 1983; Benjafield & Adams-Webber, 1975; 1976; Benjafield & Green, 1978; Benjafield & Pomeroy, 1978; Leenaars, 1981; Marczewska, 1983; Rigdon & Epting, 1982; Romany & Adams-Webber, 1981).

(2) LS = 5m(n-1)/8 {i.e., .625 m(n-1)}. Previous studies also have shown repeatedly that normal adults exhibit a propensity to assign themselves

and others to the same poles of bipolar constructs about 62.5% of the time (Adams-Webber, 1979, 1985a,b; Adams-Webber & Davidson, 1979; Adams-Webber & Rodney, 1983; Benjafield & Adams-Webber, 1975). We have observed about the same relative frequency of 'like-self' judgments when subject characterize strangers, or either sex, just met for the first time as when they describe parents and siblings (Adams-Webber, 1979). Thus, degree of familiarity does not seem to be a relevant variable. Furthermore, comparable results have been obtained when constructs were elicited from each participant individually as when the same 'standard' list of constructs was supplied to all subjects alike, or when they used mixed sets of elicited and supplied constructs (cf. Adams-Webber, 1979).

(3) Sp = 6m/8 {i.e., .75 m}. Normal subjects appear to be somewhat more generous in judging themselves than in judging others. Specifically, an analysis of the repertory grids of 1,203 Canadians, ranging in age from 8 to 20, revealed that, on average, they assigned themselves to the positive poles of 75% of constructs (Adams-Webber, 1985b).

SOME FURTHER IMPLICATIONS

(4) $P = LS$,

and, by substitution,

$LSP + USP = LSP + LSN$

Therefore,

(5) $USP = LSN$

It follows that

(6) $LSP = m(n-1)/2$

Since,

$2LSP = P + LS - (m-Sp)(n-1)$

$2LSP = 5m(n-1)/8 + 5m(n-1)/8 - (m - 6m/8)(n - 1)$

$2LSP = 10m(n-1)/8 - 2m(n-1)/8$

$2LSP = 8m(n-1)/8 = m(n-1)$

$LSP = m(n-1)/2$

Also,

(7) $USN = m(n-1)/4$

Since,

$USN = Sp(n-1) - LSP$

$USN = 6m(n-1)/8 - m(n-1)/2$

$USN = 6m(n-1)/8 - 4m(n-1)/8$

$USN = 2m(n-1)/8 = m(n-1)/4$

Also,

(8) $LSN = USP = m(n-1)/8$

since, by definition,

$LSN + USP = (m - Sp)(n-1)$

and, by substitution,

$LSN + USP = (m - 6m/8)(n-1)$

$LSN + USP = 2m(n-1)/8$ Since,

$LSN = USP$

LSN + USP = 2LSN = 2USP

and, by substitution,

2LSN = 2USP = 2m(n-1)/8

Therefore,

LSN = USP = m(n-1)/8

It follows also that,

(9) LSP = 2USN = 4LSN = 4USP

On Type 1 constructs (i.e., those on which the self has been assigned to the positive poles) *other people will be allocated to the positive poles twc thirds of the time.* As indicated previously, the number of Type 1 constructs in any repertory grid will be **Sp**; and therefore, the total number of judgments concerning others based on Type 1 constructs will be Sp(n-1).

(10) 2/3 [Sp(n-1)] = LSP.

Since,

2/3(6m/8)(n-1) = 12m(n-1)/24 = m(n-1)/2 = LSP

On Type 2 constructs (i.e., those on which the self is assigned to the negative poles) *other people will be allocated to the positive (unlike-self) poles half of the time, and to the negative (like-self) poles half of the time.* In other words, we tend to attribute what we perceive to be our own negative characteristics to about half of our acquaintances; whereas we attribute our perceived positive characteristics to a substantial majority (about 67%) of our acquaintances. This suggests that we may regard our *own* positive traits as defining the 'norm', while we do not consider our *own* negative traits to be 'deviant' (since they are shared by half of our acquaintances).

USP = LSN (5)

It follows also that about ***80%*** of perceived similarities between self and others are positive.

LSP = 4LSN (9)

Moreover, ***80%*** of the positve characteristics that are attributed to others are assigned also to the self (whereas only 67% of one's own perceived virtues are attributed to others).

LSP = 4USP (9)

These considerations suggest that, in order to maintain a predominantly positive image of the self, we are prepared to be quite generous in our evaluations of other people. It appears that we may be ready to 'give them the benefit of the doubt' so to speak much of the time, while we are even more generous in judging ourselves.

In the context of this analysis, it would seem reasonable to speculate further that a specific set of positive traits assigned to the self, which are represented by the positive poles of Type 1 constructs, constitute a normative 'prototype' on which we typically base our anticipations concerning the behaviour of other persons. Within the specific framework of personal construct theory, it would make sense to suppose that comparisons in which others are judged as sharing one's own perceived

virtues would provide the maximum 'validational' support for one's positive image of self. This line of reasoning seems to be consistent with some related repertory grid findings. For instance, we (Adams-Webber & Benjafield, 1973) have observed that subjects rank those constructs on which the self and the majority of others are allotted to the positive poles (Type 1) as "more useful for understanding people" than constructs on which the self and approximately half of their acquaintances are assigned to the negative poles (Type 2), and that subjects rate both themselves and others more definitely (i. e., extremely) on Type 1 constructs than on Type 2 constructs, indirectly suggesting that the former dimensions are more 'meaningful' to them (see Adams-Webber, 1979).

ALTERNATIVE HYPOTHESES

Interestingly, 'positivity bias', which is so ubiquitous in interpersonal judgment research, does not manifest itself at all in terms of Type 2 constructs. For example, Boucher and Osgood's(1969, p.1) 'Pollyanna hypothesis' asserts that there is an universal tendency to use E+ words (i.e., those with evaluatively positive connotations) more frequently, diversely and faciley than E- words"; or as Osgood and Richards (1973; p.410) put it, "there is a universal tendency to communicate about the positive aspects of life". This suggests that, as Deese (1973) notes, "we are all natural optimists." Thus, the Pollyanna hypothesis predicts generally that people will apply the positive poles of constructs to their acquaintances more frequently than the negative poles (Warr, 1972; Eiser & Mower White, 1973). As we have seen, however, this expectation holds only for Type 1 constructs, since the positive and negative poles of Type 2 constructs are applied to other people equally often. Indeed, this finding may provide the most convincing rationale for differentiating between Type 1 and Type 2 constructs in the first instance.

Type 2 constructs could be problematic for us simply by virtue of the fact that they represent negative characteristics assigned to the self. For example, we have found that the proportion of Type 2 constructs increases significantly when normal subjects role-play depression and other dysphoric moods (Adams-Webber & Rodney, 1983). This is consistent with repertory grid data collected from clinically depressed psychiatric patients (Ashworth, Blackburn & McPherson, 1982; Space & Cromwell, 1980; Space, Dingemans, & Cromwell, 1983). Thus, it seems intuitively plausible that uncertainty (defined as H) is maximal in terms of these constructs. It may be worth noting that Kelly (1955) defines the concept anxiety in terms of confusion and uncertainty. From a cognitive standpoint, Type 2 constructs may be problematic in that they represent experience that does not 'fit' the normative prototype defined by Type 1 constructs, and which is, therefore, relatively unpredictable.

The hypothesis that Type 2 constructs may have a lower priority in interpersonal judgment than Type 1 constructs is consistent with findings that the former are rated by subjects as less "useful for understanding

people", and that self and others tend to be rated less definitely (i.e., extremely) on them (Adams-Webber & Benjafield, 1973). It would appear as if most people were willing to acknowledge that they do indeed recognize a few negative traits in themselves; however, the same negative characteristics are exhibited by about half of their acquaintances, and therefore, they hardly can be regarded as 'deviant'. Moreover, these particular negative traits seem relatively unimportant in evaluating people; and furthermore, they cannot be judged very definitely. These kinds of considerations could make it rather easy for us to discount the importance of most of our perceived 'faults'. Nonetheless, Type 2 constructs may remain somewhat problematic in so far as they become the focus of maximum uncertainty, and perhaps anxiety.

The general hypothesis that Type 2 constructs are used to structure negative impressions of the self suggests the possiblity that subjects may have, at least implicitly, an intuitive understanding that these specific constructs are relevant to unpleasant personal expriences.This could explain why the proportion of this type of construct increases in repertory grids when normal subjects are asked to role-play depression and other dysphoric moods (Adams-Webber & Rodney, 1983). Although it is mathematically possible for the self to be shifted from the positive to the negative poles of as many as 75% of the constructs in a grid without any necessary changes in the relative frequency of either positive judgments of others or like-self judgements, this is not what has been observed empirically. Instead, when the proportion of positive judgments concerning the self declines, there are corresponding decreases in the relative frequencies of both like-self judgments and positive judgments of others. This suggests that shifting the self from the positive to the negative pole of any given construct will transform it into a different kind of dimension altogether, that is, from a Type 1 construct, which has a certain set of characteristics that I have outlined previously, to a Type 2 construct, with the opposite set of characteristics.

There have been several attempts to explain the finding that people tend to apply the positive poles of constructs to others approximately 62% - 63% of the time. For example, Lefebvre (1985) proposes that if we were to assume *a priori* that subjects actualize certain mechanisms of choice prescribed by his computational model of ethical cognition, "then the existence of this constant is explained." In repertory grid terms, he defines the 'ethical status' of any particular figure (column) as the proportion of positive poles of constructs assigned to it. In a recent paper, he demonstrates through strict mathematical deduction that, under a rather broad set of assumptions, his computational model predicts that the average ethical status of figures other than the self in repertory grids will be .625. When a somewhat more constrained set of conditions are assumed to obtain, then the predicted value becomes .618. You can refer to Lefebvre (1985) for a formal description of this model and all the relevant derivations and proofs.

An alternative interpretation formulated by Benjafield and Adams-Webber (1976), called the 'golden section hypothesis', predicts that the proportion of others assigned to the positive poles of constructs will be $(5^{1/2} - 1)/2$, which works out to approximately .618. Pythagoras, the presocratic mathematician and philosopher, developed a complex system of numbers and abstract geometric forms to which he and his followers ascribed great moral significance (cf. Wheelwright, 1966). A central concept in this system is the 'golden section', which is constructed by dividing a line segment **AB** by a point **C** in such a way that the ratio **AC:CB** = **CB:AB**. If we assume that the entire line is of unit length, and let **CB** = ø, then **AC** = 1 - ø. It follows that $ø^2 + ø - 1 = 0$. When we solve this equation for ø, we find that its positive root is equal to $(5^{1/2} - 1)/2$. The 'golden section' has had a ubiquitous influence on Western science and art. The Greeks based much of their art (e.g, the statues of Phidias) and architecture (e.g., the front of the Parthenon) upon it. This proportion occurs frequently in the patterns of growth of plants and animals (Bateson, 1979). Many European painters, including Piero della Francesca, Bellini, Poussin, Vermeer and Seurat, have proportioned their canvases on the basis of the 'golden section'. At least since Fechner (1876), psychologists have studied the aesthetic properties of this proportion. For instance, Fechner, himself measured many common rectangles, including windows, playing cards, book covers, and writing pads,showing that their proportions were often close to 1:ø This suggests the possibility that people may assign others to the positive poles of constructs about 62% of the time for 'aesthetic' reasons (see Benjafield, 1985).

Benjafield and Green (1978) hypothesize further that people employ a 'Fibonacci decision rule' in formulating their positive and negative judgments of others in repertory grid tasks. According to this 'rule', the number of negative judgments, the number of positive judgments, and the total number of judgments "are always, at any stage of the process, three successive terms of the Fibonacci sequence: 0,1,1,2,3,5,8,13,21...Each further term in this sequence is the sum of the two previous terms...the ratio between any two consecutive terms of the sequence is an approximation to ø, an approximation which improves as the numbers increase. Thus, this is a simple process which if used by subjects in a repertory grid task, would tend to produce two classes of acquaintances in the golden section ratio (p. 29)". Thus, their hypothesis could explain the finding that people tend to assign others to the positive poles of constructs about 62% of the time. For example, the results of an *a priori* simulation of the hypothesized judgment strategy was impressively consistent with the outcome of a rather complex repertory grid experiment in which they varied systematically the proportion of figures with positive and negative valences. On the other hand, it is not clear that their hypothesis can be extended to explain the other repertory grid findings that I have mentioned.

Benjafield and Adams-Webber (1976; see Adams-Webber, 1979, 1982) suggest that their 'golden section hypothesis' describes a strategy for applying the positive and negative poles of constructs to persons that may be optimal from the standpoint of allowing our negative judgments to stand out maximally as 'figure' against a general background of positive judgments. Frank (summarized by Berlyne, 1971) operationally defines the 'strikingness' (salience) of any category of event in terms of two of its properties: its relative frequency of occurrence (p), and its informational content, defined as - log(2) p . His specific index of 'strikingness' is the product of these two values, i.e., - p log(2) p . As Berlyne (1971, p. 232) points out, this expression reaches its maximum value when p = 1/e, which works out to approximately .368. He notes that this value is quite close to the minor element of the 'golden section' (.382); and he suggests, in the light of this relationship,- that the 'golden section' may derive its aesthetic appeal from the fact that it "allows the minor element to occupy that proportion of the whole that makes it maximally striking (Berlyne, 1971; p. 232)". Benjafield and Adams-Webber (1976; p, 14) speculate, on the basis of Berlyne's 'strikingness hypothesis', that when we assign other people to the negative poles of constructs about 37% of the time, we thereby render our negative judgments, considered as a whole, maximally striking as 'figure' against a diffuse background of positive impressions. Interestingly, the proportion of negative judgments specified in the structural model that I have described is .375, which is actually closer to 1/e (.368) than is the minor element of the 'golden section' (.382).

Similarly, when Frank's operational defintion of 'salience' is applied to the observed distribution of like-self versus unlike-self judgments in repertory grid data, it implies that subjects may organize their impressions of themselves and others on the basis of bipolar constructs in such a way that perceived differences between self and others will stand out as maximally salient against a diffuse background of perceived similarities (cf. Adams-Webber & Davidson, 1979). It should be noted also that, regardless of what specific mechanism produces a relative frequency of either negative judgments about others or unlike-self judgments of approximately 37%, for example, either Lefebvre's (1985) 'automatic inner computer' or Benjafield and Green's (1978) 'Fibonacci decision rule', the result would tend to render both kinds of judgment maximally 'striking' according to Frank's hypothesis.

Finally, we should give some consideration to the fact that all the hypothesized values are somewhat more precise than any of the actual findings reported to date. For example, the relative frequencies of positive judgments of others and like-self judgments observed in repertory grid experiments with normal adults have ranged from .60 to .64 under a variety of different conditions, with standard deviations between .06 and .11. Results averaged across experiments, however, do tend to converge on a fairly narrow range of values (between .62 to .63). Assuming a

certain amount of measurement error, which should 'average out' across experiments, the predictions of each model seem to 'fit' the findings fairly well. It perhaps is worth mentioning also that the function - p log p is quite 'flat' in the vicinity of its maximum value, and therefore, relatively small deviations of p from the value 1/e , such as .375, will involve very little loss in 'strikingness' as operationally defined by Frank.

REFERENCES

Adams-Webber, J. (1978). A further test of the golden section hypothesis. British Journal of Psychology, 69, 439-442.

Adams-Webber, J. (1979). Personal construct theory: Concepts and applications. New York: Wiley.

Adams-Webber, J. (1982). Assimilation and contrast in personal judgment. In J C. Mancuso & J. Adams-Webber (Eds.), The construing person (96-112). New York: Praeger.

Adams-Webber, J. (1984a). Personal construct theory. In R. Corsini (Ed.), Encyclopedia of psychology (pp. 9-12). New York: Wiley.

Adams-Webber, J. (1984b). Repertory grid technique. In R. Corsini (Ed.), Encyclopedia of psychology (p. 225). New York: Wiley.

Adams-Webber, J. (1985a). Self-other contrast and the development of personal constructs. Canadian Journal of Behavioural Science, 17, 303-314.

Adams-Webber, J. (1985b). Construing self and others. In F. R. Epting & A. W. Landfield. Anticipating personal construct psychology (pp. 58-69). Lincoln: University of Nebraska Press.

Adams-Webber, J. & Benjafield, J. (1973). The relation between lexical marking and rating extremity in interpersonal judgment. Canadian Journal of Behavioural Science, 5, 234-241.

Adams-Webber, J. & Rodney, Y. (1983). Relational aspects of temporary changes in construing self and others. Canadian Journal of Behavioural Science, 15, 52-59.

Ashworth, C.M., Blackburn, I.M. & McPherson (1982). The performance of depressed and manic patients on some repertory grid measures. British Journal of Medical Psychology, 55, 247-255.

Bateson, G. (1979). Mind and Nature. New York: Dutton.

Benjafield (1985). A review of recent research on the golden section. Empirical Studies of the Arts, 3, 117-134.

Benjafield, J. & Adams-Webber, J. (1975). Assimilative projection and construct balance in the repertory grid. British Journal of Psychology, 66, 169-173.

Benjafield, J. & Adams-Webber, J. (1976). The golden section hypothesis. British Journal of Psychology, 67, 11-15.

Benjafield, J. & Green, T .R .G. (1978). Golden section relations in interpersonal judgment. British Journal of Psychology, 69, 25-35

Benjafield, J. & Pomeroy, E. (1978). A possible ideal underlying interpersonal descriptions. British Journal of Social and Clinical Psychology, 17, 339-340.
Berlyne, D. E. (1971). Aesthetics and psychobiology. New York: Appleton-Century-Crofts.
Boucher, J. & Osgood, C. E. (1969). The Pollyanna hypothesis. Journal of Verbal Learning and Verbal Behavior, 8, 1-8.
Deese, J. (1973). Cognitive structure and affect in language. In L. Pliner, P. Krames, and T. Alloway (Eds.), Communication and affect. New York: Academic Press.
Fechner, G. T. (1876). Vorschule der Äesthetik. Leipzig: Breitkopf & Härtel.
Greenberg, J. H. (1966). Language universals. The Hague: Mouton.
Eiser, J. R. & Mower White, C. J. (1973). Affirmation and denial in evaluative descriptions. British Journal of Psychology, 64, 399-403.
Kelly, G .A. (1955). The psychology of personal constructs. New York: Norton.
Leenaars, A. (1981). Drugs and people: Repertory grid structure and the construal of two different types of target. Journal of Clinical Psychology, 37, 198-201.
Lefebvre, V. A. (1985). The golden section and an algebraic model of ethical cognition. Journal of Mathematical Psychology, 29, 289-310.
Marczewska, H. (1983). Golden section or lack of symmetry. Polish Psychological Bulletin, 14, 85-91.
Osgood, C. E. (1979). From Yang and Yin to and or but in cross cultural perspective. International Journal of Psychology, 14, 1-35.
Osgood, C. E. & Richards, M. M. (1973). From Yang and Yin to and or but. Language, 49, 380-410.
Rapoport, A. (1982). Foreward. In V. Lefebvre. Algebra of conscience: A comparative analysis of Western and Soviet ethical systems. Boston: Reidel.
Rigdon, M. A. & Epting, F. R. (1982). A test of the golden section hypothesis with elicited constructs. Journal of Personality and Social Psychology, 43, 1080-1087.
Romany, S. & Adams-Webber, J. (1981). The golden section hypothesis from a developmental perspective. Social Behavior and Personality, 9, 89-92.
Space, L. G. & Cromwell, R.L. (1980). Personal constructs among depressed patients. The Journal of Nervous and Mental Diseases, 168, 150-158.
Space, L. G., Dingemans, P. & Cromwell, R. L. Self-construing and alienation in depressives, schizophrenics and normals. In J. Adams-Webber & J. Mancuso (Eds.). Applications of personal construct theory. (pp. 365-377) New York: Academic Press.
Warr, P.B. (1972). Pollyanna's personal judgments. European Journal of Social Psychology, 1, 327-247.
Wheelwright, P. (1966). The presocratics. New York: Odyssey Press.

FOUNDATIONS FOR A MODEL OF KNOWING

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ABSTRACT: Although the bulk of Artificial Intelligence (AI) theorists concentrate on the construction of computer based intelligent artifacts and agents, others - with a "theoretical psychology" orientation - focus on building improved models of human thought. A variety of approaches (e.g., rational, behavioral, intuitive, or evolutionary) focus on different variables and address limited domains. In contrast Kelly's Personal Construct Psychology offers a richer set of concepts on which to build a general model of knowing based on "subjectively construed" validations.

INTRODUCTION

"...the single worst problem in the field of modeling at present is the inexperience of modelers in examining their own assumptions, realizing their lack of objectivity and understanding the relative strengths and weaknesses of their methods.(Meadows 1982, p. 217)

A model is supposed to be *similar* to but *simpler* than the phenomena or domain it represents. In modeling human thinking not only have we settled for simplicity, but for a cavalier simplicity, one uncritical or unaware of the powerful presuppositions on which it rests. But rarely do any of us conscientiously examine our own assumptions so we can ill afford to be self-righteously critical of those who assume that our thought processes work in a manner similar to the predicate calculus; or similar to IF-THEN production systems; or neatly like niave set theory, or subjective utility theory; or that we solve puzzles the way rats do?

We use our models then, not because they are objectively valid, but because they "work". Certainly, when viewed with the benefit of hindsight, they work only as conceptual stepping stones, or as special limiting cases, but nevertheless they once passed, or still pass, some similarity/simplicity test . Such models met some implicit and explicit "goodness-of-fit" judgments made by their proponents , no matter how degraded that isomorphism subsequently appears after the fact, or when viewed from an

enlarged perspective which is typically the unacknowledged beneficiary of earlier false or too simple starts.

KELLY IN A MODERN CONTEXT.

Kelly saw "goodness-of-fit" between our models and our observations as based on subjectively construed abstractions or representations of experience:

"Validation represents the compatibility (subjectively construed) between one's predictions and the outcome he observes. Invalidation represents incompatibility (subjectively construed) between's one's predictions and the outcome he observes". (Kelly 1955, p. 158).

What are the chances of such a subjectively anchored construing process producing valid knowledge? Various students of the philosophy and history of science agree that our knowledge is contingent on the limited sub-set of representations and inference rules we use:

"....the fallibility of reasoning is guaranteed both by the impossibility of generating unassailable propostions from particular facts, and by the tentative and theory-infected character of the facts themselves. Second, the principle of 'no conclusions without premises' puts forever beyond reach normative statements..." (Simon 1983, p. 6).

While many scholars echo Simon's theme that absolute validations or "certainty" lies beyond our grasp (Kuhn 1970, Popper 1974; Miller 1978; Campbell 1986), still, they disagree how far beyond our grasp such certainty lies. These differences range from Popper's optimism (1970), through Kuhn's relativism (1970), to Collins' nihilism (1981a, 1981b). Also, like Kelly before them, these scholars acknowledge the significant role played by anticipations and preconceptions in knowledge building and maintenance, although they disagree over the ratio of subjectivity to objectivity that forms the foundations of our "knowledge".

We believe Kelly's veiwpoint, supplemented by those of current thinkers, provides helpful guidelines for approaching the subjectivity-objectivity debate. As noted earlier, for Kelly the foundations of human thought, and knowledge, rest on subjectively construed goodness-of-fit between anticipations and abstracted representations of experience. How might such anticipations and subsequent abstracted feedback interact to produce

different kinds of knowledge: knowledge, on the one hand, that approximates "objective truth" a la Popper's anticipations and, on the other hand, knowledge that essentially reflects the anticipations of the observer, that approximates socially constructed truth a la Kuhn's anticipations?

ABSTRACTING MECHANISMS

Kelly's model of construing based on subjectively matching abstracted representations of events against anticipations and assumptions is reflected in the current literature:

"...a universe comes into being when a space is severed and taken apart". (Brown 1969, p. V).

"...our computational scenarios, for all their quantitative detail, are only computing the consequences of the assumptions we have made according to the rules we have built in." (Gaines 1984, p. 92).

"...the representation of an object as a collection of features is viewed as a product of a prior process of extraction and compilation." (Tversky 1977, p. 329).

Thus, combining Kelly's key concepts with those of current scholars, we generate the working hypothesis that we construct reality (knowledge) by computing the consequences of our assumptions and anticipations. In this construction we use severed and extracted fragments and representations of experience - explicitly and implicitly edited to fit our expectations. Popper assumes that under certain conditions such constructions will approximate "objective truth", while Kuhn believes they will strongly reflect "tribal" assumptions, paradigms, and biases, and that objective truth logically and empirically lies beyond our reach.

Kelly's theory can accomodate both Popper's and Kuhn's view by providing for graded degrees of isomorphism between "subjectively" and "objectively" construed goodness-of-fit, (e.g., relatively high isomorphism in artificial and small world domains, and relatively low, or indeterminate, isomorphism in large worlds).

Extracting and Compiling "The Truth"

For illustrative purposes we can conceive of a purported knowledge structure,

in a severed domain, as a correlation between two extracted variables X and Y, with feedback of postive and negative instances or representations influencing our confidence in that relation - as validating or invalidating our anticipations through Kelly's subjectively construed goodness-of-fit criteria. For example we can assume the following "if-then" decision rule for a class of binary choices where the possible outcomes are indicated in Figure 1:

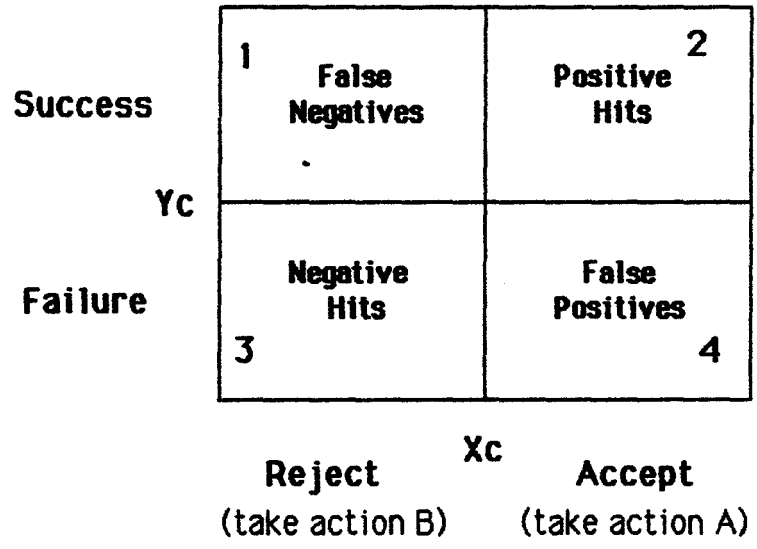

Figure 1: Extracted Feedback

if $x \geq Xc$ accept (e.g., choose action A)
if $x < Xc$ reject (e.g., choose action B)
if $y \geq Yc$ success (e.g., code as validating assumed relationship)
if $y < Yc$ failure (e.g., code as invalidating assumed relationship)

If there is a strong "objective" relationship between X and Y we would expect a large number of positive hits (cell 2), and negative hits (cell 3), while expecting relatively few false positives (cell 4), or false negatives (cell 1). To obtain reliable estimates of an "objective" relationship between X and Y rationally requires reliable empirical feedback on the data falling or edited into all four cells, as discussed by Estes 1976a, & 1976b.

Such conditions would presumably produce approximate "objective truth" in Popper's sense. Notice such conditions are essentially limited to laboratory or small world domains where artificial severences, extractions and compilations are conducted under highly controlled conditions. It is relative truth, relative to the artificial or arbitrary time/space severences,

representations, compilations, and particularly relative to the "success/failure" criteria employed by the particular anticipators or knowledge seekers.

But if we seek a general model of construing, one applicable to large as well as small worlds, we must meet large world conditions. For example, in large worlds we rarely, if ever, have access to data in all four cells of Figure 1, and so fail to meet the rational/empirical conditions of validating or invalidating the predicted XY relationship. So not only must we rely on extracted and compiled fragments (representations or abstractions) as is the case in laboratory or artificial worlds, but we also lack access to feedback from two of the four cells - feedback necessary for "objective" validation of anticipated or hypothesized relationships. How then can we continue to construe, with relative confidence, large worlds offering such impoverished feedback? We suggest that Kelly's notion of "subjectively construed" goodness-of-fit provides the basis for a general model of knowing.

Abstracting and Compiling Knowledge From Degraded Feedback

We require a model that provides for confidence (subjectively construed validation) in various knowledge structures, particularly those based on feedback from limited and degraded data or representations - e.g., impoverished feedback available from only half the cells (cell 2 and cell 4) of the tradititional four-cell rational/empirical model of validation.

Einhorn and Hogarth (1978) develop such a model under the assumptions that: a) cell 1 and 3 data are typically either unavailable or ignored (avoided); and b) outcomes are typically coded as frequencies rather than as probabilities. They then propose that confidence (C) in a relationship - subjectively construed validity - is related to feedback (F):

$$C = f(F)$$

and that (F) in turn is a function of the weighted difference between postive feedback (np) and negative feedback (nf):

$$F = B1(np) - B2(nf)$$

where the coefficients B1 and B2 reflect the relative reinforcing values - benefits and costs - of cell 2 positive hits on the one hand and cell 4 false positives (negative feedback) on the other, and where $B1 + B2 = 1.0$ ($B1, B2 \geq 0$).

Einhorn and Hogarth propose that since the positive hit rate is greater than .5 in many situations (e.g. unconditional probablity), to yield a significant negative feedback (F < 0) the B2 coeficient must be greater than .5 (e.g, B2 must be greater than B1). Thus, to discredit highly anticipated XY relations negative feedback must generate higher detectable penalties or costs than positive feedback generates payoffs or benefits. Therefore, to invalidate or reduce confidence in the given relationship the negative feedback from cell 4 must impact on the construer or expert with high negative saliency. The false positives must generate penetrating contrasts (Kelly, 1955), or high negative surprise values (Gaines & Shaw 1985).

In brief we propose that experts extract and compile similarities and contrasts (subjectively construed) from their representations of experience (e.g. cells 2 and 4) in order to construct, maintain, extend, and refine their predictions or anticipations.

Next, within this feedback model of confidence or validation, we discuss some of the conditions which would enable bounded rationality experts, working as they must with severed and abstracted fragments of experience, to generate and maintain subjective validation in their fallible knowledge constructions.

DOMAIN STRUCTURE AND CONFIDENCE

First, we would expect high confidence or subjective validation where the experts possess valid knowledge of a strong XY relation, and ready access to all four feedback cells enabling them to extend and refine that knowledge. Such would be the case within *artificial* domains involving representative samples, effective controls or control groups, reliable criteria of success and failure, and replicable if-then procedures. This represents *internal validity* in the traditional, rational/empirical model of science, albeit a model under revision by Popper, and under critical appraisal by Kuhn.

Second, we would expect high confidence in certain small worlds. Simon (1983 p. 23) proposes that for practical purposes that even in large worlds "...not everything is closely connected to everything else...problems can be decomposed into their components.." so that bounded rationality experts can extract some valid knowledge structures - the result of quasi-stable interaction effects between our probes and detector systems, on the one hand, and domain structure, on the other. In other words there is sufficient stable structure in selected time/vector frames or severences to enable us to

generate reasonably reliable predictions, as we do in some non-experimental sciences like astronomy, even without access to all four cells of the rational/empirical validation model. The contrasts and surprises which arise (e.g. feedback from the satallite space probes) while forcing "local" revisions do not threaten our general confidence in this particular knowledge structure, at least so far.

We suggest, however, that the artificial and "natural island" domains discussed above represent an infinitesimal fraction of our high confidence, subjectively validated, knowledge and further assume that most domains offer us rich opportunities to generate "knowledge" which on the one hand is either invalid or of indeterminate validity, and on the other hand is highly functional. It is functional in the sense of serving as a powerful decision aid in engaging the future, and as a convincing explanatory model for "managing" feedback - compiling positive instances and discounting negative ones that penetrate professional, institutional, or tribal defense mechanisms.

INVALID, INDETERMINATE, FUNCTIONAL "KNOWLEDGE"

High confidence can be generated from positive feedback, whether such feedback mainly flows from domain structure, or is mainly constructed or creatively construed by the "expert". The following common, large world conditions all favour the manufacture of functional yet invalid or indeterminate knowledge, in which experts can generate and maintain high confidence, or a sense of high personal and "professional" validation.

Positive Unconditional Probabilities

Construers readily generate subjective validation through positive feedback in domains where the unconditional probablity of successful outcomes is high almost regardless of the knowledge they possess or the actions they take. Medical practicioners serve as familiar examples where folk expressions acknowledge highly favourable base rates: " The doctor keeps the patient occupied while nature effects the cure", or "without treatment a cold lasts for two weeks, whereas with treatment it only last fourteen days".

But not only do professionals benefit from "occupying" benign and buffered domains, so too do most of us living in such geo-political severences as the United States, or Canada, which offer unconditional probabilities of "success" on many dimensions compared, for example, with base rates in Bangladesh. Not only do professionals inhabit relatively benign domains, but so too do

those working in government, university, or large corporate settings. Occupying such positions drastically reduces the probability of "runs" of negative feedback, and increases the probability of "success" on many dimensions more or less unrelated to knowledge, or effective action, in a rational/empirical sense. Feedback from a shrivelled cell 4 is improbable, and even when it occurs is buffered and muffled by entrenched "professional" and institutional defense mechanisms, or high cost and prolonged grievance procedures.

The "success rate", the confidence, the subjective validation, experienced by this large group of "experts" is, according to the degraded feedback model, more a function of where they practice (domain occupancy), rather than it is of what they know (valid domain knowledge).

Delayed Multi-Dimensional and Fuzzy Feedback

Not only do domains differ in their base rates of unconditional probabilities of success but they also differ in the *type* and the *timing* of positive and negative feedback. Thus, where feedback is delayed, multi-dimensional, and/or fuzzy, the goodness of fit between anticipations and results can be subjectively construed in wonderous ways - can be edited to fit the explicit and implicit anticipations of the construer, or his or her constituents. Consider the following "knowledge" construction mechanisms based on subjectively construed criteria.

1) Some experts implicitly "time-frame" domain feedback to capture and compile positive feedback, thus making the encoding of cell 2 successes, and the exclusion or reduction of cell 4 negative feedback, "manageable", at the same time maintaining or raising confidence in their anticipations or models. For example, abstracted and compiled exemplars, prototypes, and testimonials in medicine, mineral and oil explorations, stock market coups, executive "success" , etc., represent implicit temporal extractions or time/vector "frame ups" by sincere experts. Such subjective validations frequently involve extracting and claiming credit for what are spontaneous regressions toward the mean in processes demonstrating periodic negative variances, or claiming to have "engineered" what are essentially randomly generated "successes or finds". Techniques for estimating marginal gains over base rates rarely occupy a significant place in the armamentarium of experts - by their scarcity perhaps representing implicit conceptual or professional defence mechanisms (Minsky 1983).

2) Also, within time-frame severences, in domains where the feedback is delayed, multi-dimensional, and/or fuzzy, experts can encode positive "proxies", and discount negative ones. In other words they can implicitly and explicitly manipulate sub-sets of Yc criteria of success (Figure 1) so as to enlarge cell 2 and shrink cell 4 feedback (e.g., "the patient died but the operation was a success"; or by noting that " there are increasingly positive *signs* of oil bearing formations", or by using other extracted and compiled "proxies of progress".

3) If, after applying or misapplying the above noted implicit, and explicit, enhancing and protective encoding mechanisms, experts still are faced with a salient *rate*, or *type*, of cell 4 negative feedback, they can then implicitly and explicitly start fine-tuning the independent variables of their model. That is they can persistently manipulate the multi dimensional variables of the Xc "treatment" contstruct (Figure 1) by focussing on any of an infinite number of possible permutations and combinations. Periodic and spurious "successes" will serve to maintain, or re-establish, confidence in the superordinate Xc construct as the experts "safely" adjust subordinate dimensions. Such protective tuning can be conducted in any space: semantic; syntactic; and/or pragmatic.

For example, experts operating primarily in semantic space will implicitly, and explicitly, tune their operating procedures (e.g., a bit more of the drug, starting earlier in the day, with a low protein diet, etc., or in oil exploration drill a bit further north; a bit deeper; on a slight angle.; etc; etc.,). The critical premises are the implicit hidden-hand editors because they cut the infinite number of potential permutations, and combinations, down to a size that the explicit premises and technologies of the bounded rationality expert can safely "manage".

Those experts operating primarily in syntactical space, will tune different permutations and combinations of their algorithms, syntax, or model dimensions. In addition they can further launder their prototype semantic represenations to increase goodness of fit. Furthermore, analysts can emphasize "in-house" criteria like elegance, simplicity, consistency, etc., and so implicitly and explicitly protect Yc criteria from embarrassing semantic intrusions, thus establishing increasingly artificial and protected syntactic islands. But as with the semantic expert, it is the anchored, superordinate constructs or premises that reduce the search, choice, and tuning space to mind size.

Finally, experts operating in pragmatic space, will focus on different permutations of various dimensions of their phenomenological representations of "reality", again with superordinate pragmatic premises, automatically bounding and priorizing the space. For example, if the self construct is at the top of the pragmatic construing tree, then protecting it from salient and negative feedback would presumably be the top-priority meta-heuristic, resulting in implicit Yc and Xc tuning. The "image broker" must first "find" robust, high-level images of oil, or money, or hope, or power in his own mind (pragmatic space). Such automatic priorizing and encoding mechanisms, supplemented by rational/empirical ones, extract and compile tolerable positive/negative feedback ratios, but particularly serve to avoid salient negative instances (e.g., via buffering and shrinking cell four), and serve to discount negative feedback that does slip, or barge, through, via automatic damage control and garbage disposal systems. The metaphore is that of a wired in pragmatic "immunological" system.

In brief, experts locate/construct islands where they extract and compile a "knowledge" space which they can maintain and tune with confidence, whether or not, "in the long run", the knowledge structures so produced are judged to be discoverd, manufactured, or imagined.

Summary

Kelly's notion of validation through subjectively construed goodness-if-fit criteria, between anticipations and feedback, can be applied to artificial and small worlds, as well as to large worlds. For in all these domains the criteria involve highly abstracted and edited representations of domain structure.

In artificial and small worlds the subjectively construed validations presumably approximate the "objective" structure of the severed, simplified domain - as estimated by applying the popular rational/empirical criteria of the profession or "tribe". In large worlds, involving multi-dimensional, and /or delayed feedback, the subjectively construed "knowledge" can serve as functional though invalid representations of domain structure. That is, such "knowledge" can serve as powerful decision aids, and as bases for social and professional communication and coordination, even though subsequently it is judged to be invalid, or of indeterminate validity. We conclude that Kelly's Personal Construct Psychology provides a promising, but relatively neglected, foundation for building models of thinking and knowing applicable across a variety of domains.

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REFERENCES

Agnew, N. McK. & Brown, John L. (In Press). Bounded Rationality: fallible decisions in unbounded problem space. Behavioral Science.

Campbell,D.T. (1986). Science's social system of validity-enhancing collective belief change and the problems of social science. In "Fiske, D.W., & Shweder, R.A. (Eds) Metatheory in the social sciences: Pluralisms and subjectivities, Chicago: University of Chicago Press.

Collins, H. M. (1981a). Stages in the empirical programme of relativism. Social Studies of Science, 11, 3 -10.

Collins, H. M. (1981b). Son of seven sexes: the social destruction of a physical phenomenon. Social Studies of Science, 11, 33-62.

Einhorn, H. J. & Hogarth, R. M. (1978). Confidence in judgement: persistence of the illusion of validity. Psychological Review, 85, 395-416.

Estes, W. K. (1976a). The cognitive side of probability learning. Psychological Review, 83: 37-64.

Estes, W. K. (1976b) Some functions of memory in probability learning and choice behavior. In G. H. Bower (Ed.), The psychology of learning and motivation, Vol. 10, New York: Academic Press.

Gaines, B. R. (1984). Methodology in the Large: Modeling All There Is. Systems Research, Vol. 1, No. 2, 91-103.

Gaines, B. R. & Shaw, M. L. G. (1984). Emotion: a systematic development of the personal construct model. Paper presented to the Personal Construct Network Conference, Cincinnati, June 22-24, 1984.

Kelly, G. A. (1955). The Psychology of Personal Constructs. Volume 1: A Theory of Personality, Volume 2: Clinical Diagnosis in Psychotherapy. New York: W. W. Norton.

Kuhn, T. (1970). Reflections on my Critics. In Lakatos, I. and Musgrave, A. (Eds.), Criticism and growth of knowledge. Cambridge: Cambridge University Press.

Meadows, D. Richardson, J. & Bruckmann, G. Eds., (1982). Groping In The Dark. London: John Wiley.

Miller, J. G. (1978). Living Systems. New York: McGraw-Hill.

Minsky, M. (1983) Jokes and the logic of the cognative unconscious. In Groner, R., Groner, M., & Bischof, W. F. (eds.), Methods of heuristics, London: Lawrence Erlbaum.

Popper, Karl. (1970). Normal science and its dangers. In Lakatos, I and Musgrave, A., (Eds.), Criticism and growth in knowledge .Cambridge: Cambridge University Press.

Popper, K. R. (1974). Autobiography of Karl Popper. In P. Schilpp, (Ed.), The philosophy of Karl Popper, LaSalle, Ill: Open Court.

Simon, H. A. (1983). Reason in Human Affairs. Stanford: Stanford University Press.

Tversky, A. (1977). Features of similarity. Psychological Review, 84: 327-352.

NeoETS: Capturing Expert System Knowledge in Hierarchical Rating Grids

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ABSTRACT

Eliciting problem-solving information from a human expert (a form of *knowledge acquisition*) is a major problem when building an expert system. A new version of the Expertise Transfer System has been constructed (NeoETS) that uses hierarchies and rating grids with multiple variable types to represent knowledge. NeoETS interviews experts for knowledge using techniques from Personal Construct Psychology and helps them analyze, test, and refine the knowledge. Expertise from multiple experts can be represented and used separately or combined. Problem consultations are run by propagating information from rating grids through hierarchies. Assistance is given to the expert by a *dialog manager* that embodies knowledge acquisition heuristics. Knowledge bases for several *expert system shells* may be created from the knowledge in NeoETS.

Background information is presented, the knowledge elicitation and representation concepts are described, portions of a sample interview transcript for a Programming Language Advisor are presented, and the advantages and limitations of the methodology are discussed. NeoETS contains many techniques and tools for expertise transfer; several of these are illustrated. The techniques combine to make NeoETS a powerful testbed for rapidly prototyping portions of many kinds of complex expert systems.

PROBLEM

The Expertise Transfer System (NeoETS) and its predecessor (ETS) have been in use in Boeing for over three years. More than 500 prototypical knowledge-based systems have been generated by ETS. The system interviews experts to uncover vocabulary, conclusions, problem-solving traits, trait structures, trait weights, and inconsistencies. It helps construct very rapid prototypes (typically in less than two hours), assists the expert in analyzing the adequacy of the knowledge for solving the problem, and creates knowledge bases for a number of expert system shells (S.1, M.1, OPS5, KEE, etc.) from its own internal representation (Boose, 1985, 1986).

Due to several limitations, ETS is usually abandoned sometime during the knowledge acquisition process. Typically it is used to explore project approaches and assess feasibility for several days or a week, and then development continues in some other expert system shell. While the use of ETS saves substantial time when used in this way (typically one or two calendar months from a 12 to 24 month Boeing project development time) it would be desirable to make ETS more powerful by overcoming some of its limitations.

ETS stores problem-solving knowledge in a rating grid (see Figures 1 and 7). Problem solutions - *elements* - are elicited and placed across the top of a grid, and solution traits - *constructs* - are listed down the side of the grid as bipolar scales. Traits are elicited by presenting groups of elements and asking the expert to discriminate among them (this is illustrated later). Each element is given a *rating* by the expert showing where it falls on the trait scale. The interviewing techniques used in building a rating grid are based on ideas from George Kelly's Personal Construct Psychology (Kelly, 1955; Gaines and Shaw, 1981; Shaw and Gaines, 1986). ETS can analyze a rating grid in a number of ways to help the expert refine its problem-

solving capability. It makes *production rules* from the ratings in the grid that are then used to drive end-user consultations where the knowledge is tested for necessity and sufficiency.

Single rating grids are a fairly weak form of knowledge representation. Although they may be derived quickly, they lack precision and depth:

1. A single rating grid can only represent "flat" relations between single elements and traits. No deep knowledge, causal knowledge, or relationship chains may be shown.

2. Only elements or traits at the same level of abstraction may be used comfortably in a single grid. Mixing of abstraction levels leads to problems when using the grid to make decisions (Boose, 1986).

3. Complex problems may only be represented in relatively large grids; large grids are difficult for the expert to manipulate and comprehend.

4. Building hierarchies with multiple experts, several reasoning strategies, and multiple domain models cannot be represented within a single grid.

5. It is inconvenient to represent certain types of problem-solving variables as bipolar traits. Unordered variables (such as a set of computer types) must be represented as a series of bipolar traits (VAX / NOT-VAX, IBM / NOT-IBM...) when it would be easier to to combine them into a single trait (a COMPUTER trait whose values are VAX, IBM, and so on).

6. ETS only reasons with ratings on a scale from 1 to 5, not exact numeric values (e.g., dollars or temperature).

APPROACH

NeoETS attempts to overcome these limitations:

1. By helping experts structure knowledge into *solution, trait, expert* and *case hierarchies*. These hierarchies allow the expert to break up complex problems into chunks of convenient size and similar level of abstraction.
2. By allowing traits to take on unordered or exact numeric rating values when appropriate.

Hierarchical representation and reasoning will be described first, followed by a discussion on value types. Then an annotated session typescript for a Programming Language Advisor will be presented.

Knowledge in Hierarchies

In eliciting knowledge for complex problems it is sometimes difficult for the expert to identify conclusion sets whose members are at similar, useful levels of granularity. For instance, in an engine diagnostic system, the expert may include the elements "engine," "battery," "ignition coil," and "electrical system." "Engine" and "electrical system" are at different levels of structural and functional abstraction (they are more general) than "battery" and "ignition coil." Mixing more general and more specific elements in the same rating grid causes problems during trait elicitation, since those traits that are useful in differentiating "engine" from "electrical system" problems will not necessarily be those that are useful in discriminating "ignition coil" from "battery problems."

A system for knowledge acquisition should allow experts to represent and reason about elements and traits at appropriate levels of generality. Hierarchies are used by NeoETS to represent rating grids at varying levels of abstraction. They are also used to break up problems into subproblems.

Nodes in the four hierarchies combine to form rating grids. In the most simple case, the children of a node in a solution hierarchy supply the elements along the top of a grid; the children of a node in a trait hierarchy supply the traits down the side of a grid. Rating values within the grid provide information about the solution with respect to each trait (see Figure 1).

Solution hierarchies. Solutions are grouped into specialization hierarchies within NeoETS. This structure aids

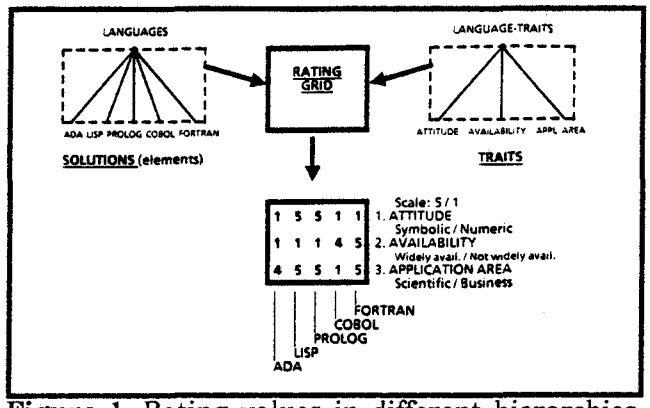

Figure 1. Rating values in different hierarchies combine to form *rating grids*. The children of a node in a *solution element hierarchy* supply the elements along the top of the grid; the children of a node in a *trait hierarchy* supply the traits down the side of a grid.

experts in organizing large numbers of solution elements that may exist at different levels of abstraction. For example, a solution class named "vehicle" is a *superclass* (parent) to "car" and "truck" *subclasses*. The "car" class can serve in turn as a parent to a class of specific car models or to a particular instance of an automobile. NeoETS can exploit this hierarchical structure by examining solution superclasses during consultation testing before considering more specific solution hypotheses.

Trait hierarchies. Characteristics of a particular level in the solution hierarchy can be structured in trait hierarchies. In a knowledge base for a Travel Advisor, the solutions exist in hierarchies of various places to visit. Each level in the solution

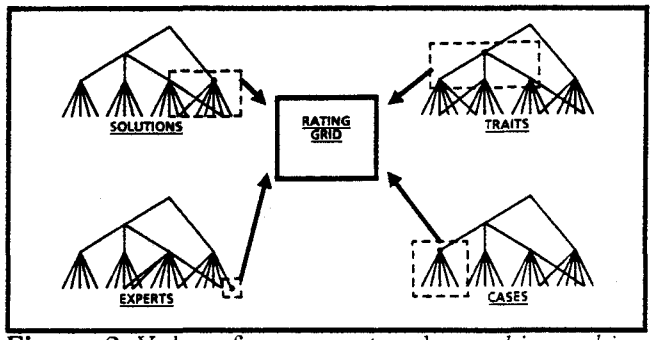

Figure 2. Values from *expert* and *case hierarchies* as well as solution element and trait hierarchies may be combined in many ways to form rating grids. Relationships between nodes do not have to be strictly hierarchical; lattices may be formed when more than one parent points to the same child.

hierarchy has its own trait hierarchy that contains whatever information is needed to select solutions at that level. A trait hierarchy attached to the "country" level of a solution hierarchy may contain information pertinent to language, exchange rate, ease of obtaining visas, and so forth for the countries in the hierarchy. The "Canada" subclass of country is attached to a Canada trait hierarchy that contains information useful in selecting a particular region of Canada to visit.

Two other hierarchies are also formed in NeoETS:

Expert hierarchies. Expert hierarchies allow the representation of multiple knowledge sources as structured groups. Each node in the expert hierarchy may represent an individual, an aspect of an individual, a group, or an independent knowledge source. Information from multiple experts may be independently elicited and analyzed, then weighted and combined to derive joint solutions to problems. Experts each have their own solution and trait hierarchies, which may or may not overlap with those belonging to others. In this way, each expert's unique problem solving strategies and information is not compromised.

Case hierarchies. Case hierarchies allow the definition of subsets of the knowledge base appropriate to solving a particular class of problems. For example, within a knowledge base of information about programming languages, a user may want to include different sets of experts, solutions, and traits when selecting a language for an account processing application than for a scientific application. An *accounting case* and a *scientific case* may be created, each one drawing on a subset of the expert pool knowledgeable in those areas. A hierarchy of cases allows the organization and tailoring of the knowledge base to specific classes of situations.

A rating grid is built by combining values associated with nodes in each of the four basic hierarchies (see Figure 2). Relationships between nodes do not have to be strictly hierarchical; lattices may be

formed when more than one parent points to the same child.

Reasoning within Knowledge Hierarchies

Many expert systems embody a hierarchical structure. After analyzing many knowledge bases, Clancey (1986) suggested that many problems are solved by abstracting data, heuristically mapping higher level problem descriptions onto solution models, and then refining these models until specific solutions are found (Figure 3). In NeoETS, data abstraction is represented in the form of hierarchies of traits, and solution refinement takes place as information is propagated through solution hierarchies.

To derive recommendations about a particular set of nodes in a solution hierarchy, the trait and expert hierarchies linked to those solutions are examined. Missing values needed in problem abstraction may be inferred on the basis of known information available elsewhere in the hierarchies. As pieces of problem models are built, hypotheses about useful solutions are generated and used to further direct reasoning. Exhaustive searches may be avoided because NeoETS can reason through *classes* of experts, solutions, and traits.

Reasoning through hierarchies takes place in a variety of ways; however two main types are distinguished: *absolute* and *relativistic*. Absolute reasoning involves judgments made without significant reservations. This "typically depends on relatively few facts, its appropriateness is easy to judge, and its result is unambiguous" (Szolovitz & Pauker, 1978). For example, in a decision involving the selection of a programming language, users may be able to say with certainty that they would only be interested in languages that run on an IBM PC, or that they will not consider a language that costs more than $400, regardless of other desirable characteristics. Experts can also build these types of absolute constraints into the knowledge base. Absolute reasoning in NeoETS is somewhat similar to the solving of a set of linked decision

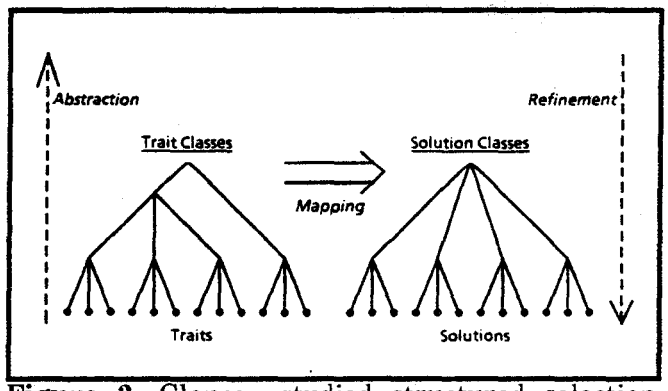

Figure 3. Clancey studied structured selection systems and built an abstraction and refinement model (1986). Inference in NeoETS typically occurs in a bottom-up fashion through the trait hierarchies and a top-down fashion through the solution hierarchies.

tables (Hurley, 1983; Michalski, 1978). Some of the inductive generalization rules described by Michalski (1983) have proven to be useful in this context.

Unfortunately, not all decisions can be absolute. Many situations involve significant uncertainty, where information from several overlapping sources must be weighed. Even if the criteria for the ideal decision can be agreed upon, sometimes it can only be approximated by the available alternatives. In these situations, evidence must be propagated in some relative or probabilistic fashion. NeoETS incorporates a variety of models and approaches to relativistic reasoning including MYCIN-like certainty factor calculus (Adams, 1985), fuzzy logic (Gaines and Shaw, 1985), and the Analytic Hierarchy Process (AHP, Saaty, 1980). AHP is a methodology that allows hierarchical structuring of problems with uncertainty and risk. It has been used in problems of prediction, input-output interdependence, resource allocation, planning, conflict resolution, and others. Hierarchical measurement has been described as "a weighting process of... variables associated with each level with nonlinear coefficients that are products and sums of variables associated with higher levels" (Saaty, 1980).

Future versions of NeoETS will allow additional models for analyzing uncertain information including Bayesian (Alpert and Raiffa, 1982), Dempster-Shafer

(Shafer, 1976; Gordon and Shortliffe, 1985), and maximum entropy approaches (Shastri and Feldman, 1985). The availability of different inference methods within a single framework allows users flexibility in adapting NeoETS to the problem at hand. We are hopeful that future research and experience will suggest heuristics for the selection of appropriate designs for particular types of questions (e.g., Shafer and Tversky, 1985).

Multiple Rating Value Types

NeoETS allows experts to use other types of rating scales besides just those with ordinal values. Allowing each trait to have its own type and range of legal values permits NeoETS to deal with situations where values are unordered and where greater precision is necessary.

In NeoETS, traits are described according to the *level of measurement* of their rating scales. This is determined by the expert. The level of measurement depends on the presence or absence of four characteristics: *distinctiveness*, *ordering in magnitude*, *equal intervals*, and an *absolute zero* (Allen & Yen, 1979). These four characteristics describe four major levels of measurement, or types of variables: *nominal* (unordered), *ordinal*, *interval*, and *ratio* (Figure 4). The additional characteristics of interval and ratio scaled rating values give increased power to analytical tools within NeoETS.

Ratings may be generated through several methods:

1. *Direct.* An expert directly assigns a rating value for a trait and an element. If an exact value is unknown, NeoETS provides methods for helping the expert derive an estimate (Beyth-Marom & Dekel, 1985). If finer precision is needed NeoETS can derive a set of ratio scaled ratings from a series of *pairwise comparisons* (Saaty, 1980).

2. *Derived.* Automatic filling in of incomplete grids is possible through *evidential inheritance* of rating values from one grid to another (e.g., from lower to higher level grids, different experts, or different cases).

RATING SCALE	DESCRIPTION	EXAMPLES
Nominal (unordered)	Unordered set	- LANGUAGE: {ADA COBOL LISP}
Ordinal	Ordered set	- COLD/HOT: {1 2 3 4 5} - SIZE: {SML MED LRG}
Interval	Ordered set with measurable intervals	- SMALL-INTEGERS: {1 2 3} - F-TEMP: {32 .. 112}
Ratio	Ordered set with measurable intervals and an absolute origin	- HEIGHT: {0.0' 1.0' ...}

Figure 4. NeoETS handles several types of rating values. Originally, ETS only accepted ordinal values from 1 to 5.

Increased precision and specificity in knowledge acquisition allow increased problem-solving power, but usually at some cost (Michalski & Winston, 1985). This cost is reflected both in the *amount of work* needed to elicit the additional information as well as in *increased complexity* and the *greater number of steps* in the reasoning process. One way that NeoETS tries to minimize this cost is by eliciting more precise information only when it is of value in solving critical portions of the problem. If, for example, NeoETS finds that it is unable to sufficiently discriminate between a set of solutions on the basis of simple rating values between one and five, it will suggest that the user perform a series of pairwise comparisons to increase the sensitivity of the judgments being made.

ANNOTATED SESSION - THE PROGRAMMING LANGUAGE ADVISOR

NeoETS is written in Interlisp and runs on the Xerox family of Lisp machines and on the DEC Vax series. The screen of NeoETS is divided into windows: a typescript window, map windows showing the hierarchies, rating grid windows, analysis windows, and test result windows (a screen image is shown later in Figure 13). Experts interact with NeoETS by text entry or with a mouse through pop-up menus in the typescript window. Pop-up menus in other windows may also be activated through the selection of graphic objects with the mouse.

Pragmatic heuristics to guide the expert through the knowledge acquisition process using NeoETS are contained in a

subsystem called the *dialog manager*. Its assistance has become an important factor in the use of NeoETS, given the complexity of the NeoETS environment and the many elicitation and analysis methods available to the expert. The dialog manager makes decisions about general classes of actions, and then recommends one or more specific actions providing comments and explanation if desired. This knowledge is contained in rules within the dialog manager in NeoETS. A session history record is kept so that temporal reasoning may be performed. Several illustrations of its use will be seen in the session transcript. Messages and advice from the dialog manager are flagged with "[DM]". For further discussion of the dialog manager, see Kitto and Boose (1986).

Following are excerpts and screen snapshots from a NeoETS session where an expert is trying to build a Programming Language Advisor. Novice software engineers and project managers would use such a system to help select programming languages for application projects.

Initial Grid Elicitation

First, NeoETS asks the expert to enter several problem test cases and selects one for analysis (satellite tracking, accounts payable, knowledge acquisition testbed, and government transaction processing are entered). The cases are added to the case hierarchy and appear in the *map window* (shown later in Figure 13). The expert chooses to think about a language for developing a knowledge acquisition testbed. Eventually experts will be able to select and modify grids and cases from an on-line library; we expect that in several years this library will contain thousands of hierarchies of grids. Building this library bears a modest resemblance to the CYC project at MCC (Lenat, 1986).[1]

The expert enters potential solutions for this problem - in this case, programming languages (Figure 5). After entering five languages, NeoETS adds another one - an *ideal language* for this problem case. The languages are added to the solution hierarchy as children of LANGUAGE. Then, NeoETS asks the expert to enter traits based on differences and similarities between languages (Figure 5). This is the heart of Kelly's interviewing methodology; NeoETS uses it in several different ways as knowledge is expanded through elicitation and analysis.

NeoETS initially assumes that the traits will be bipolar with ordinal ratings between 1 and 5 (Figure 6). The expert is asked to rate each element with regard to each trait, but the expert may optionally specify different rating scales (unordered, interval, ratio). NeoETS also assists with rating scale type recognition and change later on.

The expert is asked to rate the *importance* of each trait for this case, again on a scale

```
--- ELICITING ELEMENTS ---
Please enter a list of LANGUAGE elements for K-
ACQUISITION, one to a line. When you're done, enter a
RETURN. Try to include at least one LANGUAGE that would
NOT be good for K-ACQUISITION (a counter example).
N-ETS** ADA
N-ETS** LISP
N-ETS** PROLOG
N-ETS** COBOL
N-ETS** FORTRAN
N-ETS** (CR)
Can you imagine a new ideal LANGUAGE for K-ACQUISITION?
N-ETS** YES
For now, it will be called IDEAL-K-ACQUISITION-LANGUAGE.

--- BUILDING TRAITS BY TRIADS ---
When answering the following questions, remember to keep
the K-ACQUISITION case in mind.

Think of an important attribute that two of ADA, LISP, and
PROLOG share, but that the other one does not. What is that
attribute?
N-ETS** SYMBOLIC
What is that attribute's opposite as it applies in this case?
N-ETS** NUMERIC
What is the name of a scale or concept that describes
SYMBOLIC/NUMERIC?
N-ETS** ATTITUDE

Think of an important trait that two of LISP, PROLOG, and
COBOL share, but that the other one does not. What is that
trait?
N-ETS** WIDELY AVAILABLE
What is that trait's opposite as it applies in this case?
N-ETS** NOT AS WIDELY AVAILABLE
What is the name of a scale or concept that describes WIDELY-
AVAILABLE/NOT-AS-WIDELY-AVAILABLE?
N-ETS** AVAILABILITY
        :
```

Figure 5. NeoETS asks the expert for an initial set of potential solutions to the first problem case. Then, the solutions are presented in groups of three, and the expert gives discriminating traits.

[1] Lenat is attempting to build a very large knowledge base containing both common sense and expert knowledge to overcome problems of brittleness and labor intensity when designing large software systems.

```
--- FILLING IN RATINGS ---
Please rate these things on a scale of 5 to 1, where 5 means
more like SYMBOLIC and 1 means more like NUMERIC. If
neither one seems to apply, enter N(either). If both seem to
apply, enter a B(oth). If you would like to change the range
or type of scale, enter C(hange scale).
SYMBOLIC(5)  NUMERIC(1)
  ADA ** 1
  LISP ** 5
  PROLOG ** 5
  COBOL ** 1
  FORTRAN ** 1
  IDEAL-K-ACQUISITION-LANGUAGE ** 5
        :
```

Figure 6. The expert rates each language against each trait scale and the results are shown in a rating grid (Figure 7). If the 1 to 5 ordinal scale does not apply, the expert may change the range or change the type of trait to unordered, interval, or ratio.

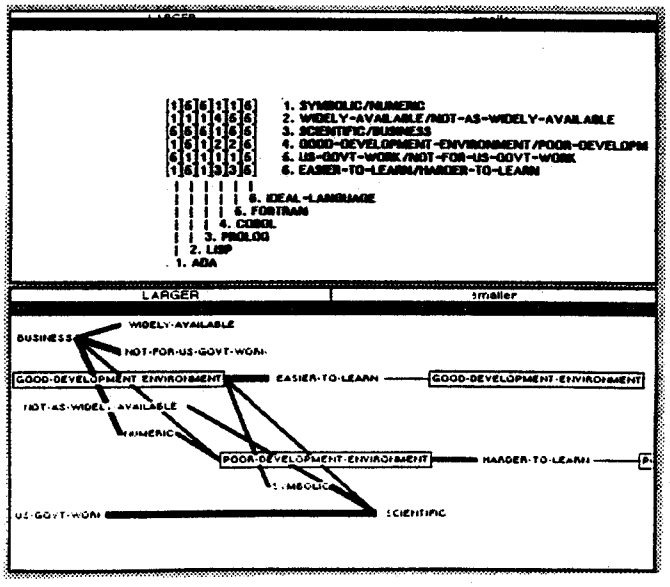

Figure 7. This screen snapshot shows the rating grid and implication graph. The graph display implications between traits that are used to help refine the knowledge base and create rules.

from 1 to 5. This knowledge is used later in the decision making process.

Single Grid Analysis and Expansion

Once a grid is complete, an analysis is performed that shows *implications* between various values of traits (Figure 7). Implications are read from left to right, and the thickness of the arc shows the strength of the implication. For instance, SYMBOLIC implies SCIENTIFIC ("if there is evidence that a SYMBOLIC language is needed, then there is also evidence that a SCIENTIFIC language is needed"). The method of ENTAIL is used to derive implications: rating grid entries are used as a sample set and fuzzy set logic is applied to discover inductive implications between the values (Gaines and Shaw, 1985). This method uncovers higher-order relationships among traits and is used later to help build trait hierarchies. The expert can also use an interactive process in NeoETS to analyze and debug this information (implication review); the expert may agree or disagree with each implication. If the expert disagrees, the knowledge that led to the implication is reviewed, and the expert can change the knowledge or add exceptions that disprove the implication (Boose, 1986). Certain types of *implication patterns* are also uncovered. Discovery of *ambiguous* patterns, for example, may mean that traits are being used inconsistently (Hinkle, 1965).

After the initial grid is complete, the dialog manager chooses a method to help the expert expand the grid. Method selection depends on the size of the grid, analysis of information in the grid, the session history, and so on. The dialog manager inserts the appropriate command on the screen; in ASSIST mode (specified at the session start) the expert may change this recommendation or accept it by entering RETURN.

In this case, the dialog manager advises the expert to expand the grid by *analyzing similarities* between languages (Shaw and Gaines, 1986). When columns (or rows) of rating values are similar then there is not yet enough meaningful information to help discriminate between solutions (or traits). ADA and PROLOG are found to be similar and NeoETS asks the expert to enter a new trait based on a new perceived difference between them. Two new traits (US-GOVT and LEARN-ABILITY) and accompanying information are added to the grid.

Testing Knowledge in a Single Grid

The dialog manager next recommends that the grid knowledge be tested (Figure 8). The expert is asked to provide desirable values for the traits associated with the solutions. These values may be appended with a certainty factor and/or the tag

ABSOLUTE to indicate an absolute constraint in the decision process.

Two methods are available in NeoETS for propagating uncertain information. One approach involves mapping this information onto *certainty factor* scales. Each rating in the grid is assigned a certainty factor weight based on its *relative strength* (a 5 is stronger than a 4), the *relative weight* the expert has assigned to the trait, and any *constraints* that the expert has specified for the trait. When a test consultation takes place, EMYCIN's certainty factor combination method is used to combine the certainty factors in the grid (Adams, 1985). The result is a rank-ordered list of solutions with certainty factor assignments (Figure 8). These certainty factors are also used when rules are generated for expert system shells.

Another approach uses Saaty's Analytic Hierarchy Process to order a set of possible solutions. Grid information obtained through pairwise comparisons (or through regular rating grid methods) is mapped onto *judgment matrices*. The *principal eigenvector* is computed for each matrix; the eigenvectors are normalized and combined to form a final ranking of the solutions. Each solution is associated with a number between 0.0 and 1.0. In a knowledge base consisting of multiple grids, these values can be propagated through the hierarchies.

Performance is measured by having experts compare their expectations with NeoETS consultation results. A rank-ordered solution list entered by the expert is compared with the recommendation list; Spearman's coefficient of rank correlation is used to measure the difference between the two lists. NeoETS notes whether a positive correlation is significant and keeps track of coefficients over time for each case as well as the "worst match" elements in each list. As the knowledge base improves, the correlation between expert and NeoETS rankings should increase. Worst match elements are used to trace backward through the reasoning process to help the expert further refine the knowledge base.

```
--- TEST-CONSULTATION ---
Would you like to run an EXISTING or NEW test consultation?
N-ETS** NEW
What do you want to call this new consultation?
N-ETS** (CR)
This test consultation will be named K-ACQUISITION.TEST-1

Please indicate the desired ADA, LISP, PROLOG, COBOL, and
FORTRAN trait selection values for K-ACQUISITION.TEST-1.
Values may be appended with a certainty factor in the form
'.8' and/or ABSOLUTE to indicate that the value is an absolute
constraint when selecting a type of LANGUAGE for K-
ACQUISITION.

What is the value of ATTITUDE for K-ACQUISITION.TEST-1?
SYMBOLIC(5) NUMERIC(1)
N-ETS** 5
What is the value of AVAILABILITY for K-ACQUISITION.TEST-
1?
WIDELY-AVAILABLE(5) NOT-AS-WIDELY-AVAILABLE(1)
N-ETS** 5
What is the value of APPLICATION-AREA for K-
ACQUISITION.TEST-1?
SCIENTIFIC(5) BUSINESS(1)
N-ETS** 5
What is the value of DEVELOPMENT-ENVIRONMENT for
K-ACQUISITION.TEST-1?
GOOD-DEVELOPMENT-ENVIRONMENT(5) POOR-
DEVELOPMENT-ENVIRONMENT(1)
N-ETS** 5
What is the value of US-GOVT for K-ACQUISITION.TEST-1?
US-GOVT-WORK(5) NOT-FOR-US-GOVT-WORK(1)
N-ETS** 1
What is the value of LEARN-ABILITY for K-ACQUISITION.TEST-
1?
EASIER-TO-LEARN(5) HARDER-TO-LEARN(1)
N-ETS** 5 .75

Test results for test consultation K-ACQUISITION.TEST-1:
1 : LISP (.89)
2 : IDEAL-K-ACQUISITION-LANGUAGE (.81)
3 : PROLOG (.47)
4 : FORTRAN (.36)
5 : COBOL (-.53)
6 : ADA (-.80)
        :
```

Figure 8. The expert tests the LANGUAGE knowledge base for the general K-ACQUISITION case on a specific problem. Values of traits are specified, and certainty factor weights are combined to produce a rank-ordered, weighted results list.

Building Hierarchies for Multiple Grids

Next, the dialog manager recommends that the expert try to expand the trait and solution hierarchies by performing a *cluster analysis*. NeoETS uses a method of single-link hierarchical cluster analysis based on FOCUS (Shaw and Gaines, 1986) to group sets of related solutions or traits. Results of the cluster analysis are shown in Figure 9. The numbers at the nodes of the cluster tree are measures of distance or similarity between groups and range from 0 to 100; the number 100 would indicate perfect correspondence between the ratings of the two matched elements or traits.

Once the cluster analysis is performed, the expert is asked to label junctions in the clusters. The junctions can be seen as "conjectures" about possible new classes of solutions or traits. These more general trait or solution classes may then be added to the hierarchies, as in this instance. If a cluster had seemed unreasonable to the expert (e.g., if ADA seemed to fit better with FORTRAN and COBOL than LISP and PROLOG), this may be a clue that new differentiating traits should be added.

Laddering is another method used to find traits at varying levels of abstraction. "Why?" types of questions are used to find more general traits:

> You said you thought it was better if a LANGUAGE for K-ACQUISITION was characterized by GOOD-DEVELOPMENT-ENVIRONMENT. What is a new trait that says why you think this is true?
> N-ETS** **FASTER SYSTEM DEVELOPMENT**

"How?" types of questions are used to find more specific traits:

> In what ways could a language for K-ACQUISITION be characterized by WIDELY-AVAILABLE?
> N-ETS** **RUNS ON MULTIPLE HARDWARE**
> N-ETS** **MANY COMPILERS AVAILABLE**
> N-ETS** **MANY COMPANIES OFFER**

In this case, laddering is invoked by the dialog manager in order to extend the hierarchy by extending small clusters of traits.

With the information now in the knowledge base, NeoETS can make recommendations about a particular language for a project. But NeoETS cannot recommend a specific *dialect* of a language unless children are added to the solution hierarchy. The dialog manager recommends that the expert expand the solution hierarchy. The expert adds children to the LISP language: MACLISP-LM, INTERLISP, and COMMON-LISP. An ideal Lisp is added as well. The expert is asked which traits should be inherited from the parent LISP, and a new rating grid is formed based on the new solutions and the old traits. The expert fills in the

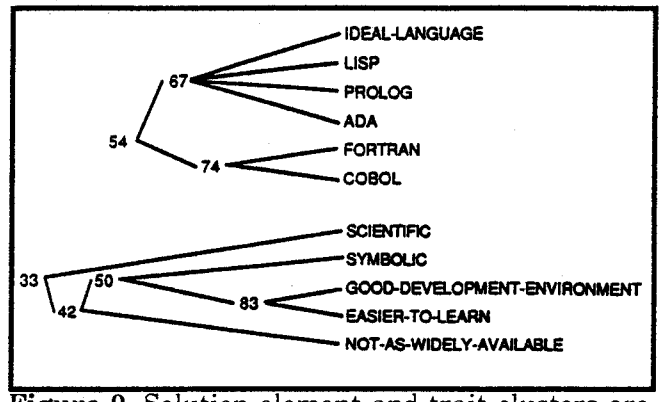

Figure 9. Solution element and trait clusters are formed from information in rating grids. The expert is asked to label nodes and expand clusters; new traits are used to expand the hierarchies.

grid ratings and more traits are added by triad comparison. Again, each trait is weighted for importance.

Using Multiple Rating Types

Later in the session, NeoETS helps the expert convert a trait with ordinal values (DELIVERY-COST: HIGH-COST(5) / LOW-COST(1)) into a trait with ratio scaled rating values (DELIVERY-COST: (1500 - 60000) DOLLARS-US). The expert re-rates the LISP solutions in terms of the new values and these values appear on the grid. If the expert were unable to provide a DELIVERY-COST for a kind of Lisp, NeoETS could provide several forms of estimation help (Spetzler and Stal von Holstein, 1983; Wallsten and Budescu, 1983). Four estimation procedures are provided: START-&-MODIFY, EXTREME-VALUES, DECOMPOSITION, and RECOMPOSITION (Beyth-Marom & Dekel, 1985). In this instance, the EXTREME-VALUES procedure would first ask for the least and greatest DELIVERY-COST one could imagine for the type of Lisp being considered. Through a series of questions, NeoETS would try to shrink this range until a satisfactory estimate could be given.

NeoETS also helps the expert change trait scale types by checking values associated with particular types of traits. For instance, when bipolar traits are found that only receive extreme ratings, it may be better to represent the knowledge with

an unordered trait instead. NeoETS can also help consolidate knowledge by combining the values of several related unordered traits into one trait.

Testing Knowledge with Hierarchies and Multiple Experts

Figures 10 and 11 illustrate a test consultation using hierarchies of traits and solutions elicited from two experts, WEC and JCA. In this consultation, the user is interested in selecting a particular version of Lisp, Prolog, or ADA for a knowledge acquisition project. Because of the large number of potential solutions within the case, the user is given the opportunity to specify some subset for consideration. The solutions in this subset are called *solution hypotheses*.

NeoETS then asks for a set of trait values for this consultation. The user enters the absolute constraint that only languages with a delivery cost of less than $30000 will be considered. The user may accept default values that have been entered in a previous consultation by pressing the RETURN key. If a default value has not been previously specified and the user types RETURN, that trait will be ignored in the inference process for this consultation.

In this example, the user's preference for HARDWARE type is partitioned among three manufacturers by a pairwise comparison process. These pairwise comparisons generate a ratio scaled set of preferences (Saaty, 1980).

The fact that a particular language runs on IBM is judged to be weakly more important than if it runs on a VAX. Availability of a VAX version of the language is considered absolutely more important than that of an ATT version.

Finally, the results of the consultation are presented to the user. For each solution, the *consensus* recommendation of the experts consulted is presented, followed by the weight of each expert that contributed to the recommendation.

In a case with multiple experts, it may sometimes be useful to examine a set of

```
--- TEST CONSULTATION --
Would you like to run an EXISTING or NEW consultation?
N-ETS** EXISTING
What is the name of this existing consultation?
N-ETS** LISP-PROLOG-ADA-ONLY
This test consultation is named K-ACQUISITION.LISP-
PROLOG-ADA-ONLY.

Which K-ACQUISITION alternatives you would like to
consider in this consultation (LISP-PROLOG-ADA-ONLY).
Enter them one to a line. If you wish all solutions to be
considered, type ALL. When done, press RETURN.
N-ETS** MACLISP-LM
N-ETS** INTERLISP
N-ETS** COMMON-LISP
N-ETS** QUINTUS-PROLOG
N-ETS** ADA-1
N-ETS** ** (CR)
The following experts know about MACLISP-LM, INTERLISP,
COMMON-LISP, QUINTUS-PROLOG, and ADA-1: WEC JCA.
Would you like to exclude or weight any of these experts?
N-ETS** NO

Please indicate the desired trait selection values for LISP-
PROLOG-ADA-ONLY solutions. Press RETURN to indicate
agreement with the default values, or type in a new value.
Values may be appended with a certainty factor in the form
'.8' and/or the word ABSOLUTE to indicate that the value is
an absolute constraint when selecting a type of LANGUAGE
for K-ACQUISITION.
(WIDELY-AVAILABLE(5), 1.0)** (CR)
(GOOD-DEVELOPMENT-ENVIRONMENT(5), 1.0)** (CR)
(LOW-COST(<45000 DOLLARS-US), 1.0, ABSOLUTE) (NOTE:
THIS INCLUDES HARDWARE FOR A WORKSTATION) **
<30000 DOLLARS-US 1.0 ABSOLUTE
        :
```

Figure 10. The expert tests the knowledge by running a consultation to select a Lisp, Prolog, or ADA for the knowledge acquisition testbed case. The expertise of two experts is used; consensus and dissenting solutions are given (see the next figure).

recommendations from a *dissenting* expert or group of experts. Since WEC's recommendations differed most from the consensus, these are listed as a dissenting opinion.

Editing the Knowledge Base to Build New Cases

Once the set of experts has entered information about the K-ACQUISITION case, they may wish to describe additional cases. They could start from scratch by entering a list of relevant solutions and traits, but that would be inefficient if there were any significant overlap in knowledge required by a previously entered case and a new one. NeoETS allows an expert to copy pieces of hierarchies and, optionally, their associated values between cases. The information copied in this manner can then be modified to fit the new context. This

```
        :
(COMPANIES(VAX .33, IBM .33, ATT .33), 1.0)** PAIRWISE
Please compare these values of HARDWARE with regard to
their importance in contributing to an overall high score for
a particular type of LANGUAGE for K-ACQUISITION in the
context of LISP-PROLOG-ADA-ONLY.
Please compare VAX and IBM. Enter:
VAX = IBM if VAX and IBM are equally important
VAX>IBM or VAX<IBM if one of the pair is weakly more
important
VAX>>IBM or VAX<<IBM if one is strongly more
important
VAX>>>IBM or VAX<<<IBM if one is demonstrably or
very strongly more important
VAX>>>>IBM or VAX<<<<IBM if one is absolutely
more important
N-ETS** VAX<IBM

Please compare VAX and ATT. Enter:
VAX = ATT if VAX and ATT are equally important
VAX>ATT or VAX<ATT if one of the pair is weakly more
important
VAX>>ATT or VAX<<ATT if one is strongly more
important
VAX>>>ATT or VAX<<<ATT if one is demonstrably or
very strongly more important
VAX>>>>ATT or VAX<<<<ATT if one is absolutely
more important
N-ETS** VAX>>>>ATT
        :
Results for test consultation K-ACQUISITION.LISP-PROLOG-
ADA-ONLY:
 1: INTERLISP  (.47: (WEC .5, JCA .5))
 2: QUINTUS-PROLOG  (.40: (WEC 1.0))
        :
Would you like to see the dissenting opinion for this
consultation?
N-ETS** YES

The following dissenting opinion was given by WEC:
Overall agreement with consensus: .79
 1: QUINTUS PROLOG (.40)
 2: INTERLISP (.39)
        [:]
```

Figure 11. The expert continues the test by specifying "run-time" values for traits, entering an absolute cost constraint, and performing a pairwise comparison task to derive relative values for hardware.

facility for copying may also be used to copy pieces of hierarchies between experts.

Rule Generation and Expert System Shells

NeoETS can generate knowledge bases for several expert system shells. The knowledge contained in grids and hierarchies is converted within NeoETS into rules (Figure 12), and the rules are then formatted for a particular expert system shell. Rules are generated with screening clauses that partition the rules into subsets. The *expert clause* is used when expertise from multiple experts is weighted and combined together. The *case clause* controls the focus of the system during reasoning.

Four types of rules are generated:

1. Implication rule: These rules are generated from arcs in the implication graph and conclude about particular traits. The certainty factor is proportional to the strength of the fuzzy implication. The use of implication rules restricts search and lessens the number of questions asked of users during consultations.
2. Solution rule: A solution rule concludes about a particular solution or solution class. The certainty factor is derived from a combination of the *grid rating strength* and the *trait weight.*
3. Absolute rule: When the expert places an absolute constraint on the value of a trait a rule is generated reflecting the restriction. Sometimes information about absolute constraints is included elsewhere when knowledge bases for expert system shells are generated.
4. Propagation rule: These rules are derived from information in the hierarchies. PropRule032 in Figure 12 generalizes the information in the children of LISP about DEVELOPMENT-ENVIRONMENT.

Further Knowledge Expansion and Refinement

Hierarchies and rating grids continue to be used during the session to expand and refine the knowledge base. Work in progress is shown in Figure 13. The decision of when one has reached the point of diminishing returns within NeoETS is a personal one, although many aids are offered. Similarities and implications analyses allow experts to determine whether traits or solutions can be adequately and appropriately discriminated from one another. The system provides correlational methods for comparing the order of NeoETS recommendations to an expert's rankings. Once the expert is convinced that the system performs reasonably, knowledge bases for other expert system shells may be generated.

```
--- MAKING RULES ---
ImpRule014:
 If: EXPERT = JCA &
   CASE = K-ACQUISITION &
   ATTITUDE = SYMBOLIC,
 Then: APPLICATION-AREA = SCIENTIFIC ( 1.00 )
     :
ImpRule022:
 If: EXPERT = JCA &
   CASE = K-ACQUISITION &
   DEVELOPMENT-ENVIRONMENT = POOR-DEVELOPMENT-
     ENVIRONMENT
 Then: LEARN-ABILITY = HARDER-TO-LEARN ( .69 )
     :
SolRule161:
 If: EXPERT = JCA &
   CASE = K-ACQUISITION &
   ATTITUDE = SYMBOLIC
 Then: LANGUAGE = LISP ( .44 )
     :
AbsRule002:
 If: EXPERT = JCA &
   CASE = K-ACQUISITION
 Then: DELIVERY-COST < 45000 ( 1.00)
     :
PropRule032:
 If: EXPERT = JCA &
   CASE = K-ACQUISITION &
   DEVELOPMENT-ENVIRONMENT = GOOD-
     DEVELOPMENT-ENVIRONMENT
 Then: LANGUAGE = LISP ( .62 )
     :
```

Figure 12. Rules are generated from information in the rating grids and hierarchies. Rules can conclude about solutions or classes of solutions and traits both within grids and across hierarchies. Each rule has several screening clauses naming the expert and case class.

The MINUS tool (Shaw and Gaines, 1986) compares grids from different experts on the same subject and points out differences and similarities. This information has been used to manage structured negotiation between experts (Boose, 1986). SOCIOGRIDS features (Shaw and Gaines, 1986) will be available in the future to display *networks* of expertise. Nodes and relations in the network show the degree of subsumption of one expert's grid over other experts' grids.

DISCUSSION

General Advantages and Disadvantages of NeoETS

NeoETS inherits the advantages of ETS: rapid prototyping and feasibility analysis, vocabulary and trait elicitation, testing and refinement tools, implication discovery, conflict point identification, expert system shell production, and the generation of expert enthusiasm.

Over 30 prototype systems have been built using NeoETS (an AI Book Consultant, an AI Tool Advisor, a Course Evaluation System, a Customer Needs Advisor, a Database Management System Consultant, an Investment Advisor, a Management Motivation Analyzer, a Personal Computer Advisor, a Personality Disorder Advisor, a Product Design and Impact Advisor, a Robotic Tool Selector, a Seattle Travel Agent, and a Wine Advisor among others). The Programming Language Advisor session took less then 2 hours with each of the two experts.

NeoETS offers a rich knowledge representation and reasoning environment. We believe that knowledge can be acquired for significant portions of most structured selection expert system problems using NeoETS. Hierarchies help the expert break down problems into component parts and allow reasoning at different levels of abstraction. Varying levels of precision are specified with multiple types of rating scales when needed.

Knowledge from multiple experts may be combined together using NeoETS. End users may receive dissenting as well as consensus opinions from groups of experts, thus getting a full *range* of possible solutions. The disagreement between the consensus and the dissenting opinion can be measured to derive a *degree of conflict* among experts for a consultation. The system can be used for cost-effective group data gathering.

The growing collection of rating grids and case knowledge represents an important future information resource for building a variety of knowledge-based systems. Knowledge will be stored explicitly with associated problem cases; this will make knowledge bases easier to update and maintain.

In the future, each expert will be able to "protect" critical areas of knowledge. Currently, an end user may copy and change any portion of the NeoETS

knowledge base during a consultation. The expert may believe protection is necessary because some knowledge is "absolute" and should not be changed, or because the knowledge has commercial value.

NeoETS is not as easy to use as was ETS. There are too many elicitation and analysis tools for a novice to understand; the decision-making process and inference engine can be set up to perform in several different ways. We expect that continuing improvements in the dialog manager will help make the system more comprehensible.

Theoretical Issues

Personal Construct Psychology methods provide no guarantee that a *sufficient* set of knowledge will be found to solve a given problem. NeoETS attempts to expand the initial subset of solutions and traits based on problem-solving knowledge for specific cases. The goal is to solve enough cases so that the knowledge is sufficient to solve *new* cases. This is the methodology of knowledge engineering in general; NeoETS helps make the process explicit and manageable.

The Analytic Hierarchy Process can be used to build intuitive, comprehensible models that seem to behave in reasonable ways. One disadvantage is that the inference process itself is relatively opaque. Another disadvantage of using hierarchical representations in general is that some problems do not easily fit the hierarchical model. It also may be true that a particular problem would best be represented by a *collection of conflicting hierarchies* (hierarchies for mechanical problems tend to model structure *or* function, not both).

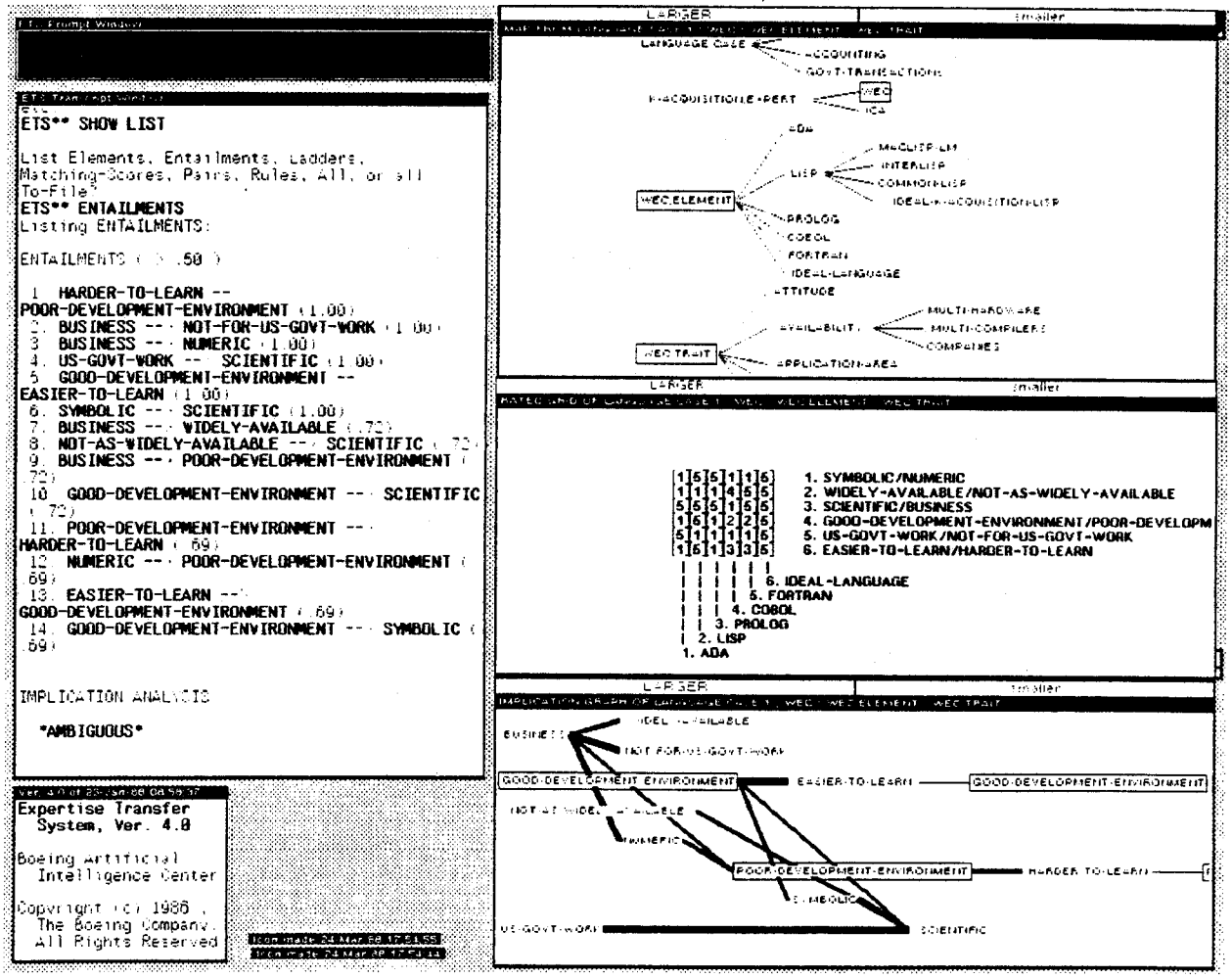

Figure 26. Full NeoETS screen snapshot showing developing hierarchies, a rating grid, and an implication analysis graph of the grid.

Kelly (1955) introduced *superordinate* and *subordinate* constructs in his organization corollary (see also Hinkle, 1965). Kelly thought that these hierarchical relationships changed from time to time. Slater (1977) observed that "a system that has been thoroughly organized hierarchically would... become ossified and ill-adapted to the needs of everyday life." NeoETS can help experts change their hierarchies, but it is up to the expert to realize *when* the relationships have changed, and to reflect that change in the system. Similarly, labels for traits and elements as well as ratings themselves may change.

More methods for handling uncertainty will be used in the future; these were mentioned above.

The use of multiple rating value types provides more flexibility, convenience, and precision when representing knowledge. However, deciding which particular type of variable to use can be a complex task. The dialog manager offers some assistance, but the expert usually learns appropriate rating type usage through experience.

It is also more difficult to generate a coherent rule set from many types of variables, and some rules, in isolation, may not be meaningful to the expert.

Elicitation, Analysis and Decision Making

Multiple analysis tools and elicitation methods help the expert think about the problem in new ways and tend to point out conflicts and inconsistencies over time. Lenat argues that knowledge representations should shift as different needs arise (Lenat, 1983); this should lead to better problem and solution descriptions, and, in turn, to better problem-solving.

Inference in NeoETS is efficient because the problem space is *partitioned*. Although no formal studies have been conducted, consultation results using the methods described above seem reasonable.

Experts develop NeoETS knowledge bases serially. In the future, we would like to build a participant system where many experts could dynamically share rating grids and hierarchies (Chang, 1985).

Rule generation for expert system shells is done in a straightforward manner. Development of the knowledge base can continue in an expert system shell that may offer advantages of speed, specialized development and debugging facilities, and inexpensive hardware. However, if the knowledge base is changed in the shell, it may be difficult to reload it back into NeoETS.

Future Development

Besides the enhancements mentioned above, we intend to build a knowledge acquisition environment that would include specific domain knowledge for different application areas (as in MDIS, Antonelli, 1983; and MORE, Kahn, Nowlan, and McDermott, 1985) and be able to acquire knowledge for synthesis problems (as in SALT, Marcus, McDermott, and Wang, 1985). Our approach will be to continue to add methods in small increments, constantly refining and integrating techniques to build increasingly more effective knowledge acquisition tools.

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BIBLIOGRAPHY

Adams, J., Probabilistic Reasoning and Certainty Factors, in B. Buchanan and E. Shortliffe (eds.) Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project, Reading, Mass.: Addison-Wesley, 1985.

Allen, M. J., and Yen, W. M., Introduction to Measurement Theory, Monterey, CA: Brooks/Cole, 1979.

Alpert, M., and Raiffa, H., A Progress Report on the Training of Probability Assessors, in D. Kahneman, P. Slovic, and A. Tversky (eds.), Judgment Under Uncertainty: Heuristics and Biases, New York: Cambridge University Press, 1982.

Antonelli, D., The Application of Artificial Intelligence to a Maintenance and Diagnostic Information System (MDIS), in the *Proceedings of the Joint Services Workshop on Artificial Intelligence in Maintenance*, Boulder, Col., 1983.

Beyth-Marom, R., and Dekel, S., An Elementary Approach to Thinking Under Uncertainty, London: L. Erlbaum Assoc., 1985.

Boose, John H., A Knowledge Acquisition Program for Expert Systems Based On Personal Construct Psychology, *Int. J. Man-Machine Studies*, **23**, 1985.

Boose, John H., Expertise Transfer for Expert System Design, New York: Elsevier, 1986.

Chang, E., Participant Systems, Calgary, Alberta: Alberta Research Council Advanced Technologies, Unpublished manuscript, December 1985.

Clancey, W., Heuristic Classification, in J. Kowalik (ed.), Knowledge-Based Problem-Solving, New York: Prentice-Hall, 1986.

Davis, R., and Lenat, D. B., Knowledge-Based Systems in Artificial Intelligence, New York: McGraw-Hill, 1982.

Gaines, B. R., and Shaw, M. L. G., New Directions in the Analysis and Interactive Elicitation of Personal Construct Systems, in M. L. G. Shaw (ed.), Recent Advances in Personal Construct Technology, New York: Academic Press, 1981.

Gaines, B. R., and Shaw, M. L. G., Induction of Inference Rules for Expert Systems, *Fuzzy Sets and Systems*, August, 1985.

Gordon, J. and Shortliffe, E., The Dempster-Shafer Theory of Evidence, in B. Buchanan and E. Shortliffe (eds.) Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project, Reading, Mass.: Addison-Wesley, 1985.

Hinkle, D. N., The Change of Personal Constructs from the Viewpoint of a Theory of Implications, Ph. D. dissertation, Ohio State University, Ohio, 1965.

Howard, R. A., and Matheson, J. E. (eds), Readings on the Principles and Applications of Decision Analysis, Palo Alto: Strategic Decisions Group, 1983.

Hurley, R., Decision Tables in Software Engineering, New York: Van Nostrand Reinhold, 1983.

Kahn, G., Nowlan, S., and McDermott, J., MORE: An Intelligent Knowledge Acquisition Tool, in the *Proceedings of the Ninth Joint Conference on Artificial Intelligence*, Los Angeles, California, August, 1985.

Kelly, G. A., The Psychology of Personal Constructs, New York: Norton. 1955.

Kitto, C., and Boose, J. H., Heuristics for Expertise Transfer: The Automatic Management of Complex Knowledge Acquisition Dialogs, Boeing Computer Services Technical Report BCS-G-2010, 1986.

Lenat, D., The Nature of Heuristics, *Artificial Intelligence*, **19** (1983) and **21** (1983).

Lenat, D., Prakash, M., and Shepard, M., CYC: Using Common Sense Knowledge to Overcome Brittleness and Knowledge Acquisition Bottlenecks, *The AI Magazine*, **6** (4), 1986.

Marcus, S., McDermott, J., and Wang, T., Knowledge Acquisition for Constructive Systems, in the *Proceedings of the Ninth Joint Conference on Artificial Intelligence*, Los Angeles, California, August, 1985.

Michalski, R. S., Designing Extended Entry Decision Tables and Optimal Decision Trees Using Decision Diagrams, Urbana, Ill.: Intelligent Systems Group, Artificial Intelligence Laboratory, Department of Computer Science, University of Illinois, 1978.

Michalski, R. S., A theory and Methodology of Inductive Learning, In R. Michalski, J. Carbonell, and T. Mitchell (eds.) Machine Learning, Palo Alto, Ca.: Tioga Publishing, 1983.

Michalski, R., and Winston, P., Variable Precision Logic, Artificial Intelligence Laboratory, Massachusetts Institute of Technology, MIT AI Memo 857, 1985.

Saaty, T. L., The Analytic Hierarchy Process, New York: McGraw-Hill, 1980.

Sattath, S., and Tversky, A., Additive Similarity Trees, *Psychometrika*, **42**, 1977, 319-345.

Shafer, G., A Mathematical Theory of Evidence, Princeton: Princeton University Press, 1976.

Shafer, G., and Tversky, A., Languages and Designs for Probability Judgment, *Cognitive Science*, **9**, 1985, 309-339.

Shastri. L., and Feldman, J., Evidential Reasoning in Semantic Networks: A Formal Theory, in the *Proceedings of the Ninth International Joint Conference on Artificial Intelligence*, Los Angeles, California, August, 1985.

Shaw, M. L. G., and Gaines, B. R., PLANET: A Computer-Based System for Personal Learning, Analysis, Negotiation and Elicitation Techniques, in J. C. Mancuso and M. L. G. Shaw (eds.), Cognition and Personal Structure: Computer Access and Analysis, New York: Praeger, 1986.

Slater, P. (ed.), Dimensions of Intrerpersonal Space, Vol. 2, London: John Wiley and Sons, 1977.

Spetzler, C., and Stal von Holstein, C., Probability Encoding in Decision Analysis, in R. Howard and J. Matheson (eds.), Readings on the Principles and Applications of Decision Analysis, Volume 2, Palo Alto: Strategic Decisions Group, 1983.

Szolovits, P., and Pauker, S., Categorical and Probabilistic Reasoning in Medical Diagnosis, *Artificial Intelligence*, **11**, 1978.

Wallsten, T. and Budescu, D., Encoding Subjective Probabilities: A Psychological and Psychometric Review, *Management Science*, **29:2**, 1983.

A Defense of Whole Figure Constructs in Construction of the Person

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Abstract

Whole figure constructs are suggested to play a central role in personal relationships. Suggestions are made as to why the verbalization of whole figure constructs is less likely with maturation. A study is conducted that invalidates current beliefs that whole figure constructs are not meaningful.

Introduction

Personal construct theory suggests the person's interactions with others is a function of the constructs they use to experience others. Hundreds of studies in personal construct theory have been published. Most of these studies have been based on repertory grid techniques. In the typical grid technique a person rates a number of people along trait like dimensions. Such rating of people along traits is not unique to contruct theory. Indeed many impression formation experiments follow a similar format. In essence these studies assume our experience of others is governed by implicit trait theories. In other words, we tend to assume our contruction of others consists of reducing others to traits instead of grasping the individual as a whole. This assumption has serious implications for theories of personal vs. only social relations. Can we have a personal relationship based on a reduction of others and the self to traits? The purpose of this study is to address this question and to begin an experimental elaboration of this issue by investigating the meaningfulness of constructions of the person as a whole.

Kelly (1955), the originator of personal construct theory, suggested that the child initially construes people with constructs that are specific to the person. In so doing the child develops constructs, called whole figure constructs, that allow the child to form distinctions such as 'like mother' vs. 'unlike mother' or 'like self' vs. 'unlike self'. As the child grows older he/she tends to verbalize such constructs less often and relies more on trait like constructions. Construct theorists have interpreted this increased use of trait dimensions as indicative of psychological maturation (Little, 1968; Barratt, 1977; Duck, 1975). There is a real danger, however, that issues are being confounded in making such assumptions. Let's examine these dangers in some detail.

The fact that children tend to use trait constructs more and whole figure constructs less as they grow older could be due to the increased insistence placed upon children in schools to describe people via traits. A child who discusses another in terms of whole figure constructs, such as "Uncle Howard", will tend to be viewed as egocentric by those who do not know the person. This shunning of whole figure constructs is more likely to the extent the child's environment is

impersonal. A more personal environment, for example, one that might be found in a smaller town where children are more likely to know one anothers' acquaintances, would tend to be less insistent on the use of traits. When a classmate in such a community mentions "Uncle Bob, the policeman" or "Mrs. Smith, the sixth grade music teacher", there is little reason for recourse to traits. With the mention of a name, i.e. Mrs. Smith, everyone would often have sufficient information to understand the reason she is mentioned in a particular context. The fact that children learn not to use such whole figure constructs as 'Like Mrs. Smith' can be more a function of living in an impersonal environment, a world where individuals are unknown quantities, than to the child's maturation. The price could well be that personal relations are suspended in the belief that maturity demands reductionistic, impersonal construction. Research should be conducted to determine the relative use of trait vs. whole figure constructs in personal vs. impersonal contexts.

A second way the role of whole figure constructs in maturation can be misunderstood concerns current assumptions concerning the meaningfulness of whole figure constructs. Following Piaget's reasoning concerning the development of constructs, the maturing child should become better at using all constructs, both whole figure and other constructs. Recent research by Chambers & Parsley (1986) in fact found that the logical consistency and integrative complexity of whole figure constructs improves with maturation. Some construct theorists, however, doubt that whole figure constructs can even be used meaningfully (Mair, 1967; Fransella & Bannister, 1977). These researchers believe whole figure constructs cannot integrate information about people in anything but inconsistent, nonintegrative ways. This belief has probably greatly reduced the amount of research conducted on whole figure constructs. Let's look closer at the justification given for the assumption that whole figure constructs are meaningless.

Mair (1967) conducted a study that supposedly demonstrates the relative meaninglessness of whole figure constructs. The study has been referenced in two authoritative manuals on repertory grid technique (Bannister & Mair, 1968; Fransella & Bannister, 1977) as evidence against the use of whole figure constructs. Mair asked subjects to rate a set of people on the whole figure construct "like self" as well as on traits elicited to be either characteristic or uncharacteristic of 'Self'. Mair found that the ratings did not polarize in the fashion he expected. Traits that subjects directly judged to be similar to self were not always positively correlated with 'like self', nor were those judged unlike self always negatively correlated with 'like self'. Mair's conclusion, and that advocated by Bannister and Mair (1967) and Fransella and Bannister (1977), is that whole figure constructs therefore are incapable of integrating the information reflected in the trait ratings. This conclusion is invalid, however, because an inadequate experimental design was used in the study. No control was used to demonstrate that other whole figure constructs are less meaningful in relation to 'like self' than are trait constructs. The conclusion could have just as easily been that the trait constructs were incapable of elaborating all the information contributing to the whole.

The meaningfulness of whole figure constructs is therefore still an unanswered question. The purpose of the following experiment is to determine whether or not whole figure constructs are more or less meaningful than trait constructs. Results should be useful in sounding the alarm that personal construct theorists need to reexamine their assumptions concerning whole figure constructs if they want to come to a better understanding of people and personal relations.

Method

Three groups of repertory grids were developed. The first group consisted of 16 9x9 matrices of random ratings. These grids were developed to simulate the extreme in meaningless construction. These grids were generated via a computer, using simulated five point scales.

16 additional grids were developed by asking 16 university students to first write the names of four people who they thought were quite similar to themselves and four people they thought were quite different. Subjects then stated traits that were descriptive of each of the eight people. This produced four trait constructs describing people similar to the self, and four traits describing people different from the self. Subjects then rated the self and the eight other people on the whole figure construct 'like self' and the eight trait constructs. A five point scale was used.

A final group of 16 grids was developed by asking another 16 students to complete a grid. In this grid students first listed four people who were similar to the self and four who were different. These people and the self were then used as elements in a grid using the same people as whole figure constructs. Subjects rated each person with respect to their similarity to each other person as a whole. A five point scale was used.

Grid Analysis

The grids were analyzed to determine the extent to which ratings made on the 'like self' whole figure construct tended to polarize the other constructs. Each of the four rows of ratings made on constructs elicited to be similar to the self were subtracted from the ratings made of the people on the like-self whole figure construct. The absolute values of these differences were summed to form a like-self score. The absolute values of the differences between the unlike self constructs and the like-self whole figure construct were summed to form the unlike self score. The polarization score was determined by subtracting the like self score from the unlike self score. Larger differences imply more meaningful relations between the like-self whole figure construct and the other constructs. For the 16 grids composed of random ratings, the first four were arbitrarily assumed to be like self constructs while the second were unlike self constructs.

Results

Analysis of variance of the polarization scores produced an F value of

21.61 (2,45), which is significant at p<.0001. A Duncan's test demonstrated that the means from all groups differed. The mean polarization score for the random grids was .68. The mean for the grid made up of trait constructs was 24.25. The mean for the grids made up only of whole figure constructs was 39.37. Results indicate the whole figure constructs produced higher polarization scores, with the trait scores producing intermediate scores. As expected, the random grids produced very low polarization.

Discussion

Results suggest the whole figure constructs were more meaningful than either the random or the trait constructs. These results stand in direct contradiction to the conclusion by Mair, Bannister and Fransella that whole figure constructs are meaningless. These results suggest there is clearly a need for more research on whole figure constructs. This conclusion is further supported by recent research suggesting grids containing whole figure constructs are useful in studying psychological adjustment, impression formation, cognitive development and decision making (Chambers, 1983; Chambers, 1985 a, b, c, d, e; Chambers and Sanders, 1984; Chambers & Stonerock, 1985; Chambers & Epting, 1985; Chambers & Parsley, 1986; Chambers, Manh & Parsley, 1986). There is little doubt that research using whole figure constructs will pose new problems. It may be necessary that psychologists admit that people think in ways that cannot be reduced to the dictionary like terms that make up the trait approach to understanding. We will have to respect the complexity, legitimacy and relative invisibility of another's experience, as described by Kelly (1955) and Laing (1967), if we are to ever meet others as persons.

References

Bannister, D. and Mair, J.M.M. (1968). The Evaluation of Personal Constructs. New York: Academic Press.

Barratt, B.B. (1977). The development of peer perception systems in childhood and early adolescence. Social Behavior and Personality, 5, 351-360.

Chambers, W.V. (1983). Circumspection, preemption and personal constructs. Social Behavior and Personality, 11, 33-35.

Chambers, W.V. & Sanders, J. (1984). Alcoholism and logical consistency of personal constructs. Psychological Reports, 54, 882.

Chambers, W.V. & Stonerock, B. (1985). Truth and logical consistency of personal constructs. Psychological Reports, 56, 1178.

Chambers, W.V. & Epting, F.R. (1985). Personality and personal construct logical consistency. Psychological Reports, 57, 1120.

Chambers, W.V. (1985a). A repertory grid measure of mandalas. Psychological Reports, 57, 923-928.

Chambers, W.V. (1985b). Integrative complexity, cognitive complexity and impression formation. Social Behavior and Personality, 13, 27.

Chambers, W.V. (1985c). Personal construct integrative complexity and the credulous approach. Psychological Reports, 57, 1202.

Chambers, W.V. (1985d). Logical consistency of personal constructs and choice behavior. Psychological Reports, 57, 190.

Chambers, W.V. (1985e). A measure of the integrative complexity of personal constructs. Journal of Social and Clinical Psychology, 3, 213-223.

Chambers, W.V., Trinh, M. & Parsley, L. (1986). Depression and personal construct logical consistency. Under review.

Chambers, W.V. & Parsley, L. (1986). Personal construct logical consistency, integrative complexity and development. In preparation.

Duck, S.W. (1975). Personality similarity and friendship choices by adolescents. European Journal of Social Psychology, 5, 351-365.

Fransella, F. & Bannister, D. (1977). A Manual for Repertory Grid Technique. New York: Academic Press.

Kelly, G.A. (1955). The Psychology of Personal Constructs. New York: Norton.

Laing, R.D. (1967). The politics of experience. New York: Pantheon Books.

Little, B. (1968). Factors affecting the use of psychological versus nonpsychological constructs of the repertory test. Bulletin of the British Psychological Society, 21, 34.

Mair, J.M.M. (1967). Some problems in repertory grid measurement II: The use of whole-figure constructs. British Journal of Psychology, 58, 271-282.

Developmental Communication Conditions: Levels and Limits of Enduring Relationships

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ABSTRACT

This paper focuses on the conditions which work for and against communication development among enduring relationships. Since marriage is the single most important institution existing over time particular attention was given to the communication pattern of a marriage. Two highly creative marriage partners were interviewed. The communication conditions of their marriage are assessed. The major communication conditions found for one partner were security and comfort, transactional connection, and belonging to a family. The major communication construct found for the other partner were romantic love, mutual support, and intimacy.

INTRODUCTION

Individuals are in relationship throughout life. Kelly noted that our construing as individuals is negotiated with those with whom we live as well as those who have gone before us (Kelly, 1930). This paper focuses on the conditions which work for and against communication development among enduring relationships. Since marriage is the single most important institution existing over time, particular attention will be given to the communication process patterns manifest in marriage, family -- or alternative styles of relationship. We will attempt to understand what is conventionally expected within marriage as an institution as well as attempt to understand the

limits of the individual persons who are involved in the relationship. Communication levels and limits will be explored.

Consideration of the origins and the anthropological history of marriage reveals it as the foundational social institution. Marriage and family are the basis of other levels and limits of communication organization. The levels and limits of communication organization in marriage and family radiate into organizations, communities and larger systems. Our entire social structure and the nature of culture rests upon the nature and qualities of marriage and family. It is no accident that anthropologists -- such as Margaret Mead and Ruth Benedict -- devoted so much of their attention to the deeply rooted, elemental institution. It is not a communication system which one either enters into or avoids, such as joining or not joining a social group or being a member of a profession. Marriage and family are so basic to all other communication systems that we must accept them and somehow deal with them.

FOUNDATION OF CIVILIZED COMMUNICATION

What do we mean by marriage as an "institution?." We mean it is larger and more foundational than any group or corporation or other organizational body. Nothing is more significant or more powerful. The United States Constitution could not create or maintain the institution of marriage and family. No law could invent it and no legislation or law could require it or prevent it. The institution of marriage and family underlies even the law of the land, just as it does our other social and societal systems, and even our international order. Begin and Sadat finally reached an aggreement when they became aware of the implications of their negotations and their relationship for the younger generation in their own families. Rowe in Living with the Bomb describes the peril we are in today and our need for change. She states: " Family life is a microcosm of the life among nations, and settling disagreements in family life can be no easier than settling disagreements between nations" (Rowe,1985, p. 215). Easwaran in writing about Gandhi, the Man quotes Gandhi as stating that it was his wife, Kasturbai, who taught him how to love. Kaswaran observed that Gandhi began to see what Kasturbai was practicing everyday was what he himself had been admiring as a theoretical ideal. She sought by personal example to root out anger and competition in their marriage by being supportive and keeping her eyes always on what was good in him (Kaswaran, pp. 125-126). Levinson and Rosenthal in studying corporate leadership found the leaders acting out in corporate life ways of relating which had been learned earlier in their nuclear families (Levinson and Rosenthal, 1984, pp. 262-268).

Marriage has always been there. Anthropologists have traced

male and female bonding as far back as four million years ago and evidence of the existence of a nuclear family has been discovered in fossils which date the occurrence as 3.6 million years ago (Fisher, 1983).

PROCESS AND ANALYTIC CONDITIONS

Marriage is also -- since it is a form of communication -- a process. It began organically, and it continues to function organically , as a process. It relies on holistic explanations and is infinitely complicated. This is the other side of it not being fundamentally a formal structure or legal matter. This is the other aspect of marriage having an independent existence. We can try to understand it, conduct analysis, but to the degree that it is a process we cannot impose ourselves upon it. It does not lend itself to laboratory tests; there are no controls possible, or else it would become something else and not an illustration of marriage.

We will not find the linear chains of cause and effect. We may find some conditions which go up and down together, such as when researchers study the Great Depression. As an organic process marriage functions according to cyclic patterns and responds to multiple sources of information. It is like a plant which responds to its inner structure; and to light, air, water,soil,and wind; and to the manner in which it is cultivated. Marriage is so large and we are consumed within it and our self and our perceptions are shaped by it, and because it is a process we do not know it. We participate in the continuity of the process which continues without beginning nor end. It goes on and on as a living process although individual marriages cease to exist as entities and new ones come into existence. These are limitation or conditions in understanding marriage.

How did marriage start? Why did it begin? How did it become so awesome and pervasive? Nobody "planned" it. No one or group consciously decided: "Let's start an institution of marriage." Since we do not know how it began or the background and tracing in the development of marriage or why it continues, we do not understand how to make it work. Why is there so much unhappiness in marriage? Blumstein and Schwartz note that even though marriages are increasing the divorce rate is almost three times as high as it was in the 1960"s. They further note that half of first marriages now taking place will end in divorce and half of all people now of marriageable age will at some time experience divorce (Blumstein and Schwartz, 1983, pp.33-34). Other indicators of the lack of wellness in marriage are reflected in the incidence of violence, wife and child battering, proportion of family homicides, and mental/emotional distress.

CONDITIONS OF MARRIAGE

Currently the number of marriages is high as is the divorce rate. The high rate of divorce challenges individual expections of an enduring relationship. This has implications for the entire family and especially the children. More than one million children per year are involved in the resulting situation which is usually a single parent family and or other relatives and child-care environments. At the same time men's and woman's roles are emerging into new forms which has implications for work, fertility and birth as well as other ramifications. Alternative life styles are also a part of the existing conditions. Cohabitaion has increased to 1.8 million unmarried couples of the opposite sex living together in 1981. In addition lesbian and gay couples are becoming a more visible part of the population. All these emerging changes point to the need to study the conditions of enduring rlationships (Blunstein and Schwartz, 1983, pp.25-48).

Campbell did extensive interviews with mainstrem couples in an attempt to better understand relationships. She identified an emerging trend toward diversity including group marriages and tribal families. She saw people creating new forms for their marriages, families, and intimate friendships. Couples are taking charge of their marriages and/or relationships and value intimate, honest communication. Old forms of relating are evolving away from relationships based on security and comfort and moving toward relationships where learning, spiritual growth and service are primary goals. Marriage is valued as a vehicle for exploring the ralities of what it means to be human (Campbell, 1983, pp. 123-143).

COMMUNICATION PERSPECTIVE

The institution of marriage is really pervasive. If we contemplate the institution, when we "see" these deep relationships in ancient human history, the ramifications in various parts of our society and world society, and when we see the relentlessness, the permanence of marriage, when we see the essential communication qualities which began with primitive humans, and began even before we were human, and in which in fact represent those very qualities which MAKE us human, one realizes the respect this institution commands. This institution is the source of our best transactional communication theory, the enduring human values involving all of our social and personal relationships, including our most important relationships and our loving relationships. Our best communication principles were there before the theorist, before the philosopher, before civilization. The institution of marriage and family are the source of what we call

"civilization." We may rebel against it as individuals. We may not choose to enter into it ourselves, We may be angry at it and flail against it and point out the flaws of it and cite terrible examples of how it does not work in specific cases We can cite divorce rates to criticize it, but no matter how many failures we may use as illustrations, the institution still stands. We must appreciate the fact that it is so pervasive, and respect the power and the universality of this living, on-going, continuing institution.

Parks in reviewing research on relational communication focuses on aspects of messages which define or redefine relationships. He notes Duncan's observation: "We do not relate and then talk, but we relate in talk." Relational communication is traced to Bateson's work on the relationship between individual behaviors in which patterns of role differentiation were delineated. The basic unit of analysis in this research is the relationship between messages and becomes the exchange or interact. Thus relational communication theory and reasearch has centered on talk (the person treated as an event or first level construing in Kellyian terms) rather than the process of communication. (Maher, 1979, pp. 203-204).

Fitzpatrick and Badzinski in examining on research in a number of academic disciplines on communication within the huclear family noted the focus on performance and output variables and emphasized the need to consider internal variables and intrepretative processes. This research approaches variables as categories rather than as constructs having diminsional properties or reference axes as described by Kelly (Maher, pp.122-123).

Monaghan proposes that "...employing Construct Theory as a way of thinking and learning about communication implies that we move from the individual case to understanding the process (Monaghan, 1983, p.2). It represents a shift of perspective from the Communicator (person) to the process of communicating.

We are attempting to move beyond second level construing which is concerned with the construing the constructs of other persons to attempt to understand the communication process from a wholistic perspective in which the relationship is stressed, that is things and events and things do not exist apart from each other. The whole is viewed as greater than the sum of the parts because the parts are not simply put together but are related. The whole is a pattern which remains, while the parts (persons) come and go, just as the human body is a dynamic patterns which persists despite the rapid birth and death of all its individual cells. The pattern does not, of course, exist disembodiedly apart from individual forms, but exists precisely through their coming and going--. We are

searching for the patterns manifested by transient forms The relationship is more significant than the persons which are related.

METHOD

Two married creative persons were interviewed. They are both full-time artists; they have no job or source of outside income beyond what they can negotiate for their artistic efforts. On the basis of prior analysis and related literature we "provided" fourteen constructs and elicited four additional constructs. We say "provided" constructs; based upon prior analysis these were held tentatively during the beginning of the interview while we observed the degree to which the respondent found these constructs naturally appropriate. At least seven of the fourteen were in the respondent's own language, and the other seven were described as meaningful. (It turned out that there seemeed to be minor variance differentail between the provided and elicited constructs in the instance). The constructs may be summarizd as follows:

1. Romantic Love: This includes deep tenderness and affection; warm attachment, benevolence, caring for the other; holding an idealized understanding of the other and characterizing the communication as colorful, "poetic," novel, mysterious, and glorifying or celebrating the other and the relationship
2. Raising of Children
3. Family: including belonging to a social group.
4. Social prestige associated with family membership.
5. Security and comfort: Social relationships are hold secure, the ability to rely upon an existing relationship
6. Companionship and friendship.
7. Intellectual and/or artistic stimulation.
8. Sex: Socially approved sexual relations, physical sex.
9. Intimacy: open information exchange; self disclosure.
10. Mutual support: A helping relationship, "therapy."
11. Economy: (i.e. marriage is less expensive than alternative lifestyles).
12. Enduring: Relationships which last, seeking a lsting, continuing, on-going, "life-long" relationship.
13. Actual: The factual conditions of the relationship.
14. Ideal: The aspiration of "hope" for the relationship.
15. Transactions: A sense of connection to the past, to family traditions; a sense of connection to the future and the new generation, anticipating a "better" future and wanting to belong or be part of the future
16. (for Barbara) Equality: Mutual respect ve. inequality: oberdience, control
16. (for Donald) Respect without pressure, acceptance of differences
17. (for Barbara) Open Marriage: a free choice "open" marriage vs. a traditional and rigid marriage.

17 (for Donald) Deterministic and controlling vs. freedom.
18. (for Barbara) attractive body, visual appeal, physical attributes vs. communion with the person.
19. (for Donald) Aggressive toward life

The names of twelve persons known to each of the respondents were used as elements in the Higginbotham (1983) and Bannister form of the Repertory Grid. Instructions were "the kind of relationship such a person desired" (as distinquished from the element person's actual relationship). Both respondents were interviewed at the same time, although they were generallly prevented from observing each other's responses. (Some of the elements were the same for both respondents, and the respondent knew most of each other's element persons). Then, following the first stage of the interview each partner was asked to replicate (i.e. predict the responses expressed by the other. The particular data selected in this exploration of communication conditions are primarily indicated by construct variance

OBSERVATIONS

The three major constructs accounting for the largest amount of variance in the communication conditions for Barbara are security and comfort, transactional connections, and belonging to a family.

Security and comfort for Barbara is related negatively and very strongly (-.87) to intimacy. Where relationships are held secure they are not like to be intimate. She experiences their actual marriage as very intimate (.59), and she does not consider their actual marriage as secure and comfortable (-.40). She associates security and comfort with transactional connections to the past, and to the future. Security and comfort is negatively related (-51) to sex, and to mutual support (-.45).

The transactional connections construct for Barbara is extremely negatively related (-.81) to mutual support. It is as if she experiences alienation from her earlier family and carries this construct relationship with her into their marriage. The transactional connections contruct does relate to the physical body (-.69), possibly having a physical attribute, or genetic kind of association.

Belonging to a family or social group is strongly related to companionship or friendship, and she does not experience companionship and friendship in their marriage.

Barbara's meaning for an enduring relationship is very weak, accounting for the second lowest variance. An enduring relationship is negatively related (-.55) to an open marriage, but postively related (.50) to intellectual or artistic stimulation.

The three major constructs accounting for the largest amount of variance in the communication conditions for Donald are romantic love, mutual support, and intimacy.

Romantic love is very strongly (-.75) adverse to security and comfort. Perhaps this implies a strong ingredient of adventure and risk in romantic love. Romantic love is strongly related (.64) to respect without pressure and accepting differences (.65). Romantic love is negatively related (-.57) to raising children (-.57) companionship and friendship (.-51) and intellectual and artistic stimulation (.48). Romantic love is not related to their actual marriage (-.22). It appears that to Donald that romantic love is quite separate from social reality, more like a kind of "game," or as it one were playing a part in a play. Romantic love does not require human relationship.

The second strongest construct for Donald is mutual support, a helping relationship. This construct is related primarily to intimacy (.75) and to companionship and friendship (.69).

Intimacy is related to family and belonging to a social group (.58) and to an enduring relationship (.57). An enduring relationship is very strongly associated (.76) with social prestige and transactional connections (.57).

RELATED READINGS

Bannister, D. and F. Fransella, Inquiring Man. (second edition) Malabar, Florida: Robert E. Krieger Publishing Co., 1980.

Blumstein, P. and P. Schwartz, American Couples. N.Y.: William Morrow and Co., Inc., 1983.

Campbell, Susan, Earth Community. San Francisco, Evolutionary Press, 1983.

Duck, Steven, Personal Relationships and Personal Constructs. N.Y.: John Wiley and Sons,1973.

Easwaran, Eknath, Gandhi the Man. (second edition) Petaluma, Calif.: Nilgiri Press, 1978.

Epting, F. and A.W. Landfield (editors), Anticipating Personal Construct Psychology. Lincoln: University of Nebraska Press, 1985.

Fisher, H. E. The Sex Contact. N.Y. First Quill, 1983.

Fitzpatrick, M.A. and D. M. Badzinski, "All in the Family: Interpersonal Communication in Kin Relationships" in Knapp, M.L. and Miller, G.R. (eds.) Handbook of

Interpersonal Communication.Beverly Hill CA: Sage, 1985.

Higginbotham, Peter, Dept. of Psychology, The University of Leeds, Leeds, LS2 9JT, England (1983).

Kelly, George A., The Psychology of Personal Constructs (two vols.). N.Y.: W.W. Norton and Co., 1955.

Kelly, George A., "The Social Inheritance," in P. Stringer and D. Bannister (eds.) Constructs of Sociality and Individuality, Academic Press, 1979.

Landfield, A.W. and L.M. Leitner, Personal Construct Psychology. N.Y.: John Wiley and Sons, 1980.

Levinson, Harry and Stuart Rosenthal, CEO: Corporate Leadership in Action. N.Y.: Basic Books,1984.

Maher, Brendan. (ed.) Clinical Psychology and Personality. N.Y.: John Wiley and Sons, Inc., 1969.

Monaghan, Robert R., "The Communication Process: Principles on Negotiation of Meaning," paper presented at the Fifth International Congress on Personal Construct Psychology, Pine Manor College, Chestnut Hill (Boston) Massacjisetts, 7-12 July 1983.

Parks, Malcolm R., "Relational Communication: Theory and Research", Human Communication Research 77, 3,4, pp. 372-381.

Rowe, D., Living with the Bomb. Boston: Routledge and Kegan Paul, 1985.

Rubin, Lillian B., Intimate Strangers. N.Y.: Harper and Row Publishers, 1983.

USE OF ELICITED AND SUPPLIED CONSTRUCTS IN THE PARENTING DOMAIN

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ABSTRACT

This study investigates the use of elicited and supplied constructs in the parenting domain with the Parent Attribute Clarifier (PAC) Filer (1983), a modified repertory grid. Eight constructs were elicited using Kelly's (1955) standard triadic method, and eight were supplied by the researcher. The use of elicited and supplied constructs is compared in terms of two aspects of parental cognitive structure, integrative usage and ability to discriminate along a dimension of meaning. Results indicate participants use supplied constructs more integratively but make finer discriminations with elicited constructs. Methodological issues for future research are discussed.

INTRODUCTION

Researchers employing some form of the Repertory Grid within Personal Construct Psychology often are faced with the choice of whether to use elicited or supplied constructs. Elicited constructs supply information on the unique ways an individual views the domain being investigated. Supplied constructs permit inclusion of researcher-provided dimensions and lend themselves to nomothetic comparisons. In addition, when a decision is made about the type of construct to be used in a study, consideration must be given to whether or not elicited and supplied constructs are employed differently by individuals.

Adams-Webber (1979), in an extensive review of the literature concluded "...individuals exhibit consistent preferences for using particular words to describe themselves and others, judge people more extremely in their own terms, and draw more inferences from information presented in their own language." (p. 31). In an earlier article Adams-Webber (1970) found little difference between measures of differentiation derived from elicited and supplied constructs, if the latter were carefully selected. Using Bannister and Mair's (1968) intensity measure, Cochran (1977) in a study of career evaluation found elicited constructs "... were significantly more interrelated than supplied constructs." (p. 244) when used to rate participant supplied occupations. In a sorting task male English architectural students' elicited constructs accounted for significantly more of the variance than supplied constructs (Stringer 1972). Cromwell and Caldwell (1962) found in rating recent and old acquaintances greater extremity ratings for the elicited constructs than the supplied constructs.

Landfield (1965) had clients in therapy rate their ideal-self, present-self, and the therapist on dimensions elicited from both the client and the therapist. He found clients rated ideal-self and present-self more extremely when they used their elicited constructs. Their ratings of the therapist also were more extreme but did not reach significance.

Warr and Coffman (1970) compared extremity ratings in judging tasks. Contrary to the findings in a majority of studies, they did not find any significant differences in the ratings between the two types of constructs.

Kuusinen and Nysted (1975) evaluated elicited and supplied constructs using an index of rating extremity and four measures of cognitive complexity. The results of their study did not uniformly show elicited to be more useful than supplied constructs. They therefore concluded "... that differences between individual constructs and provided constructs that have been found in earlier studies may be dependent upon what criterion is chosen to contrast the two types of constructs, what indices are used to measure the chosen criterion, and what type of provided constructs is compared with individual constructs." (p. 141). Their conclusion indicates the importance of re-examining studies on the use of elicited and supplied constructs in terms of the criterion used to evaluate the constructs, of the indices measuring these criterion, and of the type of constructs supplied.

Easterby-Smith (1980) raised several important methodological points that will aid in this re-examination. He states that in using the standard triadic method for eliciting constructs, elements either be selected randomly or in a manner that maximizes contrasts, not be repeated in successive triads (to do so makes elicitation of new constructs more difficult), be homogeneous (selected from the same category) and be representative of the domain in question.

If constructs elicited from elements meeting these requirements are to be compared to supplied constructs, it is important for researchers to indicate not only how the supplied constructs were chosen but the basis for their assertion that such constructs are applicable to the domain under investigation. Unless the issue of applicability is addressed, reported differences in the use of elicited and supplied constructs simply may be a result of a preference for using those constructs most applicable to the domain under investigation. Studies also must make clear the criterion used to contrast constructs. In the previously cited studies, with the exception of Kuusinen and Nysted (1975), rating extremity is equated with personal meaningfulness. Extreme ratings are said to most closely approximate the bi-polar nature of constructs.

Meaningfulness, however, does not have to be defined in terms of rating extremity. If a person is a scientist attempting to anticipate events, then a meaningful construct system may be thought of as one that allows for maximum decision making effectiveness in the domain in question. For example, Lemon and Warren (1974) did not use rating extremity as their criterion; instead, they evaluated constructs in terms of the the strength of inference one could make with them about people. From subjects' free descriptions of acquaintances they designated subjects' constructs as salient or non-salient. They found salient constructs allow one to make stronger inferences than non-salient constructs. Through questioning whether meaningfulness of construct usage has to entail extremity of rating, Lemon and Warren raise an important issue for consideration by pointing out that meaningfulness may just as well be thought of in terms of construct's potential for making inferences.

It is now possible to re-examine a number of studies in terms of the issues raised in the last few paragraphs.

Beginning this re-examination with the previously cited Cochran (1977) study, there are indications that the reported differences may be an artifact of the methodology. Cochran (1977) used supplied constructs to generate the elicited constructs. He acknowledges such a method would tend to elicit constructs superordinate to the supplied ones. It is not then surprising to find that these superordinate elicited constructs were used differently than the subordinate supplied constructs. If a set of subordinate elicited constructs had been used to elicit further constructs, would a comparison of these sub- and superordinate constructs have yielded results similar to those found in the Cochran study?

It is apparent the manner in which supplied constructs are developed is crucial. When comparative studies on the use of elicited and supplied constructs are evaluated, careful attention must be given to the methodological procedures employed. For example, Cromwell and Caldwell's (1962) use of constructs elicited from one group of participants as the supplied set of constructs for another group is an approach very different from Cochran's.

It is even more difficult, if not impossible, to evaluate studies which do not indicate the manner used to supply constructs. In this vein all Stringer (1972) says is that constructs "...were selected to represent factors which were thought might be important in architecture students' judgments of such people as their family, peers, and various authority figures." (p. 440). Were any methods used to determine the validity of the assertion of the supplied factors being representative? Stringer does not say.

Bender (1974) questions the results of Warr and Coffman (1970) by stating that the sequential form of Kelly's repertory grid which changes only one element at a time will produce less meaningful constructs. Using a form of the repertory grid developed by Malhlouf-Norris, Jones, and Norris (1970) in which constructs are elicited with five sequential and five non-sequential triads, Bender defined the five constructs with highest loadings on the first factor of the principle component analysis of the grid as most-important and the five with the lowest loadings as least important. Bender found the non-sequential triads yielded significantly more most-important constructs.

Re-examinations of these several studies have shown that to fully address the issue of whether elicited and supplied constructs are used differently, careful consideration must be given to the selection of elements, to the method used to generate elicited constructs, to the manner in which the supplied constructs are chosen or developed, and to the criterion for contrasting constructs, and to indices used for comparison.

METHOD

In this present study the issues raised in the last few paragraphs were addressed in the development of a modified repertory grid, the Parent Attribute Clarifier (PAC) (Filer 1983). The PAC elements are seventeen different parents, fifteen personally known by the participant and two generalized categories of parents, the Ideal and Abusing parent. To meet the Easterby-Smith (1980) requirement of representativeness, elements included the participant's parents, grandparent, spouse, self, five parents whose parenting methods the participant agreed with and five whose methods they did not agree with. Participants used a nine point scale to rate the seventeen parents (elements) on the sixteen constructs. High ratings indicated the parent (element) had a lot of positive pole of the construct and low ratings very little of the positive pole. All the parents (elements) were first rated on the eight elicited constructs and then on the eight supplied constructs.

Eight constructs were elicited using the standard triadic method; wherein participants were presented a triad of parents from their list of parents and asked to state how two of them were alike and different from the third parent in some dimension of parenting. The process was completed when a participant decided what to them was the opposite of the elicited dimension, thereby identifying a bipolar parenting construct. In line with criteria suggested by Easterby-Smith elements were not repeated in successive triads, and, to provide a contrast, each triad had two parents (elements) whose parenting methods the participant either agreed or disagreed with but never three of one type.

Eight supplied constructs were developed after a review of the literature on parenting. (Azrin 1974; Coigney 1974; Dinkmeyer and McKay 1976; Dodson 1974; Gordon 1973; Harman and Brim 1980; Madsen and Madsen 1972; Mancuso and Handin 1980; and Webster-Stratton 1980). In addition the constructs were evaluated by eleven professionals in child care from a major university who judged them to be important for inclusions in a study of parenting and to cover a broad range of the parenting domain (Filer 1983).

To compare the use of elicited and supplied constructs, indices of parental cognitive structure were derived from a 16x16 construct correlation matrix. Two aspects of parental cognitive structure, integrative construct usage and discrimination along a construct, were measured. The Integrative index (a count of the number of correlations found in the range .482 < R < .8 in the 16X16 correlation matrix derived from the PAC) is an index of integrative usage developed by Weckwerth (1983) in a study of career decision making. The index is an attempt to measure integrative construct usage while controlling for the problem of random usage raised in the Bannister and Fransella's (1966) study which found thought-disorder schizophrenics and cognitively complex individuals both displaying a high degree independence between constructs. They argued schizophrenics were responding randomly while the cognitively complex individuals were making use of an integrative process. To control for randomness and measure the integrative process correlations in the .482 < R < .8 are considered to be a measure of integration. Though the selection of the .8 as a cut-off point is arbitrary, it is based on the idea that correlations greater than .8 are so high that they are functionally equivalent and indicate a lack of differentiation. The .482 for the bottom cut-off was chosen because in a 16X16 matrix a set of randomly generated numbers would yield by chance only five percent of the correlations above .482.

In addition to measures of integrative construct usage, the development of measures to gauge discrimination along a dimension of meaning has been prominent in the study of cognitive structure (Rekers 1974, Signell 1966, Landfield 1977, 1981). The rationale for such measures is the idea of a construct being maximally useful when it allows fine discriminations to be made among the rated elements. When the rating levels are used evenly across the elements, a ranking process is approximated. Even use of rating levels is an indication of an ability to prioritize and make finer discriminations. Weckwerth (1983) developed an index of discrimination measuring how evenly rating levels are used across elements. Even use indicates an ability to make fine discriminations and prioritize along a dimension of meaning.

The formula is:

$$\sqrt{\sum^{c}\sum^{e}(I-O)^2/n}$$

where (I) is the ideal number of elements per category found by dividing the number of elements (17) by the total number of rating levels (9). The Discrimination Index is computed by summing the squared deviation of observed elements (O) from (I) at each rating level across levels for each construct (I-O); and taking this sum of squared deviations for each construct and summing it across constructs (n); and finally taking the square root of the average of the sum of the squared deviation for constructs. The index is an inverse measure of discrimination because it decreases as more of the entire range of rating levels is used. For a more detailed discussion the Integrative and Discrimination Indices see Forster (1985).

Using this Integrative Index and the Discrimination Index Weckwerth (1983) found greater flexibility in career decision making associated with a greater degree of integrative complexity and a greater degree of discrimination. Poole (1983) found the Integrative Index interacted significantly with the design structure of a career-decision making course. As Poole predicted, students high on integrative complexity preferred a low-structure course design and those low on integrative complexity preferred high-structure course design. He did not find the Discrimination Index to be related to students' reaction to course design.

The indices for integrative usage and discrimination were derived for both elicited and supplied constructs. This allowed comparisons to be made on the use of the two types of constructs.

SUBJECTS

Forty-four parents drawn from a large metropolitan area completed the Parent Attribute Clarifier (Filer 1983).

RESULTS

The means of the indices of integrative usage and discrimination for elicited and supplied constructs were compared using t-tests. The mean of the elicited Integration Index was 10.68 and the supplied Integration Index was 14.73. The t-value of 2.25 was significant at the .05 level. The mean of the elicited Discrimination Index was 5.24 and the mean of the supplied Discrimination Index was 5.53. The the t-value of 2.56 was significant at the .01 level. These results indicate participants used the supplied constructs more integratively and made finer discriminations with the elicited constructs.

Low non-significant correlations were found between the indices of integration and discrimination indicating that two aspects of the cognitive structure were being measured.

The reliability of these indices of cognitive structure was tested by re-administering the Parent Attribute Clarifier to eight participants five weeks after their initial completion of the instrument. The following reliability coefficients were obtained: Elicited Integrative Index .54, Supplied Integrative Index .86, Elicited Discrimination Index .84, and Supplied Discrimination Index .74. Except for the Elicited Integration Index, moderate reliability was demonstrated.

DISCUSSION

In this study finer discriminations were made with elicited constructs and supplied constructs were used more integratively. These results in terms of discrimination are consistent with a number of studies that have shown participants prefer to use their own dimensions in dealing with domains in which they are personally invested and familiar. However, the the more integrative use of supplied constructs raises questions about the criteria used to evaluate elicited and supplied constructs. If the number of constructs in the range $.482 < r < .8$ is an index of integration (something that certainly needs further investigation), then the results indicate advantages in using supplied constructs. Though great care must be exercised in generalizing the findings of this study to other domains, the results do raise several important methodological issues for future researchers as they develop repertory grids and raise questions about the evaluative criteria to be used in the study of elicited and supplied constructs.

Questions about the evaluation criteria, of course, are not limited to the study of elicited and supplied constructs. Much has been written about the ways of interpreting data generated by repertory grids. What is important is that careful consideration be given to these criteria in both the evaluation of studies of elicited and supplied constructs as well as in the development of instruments for such studies.

References

Adams-Webber, J.R. Personal Construct Theory, Concepts and Applications. Chichester: John Willey and Sons, 1979.

Adams-Webber, J.R. "Elicited versus provided constructs in repertory grid technique: a review". British Journal of Psychology, 43: 349-354, 1970.

Azrin, N.H. and Foxx, R.M., Toilet Training in Less than a Day, New York: Simon and Schuster, 1974.

Bannister, D. and Fransella, F. "A grid test of schizophrenic thought disorder". British Journal of Social and Clinical Psychology, 5: 95-102, 1966.

Bannister, D. and Mair, J.M.M. The Evaluation of Personal Constructs. London: Academic Press, 1968.

Bender, M.P. "Provided versus elicited constructs: an explanation of Warr & Coffman's (1970) anomalous findings". British Journal of Social and Clinical Psychology, 13: 329-330, 1974.

Cochran, L.R. "Differences between supplied and elicited considerations In career evaluation". Social Behavior and Personality, 5 (2): 241-247, 1977.

Coigney, Virginia. Children Are People Too. New York: William Morrow and Company, Inc., 17975.

Cromwell, R. L. and Caldwell, D.F. "A comparison of ratings based on personal constructs of self and others". Journal of Clinical Psychology, 18: 43-46, 1962.

Dinkmeyer, Don and McKay, Gary D. Systematic Training for Effective Parenting: Parent's Handbook. Circle Pines, Minnesota: American Guidance Services, Inc., 1976.

Dodson, Fitzhugh. How to Father. New York: New American Library Inc., 1974.

Easterby-Smith, Mark. "The design, analysis and interpretation of repertory grids". International Journal of Man-Machine Studies, (13) 3-24: 1980.

Filer, Rex D. Investigating Parental Cognitive Complexity With A Modified Repertory Grid. University Microfilms, Ann Arbor, Michigan, 1983.

Forster, Jerald R. "Investigating personal goals using personal construct theory and grid methods". In Franz Epting and Alvin W. Lanfield (eds.), Anticipating Personal Construct Psychology. University of Nebraska Press, Lincoln and London, 1985.

Forster, Jerald R. Job Attribute Clarifier. Seattle, Washington, Superior Publishing Company, 1982.

Gordon, Thomas. Parent Effectiveness Training. New York: Wyden Book, 1970.

Harman, David and Brim, Orville G. Jr. Learning to be Parents. Beverly Hills, California: Sage Publication, Inc., 1980.

Hinkle, D.N. The change of personal constructs from the viewpoint of a theory of implications. Unpublished Ph.D. Thesis, Ohio State University, 1965.

Kelly, George. The Psychology of Personal Constructs. New York, Norton, 1955.

Kuusinen, Jorma and Nystedt, Lars. "The convergent validity of four indices of cognitive complexity in person perception". Scandinavian Journal of Psychology, 16: 131-136, 1975.

Landfield, A.W. "The extremity rating revisited within the context of Personal Construct Theory". British Journal of Social and Clinical Psychology, 7: 135-139, 1968.

Landfield, A.W. "Meaningfulness of self, ideal, and other as related to own vs. therapist's personal construct dimensions". Psychological Reports, 16: 605-606, 1965.

Landfield, A.W. and Schmittdiel, C.J. "The interpersonal trans- action group: evolving measurements in the pursuit of theory". Paper presented at the Fourth International Congress on Personal Construct Psychology, Brock University, Canada: August 1981.

Landfield, A.W. "Interpretive man: the enlarged self-image". in J.K. Cole and A.W. Landfield (eds.). Nebraska Symposium on motivation 1976, University of Nebraska Press, Lincoln: 1977.

Lemon, Nigel and Warren, Neil. "Salience, centrality and self- relevance of traits in construing others". British Journal of Social and Clinical Psychology, 13: 119-124, 1974.

Madsen, Clifford K. and Madsen, Charles Jr. Parents/Children/Discipline A Positive Approach. Boston: Allyn and Bacon, Inc., 1972.

Mahlouf-Norris, F., Jones, H. Gwynne, and Norris, Hugh. "Articulation of the conceptual structure in obsessional neurosis". British Journal of Social Clinical Psychology, (9): 264-274, 1970.

Mancuso, James C. and Handin, Kenneth H. "Training parents to construe their child's construing". in A.W. Landfield and L.M. Leitner, Personal Construct Psychology, New York: John Willey, 1980.

Poole, Robert A. Cognitive Complexity and Course Design in Career Development. University Microfilms, Ann Arbor, Michigan, 1983.

Reker, Gary T. "Interpersonal conceptual structures of emotionally disturbed boys and normal boys". Journal of Abnormal Psychology, 83(4): 380-386, 1974.

Shannon, C. and Weaver, W. Mathzmatical Theory of Communication. Urbana: University of Illinois Press, 1949.

Signell, Karen A. "Cognitive complexity in person perception and nation perception: A developmental approach". Journal of Personality, 34: 517-537, 1966.

Stringer, Peter. "Psychological significance in personal and supplied construct systems: A defining experiment". European Journal of Social Psychology, 2: 437-447, 1970.

Warr, Peter B. and Coffman, Thomas, L. "Personality, involvement and extremity of judgement". British Journal of Social and Clinical Psychology, 9: 108-121, 1970.

Webster-Stratton, Carolyn. Effects of a videotape-modeling parent education program on mother attitudes and mother-child interaction. Ann Arbor: University Microfilms, 1980.

Weckwerth, Marilyn Jean. Cognitive Complexity and Flexibility in Career Decision Making. University Microfilms, Ann Arbor, Michigan, 1983.

ARTICULATING AND RECONSTRUCTING PERSONAL GOALS

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This paper provides a conceptual model for counseling clients whose goals are unrealized. The model focuses on the discrepancy between a goal and perceptions of what is happening. Theory and methods familiar to personal construct psychologists are used to explain goal discrepancies and devise reconstruction strategies. The model also highlights the use of feelings to indicate the degree to which natual goals are being satisfied. Several types of construction errors are described. Also included in the paper are counseling guidelines for facilitating the articulation and reconstruction of personal goals.

INTRODUCTION

Counseling can be defined as an interactive process between two individuals, where one has recognized a dissatisfaction and a desire to change. The other person has expertise in facilitating an articulation of the problem and helping the client change to relieve the problem.

The purpose of this paper is to elaborate on a particular conceptualization of the counseling process. The conceptualization is primarily based on Personal Construct Psychology. The elaboration focuses on the discrepancy between a client's wanted events and her perceived events. To focus attention on the discrepancy between what is wanted and what is perceived, a counselor facilitates the client's articulation of her goals. This articulation process depends on the elicitation of personal constructs used by the individual to differentiate among significant events in her life. These personal constructs are then used to develop goals statements.

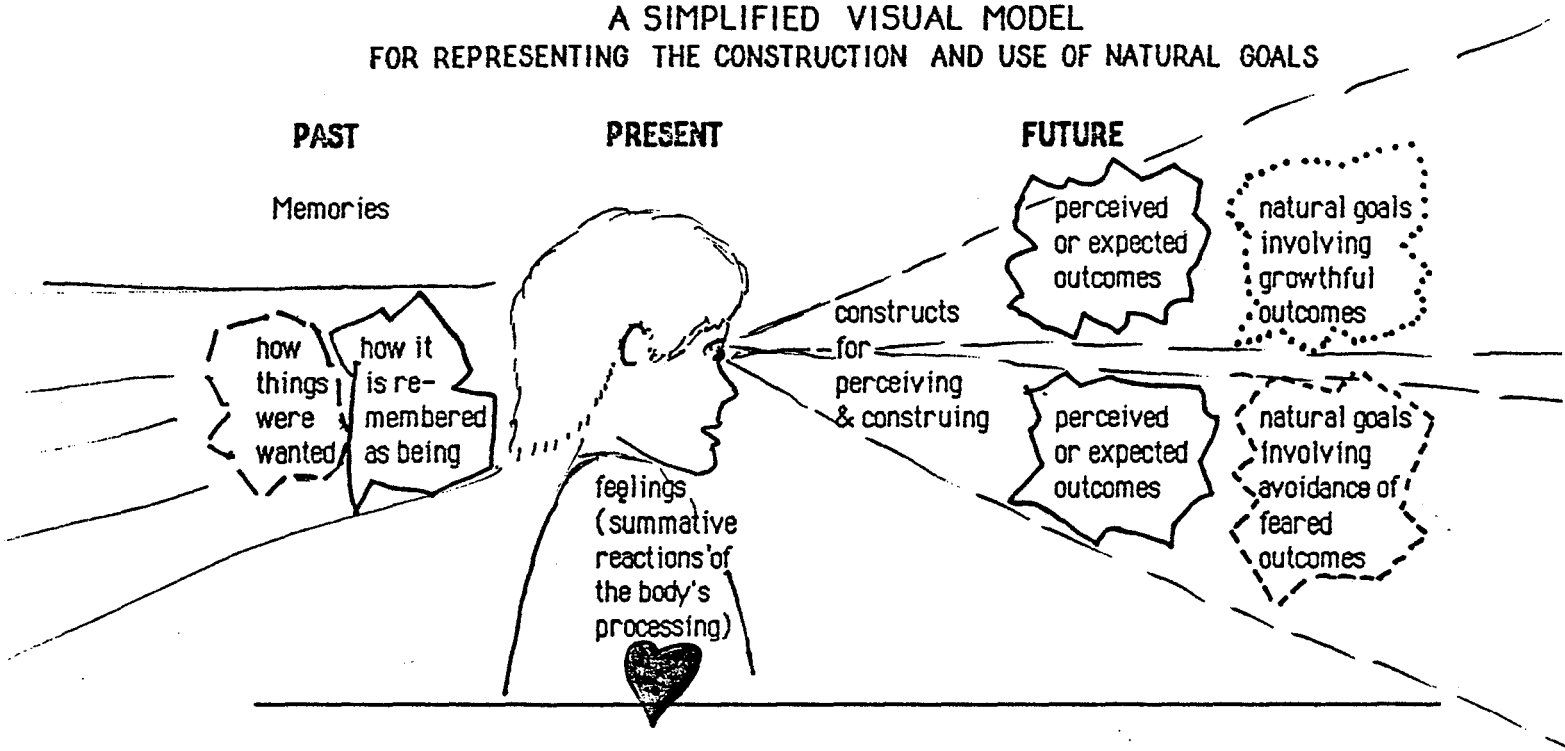
Definitions and elaborations of the most important concepts used in this clarification approach are given in the following section. The interrelations of the key concepts are shown in Figure 1.

DEFINITIONS AND ELABORATIONS OF SELECTED CONCEPTS

PERSONAL CONSTRUCT : A dimension of meaning that an individual imposes upon the world in order to make the world interpretable. Each construct allows a particular awareness that the individual uses to differentiate among stimuli and to categorize phenomena.

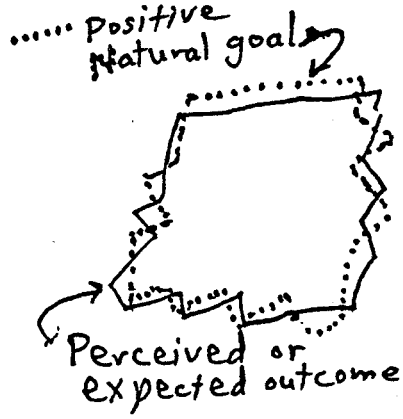
A personal construct is like a special lens or filter that permits the person to see selected colors, scenes, or aspects of a field. When a person is asked to describe another person, or an experience, or a place, that person uses personal constructs when making these descriptions. Constructs must be used to apperceive past, present, and future scenarios. Expectations are experienced through constructs. Constructs don't have to be in language form to be used for differentiating among stimuli, but to be communicated they must be put into language form or some other recognizable vehicle for communication. Examples of constructs used to differentiate among people are: shy, educated, sexy, intelligent, tall. Examples of constructs used to differentiate among events are: boring, demanding, sentimental, cold, recent.

FIGURE 1
A SIMPLIFIED VISUAL MODEL
FOR REPRESENTING THE CONSTRUCTION AND USE OF NATURAL GOALS



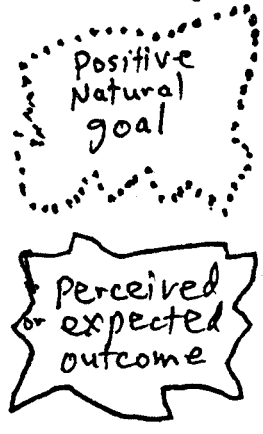
MATCHES OF NATURAL GOALS AND PERCEIVED/EXPECTED OUTCOMES
WITH RESULTANT FEELINGS

Case 1:
When natural goals involve positive and growthful outcomes, AND perceived/expected outcomes match up



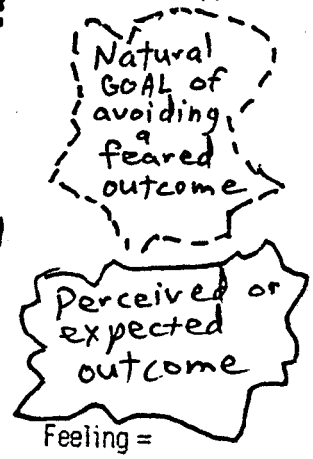
Feeling= Satisfaction and control

Case 2
When natural goals involve positive and growthful outcomes AND perceived/expected outcomes do not match with the goals.



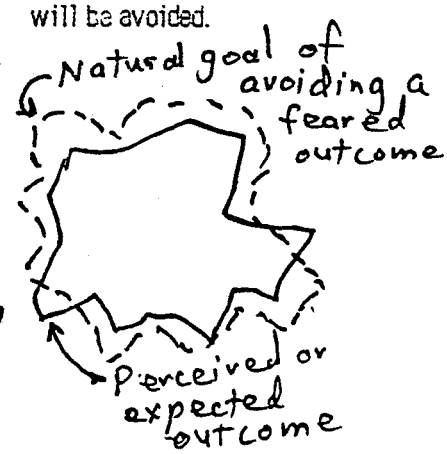
Feeling = Frustration and unfulfillment

Case 3:
When natural goals involve avoidance of feared outcomes AND perceived/expected outcomes suggest that the feared outcome will happen.



Feeling = Uneasiness and fearful foreboding

Case 4:
When natural goals involve avoidance of feared outcomes, AND perceived/expected outcomes suggest that the feared outcome will will be avoided.



Feeling = Relief and relaxation

PERCEIVED OUTCOME: Individual constructions of what is happening in a particular domain of a person's present experience. This outcome could also be called an event.

EXPECTED OUTCOME: Similar to a perceived outcome, except the event has not yet happened and the individual only expects that the event will occur.

NATURAL GOAL: A possible outcome or future event that the individual wants to happen. A person can't help but want a natural goal. Failure to attain natural goals results in feelings of dissatisfaction. There is no standardized list of natural goals that all or most people want. Each person has his own natural goals, constructed with his personal constructs. A variety of reasons may account for why the person has the unique natural goals he has, including past reinforcement schedules, biochemical programming, unsatisfied needs, etc.

Some natural goals involve growthful and/or pleasure seeking events. These are positive goals that are not dictated by fear or avoidance.

Other natural goals involve the avoidance of feared outcomes and these are negative in nature because they are influenced by noxious possibilities or threats.

MEMORIES: Recollections about past events. Memories can include what was thought to have occurred, as well as what was wanted at the time.

FEELINGS: Reactions of the individual's body to all of the cognitive processing that is occurring in response to a specific event. Feelings have been defined as an undifferentiated arousal response triggered by the autonomic nervous system.

Feelings serve as reactive signals reflecting how the individual is appraising all of the inputs possibly connected to personal benefit or threat. They are gauges that measure the summative satisfaction, or dissatisfaction, felt by the individual at any given point in time.

THEORETICAL RELATIONSHIPS AMONG SELECTED CONCEPTS

The match, or the descrepancy, between perceived or expected outcomes and natural goals, directly influences an individual's feelings of satisfaction or dissatisfaction. The individual's feelings are also influenced by the match between past outcomes and natural goals that existed at the time of those outcomes. While past matches residing in the memory influence current feelings, such results do not play a significant role in the feelings of well adjusted individuals, because such people know that future events are the really important ones. Well adjusted individuals are bothered by past discrepancies only if they portend high probabilities that future outcomes will also be discrepant from natural goals.

Perceived and expected outcomes which are not thought to be connected to natural goals do not affect the individual's feelings. The person is neutral about the desirability of such outcomes because he can see no special implication for his well-being or pleasure. However, it is not unusual for a person to become curious about certain events which seem to have little direct implication to her well-being. A curious individual becomes interested in understanding or predicting certain outcomes even though they do not relate to her natural goals. Such an individual may become invested in anticipating or understanding these events and then she has developed a natural goal that might be called "understanding for the sake of understanding." Feelings of satisfaction occur then the person increases her understanding, even when there is little practical benefit from knowing.

THE ROLE OF RECONSTRUCTION IN PROBLEM-SOLVING AND ADAPTATION

When an individual recognizes he has a problem, often accompanied by a feeling of frustration because something is not as he wants it to be, that person seeks a solution. This solution often involves the spontaneous reconstruction of the perceived situation or the reconstruction of the natural goal. If that individual gets stuck in his problem-solving task and keeps constructing it the same way without new perspectives or outward changes in the environment, he feels blocked from his natural goal. Such a person needs help in reconstructing how things appear to be, as well as how he wants things to be. He does not need to be shown how to live. He needs increased awareness, clarification and reconstruction, enabling him to be more self-directing and in control of his life. He will benefit from creative problem-solving and new ways to adapt to the environment.

PERSONAL INVOLVEMENT IN THE ATTAINMENT OF NATURAL GOALS

An important dimension to consider in this conceptualization is the individual's active involvement in bringing about her natural goals. The poles of this dimension are "active" and "passive." The active person exerts considerable effort in an attempt to change the perceived or expected outcome to make it match her natural goal. This person is trying hard to make things happen the way she wants it to be. Such a person tries to manipulate her environment so as to achieve desired ends and is said to "take charge of her life", or "is going after what she wants."

A person nearer the passive pole is more inclined to accept circumstances as he finds them, adjusting to the way things are. A person on this end of the dimension protects himself from unfulfilled goals by modifying natural goals so that they are easily attained. One can protect oneself from being threatened by reducing what is wanted or considered necessary for survival. By reconstructing what is wanted so that it matches what is expected to happen, a person can adjust to almost anything. However, if the reconstruction is not a legitimate one, but only a disguise for the real goals which are repressed, there will still be a feeling of frustration and the results of this feeling may show up in some other negative outcomes.

While there are some individuals who actively seek their natural goals, and others who are very passive in this undertaking, most mature human beings use combinations of these processes. The combination of these processes requires that the person choose when to change perceptions of what is happening to fit her natural goals and when to accept the way things are, even if the original natural goals must be modified. These adeptive and assertive individuals seem to be good at recognizing when it is time to change the environment and when it is time to change their goals. The importance of this judgment process is recognized by Alcoholic Anonymous, as is shown by their adoption of Reinhold Niebuhr's prayer:

GOD GRANT ME THE SERENITY TO ACCEPT THE THINGS I CANNOT CHANGE COURAGE TO CHANGE THE THINGS I CAN AND WISDOM TO KNOW THE DIFFERENCE

This statement may suggest that there is a clear-cut difference between the things a person can and cannot change. Approaching this difference from a contructivist perspective , however, leaves these two categories very much open to construction. In other words, each individual can construct realities that permit change of a wide selection of things or situations. Also, the territory of situations that are not seen as changeable can also be reconstructed to a considerable extent. Those two categories have considerable flexibility in their bounderies, depending on the constructive style of the category user. The recognition of this flexibility is important for the counselor who is facilitating reconstruction. That counselor can help a client approach problematic situations with the openness that is helpful for seeing new solutions or new ways of seeing how things are.

CONSTRUCTION ERRORS AND RELATED PROBLEMS

The constructivist framework offers a variety of concepts which help identify problems of construction and related malfunction. A few of these errors are described below:

1. Lack of awareness of the constructs actually being used to explain and anticipate.
Many individuals can neither identify nor articulate the primary constructs they use to attribute causation and to anticipate future events. Some of these individuals are unaware of many of the constructs they use, while others believe they are using constructs which are not the ones they actually use for their important attributions or anticipations.

2. Use of constructs which are inadequate for anticipating important outcomes.
Some individuals use constructs which are limited or inappropriate to deal with the threats facing them in a complex environment. Sometimes these individuals have been taught or programmed to use outmoded constructs which might have served their users well in less complex environments or environments with quite different threats.

3. Rigid constructions of natural goals.
Individuals with rigid constructs find it difficult to reconstruct their natural goals when reconstructions of perceived/expected outcomes fail to permit them to accommodate their natural goals. This inflexibility may be related to the type of constructs they tend to use. Concrete constructs seem to be the most difficult to modify or expand. The inability to reconstruct is likely to lead to poor problem solving.These people are easily blocked and this blockage is accompanied by repetitive attempts to solve the problem in the same way . Effective problem solvers not only reconstruct unfulfilled goals, but they also reconstruct their perceptions and expectations . Rigid constructions do not lend themselves to reconstruction.

4. Premature reconstruction of natural goals.
The premature reconstruction of natural goals could also be characterized as being overly flexible or even "wishy-washy". These individuals are also described as lacking in will power or persistence. The most serious problem with premature reconstruction of natural goals is the forfeiture of opportunities to realize potentialities. Unfulfilled talents are common among these individuals and they are often taken advantage of by individuals who are more persistent when striving for their natural goals.

5. Natural goals are dominated by avoidance of feared outcomes.
Every individual has some natural goals which are positive in nature, representing growthful strivings uncluttered by fear and avoidance. In some cases, however, these positive, growthful goals are dwarfed by the avoidance goals designed to prevent feared outcomes. When the avoidance goals dominate the person's behavior , that person operates in a defensive stance and minimizes possibilities for attaining positive goals. The cautious style of these individuals reduces risk-taking and results in the avoidance of challenging opportuntities. Such individuals waste much of their lives by focusing on feared possibilities and missing opportunities for exciting new experiences. They have little energy for reconstructing expected outcomes or positive natural goals because so much of their attention is directed toward threatening possibilities.

7. Deficits in constructs that enable long-range prediction.
These individuals lack constructs which help them predict long-term consequences of current choices. Such individuals often feel that they were victims of others or of an unfair society. Often they had experienced pleasure and short-term satisfaction without any idea that this experience might be connected with a negative, unsatisfying future outcome. Observers often describe these individuals as people who do not delay their gratification. They are obviously weak in long-range planning and survive best in a structured environment that provides clear-cut guidelines for behavior and choices, as might be found in the military.

ARTICULATION AND RECONSTRUCTION METHODS

Most applications of personal construct psychology use modified versions of Kelly's Repertory Test (1955) to elicit personal constructs. Forster(1985) used a modified version of the Rep Test to elicit and articulate an individual's personal goals. The steps used in that version are summarized below:

1. Enhance awareness of the client's feelings by sensitizing her to her own body sensations. This can be encouraged by homework assignments involving systematic recording of feelings in a daily journal.

2. Using feelings as indicators that natural goals are being satisfied or not satisfied, the client articulates personal constructs that are used to construct her natural goals. The Goals Articulation Process (Forster, 1982) provides a format for this portion of the articulation process.

3. The articulated natural goals are then used by the client to evaluate the relevance of several representative life events. This can be done by a rating process where the client rates 10 to 20 representative events regarding the extent to which they satisfy each natural goal.

4. After these ratings have been analyzed to identify patterns of relationships and profiles of goals satisfaction, feedback of the results can help the client identify particular goals which are not satisfied.

5. After the client has identified and clarified unsatisfied goals, she can begin to reconstruct the goal, the perceived situation, or combinations of the two.

When goals and perceptions are being reconstructed, several possibilities arise. The following questions suggest some of these possibilities:

How will the discrepancy between a specific natural goal and current perceptions be reconciled?

Can situations be changed so that the goal will be realized without major reconstruction ?

If the situation cannot be changed easily, can the client's perceptions be reconstructed so that the goal can be realized ?

Can the goal be reconstructed so that it can be realized with the current resources and effort ?

Is some combination of reconstructions necessary, so that both perceptions of the situation and the natural goal can be changed in ways that relieve the discrepancy ?

Reconstruction efforts will be influenced by the client's "wisdom" to know what can be changed and what can't be changed. The client's first problem-solving activity will probably be an effort to change the environment so as to attain the natural goal without reconstruction. Included in this definition of a client's environment is the client's perception of self. Therefore, some changes in the environment may include changing oneself. The distinction between "changing the environment" and "reconstructing perceptions of the environment" is an important one, although very difficult to make when self-perceptions are involved. When a client attempts to focus his attention, or exert more effort in a given direction, he is changing his environment without major changes in self-perceptions. However, when the client perceives himself in new ways, he is reconstructing that part of his environment. If these changes in environmental or situational perceptions do not permit the discrepancy between these perceptions and goals to be relieved, the client is more likely to work on the reconstruction of his goals.

The following methods are offered to facilitate the reconstruction of goals and perceptions:

a. The counselor creates an environment that reduces outside threats. This environment is facilitated by the absence of negative judgment. Nonjudgmental counselors create a sanctuary-like climate where clients can try out reconstructions without fear of negative reactions.

b. The counselor asks the client to describe the problematic situation from the perspective of other people, including people known to be quite different from the client.

c. The counselor also offers alternative constructions of the situation, as well as other goals which may be more attainable than the current one. When the counselor offers alternative constructions, she tries to emphasize the tentativeness of such offerings, ensuring that the client does not take these offerings as "recommended advice." The counselor tries to encourage the perspective that there can be several ways of characterizing a situation and no single one is the right one. The client is encouraged to consider alternative constructions as exploratory possibilities.

References.

Forster, J. R. (1982). *Goals articulation process.* Unpublished instrument, University of Washington Clinical Service and Research Center. Seattle, Washington.

Forster, J. R. (1985). "Investigating Personal Goals Using Personal Construct Theory and Grid Methods" in F. Epting and A. Landfield (Eds.), *Anticipating Personal Construct Psychology.* (pages 259-279), Lincoln, Neb. University of Nebraska Press.

Kelly, G. A. (1955). *The Psychology of Personal Constructs.* New York, Norton.

STEPS TOWARDS KNOWLEDGE SCIENCE

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There is growing convergence between psychology, systems theory and computer science towards what might be called knowledge science. Personal construct psychology is able to provide foundations for cognitive science that subsume previous information processing models and extend them to realms of human knowledge processes, including social interaction, creative thinking, emotion and personality. Systems theory is now at a stage where it can contribute a framework for these ideas that expresses them without unreasonable distortion. For psychology this opens up the possibility of an integrative theory encompassing all aspects of human life and contributing formal foundations to clinical, educational, social and applied psychology. For fifth and sixth generation computing systems this opens up the possibility of true human-computer symbiosis in which natural and artificial knowledge processes are fully integrated.

The Convergence of Psychology, Systems Theory and Computer Science

There is growing convergence between psychology, systems theory and computer science. The disciplines have interacted to become major influences on one another's development. The paradigm of *cognitive psychology* involves applying information processing concepts to human behavior (Newell & Simon 1972, Estes 1978). *General systems theory* (Von Bertalanffy 1968) and *cybernetics* (Wiener 1948) involve modeling the organism as an information processing entity. *Fifth generation computing* (Moto-oka 1982) offers natural person-computer interaction using techniques derived from artificial intelligence studies in computer science (Gaines 1984a). *Sixth generation computing* (STA 1985) is projected to integrate advances in neurology, psychology, linguistics and logic, into a new discipline, *knowledge science*, that will provide foundations for the knowledge-based systems of the future (Gaines 1986).

This convergence is now significant to the goals of each of these disciplines, all of which show immense promise but none of which has yet achieved its objectives. Cognitive psychology has concentrated on very limited aspects of human perception and cognition and has neglected key areas of psychological phenomena such as emotion and consciousness (Norman 1980). General systems theory and cybernetics have generated many interesting methodologies but no coherent overall theory with strong formal foundations and widespread application (Gaines & Shaw 1984). Fifth generation computing has been described by the Japanese as dependent on three major areas of development, hardware, software and human psychology, but the actual research program has activities only in the first two areas (Gaines 1984b); for the moment it is being assumed that classical logic adequately expresses human knowledge processes (Fuchi, Sato & Miller 1984), a dubious assumption. Sixth generation computing is still at a conceptual stage, and many doubt the possibility of the cross-disciplinary integration required.

We have argued in a number of papers that Kelly's *personal construct psychology* (PCP) provides the foundational material necessary and sufficient for the culmination of the convergence between the three disciplines (Gaines & Shaw 1981, 1984, Shaw & Gaines 1979, 1981):

- The information processing model of man may be subsumed and extended within PCP by generalizing the notion of information as suggested by Bar Hillel and Carnap (Bar Hillel 1964) to *semantic information*. PCP gives an operational explicatum for the notion of *search for meaning* as the basic human dynamic.
- General systems theory and cybernetics may be subsumed and extended within PCP by noting that they are products of the mind reflecting on nature, on itself, and on the results of its own reflection. PCP gives a theory of people theorizing, a fully recursive model of *man the modeler* and his models.
- The development of computational mind-tools may be subsumed and extended within PCP by using the theory of people as modelers to design computing that is consistent in its processes with that theory. PCP concepts are realizable through technology, both stand-alone as artificial intelligence, and interactively as a new medium extending man's capabilities through human-computer symbiosis.

The Systemic Nature of the Fundamental Postulate

Kelly's starting point, the fundamental postulate, is systemic in attributing the psychological processes of the person to his anticipation of the future:

"A person's processes are psychologically channelized by the ways in which he anticipates events." (Kelly 1955, p.46)

It is significant to note that this postulate does not mention constructs—they arise through the construction corollary, and that Kelly spends considerable effort on detailing the role and importance of each word in this statement. This postulate has great generality and the specific wording used cannot capture this fully. In a sense every word in it is technical and should be construed free of all previous associations. This is clearly impossible but may be approximated by taking each word as evocative through associations of the general principle being stated. The fundamental postulate as stated is a parable indicating a general principle.

In systemic terms the postulate may be paralleled as:

"An autonomous system is organizationally structured by the way in which it models information,"

- We use the term *autonomous* in the sense developed by Maturana (1975) and Varela (1979) as that distinction necessary and sufficient to chararacterize living organisms. Their characterization is organizational rather than physiological or teleological and specifies the structure of the system's organization rather than that of its cells or its goals. Pask (1981) and Zeleny (1977) have noted how the concepts apply to the psychological characterization of people and of social organizations, respectively.
- We use the term *models*, as Kelly does *anticipates* to encompass both prediction and action. in technological forecasting terms modeling may be either predictive or normative (Jantsch 1967). Whether we improve our models of the world by adjusting them to fit the world or the world to fit them is part of our modeling strategy, science does the first and technology the second, and the theory need make no fundamental distinction between them. Kelly (1955) emphasizes man the scientist forming a construct system to give meaning to experience, but he also gives examples of how this leads to action which changes the world and creates experience—PCP is also a theory of *man the technologist.*
- We use the term *information* as encompassing all sources and forms of message irrespective of their mode of transmittal. From a systemic point of view such messages arise as an artefact of our distinguishing one part of a system from another. To account for the correlations between processes boundaried by our distinction we have to hypothesize information passing between them. Natural boundaries are ones which minimize the message passing that we have to hypothesize, and delimit systems whose internal organization is substantially more complex than their external relationships. It is in this sense that autonomous systems are *informationally open* but *organizationally closed* (Varela 1979, Pask 1981).

The processes involving an autonomous system can be completely understood in terms of the structure necessary to organize information into a model. The logical or causal chain is from autonomy through organization to structure with modeling as an inferred telelogical principle. If we look for a deeper explanation then it lies in survival as the underlying dynamic. The organism devotes its capacity to self-organization to maintain its identity and then applies its surplus capacity to modeling its environment to the extent that the environment is relevant to its survival. *Anticipation projects survival into the future.*

The Modeling Hierarchy

Systemically, what Kelly terms a construct may be called a *distinction*, a concept upon which it is possible to build logical calculi of great generality (Brown 1969, Gaines & Shaw 1981,1985). Distinctions are not just static partitions of experience. They may be operations: actions in psychological terms; processes in computational terms. The role of distinctions at the base level of all models is evident in Klir's (1976) hierarchy of modeling shown in Fig.1. The loop from events through distinctions up through the modeling hierarchy and then down again to predictions and actions characterizes what Shaw (1980) has termed the *personal scientist* as an individual or the *communal scientist* as a group. Note that the upper levels of modeling are totally dependent on the system of distinctions, or personal constructs, used to express experience through the source system. Klir developed this hierarchy for work on symbolic modeling systems and Gaines (1977) has shown that it forms a basis for general knowledge acquisition algorithms.

This hierarchy does not introduce any additional primitives beyond that of making a distinction. The levels of the hierarchy are the results of distinctions that we make. Thus the *source system* is distinguished as those distinctions that the particular personal scientist makes; it is a distinction about distinctions defining the construct system of an individual. The *data system* is distinguished as those distinctions that have been made about a particular event; again a distinction about distinctions defining an event. The *generative system* is distinguished as a set of distinctions that also defines an event; these are model-generated rather than event-generated. It is the match between the model-generated and event-generated distinctions that determines the degree of approximation of the model to the world; this is a distinction about distinctions among distinctions that defines goodness of fit.

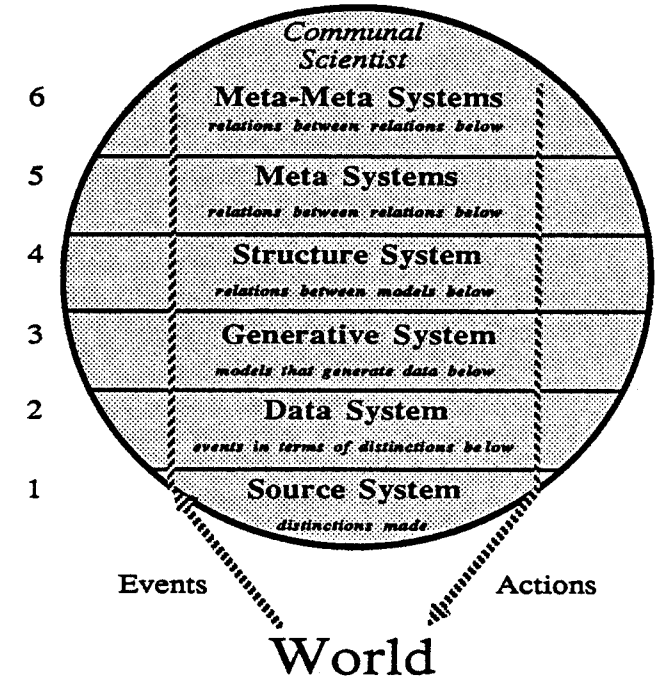

Fig.1 Distinctions in the modeling hierarchy

The systemic hierarchy based on a calculus of distinctions has an analog based on personal constructs (Gaines & Shaw 1981) shown in Fig.2. The lowest level is one of constructs, distinctions made in interacting with the world. The next level is one of experiences, events which happen to us, and we make happen, in terms of the distinctions already made. Levels above these are hypotheses which are rationalizations of experience, analogies between these rationalizations, abstractions of these analogies and transcendencies which are preconceptions underlying rationality. Interaction with the world is, therefore, mediated through the construct system to produce experience which is modeled through the higher levels and leads to predictions, decisions and actions again mediated through the construct system.

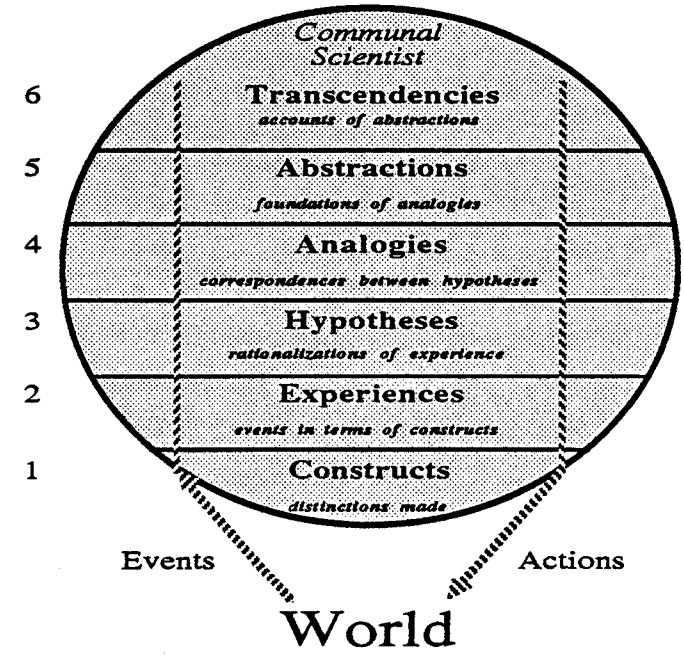

Fig.2 Construction hierarchy of communal scientist

Reflective Equilibrium—The Communal Scientist

The anticipatory processes of the modeling hierarchy extend naturally to those of society by viewing groups of people as larger cross-sections comprising multiple individuals (Shaw & Gaines 1981, 1986a, Shaw 1985). This concept may be given deeper significance by considering the inductive inference process underlying knowledge acquisition and modeled in the hierarchy. Whereas the deductive logical inference that underlies the operation of conventional computers is well-understood and well-founded, the inductive inference that underlies human learning is not. Deduction guarantees to take us from valid data to valid inferences, but the inferences are thereby part of the data—no new knowledge is generated. Induction takes us from valid data to models of that data that go beyond it—by predicting data we have not yet observed, and by giving explanations of the data in terms of concepts that are unobservable. Induction generates new knowledge but, as Hume (1739) pointed out over 200 years ago, the process is not deductively valid and it is a circular argument to claim that it is inductively valid.

Philosophers have continued to debate Hume's arguments and search for justification of the inductive process. Goodman (1973) proposed that we accept the circularity but note that it involves a dynamic equilibrium between data and inference rules as shown in Fig.3: "A rule is amended if it yields an inference we are unwilling to accept; an inference is rejected if it violates a rule we are unwilling to amend" Rawls (1971) in his theory of justice terms this a reflective equilibrium. Recently Stich and Nisbett (1984) noted flaws in Goodman's argument and repaired them by proposing that the equilibrium is social not individual: "a rule of inference is justified if it captures the reflective practice not of the person using it but of the appropriate experts in our society." This argument arose in the context of the explanation of the authority of experts in society, but it is also significant in suggesting that the basic system underlying knowledge acquisition has to be taken as a society rather than an individual.

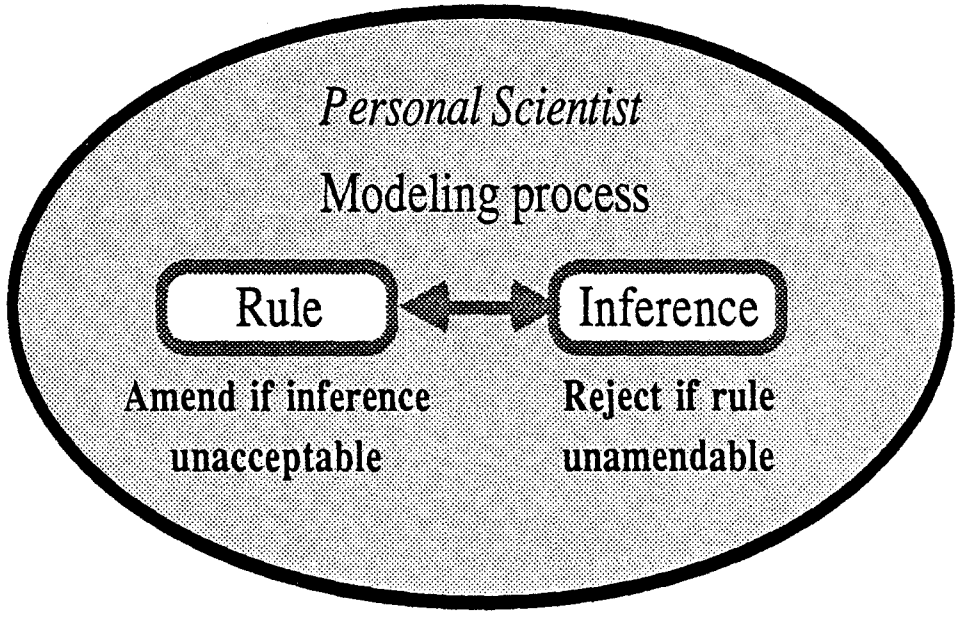

Fig.3 Reflective equilibrium in inductive reasoning

The extension of the modeling hierarchy to social processes is straightforward since Fig.1 presents a general modeling schema and applies as much to groups of people, companies and societies as it does to the roles of a person. The epistemological hierarchy of a person is a cross-section of the epistemological hierarchy of the society generating their life-world. Pask's (1975) concept of P-Individuals as the basic units of psycho-socio-processes allows roles, people, groups, organizations and societies to be treated in a uniform framework (Shaw & Gaines 1981, 1986a). An individual is defined in cognitive terms as a psychological process (Pask 1980) and more complex psychological and social structures may be defined similarly by taking into account the possibilities of timesharing, process switching and distributed processing with psychological processors. For example, one person may assume many psychological roles (process switching), whereas a group of people working together may act as a single goal-seeking entity and hence behave as one process (distributed processing).

Surprise, Preference and Language

A modeling schema results from distinctions about distinctions at each level in the hierarchy. In prediction the key distinction is to what degree a level accounts for the information flowing through it and hence we have termed this distinction one of *surprise* (Gaines 1977), borrowing the term from the economist Shackle (1955). Surprise goes in opposition to the degree of membership (Zadeh 1965, Gaines 1983) of a predicted event to an actual event and the expected surprise is a form of entropy. Surprise at the lowest level of the hierarchy corresponds to distinctions being inadequate to capture events; surprise at the next level to inadequate variety to experience events; at the next level to inadequate approximation to predict events; at the next level to inadequate simplicity to explain events; at the next level to inadequate comprehensiveness to account for events.

The formal theory of modeling is one in which models are selected at each level down the hierarchy to minimize the rate at which surprise is passing up the hierarchy. The criteria for model selection independent of the data are generally thought of as being ones of *simplicity/complexity*: of two models which fit the data equally well choose the simplest. However, notions of simplicity/complexity are not well-defined nor intrinsic to the class of models. The simplicity/complexity ordering is arbitrary and in its most general form is just one of *preference*. Hence the general modeling schema is one in which surprise flows up the hierarchy and preference flows down. In situations that are mathematically well-defined, such as determining the structure of a stochastic automaton from its behavior, such a model schema gives the correct results. Conversely, the success of the schema in stabilizing with regard to a given universe defines the characteristics of that universe. We can construct probability theory from the assumption that certain modeling schema stabilize (Gaines 1977).

The basic modeling system is one in which surprise flows up the hierarchy and preference flows down. Surprise is generated from experience so that it is easy to see its origins. However, where does preference come from? To some extent it may be preset, genetically encoded. However, this does not seem to account for the origins of novel models. *Language* is a way of by-passing the normal modeling procedures and interacting directly with the system at any level. In particular it can directly affect the preference system. Language is essential to much of human learning and our interaction with the knowledge construct (Wojciechowski 1983, Gaines & Shaw 1983) is just as important as our interaction with the world (Shaw & Gaines 1983a).

Surprise, Emotion and System Formation

Surprise is a primitive systemic notion. It is the feedback to a modeling system that what is being modeled does not accord with the model. Melges (1982) notes that:

> "the normal function of emotions is to attune the person to overall discrepancies between the present and the future so that he adjusts his plans of action to his future images."

Thus human *emotions* may be seen as derived from surprise with the type of emotion varying according to circumstances. The deviation from the model may be construed as having adverse or beneficial consequences, being distracting, requiring attention, investigation, action, and so on. This is consistent with Kelly's notion that negative emotions arise through the violation of core constructs (McCoy 1981). In the modeling hierarchy such core constructs are distinctions that we prefer not to change. Positive emotions arise from distinctions that we prefer to change. From a systemic point of view human feeling tones are signals directing the inductive inference process.

Gray (1979) gives further insight into the system dynamics involved by linking the emotions with the processes of system formation. He introduces his notion of *system-forming precursors* as part of his emotional-cognitive structure theory for understanding creative thought processes. Emotions are integrating devices for the formation of thoughts and coding devices for memory. System formation occurs when precursors are brought together: activators initiate emergence of an organizing focus allowing entry to a group; and blockers inhibit emergence of an organizing focus preventing entry to a group. *Lock-out* is a situation in which blockers prevent entry to a group which may lead to the behavior of break-in, and *lock-in* is that in which withdrawal from a group is prevented which may lead to the behavior of break-out.

If we view a group as a surviving system that is dependent on its members for its own existence then the system dynamics proposed by Gray may be seen as part of the overall life cycle of the role of an individual within a group shown in Fig.4:

- At the first stage shown at the bottom of the diagram an individual who is not part of the group is attracted to it but resists the attraction: the *pull-in—stay-out* dynamics. In systemic terms there is a possibility of bringing the expertise represented by the distinction system of the group into the

reflective equilibrium of the individual. In personal construct terms: the attraction is summed up in Kelly's choice corollary, that alternatives are chosen through which greater possibilities for definition and extension of the model are anticipated; the reluctance stems from the need to discard core constructs in accepting the system characterizing the group. Maslow (1971) sees the pull-in as satisfying a need to belong and the systemic model gives the process underlying that need. Gray's blockers are the core constructs which we are reluctant to discard in accepting the system of the group and his activators are those where we welcome the discard.

- At the second stage the individual has decided to attempt to join the group but now faces the barriers to membership, the requirement to acquire the core constructs of the group in order to become recognized as a valid member and not as a stranger in Simmel's (1950) terminology. This constitutes the *lock-out—break-in* dynamics.
- At the third stage the individual has become part of the group but this is not a static process since the reflective equilibrium between his inference processes and those of the group must be maintained. This constitutes the *push-out—stay-in dynamics.*
- At the fourth stage the individual has decided to reject the construct system of the group but has difficulty in ceasing to make distinctions which now correspond to his core constructs. This constitutes the *lock-in—break-out dynamics.*

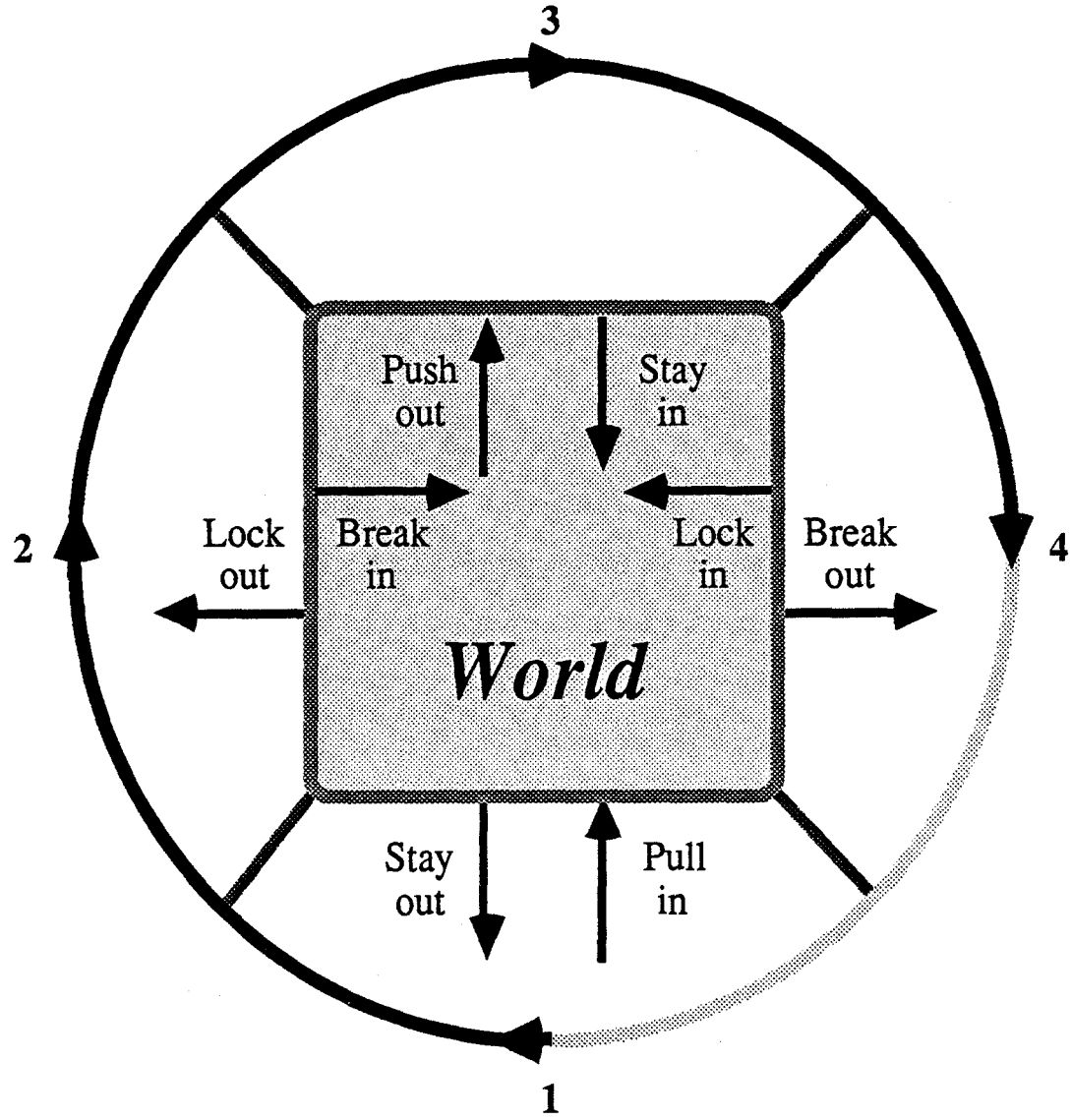

Fig.4 The life cycle of membership in a group

Constructive Alternativism in the Modeling Hierarchy

Kelly (1955) places the major emphasis of his work on the notion of *constructive alternativism* (Mancuso & Adams-Webber 1982), that we have a choice in our construct systems at every level in the hierarchy and that real-world problems may often be solved by exercising this choice. Note that this should not be interpreted as an idealist position that ascribes all phenomena to our interpretation of them. Since the construct hierarchy also leads to decision and action, changes in it may equally affect the real world. Kelly and Brown are both neutral to a philosophical stance such as idealism versus realism. It is the distinctions which a philosopher makes that determines his stance and these can be analysed in terms of the epistemological and knowledge hierarchies. PCP is reflexive and the only fundamental principle, apart from that of anticipation, is that of constructive alternativism.

The hierarchy is strongly idiosynchratic and formalization does not imply uniformity. Constructive alternativism emphasizes the dynamic and personal nature of the construct system. It is subject to change according to feedback from failure to anticipate events. It is individualistic in the constructs used, in the vocabulary used to name the constructs, in the relations between constructs in the hierarchy, and in those constructs most likely to change when necessary. Problems of communication arise because of the individualistic nature of construct systems. A person may be able to use his construction system whilst having no basis for communicating it to others. Two people may use exactly the same construct yet refer to it by different names. Two people may use the same names for a constructs and yet use it in different ways. Two people may use similar constructs at the lower level of the hierarchy and yet have them organized in different systems such that their reactions to the same event are quite different. Two people may have similar constructs at nearly all levels of the hierarchy and yet construe a novel event differently.

Another source of major individual differences is the emphasis on the construct system at different levels. The richness of the system will vary according to the focus of attention over a prolonged period. Core constructs are not necessarily superordinate in the hierarchy described here but can occur at any level. The notion of level emphasis gives an interesting taxonomy of individual types:

- Those whose primary concern is below level 1 will live for the sake of experience without having to have the means to describe it at level 1, remember it at level 2, explain it at level 3, value explanations at level 4, or value value-systems at level 5. Doers, people of action, existentialists emphasize this level.
- Those whose primary concern is at level 1 will seek a rich enough vocabulary to be able to express experience as they feel it. This may constrain what they are prepared to admit as experience. Poets, artists, linguistic precisionists emphasize this level.
- Those whose primary concern is at level 2 will seek to record as much experience as possible. This may constrain what vocabulary they allow and what they are prepared to admit as experience. Chroniclers, fact gatherers emphasize this level.
- Those whose primary concern is at level 3 will seek for a rich enough vocabulary of models to account for and subsume all their experience. This may constrain what they are prepared to admit as experience. Empirical scientists emphasize this level.
- Those whose primary concern is at level 4 will seek for analogical relations between models. This may change the perspectives of all lower levels. Paradigm changers and general systems theorists emphasize this level.
- Those whose primary concern is at level 5 will seek for abstract formulations of relations between models. This may change the vocabulary of all lower levels. Mathematicians and theoretical scientists emphasize this level.
- Those whose primary concern is at level 6 will seek values to determine paradigms but they are now so remote from experience that they will have to impose values rather than discover them. This may filter all lower levels. Religious leaders, mystics and world modelers emphasize this level.

Expressing a General Theory

What can we ask of a good general theory? First, the theory should not be expressed in such a parochial form as to be obsoleted by developments, or changes of fashion, in the modes of theoretical expression of our time. Mathematics is a tool for precise expression of theories in the sciences. However, mathematics is itself subject to rapid development so that new tools are continuing to become available. This is important because the mathematical expression of a theory imports presuppositions which are often tacit and go beyond those intended. Lewin (1935) fell into this trap with his psychological vector fields, Hull (1943) with his multiplicative habit and drive strengths, and Von Bertalanffy (1968) with his linear differential equations. Kelly (1955) avoided it by adumbrating PCP through the theoretical framework of a postulate and corollaries but avoiding any mathematical expression of them. He was wise to do so—the

mathematics and logic available in the 1950s were inadequate to encapsulate PCP without substantial distortion. The situation has improved today with the development of category theory and modal logics and there is hope that the tools may be adequate. We have suggested elsewhere (Gaines and Shaw 1984) that the criterion for an adequate general systems theory is that it should adequately represent the foundational notion of a construct, and argued that this is possible with a mathematical foundation prior to Fregean logic and set theory.

The second requirement for a good general theory is that it should be instantiable in a variety of forms, some subject to formal demonstrations of power and adequacy, and others subject to empirical demonstrations. This is the other side of the coin to our first requirement, that, although the theory should not be expressed in too parochial a form, it should have models that are so expressed and can be tested as required. One family of tests is the subsumption of existing classes of model for the relevant phenomena, for example information processing based on logic, automata, computability, complexity and probability theories. These may be termed tests of the theory instantiated in Popper's World 3 (Popper 1968). Another family of tests is the subsumption of existing classes of data appertaining to the relevant phenomena, for example human prediction and action as exhibited in the laboratory and everyday life. These may be termed tests of the theory instantiated in Popper's World 1. Another family of tests is the subsumption of existing forms of explanation that are comprehensible and acceptable to people, for example commonsense to the man in the street and expressible in the jargon of the expert in any discipline whether pure or applied. These may be termed tests of the theory instantiated in Popper's World 2. We believe PCP can satisfy all three forms of test and hope these notes sketch a basis for this.

Summary and Conclusions

This paper has concentrated on conceptual foundations and it is important to note that the framework for knowledge science presented here has proved highly applicable. For example, we have used it to model the socio-economic infrastructure of information technology, showing how generations of technology arise through individual and social processes (Gaines & Shaw 1986b). We have also developed programs that have been applied in a wide range of applications including knowledge engineering for expert systems (Shaw & Gaines 1983b, 1986b,c). Similar programs based on personal construct psychology have found extensive industrial application (Boose 1986). The theory of surprise described here has provided the essential mathematical foundations for the analysis of the data from such systems (Gaines & Shaw 1986a).

Returning to our opening theme, we noted a growing convergence between psychology, systems theory and computer science. We have concentrated in the notes above on the systemic foundations of personal construct psychology and the links between the formal model and human psychology. We believe that systems theory is now at a stage where it can contribute a framework for Kelly's ideas that expresses them reasonably well and does not distort them. Personal construct psychology is able to provide foundations for cognitive science that subsume previous information processing models and extend them to realms of human emotion and personality. For psychology this opens up the possibility of an integrative theory encompassing all aspects of human life and contributing formal foundations to clinical, educational, social and applied psychology. For future computing systems this opens up the possibility that aspects of inter-personal interaction may be programmed to add to person-computer interaction the overtones so significant in person-person interaction. It also opens up the possibility of true human-computer symbiosis in which natural and artificial knowledge processes are fully integrated.

It is the summation of all these possibilities, and others related to them, that we see as steps towards a new integrative meta-discipline which we have termed *knowledge science*.

Acknowledgements

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References

Bar-Hillel, Y. (1964). **Language and Information: Selected Essays on Their Theory and Application.** Reading, Massachusetts: Addison-Wesley.

Boose, J.H. (1986). Rapid acquisition and combination of knowledge from multiple experts in the same domain. **Future Computing Systems,** In press.

Brown, G.S. (1969). **Laws of Form.** London: George Allen & Unwin.

Estes, W.K. (1978). The information processing approach to cognition: a confluence of metaphors and methods. Estes, W.K., Ed. **Handbook of Learning and Cognitive Processes Volume 5: Human Information Processing.** pp. 1-18. Lawrence Erlbaum.

Fuchi, K., Sato, S. & Miller, E. (1984). Japanese approaches to high-technology R&D. **Computer**, 17(3), 14-18 (March).
Gaines, B.R. (1977). System identification, approximation and complexity. **International Journal of General Systems**, 3, 145-174.
Gaines, B.R. (1983). Precise past—fuzzy future. **International Journal of Man-Machine Studies**, 19(1), 117-134 (July).
Gaines, B.R. (1984a). Foundations of fifth generation computing. **Proceedings of CIPS SESSION 84**. pp. 500-508. Calgary: Canadian Information Processing Society (May).
Gaines, B.R. (1984b). From ergonomics to the Fifth Generation: 30 years of human-computer interaction studies. **Proceedings of INTERACT'84: 1st IFIP Conference on Human-Computer Interaction**. Amsterdam: North-Holland.
Gaines, B.R. (1986). Sixth generation computing: a conspectus of the Japanese proposals. **ACM SIGART Newsletter 95**, 39-44.
Gaines, B.R. & Shaw, M.L.G. (1981). A programme for the development of a systems methodology of knowledge and action. Reckmeyer, W.J., Ed. **General Systems Research and Design: Precursors and Futures**. pp. 255-264. Society for General Systems Research (January).
Gaines, B.R. & Shaw, M.L.G. (1983). Is there a knowledge environment?. Lasker, G., Ed. **The Relation Between Major World Problems and Systems Learning**. pp. 27-34. Society for General Systems Research (May).
Gaines, B.R. & Shaw, M.L.G. (1984). Hierarchies of distinctions as generators of system theories. Smith, A.W., Ed. **Proceedings of the Society for General Systems Research International Conference**. pp. 559-566. California: Intersystems.
Gaines, B.R. & Shaw, M.L.G. (1985). Three world views and system philosophies. Banathy, B.H., Ed. **Proceedings of the Society for General Systems Research International Conference**. pp. 387-396. California: Intersystems.
Gaines, B.R. & Shaw, M.L.G. (1986a). Induction of inference rules for expert systems. **Fuzzy Sets and Systems**, 18(3), 315-328 (April).
Gaines, B.R. & Shaw, M.L.G. (1986b). A learning model for forecasting the future of information technology. **Future Computing Systems**, 1(1), to appear.
Goodman, N. (1973). **Fact, Fiction and Forecast**. Indianapolis: Bobbs-Merrill.
Gray, W. (1979). Understanding creative thought processes: an early formulation of the emotional-cognitive structure theory. **Man-Environment Systems**, 9, 3-14.
Hull, C.L. (1943). **Principles of Behavior**. New York: Appleton-Century-Crofts.
Hume, D. (1739). **A Treatise of Human Nature**. London: John Noon.
Jantsch, E. (1967). **Technological Forecasting in Perspective**. Paris: OECD.
Kelly, G.A. (1955). **The Psychology of Personal Constructs**. New York: Norton.
Klir, G.J. (1976). Identification of generative structures in empirical data. **International Journal of General Systems**, 3, 89-104.
Lewin, K. (1935). **A Dynamic Theory of Personality: Selected Papers of Kurt Lewin**. New York: McGraw-Hill.
Mancuso, J.R. & Adams-Webber, J.R., Eds. (1982). **The Construing Person**. New York: Praeger.
Maslow, A.H. (1971). **Motivation and Personality**. New York: Harper & Row.
Maturana, H.R. (1975). The organization of the living: a theory of the living organization. **International Journal of Man-Machine Studies**, 7.
McCoy, M.M. (1981). Positive and negative emotion: a personal construct theory interpretation. Bonarius, H., Holland, R. & Rosenberg, S., Eds. **Personal Construct Psychology: Recent Advances in Theory and Practice**. pp. 95-104. London: MacMillan.
Melges, F.T. (1982). **Time and the Inner Future: A Temporal Approach to Psychiatric Disorders**. New York: John Wiley.
Moto-Oka, T., Ed. (1982). **Fifth Generation Computer Systems**. Amsterdam: North-Holland.
Newell, A. & Simon, H.A. (1972). **Human Problem Solving**. New Jersey: Prentice-Hall.
Norman, D. (1980). Twelve issues for cognitive science. **Cognitive Science**, 4(1), 1-32.
Pask, G. (1975). **Conversation, Cognition and Learning**. Amsterdam: Elsevier.
Pask, G. (1980). Developments in conversation theory—Part I. **International Journal of Man-Machine Studies**, 13(4), 357-411 (November).
Pask, G. (1981). Organizational closure of potentially conscious systems. Zeleny, M., Ed. **Autopoiesis**. New York: North-Holland.

Popper, K.R. (1968). Epistemology without a knowing subject. Van Rootselaar, B., Ed. **Logic, Methodology and Philosophy of Science III.** pp. 333-373. Amsterdam, Holland: North-Holland Publishing Co.

Rawls, J. (1971). **A Theory of Justice.** Cambridge, Massachusetts: Harvard University Press.

Simmel, G. (1950). **The Sociology of Georg Simmel.** Wolff, K.H., Trans. New York: Free Press.

Shackle, G.L.S. (1955). **Uncertainty in Economics.** Cambridge University Press.

Shaw, M.L.G. (1980). **On Becoming a Personal Scientist.** London: Academic Press.

Shaw, M.L.G. (1985). Communities of knowledge. Epting, F. & Landfield, A.W., Eds. **Anticipating Personal Construct Psychology.** pp. 25-35. Lincoln: University of Nebraska Press.

Shaw, M.L.G. & Gaines, B.R. (1979). Externalizing the personal world: computer aids to epistemology. Ericson, R.F., Ed. **Improving the Human Condition: Quality and Stability in Social Systems.** pp. 136-145. Kentucky: Society for General Systems Research (August).

Shaw, M.L.G. & Gaines, B.R. (1981). The personal scientist in the community of science. Reckmeyer, W.J., Ed. **General Systems Research and Design: Precursors and Futures.** pp. 59-68. Society for General Systems Research (January).

Shaw, M.L.G. & Gaines, B.R. (1983a). Computer systems in the knowledge environment: a new medium. Lasker, G., Ed. **The Relation Between Major World Problems and Systems Learning.** pp. 35-41. Society for General Systems Research (May).

Shaw, M.L.G. & Gaines, B.R. (1983b). A computer aid to knowledge engineering. **Proceedings of British Computer Society Conference on Expert Systems,** 263-271 (December). Cambridge.

Shaw, M.L.G. & Gaines, B.R. (1986a). A framework for knowledge-based systems unifying expert systems and simulation. Luker, P.A. & Adelsberger, H.H., Eds. **Intelligent Simulation Environments,** 38-43 (January). La Jolla, California: Society for Computer Simulation.

Shaw, M.L.G. & Gaines, B.R. (1986b). Interactive elicitation of knowledge from experts. **Future Computing Systems, 1**(2), to appear.

Shaw, M.L.G. & Gaines, B.R. (1986c). An interactive knowledge elicitation technique using personal construct technology. Kidd, A., Ed. **Knowledge Eliciation for Expert Systems: A Practical Handbook.** To appear. Plenum Press.

STA (1985). **Promotion of R&D on Electronics and Information Systems That May Complement or Substitute for Human Intelligence.** Tokyo: Science and Technology Agency.

Stich, S.P. & Nisbett, R.E. (1984). Expertise, justification and the psychology of inductive reasoning. Haskell, T.L., Ed. **The Authority of Experts.** pp. 226-241. Bloomington, Indiana: Indiana University Press.

Varela, F.J. (1979). **Principles of Biological Autonomy.** New York: North-Holland.

Von Bertalanffy, L. (1968). **General System Theory.** London: Penguin.

Wiener, N. (1948). **Cybernetics.** New York: Wiley.

Wojciechowski, J. (1983). The impact of knowledge on man: the ecology of knowledge. **Hommage a Francois Meyer.** pp. 161-175. Marseille: Laffitte.

Zadeh, L.A. (1965). Fuzzy sets. **Information and Control, 8,** 338-353.

Zeleny, M. (1977). Self-organization of living systems: a formal model of autopoiesis. **International Journal of General Systems, 4.**

DEVELOPING A PEGASUS PROGRAM FOR SYSTEM PRECURSOR/SYSTEM FORMING PROCESSES

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ABSTRACT

The utilization of interactive computer programs to help people gain awareness that they are thought creating creatures has to date been limited to an elaboration of George Kelly's Personal Construct Theory on the psychological side, and to an elaboration of relational data base theory, expert system theory and multivalued modal logics on the technological side by Shaw, Gaines et al. It is our intent to develop an experiment which would test the cross applicability of the PLANET series of interactive computer programs developed by Shaw and Gaines (PEGASUS, FOCUS, ARGUS, ENTAIL, PRINGRID, CORE, MINUS and SOCIOGRIDS) with System Precursor/System Forming Theory.

For many years we have been involved in developing System Precursor/System Forming Theory as a necessary component of system theory and practice (Gray 1973, 1981a, 1981b, 1982). Acts of system forming blend autonomy and individuality to processes that would be purely passive if the world were indeed totally systemic. Although our work indicates that the primary system precursor/system forming activity of the human Brain/Mind is of Emotional-Cognitive Structuring type, this area remains as yet resistant to the detailed elaboration that would be required for testing. There is a subset, however, of Emotional-Cognitive Structures which we have been able to detail sufficiently to allow for testing. The emotions involved are those of feeling Locked Out (LO), feeling Locked In (LI), of feeling like Breaking In (BI) or feeling like Breaking Out (BO). In this subset the System Precursor/System Forming nature of the interaction of feelings and actions is quite evident. In general, if one feels Locked Out a system forming action of Breaking In will result (although complementary Locking Out or Breaking Out or Away are also possible), while if one feels Locked In a system forming action of Breaking Out will usually occur (complementary Locking In may also occur).

Another set of system forming actions tends to follow if one Locks other people Out or In and when Break In or Break Out become the system precursors rather than the system formings. In addition preferential modes exist among these various system precursor or system forming feeling tones. Dimensions of intensity/modulation, sensitivity/tolerance, and rigidity/capacity for change are fundamental in determing outcomes from the system precursor/system forming linkups. We suspect that there is considerable congruence between Personal Construct Theory and System Precursor/System Forming Theory and that System Precursor/System Forming Theory will extend the usefulness of Personal Construct Theory. At this meeting we will present the

development of a PEGASUS bank friendly to the aspect of system precursor/system forming activity that we plan to use.

Our problem to date is that we are having difficulty in getting the PEGASUS program to allow us to have direct access to listing a series of 12 ELEMENTS. This can only be accomplished when PEGASUS detects that two of the ELEMENTS that we have picked are too close together in terms of the CONSTRUCTS we are using. We would like to revise the PEGASUS BANK so that it will automatically allow us from 12 to 20 ELEMENTS. We would like our ELEMENT list to be composed of four friends, four family members, four workmates, four nations, and four social groupings. In this set of twenty ELEMENTS it is the OTHER, whether friend, family member, workmate or social grouping, that takes the System Precursor (SP) role, while we tend to react to this SP with various types of System Forming. It would be helpful for people to gain a clearer awareness about whether the people and groupings with whom they interact the most are primarily Locking Out or Locking In in character, and about their own preferred mode of System Forming when faced with these different types of System Precursors.

It is a fascinating aspect of the PLANET set of programs that they tend to provide an interactive environment that is neither Locking Out nor Locking In in character. Most likely, then, the particular program used could be included in the list of elements considered as ENVIRONMENTS.

But each of us can also be considered as the System Precursor of the Lock Out etc. paradigm. Here we are the Locker Outers or the Locker Inners, and the interesting question is, "To what degree are we aware of the type of System Forming that our preferred mode produces in others?" If we are inveterate Locker Outers we may, through the use of PEGASUS, gain some insights as to why it is that others tend to break in on our privacy, or why it is that others give up rather quickly in their attempts to become friends with us, that is, when their system formation to our Locking them Out is a complementary Lock Out of ourselves.

A second major problem that we have run into in attempting to use the PEGASUS program as it presently exists is that it tends to cut us off at a level of four or five CONSTRUCTS when we had planned to use perhaps a dozen or more. Here PEGASUS is Locking us Out, and our System Forming reactions fluctuate between angry wishes to Break In so that PEGASUS would allow us the number of CONSTRUCTS we would like to use, and a complementary System Forming Lock Out reaction to PEGASUS in which we walk away and consider it not worthwhile to pursue.

In any case we probably have a larger set of CONSTRUCTS than can be accomodated in a single run of PEGASUS and we are beginning to realize that an interactive System Precursor/System Forming relationship with PEGASUS cannot be singular, but must be with a PEGASUS series, or with PEGASI. Reversals of the System Precursor/System Forming relationship probably have to be dealt with differently, in different runs of PEGASUS. One run would have to deal with situations where being Locked Out or Locking Out are in the System Precursor position, and the System Forming that results in oneself and others are primarily forms of

Breaking In or complementary Locking Out. When the primary System Precursor is being Locked In or Locking In the most usual System Formation will be various forms of Breaking Out or of complementary Locking In. Thus people who fall in love either with another person, a group formation or a field of activity are those whose response to Lock In System Precursors are complementary Lock Out System Formations. Such complementary System Formations are the origin of the capacity for intimacy. Similarly, those who tend to be Locker Outers or who tend to Break Out when faced with Locking In situations are on the way to developing a sense of individuality. If such complementary System Formings do not attenuate over time they tend to become pathological and make the development of needed degrees of both individuality and intimacy impossible.

Situations in which there is a reversal of the System Precursor/System Forming positions would probably require yet an other run of the PEGASUS program. For example, as children grow older and there is a developing relationship between people and their primary social grouping, Break In or Break Out activity become the primary System Precursors, and Lock Out or Lock In System Forming takes place. Here factors such as whether Break Our or Break In activities become intense and even overwhelming are highly significant in determining overall outcome. Similarly, the degrees of development along a Rigidity/Tolerance Scale in the case now of those in the System Forming Role are equally critical in determining outcomes.

The Intensity/Modulation dimension, which includes capacity for insight and appropriate change, is fundamental in determining overall outcome for the individual involved, as well as for societies, nations and the welfare of the world as a whole. Our experience has been that people are quite unaware of the Lock Out etc. System Precursor/System Forming pairings, and that finding ways to increase their awareness leads to capacity for modulation and change and surprisingly better overall outcome.

An additional PEGASUS BANK could be developed to deal with those situations in which the forms of Break In and Break Out are illegal, such as Breaking and Entering (e.g.,into houses, stores, factories) or Running Away and Truancy. Our own experience is that this has been very helpful in the treatment of those individuals labeled as criminals or delinquents. (Gray and Esser, 1979)

We hope that the PEGASUS BANK that we are developing may prove its usefulness in the larger spheres of international conflict that in the atomic age threaten the existence of our species. The intensity of the Lock In/Lock Out dichotomy to date blocks the possibility of any fruitful dialogue between the different ideologies and cultural belief systems of the religious groups, nations and tribes that inhabit our world. Each tends to Lock In its own members and to consider any degree of Break Out or dissent as a traitorous matter, while at the same time Locking out the other religious groups, nations and tribes, a situation which effectively eliminates any fruitful degree of understanding and any possibility of seeing and acting on the essential brotherhood of man. We have written about this in articles on the urgent need for

consensus developing approaches (Gray, Gray and Esser, 1985), on the uniquely and intensely System Forming character of the human species (Gray, 1982), and on a consideration of Crime and Juvenile Delinquency as Intra-National War and of War as Inter-National Crime and Juvenile Delinquency (Gray, Esser and Gray, 1986), and in all of these the intensity and totality of Lock Out and Lock In System Precursors have blocked all attempts at resolution to date. The possibility that PEGASUS types of programs can be of help also in this area is promising and intriguing. Such a possibility and the reasons for it are discussed with great clarity by Brian Gaines and Mildred Shaw and must be quoted.

> "It would be easy to assume that such interactive programs are merely more convenient ways of eliciting construct systems through extensions of Kelly's repertory grid and do not themselves add anything qualitatively new to the process. However, such an assumption would be missing certain crucial psychological factors in the man-computer situation and its differences from the man-man situation. We have observed informally in making PEGASUS available to a wide range of people in a variety of situations that those coming to it for the first time often seem to find it a very dramatic experience. They react to it intensely and become gripped by the interactive process of construct elicitation. They also feel that they are learning something new from the process and are prepared to use this in determining their behaviour.
>
> "Probably such involvement is also significant in the elicitation of construct systems by a person rather than computer interaction. However, we believe there are certain quite fundamental differences when the elicitation is done in such a way that interpersonal interaction is clearly absent. In particular, when a <u>person</u> is feeding back comments and guidance it is a natural and ready assumption that the constructs are being <u>injected</u> rather than elicited. It is easy for the subject to believe that the elicited constructs do not come from himself but that a tutorial or debating situation with another person is taking place. It is necessary to <u>persuade</u> him that this is not so and the persuasion has to be stronger the more striking and significant the constructs elicited. However, when a computer is the tool by which his construct structure is being reflected or laid bare then such an assumption of outside injection and interference is far less tenable.
>
> "When constructs are being elicited by a computer program then it is more likely to be accepted that it is precisely and only oneself that is being portrayed. We 'trust' a computer program to be doing just what it appears to be doing without deeper motivations and without attempting to persuade us to its point of view. No one is telling the user anything. He is seeing in interacting with PEGASUS, possibly for the first time, the basis for his own thought processes. Very often extreme surprise is the first reaction. If another person were eliciting the construct structure then the surprise would be taken as an indication that he was incorrect and one would ignore him or argue with him. With computer elicitationit is more likely that one will accept the reflected structures as being self-generated and the surprise acts as motivation to know more.

"That this knowledge can be totally private to oneself is another important feature of interaction with the computer. We do not like, as Kelly put it, to be 'caught with our constructs down.' When another person is involved we are more reluctant to expose and explore our constructs the more surprising they are; perhaps because the surprise is often the result of a conflict between our ostensive value judgements and the basis of our behaviour. Or it may just be sloppy verbal behaviour: that we are naming two distinct constructs with the same label. For example, in using PEGASUS a scientist found that he was using the word 'time' to label several different constructs and generating confusion in his arguments because of this.

"Another reason that we are reluctant to explore construct structures freely in interacting with another person, particularly a professional person, is that we are acutely aware of the possible 'waste' of their time."

We will conclude here with a sample of the kinds of CONSTRUCTS that we have been experimenting with. It must be understood that their apparent limitation results from the refusal of PEGASUS to allow us the 10 or 12 CONSTRUCT sets that we would like to use. In one run our CONSTRUCTS were

LHP	RHP
PM BI/LO (PM = Preferred Mode)	PM BI/LI
PM LI/BO	PM LI/LI
PM BO/LO	PM BO/LI
PM LO/LO	PM LO/BI

In another trial run our CONSTRUCTS were

LHP	RHP
Strong BIER (BIER = Breaker Inner)	WeakBIER
Discriminate LIERS (LIERS = Locker Inners)	Indiscriminate LIERS
Modulated LIERS	Strong LIERS
Discriminate LOERS (LOERS = Locker Outers)	Indiscriminate LOERS

In an other run our CONSTRUCTS were

LHP	RHP
LO Lasting	LO Brief

LO Prone	LI Prone
Active LOER	Modulated LOER
LO Sensitive	LO Tolerant
LI Sensitive	LI Tolerant
Job BI Good	Job BI Poor

In another CONSTRUCT run we chose CONSTRUCT names that would be equivalent to those expressed in Lock In, Lock Out et al. language. Thus,

LHP	RHP
Remains sociable	Withdrawn
Remnains joyful	Gets depressed
Extrovert	Introvert
Business sociable	Nonbusiness sociable

In regard to ELEMENTS we have chosen to deal with people we know, including ourselves, our family, friends, etc. We will in the near future include nations, religious and social groupings.

If our project succeeds it will extend George Kelly's Personal Construct Theory and practice to the area of System Forming processes, and, we hope, will extend their usefulness to a variety of fundamental areas such as scientific creativity, System Precursor/System Forming function in learning, and international relations

REFERENCES

1. Gaines, B.R. and Shaw, M.L.G. New directions in the analysis and interactive elicitation of personal construct systems. In M.L.G. Shaw (Ed.), Recent Advances in Personal Construct Technology. New York: Academic Press, 1981.

2. Gray, W. Emotional-cognitive structures: a general systems theory of personality. General Systems XVIII, 167-173, 1973.

3. Gray, W. The evolution of emotional-cognitive and system precursor theory. In J.E. Durkin (Ed.), Living Groups: Group Psychotherapy and General System Theory. New York: Brunner/Mazel, 1981a.

4. Gray, W. System-forming aspects of general system theory, group forming and group functioning. In J.E. Durkin, op.cit., 1981b.

5. Gray, W. Humanism and general system theory: a neuro-psycho-socio-cultural system precursor/system forming model. In W. Gray, J. Fidler

and J. Battista (Eds.), General System Theory and the Psychological Sciences, Vol. I. Seaside, CA: Intersystems Publications, 1982.

6. Gray, W. and Esser, A.H. Hypercycles of criminal system formation and their resolutions. Legal Medical Quarterly 3:2, 101-109, 1979.

7. Gray, W., Esser, A.H. and Gray, L.R. Conflict resolution from a TERTRA (inTERnational/inTRAnational) perspective. In press. To appear in American J. of Social Psychiatry 6:4, Fall, 1986.

8. Gray, W., Gray, L.R. and Esser, A.H. Blufaerdighed: A Danish contribution to ecology of knowledge, pluriculturalism and peaceful coexistence. Man-Environment Systems 15, January, 1985.

Death Threat, Religiosity, And Fear Of Death: A Personal Construct Perspective

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Forty males completed the provided form of the Threat Index (TIp), the Repertory Grid (RG), the Religiosity Scale (Faulkner and DeJong, 1965), the Dimensions of Religious Ideology Scale (Putney and Middleton, 1961), the Templer Death Anxiety Scale (Templer, 1970), and the Collet-Lester Fear of Death Scale (Collet and Lester, 1969). Death threat scores derived from the TIp and RG correlated moderately. Significant negative correlations were found between death threat and components of religiosity. The personal construct measures of threat correlated with fear of death of self and fear of dying of self on the Fear of Death Scale.

INTRODUCTION

There have been extensive studies into death threat from within personal construct theory (see Epting & Neimeyer, 1984, for a review). These studies have investigated the relationship between a measure of death threat (termed the Threat Index or TI) derived from PCT and other measures of death concern. However, these studies have been limited by the use of death specific constructs, global ratings of other variables (e.g., religiosity, fear of death), and restricting the sample to college populations. This study addressed these shortcomings through the use of Repertory Grid measures of death threat, multifaceted measures of other variables, and the use of a non-college sample of participants.

METHOD

Forty men (20 ministers and 20 controls matched for age and educational level) completed the TIp and a version of Kelly's (1955) Repertory Grid. Ratings of "preferred self", "self", and "death" were made on all constructs on both instruments using thirteen point scales. Three threat scores were derived from each of these two tests. First, the number of instances in which self and preferred self was rated on one pole of a construct and death was rated on the opposite pole of the same construct was computed. This score was termed "preferred self-self/death split (PS-S/D). Similarly, a second score was computed assessing self/death splits (S/D). Finally, difference scores between self and death ratings were assessed.

Subjects also completed Templer's (1970) Death Anxiety Scale (TDAS), Collet-Lester (1969) Fear of Death Scale (FODS), the Religiosity Scale (RS), (Faulkner and DeJong, 1965), and the Dimension of Religiosity Ideology Scale (DRIS) (Putney and Middleton, 1961). The FODS is divided into four subscales - fear of death of self, fear of death of others, fear of dying of self, and fear of dying of others. The Religiosity Scale contains subscales measuring ideology (core beliefs necessary to religious life), intellect (knowledge about the tenents of faith), ritualistic behavior (religious activities), experiential issues (notions of personal experiences with God), and consequential effects of religion (effect of religiosity in the person's life). The Dimension of Religious Ideology scale is divided into four dimensions - orthodoxy (central beliefs), fanaticism (individual's desire to share religious beliefs), importance (pervasiveness of beliefs in one's life), and ambivalence (ambivalence concerning beliefs). The entire administration took approximately one and one half hours. The order of these tests was counterbalanced. Subjects were tested in groups no larger than five.

RESULTS

Death Threat Measures

Correlations between the death threat instruments are found in Table 1. Different threat measures correlated highly with one another for each instrument. However, the correlations between measures based upon the two instruments are substantially lower. This suggests that these measures are tapping into different aspects of death threat. These results support the position that providing constructs for a person assesses death threat differently that eliciting personally relevant dimensions of experience.

Death Threat, Fear of Death, and Death Anxiety

Table 2 shows correlations between the threat measures and the death concern scales. Since these results are consistent with previous research (Kreiger et al, 1974; Neimeyer et al, 1977; Neimeyer and Chapman, 1978), the correlations support the generalizability of the threat measures to non-college populations. Dividing the FODS into specific subscales, the personal construct measures of death threat significantly correlated with fear of death of self and fear of dying of self. The personal construct measures did not correlate with fear of death of others and fear of dying of others. These results are consistent with the notion of personal construct measures tapping into the personal experience of death and dying.

Death Threat and Religiosity

The results in Table 3 show that threat measured on the RG significantly correlated with eleven of the twelve subscale measures of religiosity. In addition, TIp measures only

Table 1

Correlations Between Death Threat Measures

	TIp			RG		
	S/D	PS-S/D	DIFF	S/D	PS-S/D	DIFF
TIp						
S/D	___	.99***	.88***	.51**	.55**	.48*
PS-S/D		___	.90***	.48**	.54**	.48*
DIFF			___	.49**	.54**	.61***
RG						
S/D				___	.93***	.71***
PS-S/D					___	.71***
DIFF						___

Note. TIp—Threat Index; RG—Rep Grid; S/D—Self/Death Split Score; PS-S/D—Preferred Self-Self/Death Split Score; DIFF—Difference Scores.

*p < .05. **p < .001. ***p < .0001.

Table 2

Correlations Between Threat and Death Concern

	TIp			RG		
	S/D	PS-S/D	DIFF	S/D	PS-S/D	DIFF
TDAS	.08	.03	.08	.22	.14	.10
FOD1	.41***	.39**	.34*	.45***	.49***	.24
FOD2	-.03	-.03	.04	.03	.07	.12
FOD3	.38**	.34*	.35*	.43***	.40**	.20
FOD4	-.03	-.08	-.004	.06	-.03	-.06
FODT	.27	.23	.25	.34*	.32*	.17

Note. TIp—Threat Index; RG—Rep Grid; S/D—Self/Death Split Scores; PS-S/D—Preferred Self-Self/Death Split Scores; DIFF—Difference Scores; TDAS—Templer's Death Anxiety Scale; FOD—Collet-Lester Fear of Death Scale; FOD1—Fear of Death of Self; FOD2—Fear of Death of Others; FOD3—Fear of Dying of Self; FOD4—Fear of Dying of Others; FODT—Total Fear of Death.

*p < .05. **p < .01. ***p < .005.

Table 3

Correlations Between Death Threat and Religiosity Measures

	TIp			RG		
	S/D	PS-S/D	DIFF	S/D	PS-S/D	DIFF
RS1	-.08	-.04	-.07	-.37*	-.20	-.32*
RS2	-.30	-.25	-.27	-.48***	-.39**	-.41**
RS3	-.21	-.19	-.22	-.35*	-.24	-.36*
RS4	-.14	-.10	-.04	-.40*	-.26	-.24
RS5	-.12	-.08	-.11	-.37*	-.28	-.37*
RST	-.21	-.17	-.18	-.46***	-.32*	-.40**
RS8T	-.16	-.12	-.12	-.39*	-.24	-.33*
DRI1	-.36*	-.31*	-.31*	-.51***	-.36*	-.48***
DRI2	-.41**	-.36*	-.27	-.20	-.13	-.17
DRI3	-.23	-.19	-.20	-.37*	-.28	-.35**
DRI4[a]	.37*	.32*	.34*	.44***	.30	.48***
DRIT	-.34*	-.29	-.27	-.43***	-.30	-.40**

Note. TIp--Threat Index; RG--Rep Grip; S/D--Self/Death Split Score; PS-S/D--Preferred Self-Self/Death Split Scores; DIFF--Difference Scores; RS--Religiosity Scale; RS1--Ideology; RS2--Intellectual; RS3--Ritualistic; RS4--experiential; RS5--Consequential; RST--Total Religiosity Score; RS8T--Condensed Total Religiosity Score; DRI--Dimentions of Religious Ideology Scale; DRI1--Orthodoxy; DRI2--Fanaticism; DRI3--Importance; DRI4--Ambivalence; DRIT--Total Religiosity Score.

[a] DRI4 is negatively scored with the other religiosity scales.

*p < .05. **p < .01. ***p < .005.

correlated with four of the religiosity subscales. These subscales were all part of the Dimensions of Religiosity Scale. It is also interesting to note that the self/death splits and the difference scores yielded most of significant correlations. This suggests that it is something specific to how a person views the self in relation to death which strongly affects the relationship with religiosity.

DISCUSSION

TIp versus RG

A central finding of this study was the correlations of .48 to .61 for the TIp and RG measures of death threat. These correlations imply that the methods are neither congruent nor interchangeable. Thus, eliciting constructs relevant to one's day to day interpersonal functioning taps something quite different than providing death relevant constructs. This difference may be due to the nature of the various constructs. The TIp uses death specific constructs which are provided for the individuals. On the other hand, the constructs used with the RG are elicited from the individual and may be more relevant to the person's daily life.

Future studies should assess death threat based upon the TIe (a form of the TI in which constructs are elicited) and RG in order to determine the impact of eliciting death relevant constructs as opposed to the provision of constructs. Further, replicating death threat studies with RG measures will allow for indepth exploration into the possible aspects of death threat being assessed. This research should help us understand what is being addressed by these different threat measures.

Generalizability

The results of this study support the generalizability of the TIp to non-college populations. The results derived from comparisons between threat and death concern scales (i.e., TDAS, FOD) were consistent with past research. These results are important in that they provide support for the validity of the TIp and RG as measures of death threat in non-college samples. Thus, investigators may be able to place more confidence in the applicability of these measures to the general population.

Religiosity and Death threat

This study also clarified the relationship between death threat and religiosity. TIp threat scores only correlated significantly with the orthodoxy, fanaticism, and ambivalence subscales of the Dimensions of Religious Ideology scales. In contrast, the RG measures of threat correlated with eleven of the twelve measures of religiosity.

One explanation of the discrepancy between RG and TIp correlations may be found in the theoretical argument

concerning death specific constructs versus daily relevant constructs. Religion is something that is important in an individual's day to day experiences and is not restricted to contexts surrounding death. The RG provides a more general sense of the person's construal process on a daily basis. Thus, the RG should reveal more relationships between death threat and religiosity than the TIp.

In summary, this study provided a number of conceptual and empirical advances over past research. First, the use of RG methodologies reoriented death threat research toward the eliciting of personal dimensions of meaning. Further, relationships between death threat and variables such as religiosity and fear of death were clarified in significant ways. Finally, the results have implications for new lines of research.

References

Collet, L. & Lester, D. (1969). The fear of death and the fear of dying. Journal of Psychology, 72, 179-181.

Epting, F. R. & Neimeyer, R. A. (Eds.). (1984). Personal meanings of death. Washington: Hemisphere/McGraw-Hill.

Faulkner, J. E., & DeJong, G. F. (September, 1965). Religiosity in 5-D: An empirical enalysis. Paper presented at the American Sociological Association Convention, Chicago, Ill.

Kelly, G. A. (1955). The psychology of personal constructs (Vol. 1). New York: Norton.

Krieger, S. R., Epting F. R., & Leitner, L. M. (1974). Personal constructs, threat, and attitudes toward death. Omega, 5, 299-310.

Neimeyer, R. A. & Chapman, K. (1980). Self/ideal discrepancy and fear of death: The test of an existential hypothesis. Omega, 11(3), 233-240.

Neimeyer, R. A., Dingeman, P. M., & Epting, F. R. (1977). Convergent validity, situational stability, and meaningfulness of the threat index. Omega, 1, 251-265.

Putney, S. & Middleton, R. (1961). Dimensions and correlates of religious ideologies. Social Forces, 39, 285-290.

Templer, D. I. (1970). The construction and validation of a death anxiety scale. Journal of General Psychology, 82, 165-177.

COMMUNICATING PCP TO STUDENTS

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Abstract: This paper is one of the four readings assigned to participants in the Workshop on Communicating Personal Construct Psychology. This manuscript focuses on communicating PCP to students. In particular, I talk about my experiences in teaching an undergradute course on Person Perception. My second workshop manuscript, following this one, focuses on communicating PCP within one's profession. Robert Monaghan also will contribute two papers for the workshop.

I share PCP with students within four contexts. First, I teach a Person Perception course for University Juniors and Seniors who have taken at least twelve hours of psychology. Second, I teach a Graduate Seminar on PCP. Third, I talk individually with graduate students about clinical and research applications of PCP.

Focusing on the Person Perception course, I limit enrollment to 28 students. Although the course initially is over-assigned by admissions people, I soon discourage about five students from continuing the class. I tell them that they will be writing two Learning Diaries that will represent their thoughtful integrations and applictions of course material; using as grist for their implicative mills--lectures, class discussions, and readings--most of which emphasize PCP.

I require a signed statement that all redings in books amd handouts have been completed. Class attendance is taken by a roll sheet being signed each class period. More than three unexcused absences will lead to a lowering of class grade. I stress the importance of writing and thinking for oneself and how critical it is to keep up with assigned readings and "thinking notes."

This last semester, most students indicated (unsigned statements) that the quiz over the basic statements of Kelly (from his paperback and my lectures) was helpful. Usually, at least fifty percent of the class evaluate the professor as B plus or better in relation to other professors. At least eighty percent indicate that they would take another course from the professor.

The one class quiz, over the Kelly paperback and my own lecture elaborations is govem at the end of the five weeks period in the 15-16 weeks semester. I tell students that they will be asked to paraphrase, in several sentences, any one of

the main theoretical statements of PCP. Before the quiz at the start of the sixth week, I will have briefly paraphrased Kelly's major statements, including giving some concrete examples from my direct experience with people, including some clinical material.

Although I assign some reading on Attribution Theory, using the book, Encounters with Others, I do not talk much, if at all, about this book which is quite readable. It is read in the last five weeks of class. Two or three students will allude to this book in their second Learning Diary. Most will focus on implications of PCP, maybe because that is what I talk about. Fully one-half of the students will find PCP most interesting and will write some excellent diaries. One will hear such comments as--"This is the only theory that helps me make sense of myself." "I wish I had known about the theory earlier." "It makes human beings of us all, lay persons and scientists." "My other psychology courses did not say much about things that would be useful for me personally."

Although a large majority of students seem to like the course, about two students will dislike it and the professor intensely. The reasons are many. The relativity of PCP and lack of absoluteness frightens some. Certain students do not want to engage in inquiry, about self or others--even though they are taking a person perception course. Then there are students who just want to pass a test. Certain "grade getters" , used to taking structured tests and knowing things, feel threatened by the possibility of not getting the A grade. The neophyte behaviorist finds his simplistic ideas threatened. Of course, most students feel initially threatened by the "openness" of the Learning Diary. At the end of the course, most students tend to evaluate the Learning Diary most highly, sometinmes as better than the professor.

An effort is made to bring PCP alive in a blood and guts way. My clinical experience does help. Although I do talk about research, I certainly am not as detailed in my description of studies as at the graduate level. Throughout the class sessions, I ask students to converse in groups of three about such questions as "How might a person be seen accurately and inaccurately by others." "What are some of the most useful and least useful ways of describing persons?" "How do you see the potential strengths and weaknesses in extroversion and introversion?" "How do persons you know use the same descriptive adjectives differently?" "What do you tend to notice most and least on first acquaintance with males; with females?" "What Kellian ideas might help to explain marriages that work out best and those that work out less well?"

In designing lectures and small group discussion topics, one must take into consideration those events that seem most vital for students not far removed from adolescence. Relations with parents; close friendships with others; and, vocational and

marital anticipations become critical topics. Often, we talk about relating to other cultures. Favorite topics seem to focus on theoretical correlates of bigotry and stereotyping; marital success and failure; impression formation; and correlates of liking and disliking which can be very neatly related to Kelly's concepts of threat and guilt amd to my own application of an extension of Kelly's threat-- the Self Movement Interpretation of Interpersonal Threat Students seem particularly interested in PCP applications to clinical problems, such as alcoholism, and more generally to psychotherapy.

The course is a smorgasbord of awreness, insights, and ways of seeing things within larger framworks. Things I wish to accomplish relate to helping students understand that many different contexts can underlie what may seem like the same kind of behavior. Further, I want students to become acutely aware that the same words can have diferent meanings for different persons; and, that different words can have similar meanings for persons. Finally, I want them to appreciate their lives as journeys and adventures, the outcomes of which can not be pinpointed by parents, teachers, or psychologists. And, within certain limits, life can be created and recreated by the person, if he has the courage to stretch out and take some risks.

COMMUNICATING PCP WITHIN ONE'S PROFESSION

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Abstract: This paper is one of the four readings assigned to participants in the Workshop on Communicating Personal Construct Psychology. This manuscript focuses on communicating PCP to colleagues. The primary thrust of the paper is to emphasize areas of construct investigation that might arouse the interest of those less acquainted with construct psychology.

The issues of self identity, personal valuing, life span development, cultural or environmental influence, and the creative use of computers attract the attention of many investigators. If the writers and researchers within PCP also become concerned about these issues, other professionals may become interested in our observations and opinions.

When George Kelly assigned the construing of self to a subordinate position within his theory, i.e., subordinate to the construing person and to the dimensions of his construct system, he separated himself from those who emphasize self image, self identity, and self enhancement as the primary determinants of behavior.

Rather than placing these aspects of self awareness at the forefront of his theory, Kelly instead elevated the construing and anticipating person to a central position of influence. Thus, self awareness was not equated with the construing person and identity became one of the many possible constructions that might affect behavior.

Of course, Kelly did emphasize the usefulness of Self Characterization and Role Experimentation. He also talked about guilt as an awareness of dislodgement from core role structure. In regard to the concept of threat, he took an early interest in Landfield's self movement hypotheses. In these latter hypotheses, one's constructions of self--past, present and future, were used as the basis for predicting interpersonal problems. However, it was the investigator who inferred change in self. In other words, subject awareness of directions in his chnging self, although interesting, was not required for the self movement hypotheses of threat.

Although Kelly chose not to place the awareness of self at the center of his theory, the powerful influence of self construction was not denied. However, he did make a special place in his Sociality Crorollary for one's understandings of

the viewpoints of other persons.

By defining one's axes of personal meaning as superordinate to particular statements about self or others, Kelly left open the question of how important certain acquaintances, including oneself, might be in understanding the person's behavior. A construction of self could be elevated to a significant position within a person;s system. The concept of core structure, for example, does allow the investigator to envision a particular person's self identity as as a vital part of one's construct system.
Pursuing this idea of core structure, it can be argued logically that we live with ourselves more than we live with any one other person. And, as a consequence, it is potentilally possible for us to experience more feeling and meaning in relation to ourselves than in relation to others. Statements of construct theory do not seem to refute this kind of logic.

However, in saying that we have more time with ourselves, we are not implying that every person will construe self more than others or will construe self as more significant than others. Perhaps many persons in Western Culture attend to self more than to others. But, do all persons in Western Culture conform to this hypothesis?

A need to elevate self to a more important position within construct theory has been observed. Note the attempt by Laurie Thomas (1979) to define a self awareness corollary and again note the special section on self found in the 5th Congress book, Anticipating Personal Construct Psychology(1985)

Another area of concern for investigators is the place of value structures in our lives. Rokeach, the social psychologist, devoted much of his career to the pursuit of values. As for the construct researcher, it does seem that he or she is in a unique position to measure individual structures of valuing. After all, so many of our person and social situational constructs have postive and negative poles of reference. This is particularly true when we focus on significant persons or significant situations in our lives. Perhaps we should begin to talk more about value constructions and personal systems of valuing.

However, as we talk about value constructions, we are confronted with a stumbling block. We encounter the difficulty of assessing hierarchical strucutres. Rokeach mentioned this to me when he appeared on the Nebraska Symposium for Motivation. Perhaps, we are beginning to find ways of assessing hierarchical structures within PCP. However, until we develop better messures of ordinal construction, we can not fully appreciate Kelly's Organization Corollalry and we also can not do justice to research on human

values.

Continuing to the issue of child and life span development, are there ways in which we can more vigorously enter this field of inquiry? Only in the most general ways did Kelly tell us about development. How we can best enter the area of child and life span development is not clear. We want to avoid spurious growth curves of that non-existant average person. And, we must develop better ways of inferring the construct systems of children. After all, conventional Rep Tests have their limitations. Then, the PCP investigator will want to plot different pathways to develppment. And, do we really need a stage theory that charts the same sequences of development for all persons?
Moving to another issue, the impact of particular environmental and cultural backgrounds beconmes a central question for many psychologists and sociologists. How can the construct theorist best describe these cultural contexts within the format of personal construing and anticipation? If we can say more about constructions within environmental contexts, which are themselves constructions, other professionls may listen to us.

That culture does change suggests that there are both common and individuallized constructions within any given culture at any given time. Without question, constructions common to family and community become the grist for our constructive mills. Common constructions do influence us, but perhaps in more individualized ways than we fully recognize. Thus, the PCP investigator must study both the common and individualized ways persons construe events witin a community. In summary, the PCP investigator may avoid the trap of assuming monolithic and all determining cultural forces--strngely disengaged from moment to moment human understanding and interaction.

Finally, I want to mention the fascinating area of computer science, a field that holds out much hope to the construct researcher who must measure the intracacies of human conceptual systems. More of us should play about with computer programs and interactive systems for self learning. At the same time, we must carefully study the most optimal blending of computer interaction with interpersonal contact between subject and investigator. I would anticipate shifts in this optimal blending depending on the nature of the mission or project.

These are but a few of the issues that the construct investigator must confront if he or she is to more fully engage the attention of other professionals.

References

Epting, F. R. & Landfield, A. W., Eds. (1985). Anticipating Personal Construct Psychology. Lincoln: University of Nebraska

Press.

Thomas, L. f. (1979). Construct, reflect, and converse: the conversational reconstruction of social realities. In P. Stringer & D. Bannister (Eds.). Constructs of Sociality and Individuality. London: Academic Press.

Personal Construct Theory and Humanistic Psychotherapy

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The compatibilities between PCT and humanistic psychotherapy will be explored in a discussion between the author and the audience. The focus of the discussion will be on Kelly's use of the term "process", the "person vs. construct" issue, the Sociality Corollary, and issues around optimal functioning. All of these issues, central to Kelly's view of the person, have implications which are consistent with humanistic and existential writings. An outline of the topics for discussion is presented below.

INTRODUCTION

Although others (e.g., Bruner, 1956) classified it as a "cognitive" theory, Kelly (1955) was deliberately vague about the construing of personal construct theory. This vagueness was due to his discomfort with traditional categorizations like "cognitive," "behavioral," "humanistic," etc. Kelly's vagueness may be related to the confusion with which PCT is construed today. For example, some texts on theories of personality clearly place Kelly in the mainstream cognitive camp (e.g., Maddi, 1980) while others (e.g., Rychlak, 1981) argue for a more humanistic/existential understanding of the theory. This difference of opinion also exists among PCT therapists and researchers today. This paper will focus on four aspects of Kelly's work which are most compatible with more humanistic and existential writers. In so doing, I am not arguing that PCT is a humanistic theory. Rather I merely am pointing to certain compatibilities between PCT and humanistic writers. These four issues are: 1) the notion of process, 2) the "person vs. construct" issue, 3) the Sociality Corollary, and 4) optimal functioning. Each of these four issues will be addressed in turn.

PROCESS. Humanistic psychologists are fundamentally committed to a notion of the person as a growing organism (e.g., Maslow, 1968; Rogers, 1951). Kelly also was firmly committed to the humanistic assertion that persons continually grow, evolve, and change. Such a commitment can be seen in his use of the term "process" throughout the theory. For example, the fundamental postulate clearly spells out that one's processes are psychologically channnelized by how one anticipates events. In other words, people are a process of change which is channelized by our constructs. Given that Kelly argued that each word of the fundamental postulate was carefully chosen, it is hard to discount the importance of his view of the person as process.

Such a view is re-emphasized in his Sociality Corollary which Kelly considered to be among his most important. In this corollary, a role relationship is defined as one person construing the construction process (not the constructs) of another. In other words, to have a ROLE (Leitner, 1985) relationship with you, I have to construe the process of your construing -- not the content of your constructs. Such an emphasis on process assumes that you are an active, evolving organism who will continue to grow.

"PERSON VS. CONSTRUCT". Although most PCT research and theorizing focuses on constructs, Kelly clearly distinguished between constructs and the person doing the construing. In this regard, the fundamental postulate and 10 of the eleven corollaries discuss a person who construes -- not a person who is his or her constructs. The person, then, is enshrouded in mystery (Mair, 1977) and can be known only indirectly through his or her acts of construing. Since we cannot be directly known, we are, in a fundamental sense, alone. This position is quite consistent with existential writings (e.g., Yalom, 1980). (As a matter of fact, I believe that an excellent predictor of whether a person sees PCT as more existential or as more cognitive has to do with this issue. To the extent that a theorist focuses on constructs, the theorist sees Kelly as cognitive; to the extent the theorist focuses on the person doing the construing, the theorist sees Kelly as existential. The fact that Kelly focused on both aspects may be related to his discomfort with any classification of PCT!)

SOCIALITY COROLLARY. Elsewhere (Leitner, 1985, in press), I have discussed many implications of the Sociality Corollary. I have argued that, within this corollary, are implications which suggest that a person both strives for and is terrified by deep interpersonal understandings (termed ROLE relationships). When our terror is too great, we may attempt to define relationships in ways which preclude such deep understandings. However, if we are successful in doing this, we experience emptiness, meaninglessness, and guilt. The many obvious connections between this position and the writings of modern existential psychology will be elaborated in the discussion.

OPTIMAL FUNCTIONING. Kelly (1980) as well as other construct theoreticians (e.g., Epting & Amerikaner, 1980; Leitner, 1983) have discussed the notion of psychological health. The discussion of the humanistic implications of these positions can be presented in two ways. First, the concern with psychological health is a theoretical characteristic which most humanistic theories share. Second, specific aspects of PCT views of the optimal person contain many similarities to the views of humanistic and existential writers. Two examples of these views are the importance of creativity and

courage for optimally functionally persons.

REFERENCES.

Bruner, J.S. (1956). Review of George A. Kelly's The psychology of personal constructs, Vol. I & II Contemporary Psychology, 1, 355-357

Epting, F.R. & Amerikaner, M. (1980). Optimal functioning: A personal construct approach. In A.W. Landfield & L.M. Leitner (Eds.), Personal construct psychology: Psychotherapy and personality. New York: Wiley.

Kelly, G.A. (1955). The psychology of personal constructs. New York: Norton.

Kelly, G.A. (1980). A psychology of the optimal man. In A.W. Landfield & L.M. Leitner (Eds.), Personal construct psychology: Psychotherapy and personality. New York: Wiley.

Leitner, L.M. (1983). Sociality and optimal functioning. Presented at the Fifth International Congress on Personal Construct Theory, Boston, MA.

Leitner, L.M. (1985). The terrors of cognition: On the experiential validity of personal construct theory. In D. Bannister (Ed.), Issues and approaches within personal construct theory. London: Academic.

Leitner, L.M. (in press). Crisis of the self: The terror of personal evolution. In R. Neimeyer & G. Neimeyer (Eds.), A casebook in personal construct psychotherapy. New York: Springer.

Maddi, S. (1980). Personality theories: A comparative analysis. Homewood, Ill.: Dorsey.

Mair, J.M.M. (1977). Metaphors for living. In J. Cole & A. Landfield (Eds.), Nebraska symposium on motivation, Vol. 24. Lincoln: Nebraska Press.

Maslow, A. (1968). Toward a psychology of being. New York: D. Van Nostrand.

Rogers, C. (1951). Client centered therapy. Boston: Houghton Mifflin.

Rychlak, J. (1981). Introduction to personality and psychotherapy. Boston: Houghton Mifflin.

Yalom, I. (1980). Existential psychotherapy. New York: Basic

SOME USES OF PCT AND THE REPTEST IN SOCIAL PSYCHOLOGICAL RESEARCH

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ABSTRACT

A 15-year research program has centered around personal constructs and the Reptest. In experimental social cognition, people responded more positively on first acquaintance to those who shared their constructs. Further, characteristics of new acquaintances which were presented in personal construct terms had more impact than other characteristics in determining their likableness. In studies of attitudinal correlates of behavior, women who were schematic for sex roles on the Reptest had higher association between sex role attitudes and nontraditional physical activities than did those who were aschematic. Finally, constructs reflected more traditional values than did responses to a standard sex role inventory.

INTRODUCTION

The main purpose of this report is to discuss the usefulness of PCT and the Reptest in a nonclinical context. Specifically, my research focuses on some of the universal processes of social cognition, as they relate to individual differences. Some of these processes have been studied experimentally and some correlationally, but in all cases the focus is on general principles of social psychology, not on the qualities of specific individuals. The work has been done in collaboration with several generations of Master's students.

EXPERIMENTAL SOCIAL COGNITION

Experiments in social cognition are attempts to simulate under controlled conditions the complexities of everyday social events and of our reactions to them. One such event is forming impressions of new acquaintances. The favorableness of first impressions has been shown to be of great importance in predicting future interactions and, prior to my research, it had been established (cf. review by Huston & Levinger, 1978) that favorableness of impressions was a direct function of the extent to which one perceived the new person as being similar to oneself in social attitudes/values.

One of the purposes of my research was to show that similarity in the use of personal constructs was as powerful a determinant of attraction as similarity of social attitudes. Using the Byrne and Nelson (1965) proportionality research paradigm, we used Reptest responses as the basis for manipulating similarity.

Method

First, each subject took the Reptest in a Research Mode which I have devised that permits group administration and written responses which can be associated with the individual without violating privacy. It

is done as follows: Each subject is given a set of code initials and numbered white index cards (in this case, 12) on each of which s/he is to write the name of someone who is well known personally and who has been important in his/her life. In this experiment, they were each asked to write ME on card #1, and five well-liked persons of the same gender as themselves on cards #2 through #6. Then cards #7 through #12 were each to have the name of someone of the same gender whom they did not like as much or might even dislike.

The cards are then presented in triads (20 in this case) by the experimenter calling Person Card numbers aloud. The triads had been constructed in this experiment so as to balance the liked and disliked persons. For each triad, the subject writes a "similarity" shared by two of the persons on a yellow card, indicating their Person Numbers only. Then the "difference" of the remaining person is written on a green card, with that Person's Number indicated.

In the study for which I shall report data here, the subjects had been told before beginning that we were collecting short descriptions given by college students of others, about the same age as themselves, whom they know well personally. They were also told that this study was part of a cooperative research project with an East Coast college, and that the descriptions they gave today would be mailed to that college to ensure confidentiality in use. They were further told that when they returned for the second half of the study, two weeks later, they would be reacting to descriptions by students of the other college. Finally, they were told that they would take the white Person Cards with them when they left today for complete privacy.

This Research Mode of the Reptest has several advantages for research purposes:

1. Descriptions of personally relevant target persons are obtained, without anyone but the subject knowing who was described. Thus, subjects write freely, minimizing self-censorship.
2. There is minimal pressure upon subjects to "look good" or be socially desirable in their responses, since they are identified only by code letters and no one--including the experimenter--ever knows who is who. Furthermore, subjects are unaware that there is any interest in them personally; their attentional focus is on the target persons being described.
3. Descriptions are spontaneous, without any "provided constructs", and thus are truly reflective of personal constructs.

In this study, the next step was to scale the constructs for "likableness". Each construct pole was put into 3 or 4 word form by omitting unnecessary words without changing those retained, or by adding "she is" and other noncontent words for lengthening as needed. Each was typed on a separate card. The cards were shuffled thoroughly and then each was rated on a 5-point scale for "likableness" by two judges working independently, and by comparison with a standardized list of scaled personality characteristics (Anderson, 1964). Only

those constructs which all three judges agreed were positive or negative were used in the experimental sets of Session 2.

To prepare the stimuli for Session 2, sets of descriptions were developed for each subject. Every description contained four different constructs. Half the sets contained all positive ("likable") constructs and half all negative ("dislikable"). Of these sets, 20% contained all 4 from the subject's constructs; 20% contained 3 from the subject and 1 randomly chosen from other subjects' constructs; 20% contained 2 from the subject; 20% had 1 from the subject; and 20% had all 4 from other subjects. Thus, 100%, 75%, 50%, 25% or 0% of the particular description consisted of the subject's own constructs. A few practice and filler descriptions were used also, containing a mix of positive and negative items, randomly chosen from the entire pool; they were not scored.

The subject, returning for Session 2 two weeks after Session 1, was presented with a packet of descriptions and a corresponding packet of rating scales.

Here is a sample description for each of two conditions:

[25% condition; positive]	[75% condition; negative]
D.D. said about A.B.	M.K. said about J.E.
an exciting individual	a self-indulgent person [PC]
seems to be clever [PC]	she is a perfectionist
she is very friendly	she is a loser [PC]
makes others happy	she is unloyal [PC]

And a sample rating-scale page, with the scales more widely spaced:

D.D. [source person]

Like:___:___:___:___:___:___:___:___:___:___:___:___:Dislike

A.B. [target person]

Like:___:___:___:___:___:___:___:___:___:___:___:___:Dislike

Of course, the bracketed material above was not presented to the subjects.

Subjects were told that roommates at the Eastern College had described each other privately (as they had done with their friends last session), and they were now reading those descriptions. The initials were not real, but code letters just as theirs had been. They were receiving only one roommate's description of the other--never both from the same pair. We wanted their first impressions of how likable they personally would find the roommate being described [Target Person] and the roommate giving the description [Source Person]. Our ostensible purpose was to see whether these short descriptions allow people to form clear impressions. We had them write some paragraphs describing their impressions of the practice cases to buttress the cover story, to provide evidence of the complexity of impressions formed, and finally to ascertain that their English was adequate to the experimental task.

Results

As predicted, the likableness of positively described target persons increased as a linear function of proportion of the subject's own personal constructs used in the description; the likableness of negatively described target persons decreased as a linear function of the proportion of own personal constructs.

Also as predicted, the likableness of the source person increased as a function of proportion of personal constructs used, for both positively and negatively described target persons.

These findings can be seen in Figure 1. The F-ratios (1/76) for linear component were significant beyond the .01 level in all cases. The proportion of variance explained by the linear component ranged from .76 (Source Person, Negative) to .96 (Target Person, Negative).

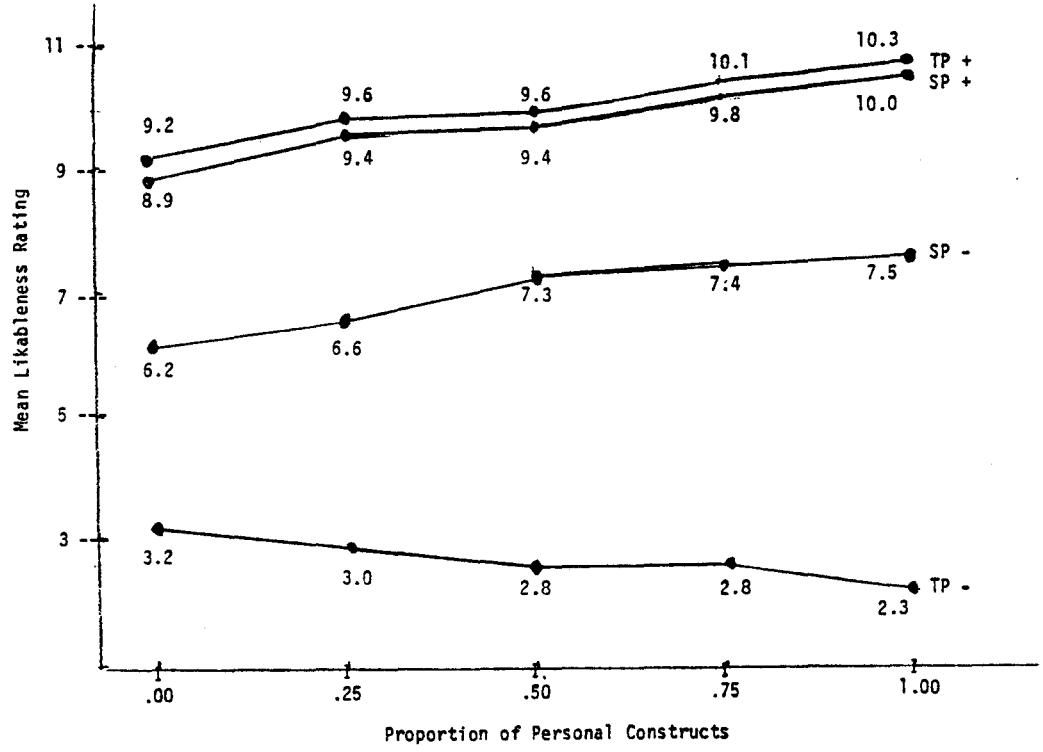

Figure 1. Likableness of source and target persons of favorable and unfavorable descriptions as a function of proportion of the subject's own personal constructs. (from Thackrey, 1978, after correction of clerical error)

Discussion

Clearly, information communicated in terms of one's personal constructs has more weight in determining impressions of new acquaintances than does equally favorable or unfavorable information which is not so expressed. Objectively, the descriptions containing one's own constructs were no more positive or negative than those containing only the constructs of others. Subjectively, judgmentally, impressionistically, they were much more impactful and, therefore, led to more extreme impressions.

Furthermore, information-givers who provide those communications are much more attractive if they use one's own personal constructs than if they do not. Again, objectively there was no difference in the extremeness of the positive or negative information being transmitted. Subjectively, there was an increment in the likableness of the communicator with every increment in use of one's own constructs. It is of interest that this increment in attractiveness occurred even for those ostensibly describing their roommates negatively. All of those sources of negative roommate-descriptions were liked less than their more positive counterparts, but the personal-construct increment applied to them almost as much as to the positive sources.

Several experiments were run, with variations in source and target persons, cover stories, situation, and kinds of judgment. For example, one study used trainee clinjcians as subjects, descriptions of clients, and prognostic judgments (rather than likableness judgments). The results were consistent with those given above, which were reported by Thackrey (1978).

Finally, we had developed a Research Mode of the Reptest that was to prove useful in subsequent research as well.

ATTITUDINAL CORRELATES OF BEHAVIOR

The next study to be reported here was one of a set dealing with the attitudinal correlates of changing sex role behavior. Increased physical activities by women, especially in nontraditional athletic activities, was fashionable in Southern California in 1982, and it was in that context that the studies were designed.

The work of most interest here combined four lines of research.

Previous research (cf. Myers & Lyss, 1978) had shown that female participants in nontraditional competitive sports were also nontraditional in sex role attitudes/values. Secondly, there had been voluminous research using the Bem Sex Role Inventory (cf. Bem, 1974; 1979) on women's sex role attitudes/values. Thirdly, Markus (cf. Markus, 1977; Markus, Craine, Bernstein & Siladi, 1982) had done groundbreaking work in showing that how we react to many social stimuli depends on the extent to which we have cognitive schemata to deal with them. This, of course, is not a new thought to Kellians, but the Markus distinction between being "schematic" vs. "aschematic" led to predictive ability regarding social attitudes and cognitions that I had not seen before.

Finally, and most importantly for Kellians, the Reptest provided a method for eliciting sex role schemata that would be spontaneous and private, without provided constructs.

It was hypothesized that college women who were not athletes would show the same associaton between physical activities and sex role attitudes as had been found in athletes. Secondly, this association was predicted to be stronger in describing the ideal woman than in describing the self. The reasoning was that aspirations are more likely to be consistent and homogeneous than are realities.

The hypothesis of most interest to u s was that women who were more schematic about sex roles would show a stronger association between physical activities and sex role attitudes than would those who were relatively aschematic.

Method

Of the total 86 female college participants, 34 took the Reptest. It was given in the Research Mode as described for the previous experiment, except that only 8 triads were used, balanced for liked and disliked persons. The cover story was simply that we were studying short descriptions by college women of other women.

Then the 34 subjects each described themselves on the Bem Sex Role Inventory (Bem, 1979). Next they each answered the Bem again, this time to describe their personal view of the "ideal woman". Finally they answered an ad hoc Physical Activities Survey on which they reported their activities of the previous week, indicating whether they had been typical activities for them personally.

Only 22 of the Reptest subjects reported a typical previous week of physical activities, and so the hypotheses involving physical activities and sex role schemata on the Reptest were tested on only those 22 subjects.

As in the previous experiment, content analysis of Reptest responses by three independent judges was carried out, treating each pole of a construct separately. In this study, they were coded as to whether the content of a Bem Sex Role item did or did not appear. Three-way agreement occurred on 82% of the constructs; only these were used. The greater the number of sex role constructs used by a subject, the more schematic was she considered to be in relation to sex roles.

Results

For the 34 Reptest participants, the number of sex role constructs ranged from 2 to 12 (of a possible 16) with the median between 7 and 8. Fortunately, of the 22 "typical week" subjects, 11 were Schematic (8 or more constructs) and 11 were Aschematic (7 or fewer constructs) for sex roles.

Based on all 86 subjects, the activity data were divided by median split, with a range from 0 to 17 hours of nontraditional activity, the median being between 2.5 and 3.0 hours.

Bem Sex Role scores for self-descriptions were split at the median on the Feminine and Masculine scores respectively, in the established way for research purposes (cf. Spence, Helmreich & Stapp, 1975; Taylor & Hall, 1982). The participants labeled Androgynous were those above both the Feminine and Masculine medians; Undifferentiated were below both medians; Feminine were above the Feminine and below the Masculine median; and the Masculine participants conversely. In categorizing participants on their Ideal Woman ratings, the self-ratings medians were also used, since it was comparison with self-ratings that were of interest.

As reported by Lindner (1984), the results supported all hypotheses. Of the High nontraditional physical activity women, 43% reported the self as Androgynous and only 11% as Feminine. Of the Low nontraditional physical activity women, only 20% reported the self as Androgynous and 32% were Feminine.

While 28% of all participants described themselves as Androgynous, 58% so described the Ideal Woman. While 20% described themselves as Feminine, only 8% did so for the Ideal Woman. Further, of those who changed categories from Self to Ideal descriptions, 91% changed to either Androgynous or Masculine; only 2% changed to Feminine. All are significant differences in proportions at the .05 level.

Finally, we compared women found on the Reptest to be schematic for sex roles against those found to be aschematic. This was to test the hypothesis that the schematic High vs. Low nontraditional activity groups would differ more from each other in their Bem sex role descriptions than would the two groups of aschematic women.

The 11 Aschematic and 11 Schematic women who had reported "typical" physical activities were the subjects of interest. The number of subjects being so small, it was necessary to combine the High and Low activity subjects for statistical testing. Thus, we had 10 Schematic women (91%) whose activity level X sex-role association was as predicted (High activity/Androgynous or Low activity/Feminine) as against only 4 Aschematic women (36%) for whom this was the case. This difference was significant at the .05 level, indicating support for the hypothesis.

Discussion

The findings of most immediate interest here relate to the distinction between being schematic and being aschematic with regard to a specific social-cognitive domain. The Reptest has been shown to be a useful method for eliciting relevant schemata.

As reflected in the recent Handbook of Social Cognition (Wyer & Srull, 1984), much recent research on social schemata has encountered problems in eliciting schemata relevantly, reliably and validly. There are also several theoretical issues bedeviling recent work in social schemata that might well be illuminated by judicious application of Personal Construct Theory.

ASSESSING ATTITUDES WITHOUT DEMAND CHARACTERISTICS: THE REPTEST

The final topic I shall present arose serendipitously from the line of research just described. After we had used the Reptest responses as we had intended to classify subjects as Schematic or Aschematic as to sex roles, it occurred to me that it would help validate subsequent use of the Reptest Research Mode if we went beyond counting the number of sex role responses to actually analyzing their content.

Accordingly, we coded those responses which matched items of the Bem Sex Role Inventory (1974; 1979), the most widely used standard instrument for assessing sex role constructs.

To my surprise, in view of the high Masculine-scale scores on the Bem, only 20% of the Reptest responses matched Bem Masculine items, while 80% matched Bem Feminine items, a significant difference between proportions.

Even more striking, 64% of the Reptest responses coded Feminine by comparison with the Bem were used to describe Persons #1 through #6, that is, the Likable Women and the Self, while 90% of the responses coded Masculine were used to describe Persons #7 through #12, the Disliked Women. This difference too was significant.

As discussed by Lindner (1984) it appears that women may use more traditionally feminine constructs when expressing themselves spontaneously than when presented with a balanced preset list of traits.

Moreover, feminine constructs may be evaluated much more positively, and masculine constructs much more negatively than is evident from research or assessment using only a balanced preset list.

Social desirability concerns by women are also relevant here. As traditionally feminine traits lose social desirability in our culture and traditionally masculine traits gain in social desirability for women in our culture (cf. Basow, 1981), women will become more likely to respond with masculine constructs to a balanced set of provided constructs, such as those used in the Bem Sex Role Inventory.

Replications and variations of this study have confirmed the findings. Subjects respond with more traditional sex role attitudes and values on the Reptest than on the Bem, which evidently presents "demand characteristics" for expressing fashionable attitudes. This pattern has been found in men as well as in women.

CONCLUSIONS

Personal constructs have been shown to be critical in several aspects of social cognition. The Reptest Research Mode has been a valuable and reliable tool. They key to this mode is that respondents are able to respond frankly and personally while maintaining complete privacy, and without demand characteristics for the type of response wanted. Also, this written version permits group administration. It is worth noting too that participants enjoy the task; they are motivated, relaxed and productive. The constructs so obtained are readily content-analyzed for many different purposes. The data are easily coded for computer analysis.

Research in social cognition often requires the use of nondirective situations and instruments, with what might be called low "face validity" for participants. It should not be apparent which responses would be socially more desirable, make one "look good." For example, the sex role implications of the Bem Sex Role Inventory are evidently all too salient for respondents sensitized by years of cultural change since its introduction (Bem, 1974).

In PCT and the Reptest, we have available a well-developed and sophisticated theoretical and methodological package. It is time for its uses and implications to be systematically applied to tough issues in social cognition.

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REFERENCES

Anderson, N. H. (1968). Likableness ratings of 555 personality-trait words. Journal of Personality and Social Psychology, 9, 272-279.

Basow, S. A. (1981). Sex role stereotypes: Traditions and alternatives. Monterey, CA: Brooks/Cole.

Bem, S. L. (1974). The measurement of psychological androgyny. Journal of Consulting and Clinical Psychology, 42, 155-162.

Bem, S. L. (1979). Administration and scoring guide for the Bem Sex Role Inventory. Palo Alto, CA: Consulting Psychologists Press.

Byrne, D., & Nelson, D. (1965). Attraction as a linear function of proportion of positive reinforcements. Journal of Personality and Social Psychology, 1, 659-663.

Huston, T. L., & Levinger, G. (1978). Interpersonal attraction and relationships. Annual Review of Psychology, 29, 115-156.

Lindner, R. (1984, April). Psychological androgyny and nontraditional physical activity: Women's use of sex role schemata in describing themselves and their ideals. Paper presented at the 26th Annual Conference of the Western Social Science Association, San Diego, CA.

Markus, H. (1977). Self-schemata and processing information about the self. Journal of Personality and Social Psychology, 35, 63-78.

Markus, H., Crane, M., Bernstein, S., & Siladi, M. (1982). Self-schemas and gender. Journal of Personality and Social Psychology, 42, 38-50.

Myers, A., & Lyss, H. (1978). Participation in competitive amateur sports as a function of psychological androgyny. Sex Roles, 4, 571-578.

Spence, J. T., & Helmreich, R. L. (1979). On assessing "androgyny". Sex Roles, 5, 721-738.

Spence, J. T., Helmreich, R. L., & Stapp, J. (1975). Ratings of self and peers on sex role attributes and their relation to self-esteem and conceptions of masculinity and femininity. Journal of Personality and Social Psychology, 32, 29-39.

Taylor, M. C., & Hall, J. A. (1982). Psychological androgyny: Theories, methods, and conclusions. Psychological Bulletin, 92, 347-366.

Thackrey, M. J. (1978, April). Attraction as a function of similarity of personal constructs. Paper presented at the 58th Annual Meeting of the Western Psychological Association, San Francisco, CA.

Wyer, R. S., & Srull, T. K. (1984). Handbook of social cognition. Hillsdale, NJ: Lawrence Erlbaum Associates.

Relationship of Supervisor Ordination with Accuracy in Predicting Student Psychotherapist Construct Ratings

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Repertory Grids of 29 graduate student psychotherapists who worked in various outpatient settings and their Ph.D. supervisors were analyzed using Landfield's LTORP 3 program. Supervisors were given the constructs of their trainees and asked to predict (on 13-point scales) the trainees ratings of the supervisor, two clients most frequently discussed in the last four weeks, and the trainee's self in the context of various relationships. Supervisors and therapists also completed questionnaires rating the quality of the supervision. Supervisor ordination scores were correlated significantly with supervisor accuracy in predicting therapist ratings of a) the supervisor, b) the clients discussed in supervision, and c) the therapist self in relationship to the supervisor. Supervisors who scored higher on ordination rated themselves lower on a questionnaire item which asked for their perception of how well they understood their trainee's viewpoint. When the effects of supervisor differentiation were partialled out, supervisor ordination was correlated significantly with accuracy in predicting therapist's ratings of a) self, b) supervisor, c) clients, d) self in relationship to supervisor, and e) self in relationship to clients. The results suggested that supervisors who showed greater integration of their constructs into meaningful hierarchies (as measured by Ordination scores) understood better their therapist's construction processes, although they tended to rate themselves as doing worse.

INTRODUCTION

Except for the Rogerian school (e.g., Truax & Carkhuff, 1967), there have been few published attempts to integrate personality theory into the study of psychotherapy supervision. Among PCT researchers, Townes & Carr (1973) and Duehn & Proctor (1974) have demonstrated relationships of differentiation (measured by the IDT) with perceptions and efficacy of mental health training. This paper presents a portion of the findings from a study examining the relationship of personal construct system characteristics of supervisors and student psychotherapists to the processes and perceptions of understanding and being understood. Specifically, this paper addresses how the integration of the supervisor's construct system is related to the supervisor's ability to understand the student therapist's point of view. In addition, we examine how the supervisor's

construct system integration is related to perceptions of how well the supervisor understands the therapist.

METHOD

The participants were 29 Masters and Doctoral-level graduate students enrolled in Clinical, Counseling, Professional, and Human Services psychology programs and their supervisors who held Ph.D. degrees in Clinical or Counseling psychology. All therapists provided outpatient psychotherapy in a variety of treatment settings. Diverse theoretical and technical orientations were represented. None of the therapists had extensive contact with the supervisors prior to or outside of the supervisory relationship.

Supervisors and therapists completed self-administered, monadic elicitation versions of Landfield's (1971) modification of the repertory grid. The grids were analyzed using Landfield's LTORP 3 program. Supervisors then were given their therapist's constructs and asked to assume the therapist's viewpoint and predict the therapist's ratings of the supervisor, the two clients (designated A and B) most frequently discussed in the past four weeks, and the therapist's self in the context of the supervisory and treatment relationships. Additionally, supervisors and therapists completed questionnnaires developed to assess perceptions of the quality of supervision.

RESULTS

The supervisor Ordination scores used in the analyses were the NEWORD Total scores from the LTORP 3 program (combining ordination across constructs and persons). The accuracy of supervisor predictions of therapist ratings was calculated in two ways. The "Sum of Hits" measure is a "sidedness" score summing one hit for each time the supervisor rates on the same side of the zero point as did the therapist. The "Sum of Errors" is the algrbraic sum of the differences between supervisor and therapist ratings on each 13-point scale, using each scale point in the calculation.

The supervisor's self-rating of ability to understand the therapist's point of view is scored from the number (1-13) circled in response to the questionnaire item, "Rate your skill as a psychotherapy supervisor in understanding the therapy cases from the therapist's perspective." The differentiation scores used in the partial correlations were the Supervisor FIC Total scores.

DISCUSSION

The results showed that supervisor ordination scores were related significantly to supervisors' accuracy in predicting therapists' use of personal constructs in rating self,

Table 1

Correlations of Supervisor Ordination with Accuracy in Predicting Therapists' Ratings and Perceptions of Supervisor Understanding

Person Rated	Sum-of-Hits	Sum-of-Errors
Supervisor	.34* (29)	-.26 (29)
Client A	.58*** (29)	-.39* (29)
Client B	.46** (27)	-.46** (27)
Self	.23 (29)	-.34* (29)
Therapist's Self-in-Relation-to-Supervisor	.35* (29)	-.37* (29)
Therapists' Self-in-Relation-to-Client-A	.23 (29)	-.12 (29)
Therapists' Self-in-Relation-to-Client-B	.09 (27)	.08 (27)

	Supervisor's Rating	Therapist's Rating
Perception of Supervisor's Ability to Understand Therapist's View	-.49** (29)	-.13 (29)

N's.n parentheses

* $p \leq .05$
** $p \leq .01$
*** $p \leq .001$

Table 2

Partial Correlations of Supervisor Ordination with Accuracy in Predicting Therapists' Ratings, Controlling for Effects of Supervisor Differentiation

Person Rated	Sum-of-Hits	Sum-of-Errors
Supervisor	.34*	-.30
Client A	.55**	-.44*
Client B	.46**	-.45**
Self	.35*	-.42*
Therapist's Self-in-Relation-to-Supervisor	.38*	-.42*
Therapists' Self-in-Relation-to-Client-A	.33*	-.20
Therapists' Self-in-Relation-to-Client-B	.17	.07

Df = 24
* $p \leq .05$
** $p \leq .01$

clients, supervisor, and self in relationship to the supervisor. Controlling for the effects of supervisor differentiation showed similar results. Curiously, higher supervisor ordination was associated with lower supervisor ratings of their ability to understand how their therapists view cases.

While the importance of ordination in the process of being understood is often emphasized, these findings suggest that the organization of constructs into meaningful hierarchies is a predictor of the supervisor's ability in the important task of understanding the therapist's experience and ways of making sense of him/herself and clients. Greater integration of constructs in a meaningful way also seems related to supervisors making more modest ratings of their abilities in the complex task of entering the world of the therapist's meaning-making.

REFERENCES

Duehn, W.D. & Proctor, E.K. (1974). A study in cognitive complexity in the education for Social Work practice. Journal of Eduaction for Social Work, 14, 239-245.

Landfield, A.W. (1971). Personal construct systems in psychotherapy. Chicago: Rand McNally.

Townes, B. & Carr, J.E. (1973). Differentiation and teaching effectiveness in medical education. Journal of Applied Social Work, 3, 78-83.

Truax, C.B. & Carkhuff, R.R. (1967). Toward effective counseling and psychotherapy: Training and practice. Chicago: Aldine.

DEVELOPMENTAL TYPOLOGIES AND GENERALIZED ASPIRATION

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ABSTRACT

George A. Kelly observed what he called the elaborative choice, which for communication implies a pattern of human optimization providing an ultimate way of making better relationship building choices in the future. A systematic Repertory Grid interpersonal communication case study of two married artists allowed the search for high aspiration constructs which may be compared to the "ideal marriage relationship." Some correlations between ideal and actual marriage conditions are moderate for one of the partners and less strong for the other. Although both are full-time, professional artists, their need for artistic stimulation is generally not a significant part of their marriage.

INTRODUCTION

The meanings persons place upon their communication experience over a long period of time represent working hypotheses regarding the nature of their relationship. When persons participate in communication, they are submitting their meaning to the test of experience. "As one's anticipations... are successively revised in the light of unfolding sequence of events, the construction systems undergoes progressive evolution." (Kelly, 1955, p. 72) As communicating persons reconstrue, their relationship undergoes development; and since no two relationships are the same, there is more than one kind of communication development.

We need to understand patterns of communication development, how different relationships grow in different ways. Some relationships not only endure over a long period of time, but are also characterized by an on-going creative quality. Others languish and die. We do not expect to see the same developmental pattern in a life-long marriage as we expect in a short term relationship. We do not expect to see the same kind of growth in a business relationship as might be seen in a personal friendship. How can this be explained?

What are the WAYS relationships grow as each follows its own pattern of development? What are the kinds of communication growth patterns which may be observed, studied and understood? This paper is intended as part of a series inquiring into one theoretical aspect called generalized aspiration, the elaborative choice, or ideal.

THE ELABORATIVE CHOICE

At the heart of constructivism and the transactional perspective is the question of choice, and the role of choice in communication. If we read Kelly and his students carefully we find them pushing ever higher the limited assumptions which researchers have previously held regarding the nature of human potentiality, and what this implies regarding human communication. When Kelly formulated his Choice Corollary he did not limit our understandings of choice to merely a particular creative choice. When Kelly described choice as "... the alternative which seems to provide the best basis for anticipating the ensuing events..." (Kelly, 1955, p. 64) he moved, not just into the realm of a limited, specific choice, but rather into what he called "the elaborative choice." (Kelly, 1955, 65). He refers to a comprehensive pattern of human optimization which provides an ultimate way of making better choices in the future. That is, the person is not looking for just a percular individual extension, but is rather gradually searching for a comprehensive way of elaborating or developing his or her potentialities in the future, and seeks that choice "...which appears to provide the best opportunity for further elaboration." (Kelly, 1955, p. 944). This does not mean, of course, that the person will be wise enough to actually make the most self actualizing choices (Landfield and Leitner, 1980, p. 9) but rather that the person seeks to "...provide an ultimate way in which more events may be better predicted... toward evolving a system... (and the person) ...does not necessarily seek merely those events which are already optimally anticipated." (Kelly, 1955, p. 523).

While the concept of aspiration may be difficult to define operationally (Cantril, 1963), and difficult to define theoretically (Bannister and Fransella, 1982, pp. 22-23), when one's own individual, day-to-day sense of hope is considered it might be recognized as a human experience.

Much communication research might be characterized, perhaps through training in objectivity, to introject or imply the desirability of an impersonal human relationship quality. The dehumanized nature of many teaching and professional relationships has been the source of a large field of communication research, going at least as far back as Sidney Jourard's Transparent Self in 1964. It is, of course, our duty in our professional roles as teachers or therapists or

consultants to offer our students and clients a realistic assessment of outcome probabilities based upon rigorous scientific predictions; yet there are also unknown possibilities and maximum potentialities toward which the student or client may be encouraged to aspire.

This aspiration or creative intention might be called hope. As far as we now know the communication quality of generalized expectation has four characteristics:

1. It is generalized;
2. It is intentional (from within);
3. It moves in the direction of self realization;
4. It seeks maximization of the potential.

This is why we choose to call it generalized expectation: the generalized intention toward realization of maximum communication potential.

Perhaps such human aspiration or intention exists and can be studied. Perhaps it can be observed or assessed within the context of data gathering, analysis, and perhaps it is possible to generate research findings and scientific predictions which help us understand the conditions within which such generalized intentionality is sometimes sought.

Generalized expectation is not defined by a particular "hope" such as hoping another person will say "yes" to an invitation to attend a social affair or an evening at the symphony. Such particular expectations do not fall into the creative intentionality category of generalized expectation. Under such a limited construction or interpretation human relationships would simply move from one encounter or episodic event to the next. There would be no room in such a theoretical expectation for growth or development in the quality of the relationship. Generalized expectation is comprehensive as well as optimal. As Kelly and his students describe this process of self elaboration, or creative intentionality, the person's expectation is not limited to specific events, but is generalized and creative in the elaborative sense. Such creative intentionality is implied, or described by Hinkle's implication theory: a person chooses that alternative through which he or she anticipates "...the greater possibility for increasing the total number of implications.." of his or her self; and we assume this implies the desired nature of a person's human relationships. Hinkle states the generalized nature of Kelly's Choice Corollary: "That is to say, a person always chooses in that direction which he (or she) anticipates will increase the total meaning and significance of his (or her) life." (Hinkle, 1965, p. 21). Kelly himself describes the generalized way in which we humans employ the Choice Corollary in making choices "... in such a way as to define or extend his (or her) system of channels, for this must

necessarily be his (or her) comprehensive way of anticipating events." (Kelly, in Maher, 1969, p. 89). Kelly and his students provide a basis for further theoretical integration, and perhaps even a framework allowing a search for long range predictors of interpersonal relationships.

METHOD:

Two highly creative married partners were interviewed. They are both full-time artists; they have no job or source of outside income beyond what they can negotiate for their artistic efforts. On the basis of prior analysis and related literature we "provided" fourteen constructs and elicited four additional constructs. We say "provided" constructs; based upon prior analysis these were held tentatively during the beginning of the interview while we observe the degree to which the respondent found these constructs naturally appropriate. At least seven of the fourteen were in the respondent's own language, and the other seven were described as meaningful. (It turned out that there seemed to be minor variance differential between the provided and elicited constructs in this instance). The constructs may be summarized as follows:

1. Romantic Love: This includes deep tenderness and affection; warm attachment, benevolence, caring for the other; holding an idealized understanding of the other, and characterizing the communication as colorful, "poetic," novel, mysterious, and glorifying or celebrating the other and the relationship.
2. Raising of Children.
3. Family: including belonging to a social group.
4. Social prestige associated with family membership.
5. Security and comfort: Social relationships are held secure, the abillity to rely upon an existing relationship.
6. Companionship and friendship.
7. Intellectual and/or artistic stimulation.
8. Sex: Socially approved sexual relations, physical sex.
9. Intimacy: open information exchange; self disclosure.
10. Mutual support: A helping relationship, "therapy."
11. Economy: (i.e. marriage is less expensive than alternative lifestyles).
12. Enduring: Relationships which last, seeking a lasting, continuing, on-going, "life-long" relationship.
13. Actual: The factual conditions of the relationship.
14. Ideal: The aspiration or "hope" for the relationship.
15. Transactions: A sense of connection to the past, to family traditions; a sense of connection to the future and the new generation, anticipating a "better" future and wanting to belong or be part of the future
16. Equality: Mutual respect vs. Inequality: obedience, control (for Barbara)
16. (for Donald) Respect without pressure, acceptance of

differences
17. (for Barbara) Open Marriage: A Free choice "open" marriage vs. a traditional and rigid marriage.
17. (for Donald) Deterministic and controlling vs. freedom.
18. (Barbara) Attractive body, visual appeal, physical attributes vs. communion with the person.
18. (Donald) Aggressive toward life

The names of twelve persons known to each of the respondents were used as elements in the Higginbotham (1983) and Bannister form of the Repertory Grid. Instructions were "the kind of relationship such a person desired" (as distinquished from the element person's actual relationship). Both respondents were interviewed at the same time, although they were generally prevented from observing each other's responses. (Some of the elements were the same for both respondents, and the respondents knew most of each other's element persons). Then, following the first stage of the interview each partner was asked to replicate (i.e. predict) the responses expressed by the other. The particular data selected in this exploration of aspiration or creative intentionality are primarily correlations with the ideal construct.

OBSERVATIONS

We first offer a summary of Barbara's and Donald's own orientations toward marriage, particularly in relation to their own communication aspirations, or ideal; we then compare their interpersonal perceptions, especially regarding their individual aspirations (i.e. ideal marriage) and what these imply in their communication.

General Aspirations and Actual Marriage Perceptions: The overall correlation between the ideal and actual marriage for Barbara is moderate (.33), but the correlation of ideal and actual marriage for Donald is very low (-.42).

Barbara's Equality Ideal: Barbara's idealized data reveal a strong correlation (.65) with equality, and equality is strongly related (.64) to the social prestige of family membership. Equality means mutual respect; inequality implies the expectation of obedience and involves efforts by one person to control another. Barbara's ideal marriage relationship correlates directly (.51) with social prestige. However, the relation between her actual marriage and social prestige (-.09) suggests that she does not in fact enjoy the prestige to which she clearly aspires.

Barbara and Open Marriage: While she does not want an "open marriage" (-.34), nevertheless an "open" marriage is the actual condition of their relationship (.50). Also, the correlation coefficient between the ideal marriage and intimacy (.29) and her actual marriage and intimacy (.59)

suggests that there is somewhat more intimacy than she wants in their marriage.

Barbara and Romantic Love: Barbara has no interest whatever (.01) in romantic love. Although she relates companionship and friendship to romantic love (.62), she does not see companionship and friendship as existing in their actual marriage (-.52); nor are companionship and friendship qualities which she seeks (-.17).

Donald's Sexual Ideal: While Barbara wants equality and the social prestige of marriage more than anything, Donald's major aspiration is almost singularly sexual (.62). "Sex" is a straightforward construct referring to the physical act as a socially approved marriage activity. Sex additionally correlates with "respect without pressure" (.54), romantic love (.45), an enduring relationship (.36), and somewhat with mutual support (.29) and intimacy (.28). While sex is very clearly the most outstanding aspiration for Donald, he does not experience sex as a significant part of their marriage (-.15). And a marriage index comparing the ideal and actual marriage -- that to which he aspires compared to that which he actually experiences -- shows Donald's level of satisfaction with the marriage markedly negative (-.42). He is generally not happy with the relationship. While the big problem is that sex is missing, he also wants a bit of romantic love (.36), which is also missing (-.22).

Communicated Aspirations Regarding Sex: Much of this gap is accounted for in the sexual aspects of their relationship. Barbara is not aware of Donald's aspirations for physical sex. Her prediction of his ideal and sex is zero (.00) while his own correlation between his ideal and physical sex is extremely high (.62). She thinks he has no interest, or is quite indifferent to sex, while he is extremely interested in sex. Yet the correlation between her own ideal marriage and physical sex is mildly negative (-.32). While Donald's prediction of Barbara's desire for sex is zero (.06), she is even less interested than he assumes. That is, he does think she is uninterested, but she is even less interested than he realizes. It might be somewhat more accurate to say that she rejects sex.

Communication of Actual Sexual Relations: While Barbara's prediction of Donald's desire for sex is very far off the mark, her prediction of their actual sexual relations is very close to his own description of their actual sexual relationship. Her prediction of the correlation between his meaning of their actual marriage with regard to sex is zero (.06) and his actual correlation with sex is extremely low (-.15). Also, her own description of their actual marriage and sex is low (.07). They both agree that physical sex is not highly characteristic of their actual marriage.

Communication of Aspirations Regarding Children: He predicts that she aspires to have children and raise them (.49), but her own correlation between the ideal marriage and children is clearly negative (-.45). He thinks she wants children, but she clearly does not.

Communication of Aspirations Regarding an Enduring Relationship: Donald's prediction of Barbara's aspiration for an enduring relationship is very high (.54), but he is seriously off in this construction of her intention or aspiration regarding an enduring marriage. He assumes that she wants a lasting relationship, which is consistent with his assumption that she sees a significant relationship between an enduring relationship and having and raising children (.59). Her own correlation between ideal and an enduring marriage is very low (-.12). He thinks she wants an enduring relationship, but she is not so committed. Although he has some aspiration toward a enduring marriage (.31), he does not see in their marriage a long-term relationship (-.28). Neither partner holds much expectation for their marriage over the long haul.

Communicated Aspirations Regarding Equality: In the relationship between Barbara's perception of the relationship between Donald's ideal and his meaning for equality Barbara assumes that Donald holds the value of equality high (.56) while his actual correlation between ideal and equality is zero (.03). He is unconcerned about equality, although he sees some equality (.26) in their actual relationship. She thinks equality is a high value for him; he has no such aspiration. Barbara's prediction of the index between equality and his perception of their actual relationship is very high (.62). His actual description of the relationship between their marriage and equality is much lower (.26). That is, she assumes that he places much more emphasis upon equality than he actually does; and she thinks that he sees more equality in their relationship than he actually does.

Communicated Aspirations Regarding Economy; Barbara thinks Donald is unconcerned about economy in their marriage. Her prediction of his ideal and economy is -.43 and his own ideal and economy is - .38. Her perceptions of Donald's aspiration regarding economy in marriage are correct.

Communicated Aspirations Regarding Romantic Love: Her predictions of his appreciation for romantic love (.41) and the data from his own description of ideal and romantic love (.36) are also very close. She seems to understand his interest in romantic love.

Communicated Aspirations Regarding Prestige: Her prediction of his aspiration toward prestige is moderate (.39), and she is quite correct; the correlation of his ideal marriage and

his social prestige is approximinately the same (.30).

Communicated Aspirations Regarding Companionship: Donald's prediction of Barbara's ideal-companionship correlation is very high (.66), but the accuracy of his perception is far off, for her own ideal-companionship correlation is extremely low (-.17). He thinks she wants companionship when this is unimportant to her. At the same time her prediction of his perception of the actual role of companionship in their marriage is very much off his perception of the actual role of companionship in their marriage. While she thinks he sees their relationship as almost totally void of companionship (-.79) it might be more accurate to say that he simply does not see companionship (.10) as relavant to their marriage. Or, perhaps a more positive way of saying it might be that she thinks he sees less companionship in their marriage than he actually does.

Communicated Aspirations Regarding Artistic Stimulation: Regardless of the fact that they are both full-time artists and earn their livelihood as artists, artistic stimulation is does not seem to be meaningful in their relationship. Barbara's prediction of Richard's perception of artistic stimulation in their marriage is strongly negative (-.55), and Donald's own correlation between their actual marriage and artistic stimulation is quite high (.50). Barbara's predication of Donald's ideal marriage and artistic stimulation is zero (.00), and his own correlation between the ideal marriage and artistic stimulation is very close to this (-.13). The relationship between artistic stimulation and his own ideal marriage is very low (-.13). He has more artistic stimulation than he wants.

Communicated Aspirations Regarding Mutual Support: Donald's prediction of Barbara's interest in mutual support, or a helping relationship, is quite high (.42). Her own expression of mutual support "therapy" kinds of conversations is extremely low (.11). He thinks she wants interpersonal marriage "therapy" sessions; she does not.

IMPLICATIONS

These two marriage partners do not enjoy the societal support services and resources as do many of us who live more conventional lives in more stable communities. They do not have a nearby network of long-time friends, own their own home, or enjoy a regular income or fringe benefits kinds of support such as some conventional couples and families do. And we are not here suggesting they should. We are merely observing that, to a large part, they carry their own sources of growth and support system with them: each other. Our interest and concern is not that they do, or do not, depend upon each other; nor is it our concern that they do or do not remain married, and if they do, what qualities of

relationship they may or may not need from each other in or out of their marriage. Our interest is in the degree to which they understand each other, communicate with each other, and how they might learn what they can realistically expect from one another.

Studies have shown that repeatedly dashed expectations will damage or destroy not only communication, but also the people themselves. Although these two artists are seen as strong and resourceful persons, we question how they will develop individually, or in their relationship, without a greater amount of interpersonal communication testing and subsequent validation than they are now experiencing together.

If these two highly creative individual cultivate and develop relationship they may grow individually, and if they grow individually they may experience greater communication validation. Unless they experience greater communication validation we predict their relationship will wither or fade and maybe die.

We suggest they look to the grounding of their mutual expectations and convey these to each other. Both are keenly sensitive, highly intelligent and unusually talented persons. Even under the worst circumstances among the poorest of persons and groups people who speak together meaningfully can grow and ultimately find some form of creative relationship.

RELATED READINGS

Adams-Webber, J.R., Personal Construct Theory. N.Y.: John Wiley & Sons, 1979.

Bannister, D. and F. Fransella, Inquiring Man. (second edition) Malabar, Florida: Robert E. Krieger Publishing Co., 1980.

Bettelheim, Bruno, Surviving and Other Essays. N.Y.: Alfred A. Knopf, 1952.

Boxer, Philip J., "The Flow of Choice: The Choice Corollary," chapter 7, in Mancuso, James C. and Jack R. Adams-Weber, The Construing Person (eds.) N.Y.: Praeger, 1982.

Cantril, Hadley, "A Study of Aspirations," Scientific American. Vol. 208, No.2, February 1963, pp. 41-45.

Colarelli, Nick J. and Saul M. Siegel, Ward H: An Adventure in Innovation. N.Y.: D. Van Nostrand Co., 1966.

Echelbarger, May Ellen Eakin, "Negotiated Meaning of

Health: A Transactional Perspective Based Upon Construct Theory," Ph.D. dissertation, The Ohio State University, 1985.

Foster, Florence P., "The Human Relationships of Creative Individuals," The Journal of Creative Behavior. Vol. 2, No. 2, (Spring 1968) pp. 111-118.

Higginbotham, Peter, Dept. of Psychology, The University of Leeds, Leeds, LS2 9JT, England (1983).

Hinkle, Dennis Neil, "The Change of Personal Constructs from the Viewpoint of a Theory of Construct Implications," Ph.D. dissertation, The Ohio State University, 1965.

Hutschnecker, Arnold A., The Will to Live. N.Y.: Permabook, 1951.

Jourard, Sidney M., The Transparent Self. Princeton, New Jersey: D. Van Nostrand Company, Inc., 1964.

Kelly, George A., The Psychology of Personal Constructs (two vols.). N.Y.: W. W. Norton & Co., 1955.

Landfield, A. W. and L.M. Leitner, Personal Construct Psychology. N.Y.: John Wiley & Sons, 1980.

Leitner, L.M., "Contextual Shifts in the Interpersonal Constructions of Couples," paper presented at the Sixth International Congress on Personal Construct Psychology, Cambridge, England, August, 1985.

Maher, Brendan, (ed.) Clinical Psychology and Personality. N.Y.: John Wiley & Sons, Inc., 1969.

Maslow, Abraham H., Toward a Psychology of Being. D. Nan Nostrand Co., 1962.

Monaghan, Robert R., "The Communication Process: Principles on Negotiation of Meaning," paper presented at the Fifth International Congress on Personal Construct Psychology, Pine Manor College, Chestnut Hill (Boston) Massachusetts, 7-12 July 1983.

Selye, Hans, The Stress of Life. N.Y.: McGraw-Hill Book Co., 1956.

Smith, Judith A., The Idea of Health: Implications for the Nursing Professional. New York: Teachers College, Columbia University, 1983.

Udry, J. Richard, The Social Context of Marriage. Philadelphia: J. B. Lippincott Co., 1966.

A PARTICIPANT CONSTRUCT SYSTEM

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Advances in computer technology make it feasible to develop systems for group problem solving, participant systems in which a number of people interact with one another through personal computers on a network. This paper introduces the notion of a *participant system* and gives examples of such systems for teleconferencing and personal construct psychology. The design considerations and detailed examples of a *participant construct system* using interactive repertory grid elicitation and exchange grid methodologies are described for a network of Macintosh computers.

Introduction

This paper describes a system for interactively eliciting, exchanging and comparing repertory grids from multiple simultaneous users on a network of personal computers. The *participant construct system* (PCS) which does this has been designed as an aid to group problem-solving (Shaw 1986a,b). The users of PCS are attempting to extend and understand their own thinking and problem-solving capabilities by interacting with other people. They are able to:

- see the relationship of their points of view to those of others;
- explore differing terminology for the same constructs;
- become aware of differing constructs having the same terminology;
- extend their own construct systems with those of others;
- provide others with constructs they have found valuable;
- explore a problem-solving domain using the full group resources.

The manual elicitation of construct systems using structured interview techniques is tedious, time-consuming, and requires skill, practice and an appropriate personality. In recent years computer-based techniques have been developed for on-line elicitation and analysis of construct systems. These have proved very successful and are now in widespread use (Shaw 1980, 1981a). One of the most interesting developments of such systems has been to attempt to combine the construct systems of a number of people, make them accessible to all and hence share their knowledge and skills (Shaw 1981b, 1985, Shaw & Gaines 1981, Boose 1986). The extension of interactive construct elicitation techniques to groups exemplifies the operation of a *participant system* (PS)—computer-based communication between multiple users that is essential to the performance of their tasks, rather than merely incidental to their use of a timeshared computer or computer network (Chang 1986a,b).

Participant Systems

The concept of a participant system is best presented by contrasting it with the rationale behind the majority of current multi-user computer systems. Interactive timeshared computers were developed in the 1960s to give each user a virtual machine that emulated personal access by that user to a dedicated computer. The design requirement was that the interaction of other users with the time-shared computer should be as far as possible not apparent. Timesharing could never fully achieve this objective since CPU availability and disk access were subject to the fluctuating demands of other users and this could be strongly apparent to a user as varying time delays that were disconcerting because they had no relation to the tasks he had initiated.

The decline in cost of computer hardware in the 1970s made it possible to provide personal computing through dedicated actual machines rather than timesharing virtual machines. Personal computers satisfy the original design requirements for timesharing systems and the only reasons, within those requirements, for a user to access another system are: access to greater computing power such as an array processor; access to greater information storage such as high-volume files; access to information updated remotely such as a centralized database.

It is interesting to note that the first two requirements, for computing power and storage, are being increasingly satisfied by personal computers. Only the third, access to remotely updated information, has a fundamental, systemic component requiring a communication capability. It is this third requirement that the concept of participant systems addresses—the interaction of multiple users as an essential requirement of their individual, or mutual, tasks.

Fig.1 shows a typical configuration for a participant system implemented as a network of personal computers. The group of persons, who have come together to participate in the system, each access it through a personal computer acting as a terminal to a distributed computing network. Terminals to a timeshared central computer could provide an alternative implementation but the delay-free interaction of personal computers is preferable in giving a highly responsive system, particularly for graphic interaction. The database shown provides storage for information that may be shared among the participants. They may communicate with the database, or one another, through the network.

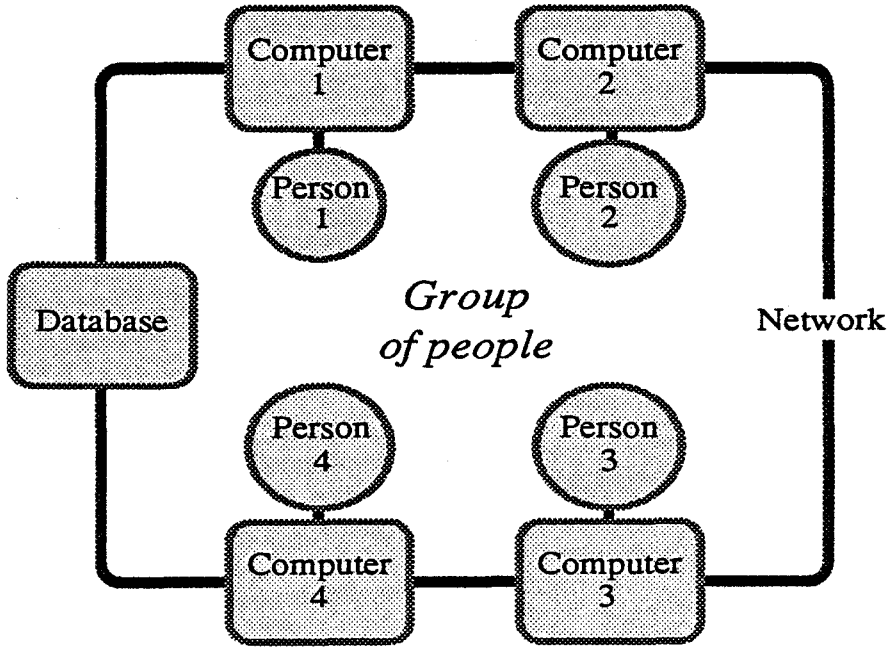

Fig.1 Typical participant system implementation

Note the emphasis on a group of people—the diagram could be of individuals, each carrying out separate activities on a computer network. However, it is the essence of a PS that those using it have some joint purpose, giving them coherence as a group.

CANTATA: A Teleconferencing Participant Systems

Cantata (Chang 1986a) is a PS for conferencing that was originally implemented at the University of Victoria on a network of IBM-XT's linked through Ethernet, and is being implemented at the ARC on Macintoshes networked through Appletalk (Kasperski, Mellen

& Chang 1986). It broadcasts text messages from one user to all others on the network, displaying them in windows that are specific to the sender. The windows are sizable, scrollable, selectably visible or invisible, and support word-wrap. A status message is displayed when text comes to an invisible window. Apart from this, no user interaction protocols are implemented within Cantata itself. Communication can exist at task and meta-task levels, but since both map on to text messages, no explicit mechanism for meta-task communication has been created as yet. In Cantata, there are no explicit rules for communication, since everyone can address everone else at the same time for as long as each likes with no specific topicality; concepts like turn-taking, topic switching, decision-making, must be dealt with through structures that evolve from the participants themselves. In these ways, Cantata is different from most computer conferencing systems, which by contrast, suppport asynchronous communications and a bulletin-board model.

This lack of enforced interaction protocol gives Cantata users great flexibility and freedom, but also creates the problem of coping with a novel communication situation and developing protocols to operate effectively. Cantata users face an enigmatic situation. On the one hand they are able to receive messages as they are constructed, and can respond to one or more messages before the sender(s) complete them. The ability of the eye to read much faster than the hand can type means that the recipients can understand and act upon several input streams in parallel, while messages are being constructed. This is therefore a medium that has no analog in the normal world of personal interaction: you can interrupt without interrupting, and listen to three people at the same time in Cantata. On the other hand, the absence of structure in the communications among participants causes some confusion, partly because of the newness of this medium. It is difficult to get away from the usual cultural expectation that only one person in a conversation has the floor, that there are leadership or consensus methods for changing or maintaining topics, that feedback is expected as one speaks. It is difficult, at present, to know whether the advantages of this kind of medium can be better exploited by building structuring mechanisms into the system, or by more meta-conversational exchanges, so that participants can create rules for using Cantata dynamically, and follow them voluntarily.

The design, development and application of participant systems requires an understanding of both the computer technology involved and the psycho-socio-dynamics of the users. The participant construct system design addresses this requirement by designing a specialist PS for a domain where large-scale cognitive psychological and sociological theories already exist, implementing it on a network of Apple Macintosh personal computers where an appropriate human-computer interface already exists. The highly structured knowledge elicitation techniques developed for the PLANET system (Shaw 1982, Shaw & Gaines 1986) provide a working environment for the users of PCS which avoids the problems of direct, unstructured interaction in Cantata. Ultimately, both informal and structured interaction must be combined to allow the full capabilities of PSs for group problem solving to be exploited.

Personal Construct Psychology

Kelly's (1955) Personal Construct Psychology (PCP) provides a systemic model of the cognitive and behavioral processes of the individual, including inter-personal and social interaction. A person is modeled as *construing* her experience by dividing it up into chunks (elements) and classifying these using a system of bipolar constructs. Constructs are themselves construed by other constructs and hence form a hierarchical system. Construing is used to enable a person to anticipate the future as a hypothesized replication of the past. Constructs are changed as a result of errors in anticipation so that personal philosophies are seen as essentially fallibilist. A person will be more willing to change some constructs rather than other, core, constructs, giving a further order relation on the construct system.

In PCP, learning is seen as the development of the construct system, social processes are seen as the development of shared constructs, and problem-solving is seen as the active anticipation of the future. The theory provides complete foundations for all human psychological and social processes. Hence it is possible to build technologies based upon it which are very general in concept and application. For example, an expert system in PCP terms is a computer-based system in which the relevant construction system of an expert has been encoded in an active form (Shaw & Gaines 1983).

In computational terms the elements in PCP may be seen as entities, the constructs as attributes and the relation between elements and entities as values in an entity-attribute database. Kelly terms such a database a repertory grid and Fig.2 shows how a typical grid may be represented. The elements in this grid are people represented by their initials. The three constructs illustrate the mix between subjective and objective possible in personal constructs.

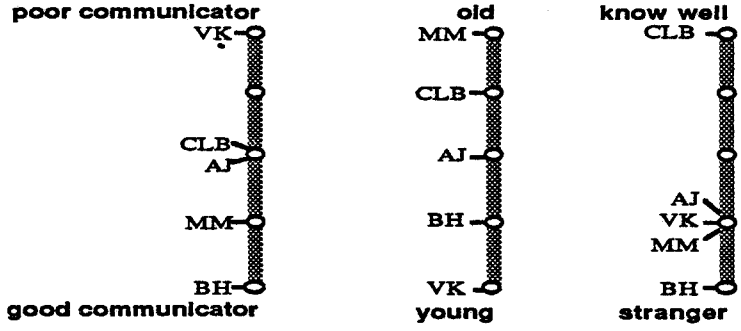

Fig.2 A repertory grid of people on three constructs

Participant Construct System Design

With the previous discusion in mind, and based on past experience with the PLANET system, the PEGASUS individual grid elicitation procedure was taken as an initial model for PCS. Interaction with PEGASUS, with feedback of construct and element matches, is known to be a stimulating and enlightening experience. Then to ensure that the group interaction through PCS is seen as important in its own right, the features have been included to:

- Select additional elements from those entered by other participants;
- Compare one's own constructs with those of other participants;
- Exchange complete grids with other participants and evaluate mutual agreement and understanding.

Such *exchange grid* procedures are known to aid individuals in coming to understand their agreements and disagreements with the way others perceive the world, and to help them to understand and use the constructs of others (Shaw 1980). They give a basis for group problem solving and hence PCS may be presented to interested users as a participant system around which group problem solving procedures may be built.

In choosing a technology for the implementation of PCS the importance of a simple and attractive user interface has been paramount. PEGASUS was designed as a structured interview for users with little or no knowledge of problem solving techniques. The program largely controls the interaction and limits the user's choices to a few significant decisions. Greater flexible was both desirable in PCS and also intrinsically required by the overlay of group interaction on the basic construct elicitation procedures.

A poor person-computer interface can completely negate the value of the most advanced participant system. This has been a major consideration in the PCS design and the Apple Macintosh was chosen as a user terminal to PCS because:

- The windowing facilities make it possible to present multiple channels of information in a modular and comprehensible fashion.
- The graphic data presentation makes it possible to present grid data structures in an attractive and comprehensible format, replacing the display of numeric ratings with one based on spatial relations.
- Much of the interaction with PCS can consist of spatial manipulation using the mouse to click and drag objects on the screen, rather than typing text or commands.
- The proper use of the toolbox routines leads to a uniform interface that is consistent with other Macintosh programs that users already know.
- The Macintosh has a reputation for being simple to understand and easy to use without training or reading manuals, reducing user anxiety and encouraging expectations of being able to operate the system.

The Macintosh interface encourages an object-oriented programming paradigm in which the user has access to a number of discrete, manipulable objects, most of which are potentially accessible at any time. That is, there is very little imposed flow of control. This gives the system tremendous flexibility, allowing much freedom in use, and enabling the users to impose their own mode of working upon the system rather than having to conform to some preset sequence. However, flexibility and freedom are not in themselves necessarily advantageous in human-computer interaction. Users may find the decision-making necessary to drive the system too great a burden, or they may never discover how to use the system effectively because it gives little indication of reasonable modes of use. Thus the Macintosh interface in its own right is no panacea for effective human-computer interaction. It needs careful system design based on an understanding of its underlying concepts, functionality and the psychology of interaction.

These considerations led to the following design rules for the PCS user interface on the Macintosh computer:

- Follow the Macintosh standards (defined by the toolbox and its use by programs such as the Finder, MacWrite and MacDraw) as closely as possible so that Macintosh users find PCS natural in use.
- Make each object defined by a window a natural concept unit of the grid elicitation and analysis process so that its purpose and functionality are obvious.
- Design each object to be self-describing so that minimal explanation and use of the manual are necessary.
- Use a graphic representation of data structures and results of analysis.
- Base user data entry on object manipulation using the mouse wherever possible.
- Make the system tolerant of user actions giving ease of system exploration through the capability to reverse actions and recover from errors.
- Within these constraints offer the user the maximum freedom of action possible.

These rules are largely ones of Macintosh programming style that any program should follow. There are, however, many commercial programs that deviate from this style, often because they have been transfered from other computers. Worse, there are a number of programs also that apparently conform to the style but fail to follow it in some important features. These latter programs undermine the user's confidence in the system and his capability to understand it and it has been important to avoid such problems in PCS.

PCS in Operation

The illustrations of PCS in this section are taken from the *PCS User Manual* (Shaw 1986a). In this example Bill is construing *managers* to see which of the ones he knows are *effective* and why. When starting a new topic the status window must first be checked and changed if necessary. Usually a new topic will have a specific purpose which should be entered in the appropriate box, and kept in mind as the interaction proceeds. The bottom half of the window will change automatically as elements and constructs are added (Fig.3).

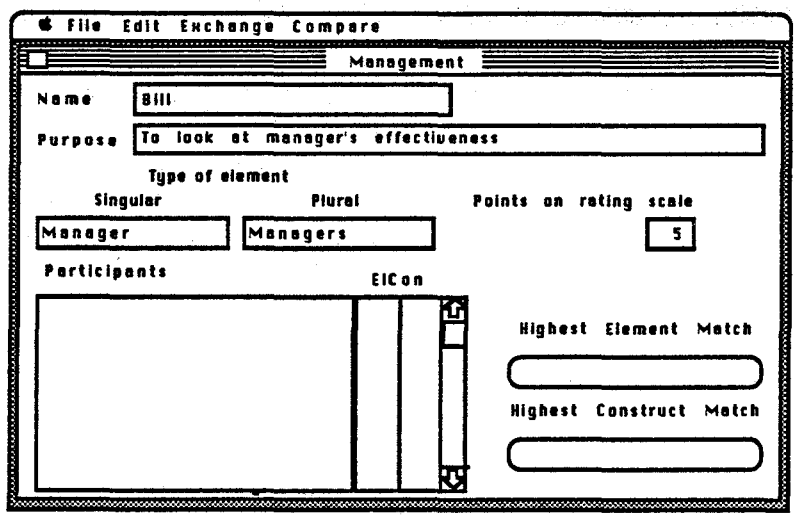

Fig.3 PCS status window

The next thing for Bill to do is to think of some managers and add these as elements. He does this by going to the *Elements* window in the *Edit* pull-down menu, then typing in the names of the managers he would like to think about one on each line. He adds five (Fig.4).

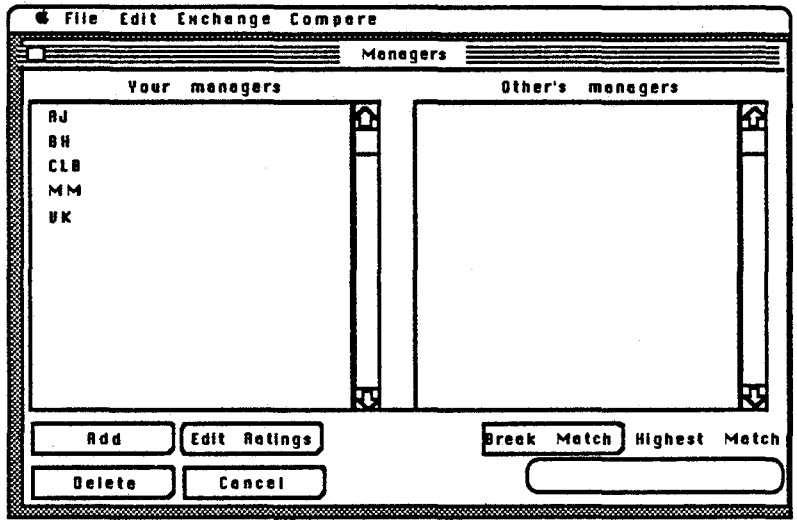

Fig.4 PCS elements window

As Bill is just starting his grid, he decides to elicit a construct from a triad, so he goes to the *Constructs* window in the *Edit* pull-down menu, and chooses triadic elicitation from a random triad. Sometimes part way through the elicitation the user may wish to choose his own triad, otherwise the system will choose one at random. Bill sees the three elements in the triad, and decides that VK is the one which is different from AJ and BH (Fig.5).

Next Bill has to decide why he thinks AJ and BH are alike and different from VK. He types in the description of the pair, *don't need supervision*, on one pole of the construct (Fig.6). Then he names the other end—that is, the way in which VK is different is that he *needs supervision*. This defines Bill's scale from *don't need supervision*, to *needs supervision*. He now has to rate all his other elements on this scale. If he finds that his original triad AJ, BH and VK need to be moved to accommodate the others he can do that. In this case he puts CLB partly up the scale, and MM partly down the scale, because MM doesn't need much supervision and CLB needs a bit more but not as much as VK (Fig.7).

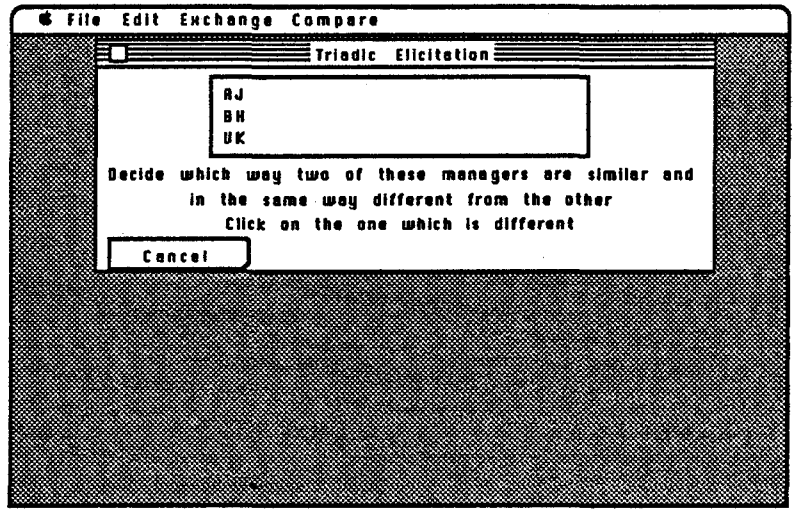

Fig.5 PCS triadic elicitation

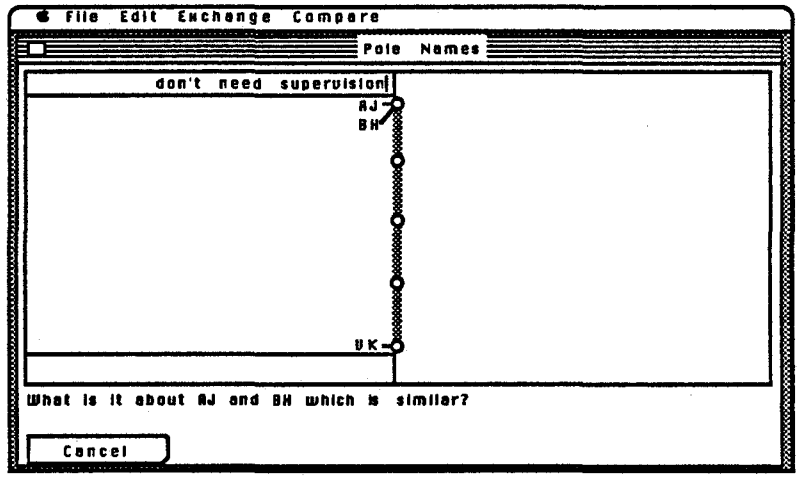

Fig.6 PCS adding pole names

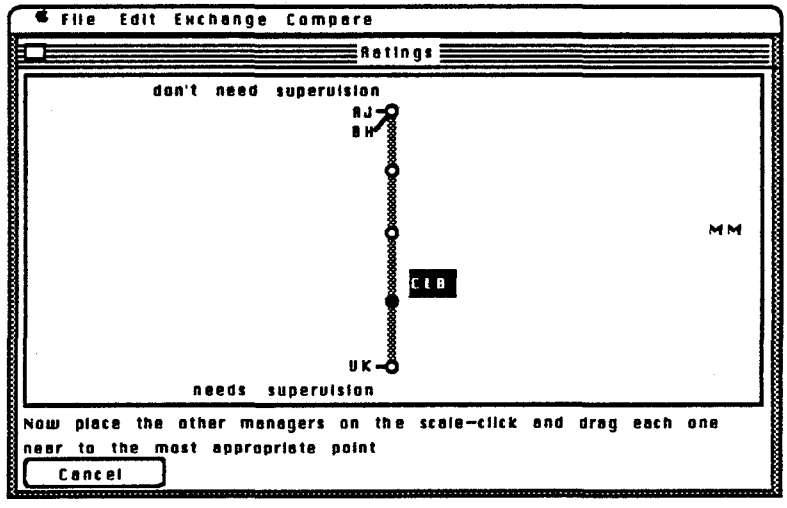

Fig.7 PCS ratings

Now Bill has got his first construct. He now continues adding several more constructs from triads before he decides to look at who else is on the system. He brings up the *Status* window from the *Edit* menu, and sees that Fred has six elements, and Joe has five. He can also see that he has a high construct match, and decides to split it. Perhaps he can use one of Fred or Joe's elements for that (Fig.8).

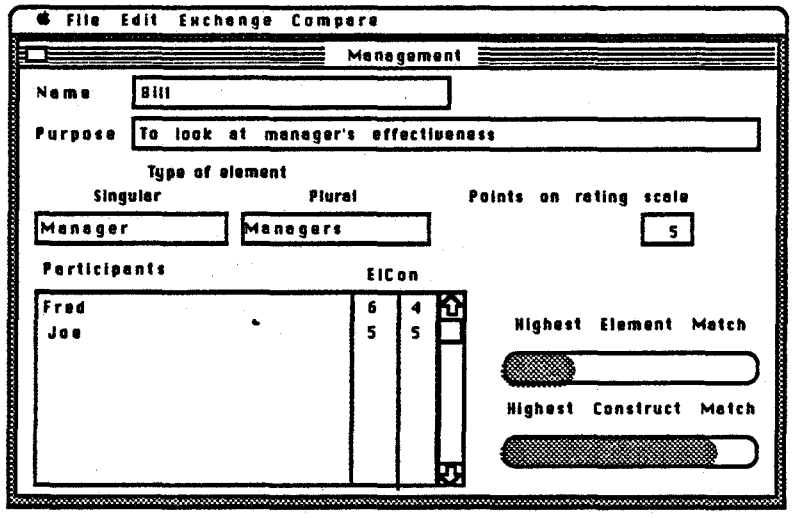

Fig.8 PCS status window

Bill brings up the *Constructs* window from the *Edit* menu and clicks on the *Highest Match* box. This takes him to a new screen showing which constructs are matched (Fig.9).

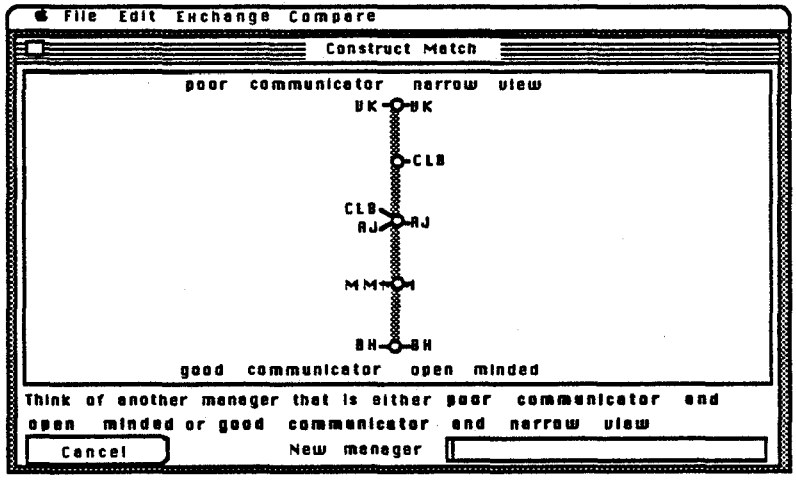

Fig.9 PCS construct match

Bill decides to add an element so he brings up the *Elements* window from the *Edit* menu. Now he can see the elements put in by Fred and Joe, and either click on one of those to add it to his list, or just type in a new one of his own. If he wants to go back and look at the matched constructs again, he would have to go back to the *Constructs* window, and click on the *Highest Match* box. He chooses to add *RA* from Fred and Joe's list (Fig.10).

Next he will have to rate *RA* on each of his constructs in turn. The screen shows his constructs one at a time and he must place *RA* where he thinks he fits on the scale (Fig.11). Note that he may still choose not to rate *RA* on opposite ends of the two matched constructs, but if he does not then the constructs will still be highly matched.

Bill continues to elicit his grid with the options available. At any time he can review his purpose on the *Status* window to make it more closely reflect his choice of elements and constructs. He can add or delete elements or constructs, use triads or just type in names and ratings. When he chooses to finish he can *Close* the file from the *File* menu, and it will be stored as part of the total interaction on the Participant Grid under the topic file name.

There are also two forms of construct *Exchange* available to Bill to enable him to compare his perspective on management effectiveness with those of other participants. He can rate a chosen participant's elements on his constructs either as: Bill would have done; or as Bill thinks the other participant did. These two procedures enable him to compare either his *agreement* with the other participant or his *understanding* of the other participant. He can select either of these forms, or do both one after the other.

Bill chose *Agreement* with Fred and his first screen was that shown in Fig.12. He placed these elements on this construct as if it were one of his own constructs, then continued with the next construct until he had done this for all of Fred's constructs.

To repeat this process for *Understanding* Fred's constructs, Bill had to go back to the *Exchange* menu title, drag to *Fred* as before, then select *Understanding* by clicking on that box. This time he had to rate Fred's elements on Fred's constructs *as he thought Fred had rated them.* The screens looked the same for each construct, just the positioning of the elements was different (Fig.13).

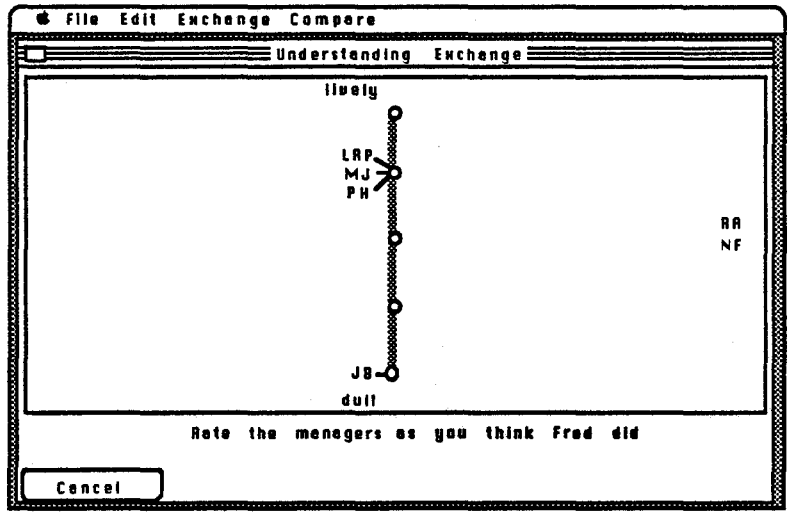

Fig.13 PCS understanding exchange

Conclusions

The new technology of interactive, networked personal computers make it feasible to develop systems for group problem solving, participant systems. This paper has described such a system based on personal construct psychology. The *participant construct system* interactively elicits, exchanges and compares repertory grids from multiple simultaneous users on a network of Macintosh computers. The users of the system can extend and understand their own thinking and problem-solving capabilities by interacting with other people to see the relationship of their points of view to those of others. They can also explore differing terminology for the same constructs; become aware of differing constructs having the same terminology; extend their own construct systems with those of others; provide others with constructs they have found valuable. Thus PCS enables a group of people to explore a problem-solving domain using the full group resources.

Acknowledgements

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References

Boose, J.H. (1986). Rapid acquisition and combination of knowledge from multiple experts in the same domain. **Future Computing Systems**, In press.

Chang, E. (1986a). Participant systems. **Future Computing Systems**, in press.

Chang, E. (1986b). Participant systems: group human-computer interaction. **Proceedings of 1986 International Conference on Systems, Man and Cybernetics**. To appear. Atlanta (October).

Kasperski, R., Mellen L. & Chang, E. (1986). CANTATA: group protocols in a conferencing environment. **Proceedings of 1986 International Conference on Systems, Man and Cybernetics**. To appear. Atlanta (October).

Kelly, G.A. (1955). **The Psychology of Personal Constructs**. New York: Norton.

Shaw, M.L.G. (1980). **On Becoming a Personal Scientist**. London: Academic Press.

Shaw, M.L.G., Ed. (1981a). **Recent Advances in Personal Construct Technology**. London: Academic Press.

Shaw, M.L.G. (1981b). Conversational heuristics for eliciting shared understanding. Shaw, M.L.G., Ed. **Recent Advances in Personal Construct Technology**. pp. 31-44. London: Academic Press.

Shaw, M.L.G. (1982). PLANET: some experience in creating an integrated system for repertory grid applications on a microcomputer. **International Journal of Man-Machine Studies, 17**(3), 345-360.

Shaw, M.L.G. (1985). Communities of knowledge. Epting, F. & Landfield, A.W., Eds. **Anticipating Personal Construct Psychology**. pp. 25-35. Lincoln: University of Nebraska Press.

Shaw, M.L.G. (1986a). **Participant Construct System User Manual**. ARC-CPCS-PCS-MANUAL:FEB86. Calgary: Alberta Research Council (February).

Shaw, M.L.G. (1986b). Participant systems: group human-computer interaction. **Proceedings of 1986 International Conference on Systems, Man and Cybernetics**. To appear. Atlanta (October).

Shaw, M.L.G. & Gaines, B.R. (1981). The personal scientist in the community of science. Reckmeyer, W.J., Ed. **General Systems Research and Design: Precursors and Futures**. pp. 59-68. Society for General Systems Research (January).

Shaw, M.L.G. & Gaines, B.R. (1983). A computer aid to knowledge engineering. **Proceedings of British Computer Society Conference on Expert Systems**, 263-271 (December). Cambridge.

Shaw, M.L.G. & Gaines, B.R. (1986). Interactive elicitation of knowledge from experts. **Future Computing Systems, 1**(2), to appear.

Self-Concept and Self-Esteem of Criminal Offenders: A Personal Construct Investigation

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ABSTRACT

A modified repertory grid was used to assess criminal offenders' self-concepts and self-esteem as related to their criminal activity. Twenty high criminality and 20 low criminality incarcerated offenders were studied. Subjects completed a 16 (element) X 22 (construct) rep grid designed to assess their construal of significant others, crime-relevant figures, and three aspects of self-concept. Rep grid data indicated that, while the two offender groups did not differ in present self-esteem or in self-esteem regarding their crimes, they differed significantly in the degree to which they viewed themselves as criminals. Implications for therapy with incarcerated offenders were discussed.

INTRODUCTION

An interesting topic from a personal construct perspective is the study of criminal offenders' self-concepts. Indeed, one of the first papers describing the clinical use of repertory grids was a case study of an arsonist (Fransella & Adams, 1966). Using a series of grids, the authors found that the arsonist's self-concept did not include a view of himself as an arsonist. Instead, he demonstrated the rather idiosyncratic construal of himself as a punisher of wrong-doing, a self-construct which presumably contributed to his fire-setting behavior. Since the appearance of this seminal article, the study of criminal offenders' construal processes has been extended to violent offenders (Howells, 1983), juvenile car thieves (Kelly & Taylor, 1981), poisoners (Howells, 1978), pedophiles (Howells, 1979), and rapists (Howells & Steadman-Allen, 1977; Needs, 1985).

While personal construct investigators have examined the construal processes of individual offenders and specific offender groups, little attention has been paid to the self-construing of criminal offenders in general. In particular, an unanswered question is whether criminal offenders regard themselves as criminals. Such a question is important to criminologists, particularly if incarceration is expected to deter offenders from committing future crimes.

Afterall, a person cannot abandon an identity (or behaviors associated with that identity) if he does not accept the identity in the first place.

This paper is based on a larger study, the purpose of which was to empirically assess incarcerated offenders' self-concept and self-esteem as related to their criminal activity. The study investigated self-concept variables which were hypothesized to distinguish offenders high and low in criminality (i.e., the propensity to commit crime), and which presumably play a role in the criminal's decision to maintain his illegal activities. Five major questions constituted the focus of this research:

1. Do criminal offenders construe themselves as criminals? More precisely, in the context of this investigation, is the offender's self-concept similar to his concept of a person he regards as a criminal?
2. What is the relationship between level of criminality and criminal self-identification? More specifically, is the offender high in criminality more or less likely to accept a criminal self-identification than is the offender low in criminality?
3. Do criminal offenders evaluate people they regard as criminals positively or negatively?
4. What is the relationship between degree of criminal self-identification and self-esteem?
5. What is the relationship between level of criminality and self-esteem? More specifically, do offenders distinguished by level of criminality differ in level of self-esteem?

METHODOLOGY

Subjects consisted of 40 adult male inmates incarcerated at the Federal Correctional Institutions in Ashland and Lexington, Kentucky. In order to minimize the effects of incarceration on self-concept and self-esteem, subjects were limited to offenders incarcerated for no less than six weeks and no more than six months at the time of testing. Level of criminality was measured by means of (1) the Salient Factor Score (SFS, see Hoffman, 1983), an actuarial device used by the United States Parole Commission because of its reliability in predicting parole success, and (2) the security level of the prison at which the inmate was incarcerated. Twenty high criminality (HC) inmates were from the medium security FCI-Ashland, while 20 low criminality (LC) inmates were from the minimum security FCI-Lexington.

All subjects volunteered for the study and were tested individually. The Quick Test (Ammons & Ammons, 1962), a brief test of verbal fluency, was administered to screen out subjects with insufficient verbal skills. Inmates who scored above a 90 IQ on this instrument were administered the

Rosenberg Self-Esteem Scale (RSES, Rosenberg, 1979), a 10-item self-esteem inventory, and a modified rep grid (Kelly, 1955). The grid consisted of 16 elements designed to assess each inmate's construal of 10 significant others (mother, father, sister, brother, wife or girlfriend, closest friend other than spouse/girlfriend, most successful person, least successful person, most admired person, and least admired person), 3 crime-relevant role types (law abiding person, person who committed same crime as subject, and person subject regards as a criminal), and 3 aspects of self-concept (present self, ideal self, and self while committing last crime ["criminal self"]). Twelve bi-polar constructs were elicited, one for each of the 10 significant others in the role-title list, and 2 pertaining to the individual's present construal of self. Ten bi-polar constructs were additionally supplied, taken from Yochelson and Samenow's (1976, 1977) analysis of criminals and criminal behavior: powerful vs. weak, hurts others vs. respectful of others, dull vs. exciting, criminal vs. noncriminal, honest vs. dishonest, hot tempered vs. controlled, responsible vs. irresponsible, depends on others vs. stands on own two feet, unique vs. ordinary, and law abiding vs. law violating. Subjects rated the 16 elements along the 22 elicited and supplied constructs using a 6-point rating scale. Subjects were additionally requested to choose the five constructs (from the list of elicited and supplied constructs) which they considered most important to them, and on which a change would be most difficult or impossible. For the purpose of later analyses, these constructs were considered to reflect the individual's core construing.

Each subject's matrix of ratings was analyzed using both simple additive measures and Slater's INGRID principal components analysis (Slater, 1976). The following scores were selected from individual analyses as being relevant to the assessment of self-concept and self-esteem for the two offender groups:

1. Criminal self-identification. The degree of criminal self-identification was measured by the "present self" - "criminal" element distance.

2. Present self-esteem. Three grid-based scores were used to assess an offender's present self-esteem: (a) "present self" - "ideal self" distance, (b) number of constructs on which the "present self" element is rated positively (based on the placement of the individual's "ideal self" element), and (c) sum of the ratings for the constructs on which the "present self" was rated positively. The Rosenberg Self-Esteem Scale (RSES) was used as a fourth, non-grid based measure of present self-esteem.

3. Self-esteem regarding one's crime. An offender's self-esteem regarding his crime was assessed in the same

manner as his present self-esteem, except the "criminal self" element was substituted for the "present self" element in the three grid-based scores.

4. Core dislodgement. Two related scores were used to measure an offender's dislodgement in construing his crime. The first score consisted of the number of constructs designated as important by the offender on which the "criminal self" and "ideal self" elements were rated on opposite poles. The second score was the algebraic difference between the ratings of the two elements for all five constructs.

5. Negativeness of "criminal" element. Two measures were used to assess the degree of negativeness with which an offender viewed a person he regarded as a criminal: (a) number of constructs on which the "criminal" element was rated positively (based on the placement of the individual's "ideal self" element), and (b) number of constructs on which the "criminal" element was rated positively.

RESULTS

Results are discussed in terms of the major self-concept variables addressed in this study.

Criminal identification. HC offenders demonstrated a significantly greater degree of criminal self-identification than did LC offenders ($\underline{x}$s = 1.07 and 1.42, $\underline{t}$ = 3.24, $\underline{p}$<.01).

Self-esteem. The two offender groups demonstrated high present self-esteem and did not differ significantly on any of the measures of present self-esteem or self-esteem regarding their crimes. However, mean comprisons indicated that, for both groups, self-esteem regarding the offender's crime was significantly ($\underline{p}$<.01) lower than was present self-esteem.

Correlations among the self-esteem and criminal identification measures suggest an interesting difference between the two offender groups. For the LC offenders, degree of criminal identification correlated significantly ($\underline{p}$ <.01) and negatively with all four measures of present self-esteem. In contrast, for the HC offenders, no relationship existed between measures of present self-esteem and criminal identification.

Core dislodgement. The two offender groups did not differ significantly on degree of core dislodgement concerning their crimes.

Negativeness of "criminal" element. The two offender groups evaluated people they regarded as criminals equally negatively. However, comparisons of similar measures used to

assess the construing of the "present self," "criminal self," and "criminal" elements revealed an interesting difference between the two groups. The LC offenders construed the people they regarded as criminals significantly more negatively ($p<.01$) than they construed themselves while committing their crimes. In contrast, the HC offenders construed the people they regarded as criminals and themselves while committing their crimes equally negatively.

Ratings on supplied constructs. Two-tailed t-tests were used to compare the two offender groups on their ratings of the "criminal," "present self," "ideal self," and "criminal self" elements along the 10 supplied constructs. Contrary to expectation, only four significant differences were found, a number which is close to that expected by chance. An interesting finding is noted, however, in that the HC and LC offender groups regarded themselves while committing their crimes as equally criminal and law violating.

DISCUSSION

The overall pattern of results suggests the two offender groups differ in important ways in their self-concept and self-esteem related to their criminal behavior. The LC offenders rejected a criminal self-identification and construed people they regarded as criminals in extremely negative terms. They demonstrated low self-esteem concerning their crimes; however, despite their incarceration, they evaluated themselves highly at the time of testing. In effect, the LC offenders appeared to state, "I am not a criminal. I dislike criminals. I don't feel good about myself thinking back on my crime, but I like myself now." The pattern for the HC offenders differed significantly in one respect. As with the LC offenders, they evaluated people they regarded as criminals negatively. They also demonstrated low self-esteem for their crimes, and they evaluated themselves highly at the time of testing. However, in contrast to the LC offenders, the HC offenders tended to accept a criminal identification. In effect, the HC offenders appeared to state, "I am a criminal. I dislike other criminals, and I don't feel good about myself in thinking back on my crime, but I like myself now."

How is it possible for the two offender groups to differ in criminal self-identification, and yet demonstrate similarly high levels of present self-esteem? Although the data does not provide a definitive answer, the results suggest degree of criminal identification and present self-esteem are differentially related for the two offender groups. For the LC offenders, degree of criminal identification correlateed significantly and negatively with present self-esteem; that is, the greater the degree of criminal identification, the lower the present self-esteem. However, for the HC offenders, no consistent relationship was found between

degree of criminal identification and present self-esteem. While some HC offenders demonstrated a criminal identification and low present self-esteem, others demonstrated a criminal identification and high self-esteem. Clearly, some HC offenders were able to accept a criminal identification and yet maintain a high level of present self-esteem. The reasons for this are many and likely differ from case to case. However, the data is consistent with Yochelson and Samenow's (1976, 1977) contention that it is the high criminality offender's high self-esteem which helps perpetuate his criminal lifestyle.

It is noteworthy that the two offender groups did not differ either in self-esteem regarding their crimes or in degree of core dislodgement. These results suggest the HC and LC offenders viewed themselves while committing their last crimes equally negatively. This does not imply, however, that the reasons underlying the negative "criminal self" evaluations are the same for the two offender groups. Indeed, this researcher's experience in working with inmates is that LC and HC offenders differ in their evaluation of the behaviors which brought them to prison. LC offenders tend to view their illegal activity negatively because it resulted in their incarceration. They attribute their being in prison to the fact that they broke the law. HC offenders also view their illegal activity negatively. However, they attribute their being in prison to the fact that they did not break the law well enough. Consequently, the experience of prison holds different meanings for the two offender groups. LC offenders decide to not break the law again following release so as to avoid a return to prison. HC offenders devise schemes to break the law better so as to elude law enforcement agents, thereby avoiding a return to prison. The two offender groups consequently evaluate the illegal behavior which brought them to prison negatively, but for different reasons.

Several implications are suggested by these findings. As regards therapy, groups which focus exclusively on offenders' present self-esteem will likely have little impact on subsequent criminal behavior. Both the HC and LC offenders demonstrated high self-esteem at the time of testing, and efforts at bolstering their self-esteem without examining factors which contributed to their criminal behavior would be of little value. Moreover, in the case of the HC offenders, such therapy would merely reinforce their already high present self-esteem, and would possibly provide them with an excuse to continue their criminal lifestyle. It is the researcher's experience that in doing therapy with HC offenders, the only meaningful intervention for effecting change is a reality-based approach which focuses on the negative consequences of their behavior. If the offender is able to internalize the hurt he has caused others, his self-esteem will be significantly lowered. Only after this

crucial step can therapy focus on raising self-esteem through prosocial behavior.

For the LC offender, the rejection of a criminal self-identification is likely based in reality. Their criminal behavior is an isolated incident and is not reflective of an enduring criminal lifestyle. Consequently, to provide a measure of deterrence, a reality-based and confrontive therapy focusing on their self-identification would likely be inappropriate. For such offenders, this investigator has found more traditional insight-oriented therapies to be helpful. Such therapies help the offender to identify the factors which contributed to his committing a crime, and thereby help him to avoid repeating his mistakes. It should be noted this researcher does not advocate replacing penalties (e.g., probation, incarceration, financial renumeration) with therapy. Penalties, when chosen appropriately to fit the severity of the crime, provide the necessary impetus to avoid the future commission of crimes. Therapy, in this instance, can capitalize on the motivation for change created by the penalty. Thus, this researcher does not argue for the supremacy of therapy or penalties in deterring crime, but finds the two can be combined effectively.

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REFERENCES

Ammons, R. B., & Ammons, C. H. (1962). The Quick Test (QT): Provisional manual. Missoula, MT: Psychological Test Specialists.

Fransella, F., & Adams, B. (1966). An illustration of the use of repertory grid technique in a clinical setting. British Journal of Sociology and Clinical Psychology, 5, 51-62.

Hoffman, P. B. (1983). Screening for risk: A revised salient factor score (SFS81). Journal of Criminal Justice, 11, 539-547

Howells, K. (1978). The meaning of poisoning to a person diagnosed as a psychopath. Medicine, Science and the Law, 8, 179-184.

Howells, K. (1979). Some meanings of children for pedophiles. In M. Cook & G. Wilson (Eds.), Love and attraction.

London: Pergamon.

Howells, K. (1983). Social construing and violent behavior in mentally abnormal offenders. In J. W. Hinton (Ed.), Dangerousness: Problems of assessment and prediction. London: George Allen & Unwin Ltd.

Howells, K., & Steadman-Allen, R. (1977, April). The emotional mediation of sexual offenses. Paper presented at the Annual Conference of the British Psychological Society, Exeter, England.

Kelly, D., & Taylor, H. (1981). Take and escape: A personal construct study of car theft. In H. Bonarius, R. Holland, & S. Rosenberg (Eds.), Personal construct psychology: Recent advances in theory and practice. New York: St. Martin's Press.

Kelly, G. A. (1955). The psychology of personal constructs (2 vols.). New York: Norton.

Needs, A. (1985, August). The use of grid techniques in the psychological investigation of offending behaviour. Paper presented at the Sixth International Congress on Personal Construct Psychology, Cambridge, England.

Rosenberg, M. (1979). Conceiving the self. New York: Basic Books.

Slater, P. (Ed.). (1976). Explorations of intrapersonal space (2 vols.). New York: Wiley.

Yochelson, S., & Samenow, S. (1976). The criminal personality: Volume I: A profile for change. New York: Jason Aranson.

Yochelson,S., & Samenow, S. (1977). The criminal personality: Volume II: The change process. New York: Jason Aranson.

Idea Attribution: Differences between High and Low ACT Subjects

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ABSTRACT
Seventeen subjects, nine with high ACT and eight with low ACT scores, rated eight provided ideas on a scale from one to nine on ten provided polar attributes. ANOVA showed that high and low ACT groups differed in the degree in which they attributed ideas with being growth producing/stagnant ($F = 6.95$, $p < 0.009$), and enlightening/confusing ($F = 8.19$, $p < 0.005$). Ideas were shown to be significantly different on six of the ten attributes (from $F = 3.32$, $p < 0.003$ to $F = 9.33$, $p < .0001$). Two primary factors accounting for 81% of the variance: 1. (+/- value) eigenvalue = 5.68, 56.8%; 2. (complexity) eigenvalue = 2.44, 24.4%. Clusters, four of attributes and three of ideas were identified.

INTRODUCTION
The postulates and corollaries of George Kelly's (1955) theory of Personality have a great deal of logical appeal and credibility. The research done using Kelly's postulates and corollaries has been voluminous. Topics studied widely include personality development and behavioral change (Maher, 1965; Adams-Webber, 1979; Bonarius, Holland, & Rosenberg, 1981; Mancuso & Adams-Webber, 1982), interpersonal communication (Duck, 1977; Slater, 1976, 1977), business applications such as management, vocational guidance, and training, (Beck & Cox, 1980; Stewart & Stewart, 1981), and fields in education such as teacher evaluation, student evaluation, raising perceptual awareness, educational enquiry, teacher training, curriculum development, and inter-personal negotiations (Shaw & Keen, 1983; Schank & Abelson, 1977, Osgood, Suci, & Tannenbaum, 1957; Tyler, 1983; Attneave, 1959; Pope and Keen, 1981). Even with these areas being explored, little has been done to extend the application of Kelly's postulates to the area of cognition and learning. Since Personal Construct Psychology has been labeled a cognitive theory of personality, suchan extension is important.

It is reasonable to believe that as ideas or rules have identity they will be construed with both roles and attributes in the person's construct system similar in form, principle and dynamics to those used with people (Adams-Webber, 1979). Constructions and anticipations made about an idea, its effects, changes it may undergo,etc. could limit how a person acts on, learns, accepts, validates, applies, organizes, or values that idea.

The present study had two purposes: 1. Do ideas differ by attributed qualities that may be tested by a repertory grid? 2. Do students with low and high ACT scores differ in the ways they attribute idea qualities.

METHOD

Subjects were asked to rate from one to nine each idea on each construct, with one pole or extreme of the attributes or constructs as a rating of one and the other pole or extreme as a rating of nine, with other numbers representing ratings between the extremes.

Instrument development

A repertory grid supplying both elements (ideas) and constructs (bi-polar attributes) was created. Eight specific ideas and ten constructs or polar attributes identified from elicited student answers to the Idea Repertory Inventory (Timothy, Note 1) were selected to represent attitudes about courses, teachers, materials, and personal ability.

Subjects

Twenty six subjects, volunteer members of a psychology course given extra credit for research participation were given the repertory grid. Subjects were divided into groups based on their ACT composite scores. The average at the selected school was 16. The high ACT group consisted of nine students with composite ACT scores of 2Ø and above. The low ACT group included eight students with composite ACT scores of 14 and below. Nine subjects with composite ACT scores of 15-19 were not used.

Analysis

Ten two-way analyses of variance were done, one for each attribute pair, using the ANOVA procedure on Statistics with Finesse@ (1985). Comparisons were made of high and low groups, ideas, and interactions. A significance level of $p < .Ø1$ was deemed acceptable with this exploratory research.

A principal components analysis used PRIFAC (Brown, Williams and Barlow, 1984). The factor loadings from the analysis were used to plot the factors and the attributes on a two dimensional scale (see figure one), using the main factors as the center and perpendicular dimensions. The plot was rotated and flipped as necessary to enhance visual groupings of factors without changing the relationships. The ideas and subjects were also plotted on the same dimensions for comparison and clustering.

Clusters were identified by reasonable proximity on the two dimensional scale. Brown, Williams, & Barlow (1984) and Pope & Keen (1981) have discussed the theoretical, logical, and mathematical reasoning in such analysis.

Table 1
Summary of ANOVA results.

Attribute	Factors	DF	SS	F-RATIO	Significance
Theoretical/ Practical	Ideas	7	24.10	3.65	.002
	ACT group	1	4.85	0.73	n.s.
	Interaction	7	7.08	1.07	n.s
	Residual	120	6.61		
Hard/Easy	Ideas	7	6.94	1.57	n.s.
	ACT group	1	4.25	0.96	n.s.
	Interaction	7	1.00	0.22	n.s.
	Residual	120	4.43		
Complicated/ Simple	Ideas	7	6.60	1.29	n.s.
	ACT group	1	12.94	2.54	n.s.
	Interaction	7	1.38	0.27	n.s
	Residual	120	5.10		
Technical/ General	Ideas	7	15.51	2.22	n.s.
	ACT group	1	5.78	0.83	n.s.
	Interaction	7	5.69	0.81	n.s.
	Residual	120	6.99		
Abstract/ Concrete	Ideas	7	26/08	3.48	.002
	ACT group	1	1.04	0.14	n.s.
	Interaction	7	6.16	0.82	n.s.
	Residual	120	7.50		
Enlightening /Confusing	Ideas	7	11.54	2.21	n.s.
	ACT group	1	42.75	8.19	.005
	Interaction	7	1.76	0.34	n.s
	Residual	120	5.22		
Helpful/ Hurtful	Ideas	7	21.65	4.19	.0006
	ACT group	1	19.50	3.78	.05
	Interaction	7	3.00	0.58	n.s.
	Residual	120	5.16		
Growth Prod. /Stagnant	Ideas	7	23.86	4.75	.0002
	ACT group	1	34.95	6.95	.009
	Interaction	7	1.68	0.33	n.s.
	Residual	120	5.03		
Challenging/ J. Happens	Ideas	7	17.90	3.32	.003
	ACT group	1	4.68	0.87	n.s.
	Interaction	7	5.49	1.02	n.s.
	Residual	120	6.04		
Good/Bad	Ideas	7	39.04	9.33	.0001
	ACT group	1	4.00	0.96	n.s.
	Interaction	7	2.74	0.66	n.s.
	Residual	120	4.18		

RESULTS

Anova

The analysis of variance showed significant differences between ideas on six of the ten attributes. These attributes were theoretical/practical ($F = 3.65$, $p = .002$), abstract /concrete ($F = 3.48$, $p = .002$), help/hurt ($F = 4.19$, $p = .001$), growth producing/ stagnant ($F = 4.75$, $p = .0002$), challenging/just happens ($F = 3.32$, $p = .003$), and good/bad ($F = 9.33$, $p = .0001$) (see table 1).

The analysis of variance also showed significant differences between the high and low ACT groups on two of the ten attributes, enlightening/confusing ($F = 8.19$, $p = .005$) and growth producing/stagnant ($F = 6.95$, $p = .009$). Examination of the means showed that these differences were in degree rather than in direction of attribution.

None of the attributes had a significant interaction between ideas and the ACT groups.

Prifac

Two main factors accounted for 81% of the variance among the factors (see figure 1 and table 3). Factor one had an eigenvalue of 5.68, accounting for 56.8% of the variance, and factor two had an eigenvalue of 2.44, accounting for 24.4% of the variance (see tables 2 and 3).

Table 2
Factor Loadings Matrix

Attributes	Factor 1	Factor 2	Communalities
Theoretical/Practical	-0.8221	-0.2723	0.7500
Hard/Easy	-0.1444	0.8855	0.8049
Complicated/Simple	-0.6294	0.6996	0.8855
Technical/General	-0.6455	0.6016	0.7786
Abstract/Concrete	-0/6016	-0.5033	0.6152
Enlightening/Confusing	0.8317	-0.3197	0.7939
Helpful/Hurtful	0.9258	0.0900	0.8651
Growth prod./stagnant	0.9200	0.1802	0.8788
Challenge/just happen	0.7150	0.5745	0.8413
Good/Bad	0.9486	0.0377	0.9013

Table 3
Eigenvalues and Percent of Variability Accounted for

	FACTOR 1	FACTOR 2	
EIGENVALUES	5.6774	2.4372	
PERCENT EIG.	56.7736	24.3717	81.1453

The factor loadings for ideas, attributes, and high and low ACT groups were plotted on a two dimensional surface and the plot was flipped over and rotated 96 degrees to enhance meaningful visual comparisons of the factor loadings (see

tables 2, 3, and 4, and figure 1).

Four clusters of attributes were identified. The first cluster included good, growth-producing, helpful and practical as opposed to bad, stagnant, hurtful, and theoretical. A second cluster, perpendicular to the first factor, was hard as opposed to easy. A third cluster, between hard and bad, included complicated, technical, and confusing as opposed to simple, general, and enlightening. The fourth cluster, between hard and good, included challenging and concrete as opposed to just happen and abstract.

Table 4
Factor Scores

Idea/Group/Interaction	FACTOR 1	FACTOR 2
Problems are Solvable	-Ø.Ø293	1.3481
Teachers try to help students	Ø.8429	-Ø.9437
I am capable	Ø.8438	-Ø.6454
Knowing is better than guessing.	Ø.3129	Ø.8842
Books have all the answers.	-1.3878	-Ø.3392
That which is written is true.	-1.5871	Ø.1742
Some ideas are better than others.	-Ø.2940	-1.4191
Achievement comes through work.	1.1831	1.Ø329
High ACT	-Ø.3493	Ø.2776
Low ACT	Ø.3620	-Ø.2872
Hi X Problems are Solvable.	-Ø.Ø554	1.2444
Hi X Teachers try to help students.	Ø.ØØØØ	1.4645
Hi X I am capable.	Ø.4533	-Ø.72Ø5
Hi X Knowing is better than ...	1.281Ø	-1.1947
Hi X Books have all the answers.	Ø.5857	-Ø.Ø289
Hi X That which is written is true.	1.1334	-1.3387
Hi X Some ideas are better than ...	-Ø.1252	1.7Ø35
Hi X Achievement comes through work.	Ø.8Ø51	-Ø.Ø375
Lo X Problems are Solvable.	-1.7ØØ3	-Ø.Ø188
Lo X Teachers try to help students.	-1.Ø356	-Ø.7Ø01
Lo X I am capable.	-2.Ø13Ø	Ø.6169
Lo X Knowing is better than ...	-1.1Ø74	-Ø.3233
Lo X Books have all the answers.	-Ø.6159	-1.8Ø49
Lo X That which is written is true.	Ø.Ø68Ø	-Ø.985Ø
Lo X Some ideas are better than ...	Ø.6775	1.2282
Lo X Achievement comes through work.	1.7518	Ø.8128

Three clusters of ideas were also identifiable. "Books have all the answers" and "that which is written is true" were clustered near bad, hurt, static, and theoretical. The ideas "I am capable," "teachers try to help," and "some ideas are better than others" clustered near easy. Finally, the ideas "problems are solvable," "knowing is better than guessing," and "achievement comes through work" clustered between good and hard.

It is interesting that the direction of the group mean differences were reversed on two of the ideas. Even though differences were not significant, "some ideas are better than others" and "problems are solvable," tended more to the easy end, while still being less on the good side for high ACT as compared to the low ACT subjects.

The factor analysis was repeated including the subjects, and the results were plotted to identify clusters of subjects (see figure 2). While clusters of subjects were found, no other information is available about the subjects to render these clusters meaningful.

DISCUSSION

The hypothesis that ideas may be differentiated by attributions was supported by the results. Ideas used were treated as different entities by the subjects. The attributes used did classify, differentiate and identify idea groups.

The first primary factor may be called evaluative, and the second complexity. Similar main factors occur on many personality repertory groupings. This finding would suggest that learners treat ideas much as they do people, with stereotypic attribution playing a major role in deciding which ideas one will seek out and which one will get to know well. This finding has implications for learning and teaching processes and theories of instruction. Evaluation as a primary factor in dealing with ideas is in harmony with Guilford's (1967) structure of the intellect, and is dissonant with the hierarchical aspects of Bloom's (1956) taxonomy.

Low and high ACT students significantly on two of the attributes, helpful/hurtful, and growth producing/stagnant in degree, but not in kind of attribution. Low ACT students were more positive in their attribution on these two attributes than the high ACT students. This finding suggests that high ACT subjects are more skeptical than low ACT students. This finding raises new questions. Since there was no interaction between ideas and ACT scores, the differences between the groups are not dependent on the ideas. Are the differences developmental, rather than typological? Will the differences be consistent with other groups? Are high ACT subjects more pessimistic about ideas than low ones? A post hoc examination of the data indicates that a sign test would be significant in the affirmative. More data needs to be gathered on these points.

Differences in ACT groups were minor. More important attribution differences may be identified by comparing other groups, such as high and low grade point averages, varying occupations and major choices, styles of learning and teaching, developmental levels, and age groups. More specific comparisons on individual ideas and attributes in varying combinations should be done.

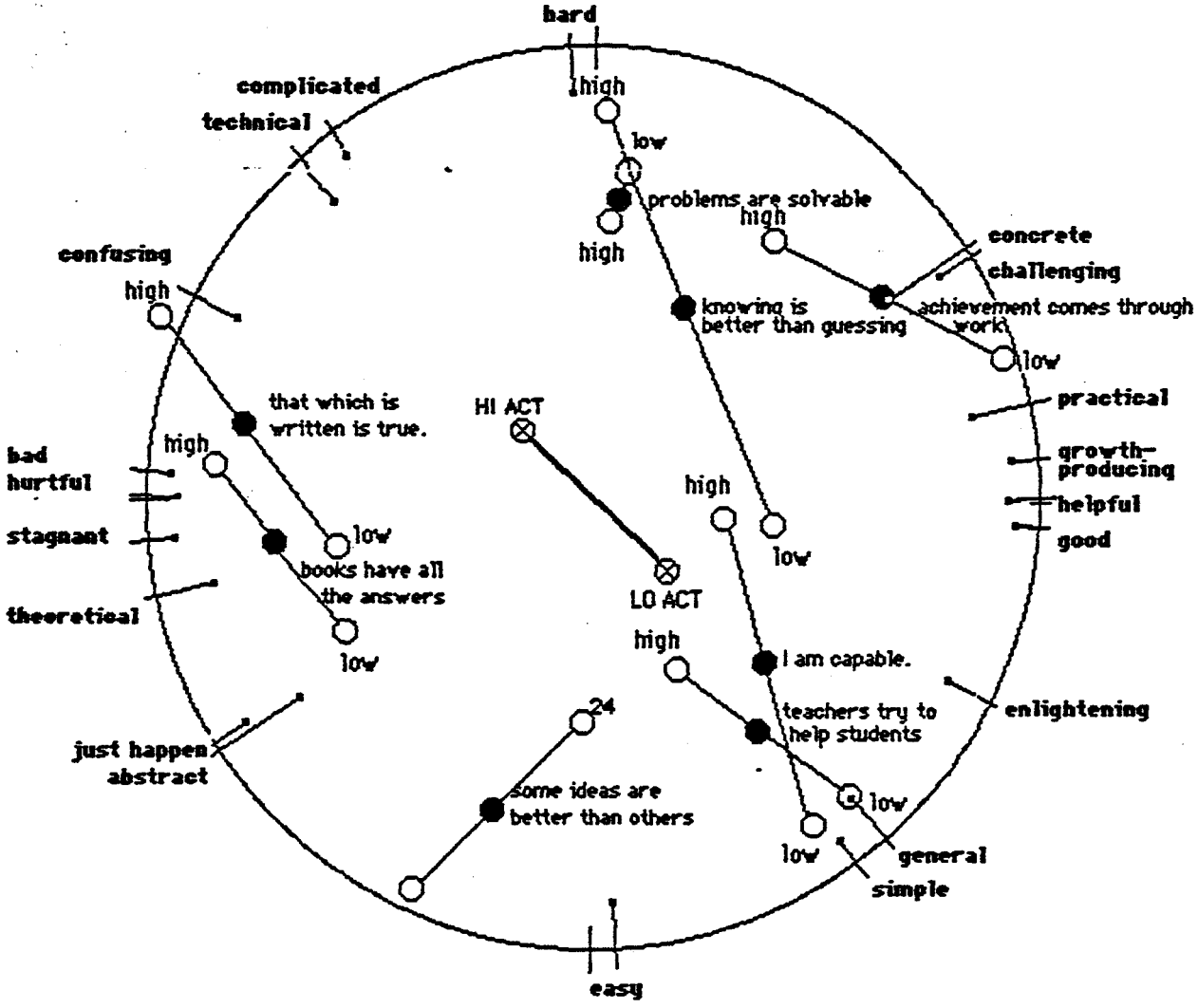

Figure 1. Plot of Attributes (small dots), Ideas (filled circles) High and Low ACT groups and Group X Idea Interaction (circles).

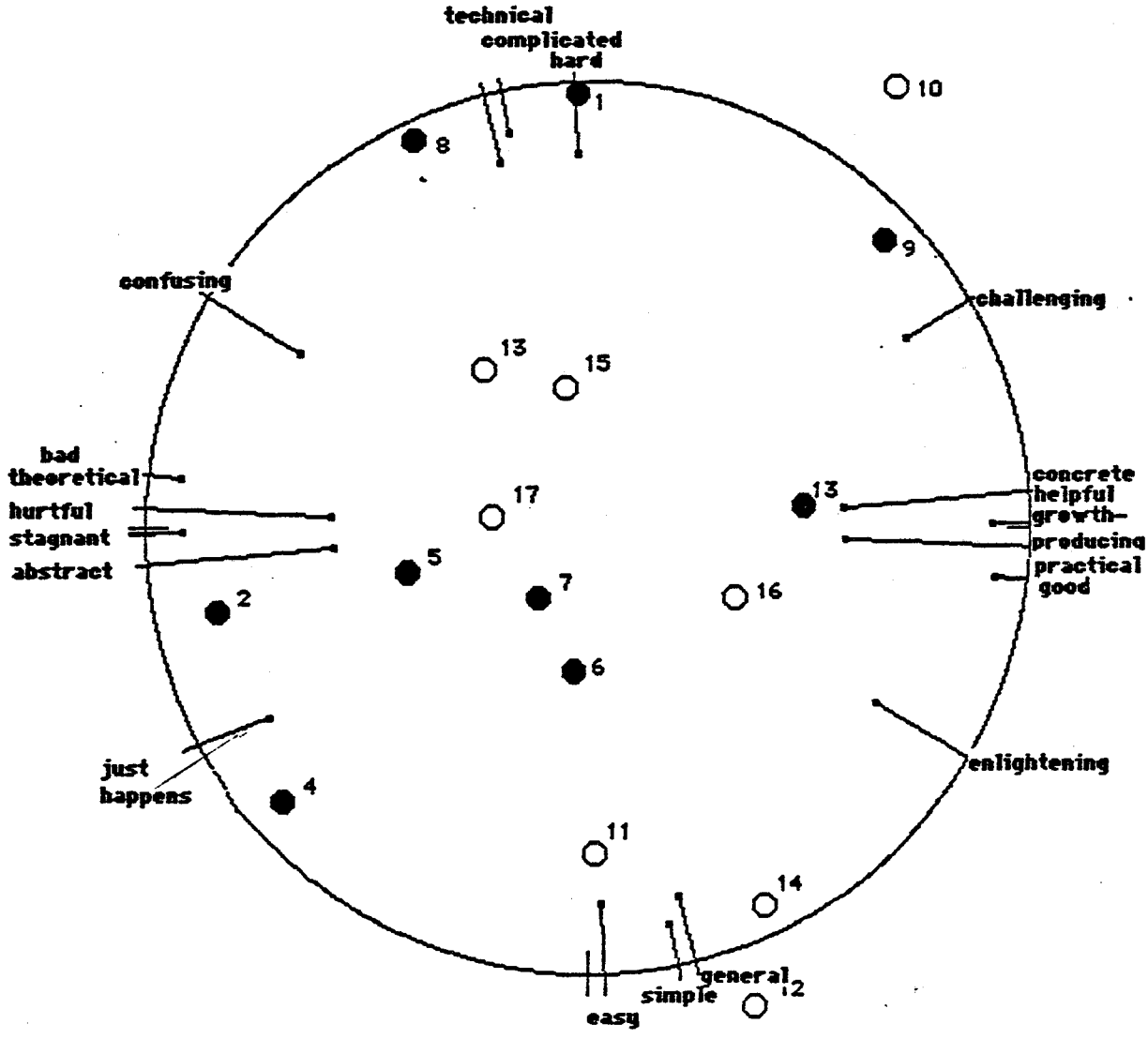

Figure 2. Plot of subject averages for High ACT (filled circles) and Low ACT (empty circles) with Attributes.

NOTES

1. Timothy, G.L. (1968). Unpublished pilot study. Rexburg: Ricks College.

REFERENCES

Adams-Webber, J. R. (1979). Personal Construct Theory: Concepts and Applications. New York, John Wiley & Sons.

Attneave, F. (1959). Applications of Information Theory to Psychology. New York: Holt, Rinehart & Winston.

Beck, J. E. & Cox, C. J. (Eds.) (1980). Advances in Management Education. New York: John Wiley.

Bloom, B.S. (Ed.), Engelhart, M.D., Furst, E.J., Hill, W.H., and Krathwohl, D.R. (1956). Taxonomy of Educational Objectives--The Classification of Educational Goals. Handbook I: Cognitive Domain. New York: David McKay Company, Inc.

Bonarius, H., Holland, R. & Rosenberg, S. (1981). Personal Construct Psychology: Recent Advances in Theory and Practice. New York, St. Martin's Press.

Brown, B. L., Williams, R. N. & Barlow, C. D. (1984). PRIFAC: A PASCAL Factor Analysis Program. Journal of Pascal, Ada, & Modula- 2, Mar.-Apr.

Duck, S. W. (1977). Personal Relationships and Personal Constructs: A Study of Friendship Formation. London: Wiley.

Guilford, J.P. (1967). The Nature of Human Intelligence. New York: McGraw-Hill.

Kelly, G. A. (1955). The Psychology of Personal Constructs. New York: Norton.

Maher, B. A. (Ed.) (1965). Progress in Experimental Personality Research (Vol. 2). New York: Academic Press.

Mancuso, J. C. & Adams-Webber, J. R. (1982). The Construing Person. New York, Praeger Publishers.

Osgood, C.E., Sucy, G.J., & Tannenbaum, P.J. (1957). The Measurement of Meaning. Urbana: University of Illinois.

Pope, M. L. & Keen, T. R. (1981). Personal Construct Psychology and Education. New York, Academic Press.

Schank, R. & Abelson, R. (1977). Scripts, Plans, Goals, and Understanding. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Shaw, M. L. G., & Keen, R. R. (Eds.) (1983). Practicalities of Personal Construct Theory: Applications of the Repertory Grid Methodology. Montreal: Cybersystems Publishing.

Slater, P. (Ed.) (1976). Dimensions of Intrapersonal Space. Vol. 1. London: John Wiley.

Stewart, V., & Stewart, A. (1981). Business Application of Repertory Grids. McGraw-Hill.

Tyler, L. (1983). Thinking creatively. San Francisco: Jossey-Bass.

COGNITIVE COMPLEXITY: AN APPROACH TO INDIVIDUALS IN GROUPS AS EFFECTIVE DECISION MAKERS

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The effectiveness of decision-making in groups will depend in part on individual's ability to acquire information from others. One crucial individual variable which has been shown to be a determinant of effective decision-making is a cognitive complexity dimension. The Kellyan Personal Construct view of cognitive complexity in terms of individual's levels of differentiation and integration was used for individual measures. A discriminant analysis was conducted to evaluate the extent to which individual differences in cognitive complexity was predictive of group levels of performance. Individuals with higher differentiating scores and abstracting abilities were members of higher performing groups. Implications for future research are given.

Individuals participating in small group decision making are involved in the interdependent functions of information acquisition, information processing, and subsequent decision making (Stager, 1967). The effectiveness of an individual's decision-making in groups will depend in part on his abilities of acquiring information from others. Some of this ability of acquisition will be determined by the manner in which an individual construes differences among others in his or her environment. That is, to what extent can an individual discriminate differences among others in order to develop the most appropriate strategy for acquiring information regarding the task at hand?

One crucial individual variable which has been shown to be a determinant of effective decision-making is a conceptual complexity dimension (Schroder, Driver, & Streufert, 1967). This cognitive complexity construct is a function of the extent of differentiation along which stimuli are ordered and the schemata with which the differentiated dimensions of information are organized (Landfield, 1971). Individuals who process information through use of little differentiation of stimuli and little organization of the dimensions of information are described as having a low cognitive complexity level. Individuals who process information through use of many differentiated dimensions and a substantial organization of these dimensions are described as having a high cognitive complexity level.

The ability to differentiate differences among others and to have a schemata for integrating the perceived differences would enable an individual to be more sensitive to group members' ways of thinking, feeling, and valuing (Landfield, 1979). Even if a group member disagrees with other members, there will be less frustration because of a more complex view of others rather than viewing them simply as an obstacle. Individuals who utilize a more cognitively complex interepretation of other members could take better

advantage of the variety of resources available.

One advantage more highly cognitively complex individuals may have is development of more appropriate strategies for communicating with others. In being able to effectively differentiate among important others with a schemata for integrating these differences, an individual could lessen defensiveness and facilitate acquiring information for decision making. The focus of this research effort will examine this cognitve complexity issue regarding effective decision making in small groups.
HI: Individuals evaluated as high in cognitive complexity regarding their communication toward others will participate in more effective decision making groups than will individuals evaluated as low in cognitive complexity.

METHOD

Subjects

Thirty graduate college students (20 males, 10 females) served as subjects in this study and were recruited from graduate organizational behavior classes. Subjects were informed that the study involved personal information concerning their relationships with family members and other acquaintances, and that, if they were uncomfortable, they could choose not to participate in the study. All subjects participated.

Decision-making effectiveness. At the beginning of the organizational behavior course, students were assigned to permanent groups of a heterogeneous nature regarding academic background (Michaelsen, Watson, Cragin & Fink, 1982). Final course evaluations resulted from individual input and group projects. In order to evaluate students' preparation over assigned readings, a series of six standardized mini-tests were administered at a relatively even sequence over the semester. The mini- test procedure (Michaelsen, Watson, and Shrader, 1985) consisted of a series of six objective tests (approximately 18 items each) that covered the assigned readings. First, each individual in the class took the test independently, the answer sheets for these tests were collected, and then each group collectively answered the same questions during a face-to-face discussion. Since individual completed their tests within a 10 minute time limit, groups were given only 5 minutes to answer the same questions. Thus, individuals were familiar with the items and groups had the decision-making tasks of acquiring information from each other regarding item alternatives and selection of the correct response. The group score was given to each individual in his or her group. There were a total of ten groups. The summation of these six standardized group tests were our measure of group effectiveness.

Cognitive Complexity. Landfield's modification (1971, 1977) of Kelly's (1955) Role Construct Repertory Test (Rep Test) was used to elicit each subject's cognitive representations relative to selected family members and other acquaintances.

Procedure

At approximately three months into the four month semester the Rep Test was administered for one and one-half hours. The Rep Test Response Sheet is a matrix of 15 columns and 15 rows. Above the columns, Ss enter the names of

15 family members and othe acquaintances. These relationships become the basis for a series of planned comparisons across rows in which Ss describe how they communicate similarly toward the two designated target persons (e.g., "openly") and differently toward a third target person (e.g., "defensively"). These bipolar constructs become descriptive endpoints for 13-point rating scales (-6 to 0 to +6) that are entered adjacent to each row. The cells of the matrix are completed when Ss employ each of the 15 bipolar constructs to rate each of the 15 target persons across all rows.

Measurement of Cognitive Complexity Variables. The differentiation measure of Ss cognitive complexity was the Functionally Independent Construct Score (FIC) (Landfield 1971; 1976; 1977). Although by instruction, the Rep Test elicts 15 separate persons and 15 separate constructs, the FIC score (range from 2 to 30) is a statistical examination and estimate of fusion versus differentation among target persons and among interpersonal concepts with regard to Ss's representational system.

The measure of integration of concepts is an Ordination score (Ord) (range 0 to 60) with higher scores indicating greater hierarchical organization. Whereas FIC scores are based on the degree of differentiation between target persons and between concepts, Ord scores evaluate the extent to which Ss order acquaintances within an interpersonal concept or order these constructs in relation to an acquaintance using different levels of meaningfulness.

Additional variables examined from the 13-point rating scales (15 rows) were percentage of scores to the left of the zero (left side scores), percentage of scores to the right of the zero (right side scores), and the percentage of zeros chosen. Left side scores utilize constructs describing Ss ability to abstract similarities in their manner of communicating toward the two target persons. The right side scores are considered less meaningful in that Ss supply contrasts to the left side constructs on the matrix. Zero scores indicate that the specified set of constructs are not considered applicable for the target person. Individuals who give higher differentiation scores tend to have higher percentages of scores on the left side and fewer zero scores and right side scores.

Category Constriction scores for rows and columns of the matrix were tabulated. Category constriction was scored for a column or for a row whenever a row or column was rated with the same scale number at least eight times and one other row or column is rated with the same scale number at least three times; or one row or column is rated with the same scale number at least eleven times (Landfield, 1979). Category Constriction scores indicate excessive use of certain rating scale points regardless of where on the scale it occurs.

RESULTS

Ss responses to the Rep Test were analyzed using a multiple discriminant analysis ($p = .002$) with high and low group mini-test total scores as the criterion (Nie, 1983). The top one-third scores were considered to be a grade of excellent, while the lower two-thirds scores were considered good to acceptable. The dividing point was a cumulative group score of 90 points. Six of the cognitive complexity variables significantly

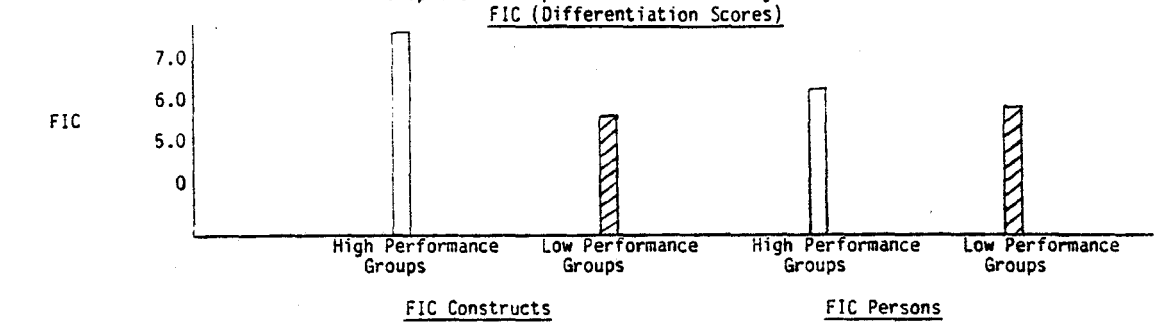
discriminated between high and low cumulative group test scores (See Table 1). The six variables demonstrated a moderately strong degree of separation (Wilk's Lamba = .43) and a canonical correlation of .75.

TABLE 1
Means and Wilk's Lambda Results
for Significant Cognitive Complexity Predictors
of Group Decision-Making Effectiveness

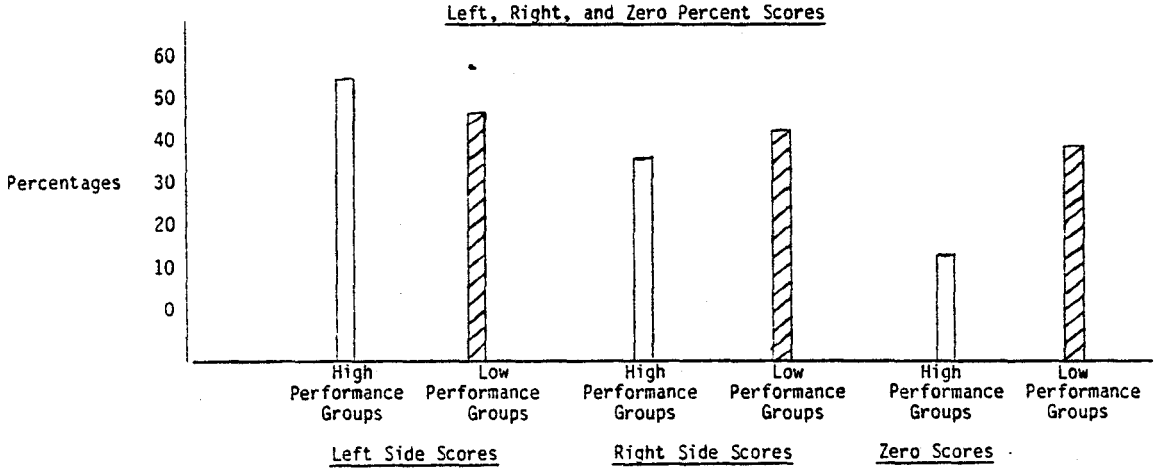
Cognitive Complexity Measures	$\bar{X}$'s of Individuals in Higher Performing Groups (N=10)	$\bar{X}$'s of Individuals in Lower Performing Groups (N=20)	Wilk's Lambda
FIC Scores (Constructs)	7.50	5.43	.80
% of Left Side Scores	53.88	45.14	.67
% of Right Side Scores	33.25	42.14	.60
% of Zero Scores	11.50	35.52	.54
Constriction Scores (Target Individuals)	5.50	3.57	.47
FIC Scores (Target Individuals)	6.00	5.66	.43

A comparison of group test score means shows which cognitve complexity variables had the greatest relationship to group decision-making. Variables with higher means in the high scoring groups relate to decision-making effectiveness (more accurate responses to test items) (See figure 1).

FIGURE 1
Graphs of Multiple Discriminant Analysis Results
FIC (Differentiation Scores)



Left, Right, and Zero Percent Scores



Individuals in the higher scoring groups were classified at 100% accuracy and individuals in the lower scoring groups were classified at a 90% accuracy (2 cases in the lower performing groups were misclassified) with an overall classification accuracy of 93.33% (See Table 2).

TABLE 2
Multiple Discriminant Analysis
Classification Results

Group Performance Level	No. of Cases	Predicted Group Membership	
		High Performance	Low Performance
High	10	100%	0.0%
Low	20	10%	90%

Percent of "Grouped" Cases Correctly Classified: 93.33%

DISCUSSION AND CONCLUSION

This research effort examined how individual's levels of cognitive complexity related to decision-making effectiveness. The focus of the cognitive complexity assessment was on person's abilities to describe their style of communicating to others. That is, to what extent would their ability to differentiate among others and to organize these dimensions relate to effectiveness of decision-making groups? The hypothesis of the study stated that individuals evaluated as having higher levels of cognitive complexity regarding communication styles toward others would constitute more effective group decision-making.

The hypothesis was confirmed. Individuals assessed as having higher scores on several cognitive complexity measures were members of groups that chose significantly more correct responses on standardized group tests. Ss were members of the same group over a four month period and six standardized group tests were administered over equal intervals during the time period.

Individuals in more effective decision-making groups had significantly higher differentiation scores (FIC) for both persons and constructs on their REP test grids. Higher FIC scores for people indicated that these Ss view the fifteen persons on the REP test as being more distinctly different from each other than Ss with lower FIC scores. The higher FIC scores for constructs indicated that these Ss use of the descriptors they supplied were more distinctly different from each other than Ss with lower FIC scores for constructs. Those persons showing greater tendencies in differentiating their communication toward others were members of more effective decision-making groups.

In addition to higher FIC scores, Ss who were members of more effective groups had a significantly higher percentage of scores on the left side of the REP test grid and a lower percentage of zero scores. Left side scores indicate more of an abstracting ability by providing descriptions of similarities of communicating with the two target persons on each row of the grid. Right side scores are simply contrasts to the left side descriptions. Zero scores show that the constructs supplied did not apply to a target person. Thus, Ss with higher abstracting abilities regarding their communication approach toward others made up more effective decision-making groups.

In this social psychological examination of the relationship of Ss's individual differences in cognitive complexity to group decision-making, the hypothesis was confirmed. The group decision-making task was to collectively select correct responses on standardized group tests administered over six points in time. The time limit on each test was brief (five minutes), therefore, information acquisition from group members, the processing of the information, and the decision among choices was conducted in a very intensive

manner. Ss who were more differentiated in their communication approach toward others and who showed greater abstracting abilities were members of groups who were more effective decision-makers over time.

A rather interesting finding was that individuals in the more effective groups had higher column constriction scores than members of the lower performing groups. Higher column constriction scores indicate a greater use of the same scale number on the grid for target persons. One interpretation could hinge on the fact that a great deal of information acquisition and processing took place in a brief amount of time and, therefore, members viewed others as occupying certain roles in order to complete the task. Since the REP test was administered toward the end of a four month semester in which the work was very task oriented, a "tightening" of the constructs could have begun (Fransella, 1980). Ross (1985) stated that excessive use of certain rating scale points cannot validly as a measure of constriction as discussed but could represent a form of consistency in the ratings. This finding is not clear within the differentiation and integration assumptions, but the result could illustrate an additional aspect of cognitive complexity. Further research is needed for clarification.

The trend in the study showed that individuals indicating greater differentiation among others and greater abstracting abilities were members of more effective decision-making groups. The differentiation and abstracting perspective was individuals' communication strategies toward others. Individuals showing higher levels of cognitive complexity regarding their communication strategies were members of the most effective decision-making groups.

This examination of the relationship of individual's cognitive complexity on group decision making focuses on one decision-making context. Follow research should include cognitive complexity measures soon after the time of group formation as well as toward the end of the group's life span. In addition to cognitive complexity measures over time, utilizing different tasks would broaden understanding of individual's decision-making processes.

REFERENCES

Fransella, F. Teaching personal construct psychotherapy. In A.W. Landfield & L.M. Leitner (Eds.), Personal construct psychology: Psychotherapy and personality, New York: Wiley, 1980.

Kelly, G.A. The psychology of personal constructs (vols. 1 & 2). New York: Norton, 1955.

Landfield, A.W. Exploring socialization through the interpersonal transaction group. In P. Stringer & D. Bannister (Eds.), Constructs of sociality and individuality. New York: Academic Press, 1979.

Landfield, A.W. Interpretive man. In A.W. Landfield (Ed.), Nebraska symposium on motivation, 1976 (vol. 24). Lincoln: University of Nebraska Press, 1977.

Landfield, A.W. Personal construct systems in psychotherapy. Chicago: Rand-McNally, 1971.

Landfield, A.W., & Barr, M.A. Ordination: A new measure of concept organization. Unpublished manuscript, University of Nebraska, 1976.

Michaelsen, L.K., Watson, W.E., Cragin, J.P., & Fink, D.L. Team learning: A potential solution to the problems of large classes. Exchange: The organizational behavior teaching journal, 1982, 7, 31-42.

Michaelsen, L.K., Watson, W.E., & Shrader, C.B. Informative testing - A practical approach for tutoring with groups. The organizational behavior teaching review, 1984-1985, 9, 18-33.

Nie, N.H. SPSSX: User's guide. New York: McGraw-Hill, 1983.

Ross, M.V. Depression, self-concept and personal constructs. In F. Epting & A.W. Landfield (Eds.), Anticipating personal construct psychology, Lincoln: University of Nebraska Press, 1985.

Schroder, H.M., Driver, M, & Streufert, S. Human information processing. New York: Holt, Rinehart and Winston, 1967.