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Pile Sorts, A Cognitive Anthropological Model of Drug and AIDS Risks for Navajo Teenagers: Assessment of a New Evaluation Tool

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SUMMARY. This article presents data which support the use of a cognitive anthropology research method, "pile sorting," to compliment and enhance the qualitative and quantitative evaluation tools used by drug prevention programs. The method was employed in the assessment of a Drug, Alcohol, and AIDS prevention program conducted by a community based organization. It produced significant information on the cognitive models of risks held by Native American teenagers, and provided a method of determining target areas for revision of the prevention and intervention program, as well as

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assessing the impact of the existing program. Pile sorting proved to be simple to administer, fun for respondents, and provided analytical information at a positive ratio between time-on-task compared to richness of result.

INTRODUCTION

This paper explores the potential for using a cognitive anthropology method, called "pile sorting" (Weller and Romney 1988) to evaluate drug and HIV risk prevention programs. The technique was developed to assess culturally defined taxonomic relationships (Roberts et al. 1980) and has subsequently proven extremely useful in accurate cognitive mapping of ecological issues. Boster and Johnson (1989) demonstrated an effective use of pile sorts to establish models of the underlying cultural relationships between species of fish which are favored or avoided by sports fishermen in the United States. This led to successful efforts to reduce ecological pressure on over-fished species, and an increased utilization of under-fished species on the Florida coast. Their achievement raises the possibility of applying the method to other areas of prevention and intervention.

We hypothesized that analyzing a group's cultural depiction of the relationships among drug, alcohol, HIV and other risks might lead to practical uses for this technique. Therefore the authors conducted a study to determine whether pile sorting could assist the evaluation of a program to reduce behaviors which place Native American teenagers at risk through drug use, sexual encounters, school drop-out and other problems.

BACKGROUND FOR THE STUDY

Navajo and other Native American teenagers are at high risk for drug and alcohol related conditions, school problems, car accidents, and family disruption (Lamarine 1988, Beauvais et al. 1989). They are at increasing risk from HIV infection (Metler et al. 1991, Blum et al. 1992), as indicated by key co-morbidity markers for HIV, such

as sexually transmitted diseases (Toomey et al. 1989). Efforts have been undertaken by tribal officials, local community groups and others to increase Native American teenagers' awareness of the risks of drug abuse, HIV infection, and other problems. These efforts include media campaigns, health fairs, and in-school AIDS awareness and prevention projects (Rolf et al. 1991a). The result is an increasing awareness of the most common drug and alcohol problems as well as the standard modes of transmission of the HIV virus, in terms of unprotected sexual contact and needle sharing among drug users (Rolf et al, 1991a, 1991b).

METHODOLOGICAL AND THEORETICAL CONSIDERATIONS

The pile sort technique produces unconstrained clusters of the items being sorted. These clusters are representative of a cultural taxonomy, which can then be transformed into individual and composite distance matrices using available computer programs such as ANTHROPAC.[1] The aggregate matrix produces an averaged group view of the relationships among these variables. There are two standard ways of analyzing and presenting this data; through the use of cluster analysis, and through multidimensional scaling. Both produce visual and quantitative representations of the data, which can be analyzed by the researcher solely as a test of a hypothesis, or can be returned for further exploration and commentary by informants, or both.

We initiated a base line standard for our project that the pile sort method meet the following criteria, in order to demonstrate its effectiveness as an evaluation tool. The first condition is that the technique provide us data that clearly recapitulates data derived by other methodological approaches, thus providing a measure of the validity of the method by demanding that pile sorts show the same relationships that can be found within original open ended ethnographic or quantitative interview data collected on the target cultural domain. The pile sort analysis should exhibit the same type and direction of linkages and interactions between the risks that would be found by other research methods. The second standard is that the

technique should be capable of showing a change in relationships that reflects a change in the way that our respondents think and talk about the risks. If these base line conditions are supported by the analysis of the pile sort data, we feel that we can demonstrate a practical drug program application for this technique.

METHODOLOGY

In 1992 a group of Native American teenagers received an AIDS, drug, and alcohol risk prevention program sponsored by a local community organization, NACA,[2] in Flagstaff, Arizona. The primary goal for the NACA intervention was to offer education about choices pertaining to alcohol, drugs, sex relations, IV drug use, and their relationship to AIDS. Considerable time was spent dealing with alcohol use and drug use related to family problems. Avenues of HIV transmission were discussed and special emphasis was placed on sexual activity and the use of condoms, but only limited information was presented on the relationship between injection drug use and HIV transmission. This program provided an opportunity to pilot test the pile sort evaluation technique.

Based on previous research on the Navajo Reservation (Trotter et al., in press), we created a set of variables that described the cultural domain of risk taking for Native American teenagers, sub-divided by risk clusters. The categories and the individual risks selected for exploration in our pile sort research were then chosen by a panel composed of Navajo and non-Native American project personnel, following extensive ethnographic work. Those categories are listed below, as they were printed on the pile sort stimulus cards. The letters associated with each risk (used as identifiers in the cluster analysis and multidimensional scaling plots) result from a randomization of all of the risk factors, to avoid the bias of placing the original risk clusters together during their presentation to the respondents.

1. Drug Related Risks

The focus group discussions of drug risks included the drugs available on and off the reservation, descriptions of the types of

behaviors that were engaged in by people who use drugs, the risks associated with drug use (including harm to self and harm to others). The panel included the following risks from this set: *C.* Using More Than One Drug at the Same Time; *E.* Sniffing Something to Get High; *R.* Getting High; *X.* Marijuana; *Z.* Using IV Drugs (Needle Drugs); *g.* Smoking Cigarettes.

2. Alcohol Related Risks

The Navajo teenager and adult interviews explored the alcoholic beverages available on and off the reservation, descriptions of the behaviors of people who drink, and the risks associated with drinking (including harm to self and harm to others). The risk cards contain the following items: *H.* Drinking Hard Liquor (Whisky, Vodka, Gin, Tequila, Etc.); *K.* Drinking; *L.* Cruising Around in a Car and Drinking; *P.* Passing Out; *a.* Drinking Wine; *h.* You Can't Remember What Happened While You Were High or Drunk; *i.* Someone Getting You Drunk When You Don't Want To; *o.* Drinking Beer.

3. Sexual and HIV Related Risks

Our ethnographic interviews determined what our respondents knew about sex and the causes of HIV infection, how it could be reduced through protective practices, how concerned they were about AIDS, and what they thought could be done to reduce the risk of HIV infection on and off the reservation. The risk factors presented to the respondents included: *A.* Unprotected Sex; *B.* Having Sex Frequently; *G.* Having Lots of Sex Partners; *I.* Raping Someone; *Q.* AIDS; *S.* Having Sex without Birth Control; *T.* Getting Pregnant; *U.* Venereal Diseases (STD's); *W.* Getting Someone Pregnant; *k.* Having Unwanted Sex or Intercourse; *n.* Getting Raped; *p.* Having Sex with Someone You Don't Know.

4. School Related Risks

School risk discussions included academic risk (poor grades and dropping out) as well as problems in peer relationships and relation-

ships with teachers and parents that were connected to school. The risks chosen for inclusion included: *J.* Poor Grades or Flunking Out of School; *O.* Dropping Out of School; *V.* Ditching School; *f.* Doing Something that Gets You Suspended from School; *l.* Not Doing Your Homework; *m.* Showing Disrespect for Parents or Teachers.

5. Family Violence and Personal Violence Risks

The risks mentioned about family relationships included family violence, alcohol and drug abuse, and school pressures. The other violence related risks included dares, hazardous driving, suicide, fights with others, and other forms of interpersonal conflict. Some of these risks were placed in other categories, based on primarily associations during the discussions. The remaining family or individual risks (from interpersonal conflict, dares, or accidents) were placed in this category: *D.* Hurting Yourself; *F.* Family Violence; *M.* Driving Fast; *N.* Riding With Someone Who is Driving Dangerously; *Y.* Beating Someone Up; *c.* Getting in Fights; *d.* Harassing People; *e.* Suicide Attempts; *q.* Car Accidents.

6. Two Risks from Traditional Beliefs

Only 41 of the 43 risks presented to the students come from the original ethnographic data sets. At the suggestion of one of the panel members, two risks from Navajo traditional beliefs were added as comparative spiritual or supernatural markers for these physical and social risks. The traditional risks are: *b.* Walking Around in a Lightning Storm and *j.* Walking Home Alone at Night.

The 43 risks were presented on individual cards, with the letter designator for the risk on the back to assist in data recording. The sorts were accomplished by laying the risk cards out in identically ordered rows in front of each respondent, so they could see all of the risks at the same time. We asked the students to look at the risks and then place them in piles, according to the ones that they felt go together. They were told they could make as many or as few piles as they wanted, and could put the cards together on the basis of anything that they think appropriate. The data were recorded by noting the individual risks placed in each pile by each respondent, as well

as the total number of piles created. We also recorded the answer to the question, "why did you put these things in this pile," for each of the respondent's piles.

The data reported in this article were collected from Navajo males ranging in age from 18 to 19 years old. The pretest data set was collected from 11 students prior to their taking the NACA Drugs, Alcohol, and AIDS awareness program. The posttest set was collected from 17 students who completed the NACA program. Six students completed both the pretest and the posttest, the others completed only one of the two tasks. Since this pilot study was designed as a preliminary methodological test of the processes, rather than an attempt to thoroughly explore all of the interconnections of risks for these groups, it was felt that this collected sufficiently reliable data to either recommend the technique be employed in larger projects, or suggest that the technique was not worth pursuing on a larger scale, according to suggested sample sizes for this type of task (Kruskal and Wish 1978). The results from the pilot are also very consistent with the results from pile sorts we ran on comparable (but larger) groups (Trotter, Potter, Price 1993), which enhances our confidence in the technique.

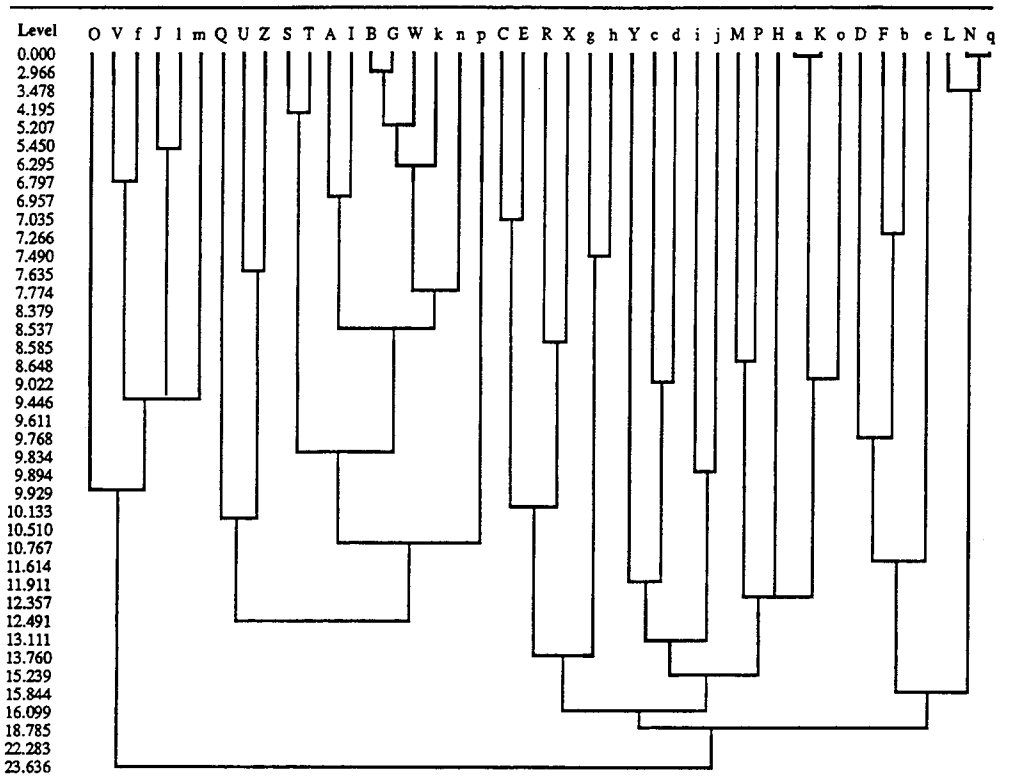
DATA AND ANALYSIS

Pile sort distance matrices produced by ANTHROPAC were analyzed using cluster analysis and multidimensional scaling to demonstrate either the hierarchical relationships of the risks to one another, or the latent structure inherent in the relationships of the variables to one another in multidimensional space.

The following dendrogram depicts the hierarchical cluster relationships as they were created by the Native American teenagers during the pretest pile sort data collection (Figure 1).

The data support two of the relational considerations discussed in the theory section. The basic clusters of risks that were identified by the panel members, from the ethnographic data, have been recapitulated by the pile sort technique, even though the risks were randomized. Reading from the left of the dendrogram, the first six elements are school risks ("O" through "m"), the following 13 ("Q"

FIGURE 1. Pre-test Cluster Analysis



through "p") are the sex and HIV risks, with the exception of "Z," which is IV Drugs (Needle Drugs). The subsequent set "C" through "g" are the drug cluster. The placement of "Z," IV Drugs, indicates that some of the students were associating HIV and IV Drug risks at this level or relationship.

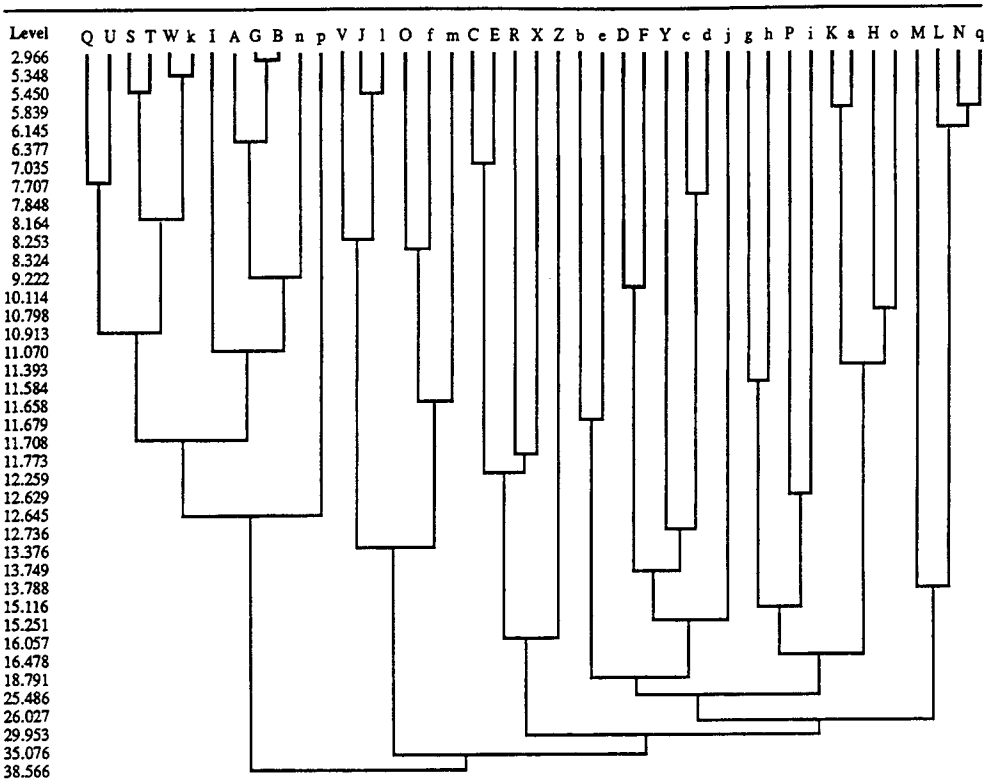
This dendrogram indicates significant inter-relationships between the family and individual violence risks and the alcohol related risks (the variables "h" through "q" in the dendrogram). This configuration was similar to that found in the ethnographic data which preceded the project. Some of the risks interconnect at close or strong levels, such as "N" and "q" (riding with someone who is driving dangerously and car accidents), while others remain more cognitively separated in their relationship, as with "n" and "p" (getting raped and having sex with someone you don't know).

The cluster analysis performed on the posttest data allowed us to generate a time-two analysis of the data (Figure 2).

This dendrogram presents the relationships among risks for the posttest which shows some key differences compared with the first analysis. Most of the clusters are stable, and in some instances have been strengthened. For example, beginning at the left of the dendrogram, "Q" through "p" are the sex and HIV risks. This time, IV Drugs is embedded in the drug cluster ("C" through "Z"), and the cigarettes variable has moved into the alcohol related risks. This indicates that the underlying domain structure, and the boundaries between domains, were strengthened by the intervention (or external education), since some interconnections were reformulated. Strengthening these associations was one of the goals of the intervention, and this outcome indicates success in this attempt. As with the first dendrogram, the strongest cross-group associations are between alcohol related risks and family and personal violence related risks.

The dendrograms have a limited utility for exploring the highly complex latent structural relationships captured in the pile sort data. Therefore, we conducted a second analysis of the data using multi-dimensional scaling. The MDS data creates visual depictions for all of the n dimensional combinations of the variables. We analyzed the statistical and graphic summaries of 4 dimensions in this data set: 1 by 2, 1 by 3, 1 by 4, 2 by 3, 2 by 4 and 3 by 4. Only the representa-

FIGURE 2. Post-test Cluster Analysis



tions of two of these dimensional comparisons are presented below, due to space limitations. The other plots show similar relationships between the sex and the drug variables, which are the focus of this paper, although they indicate differences among the other risk clusters, which would be worthy of further exploration for a different forum.

Two pretest MDS plots were chosen to show the maximum demarcation of the original, panel created, risk domains (Figure 3), and the maximum integration of these multiple domains (Figure 4).

In evaluating the preceding two plots, note the separation of the HIV

FIGURE 3. Pretest MDS Plot 1

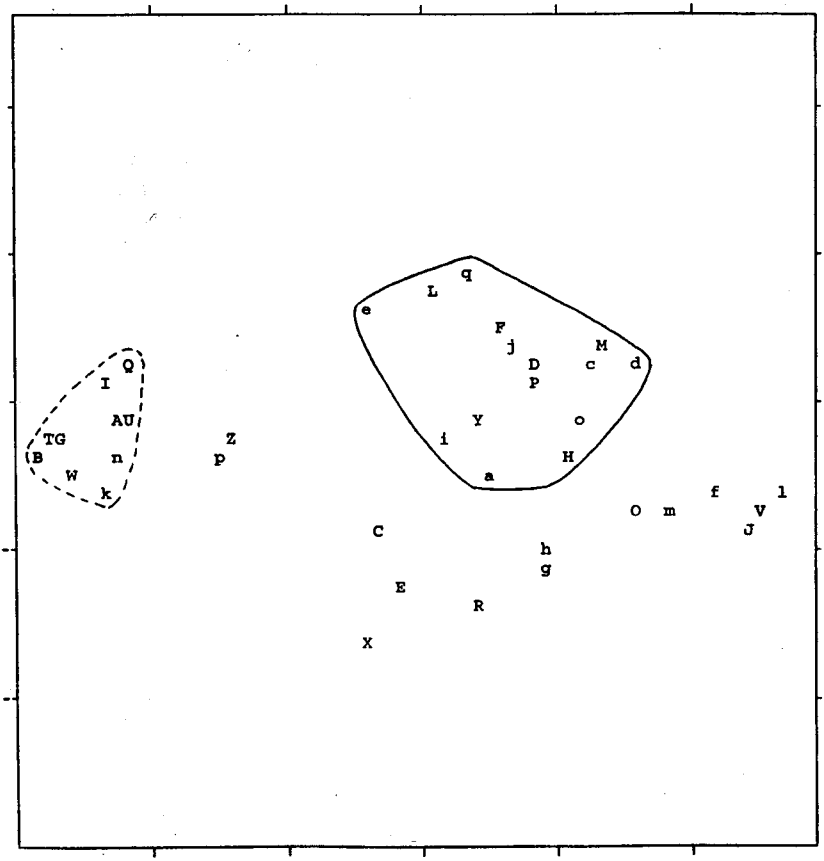
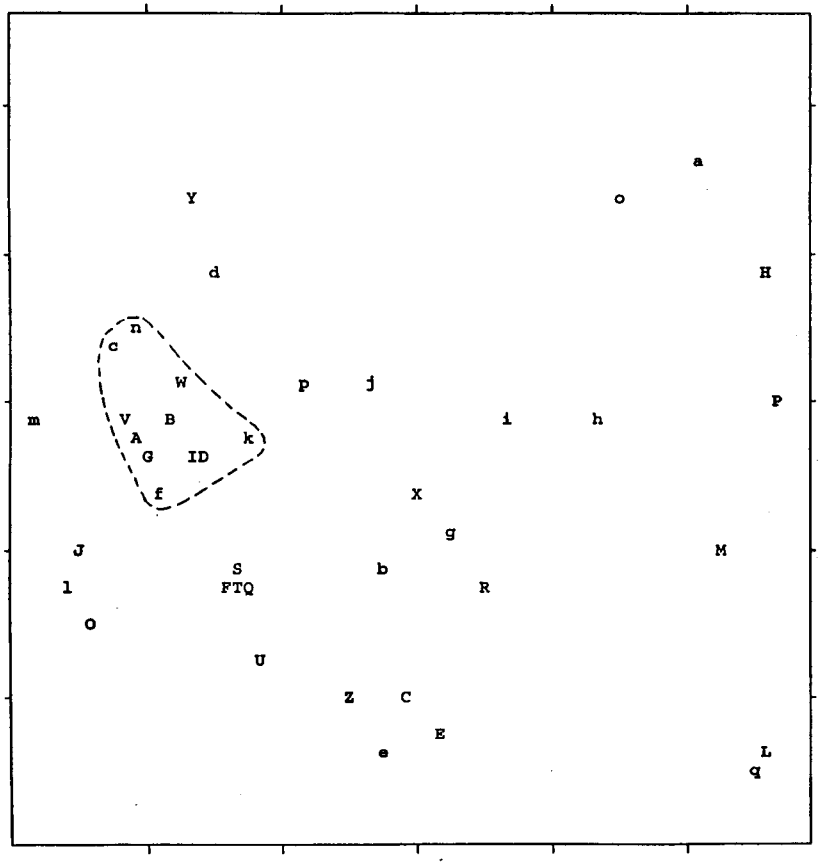


FIGURE 4. Pretest MDS Plot 2



and sexual risk constellation (the letters inside the dotted line) from other risks in Figure 3, while there is clear interpenetration of alcohol, family violence, and individual violence risks (indicated by letters enclosed by solid line in Figure 3). The drug risks and school risks also form distinct, non-interrelated clusters. Only one relationship is depicted between IV drugs and a sex risk, in this case "p," having sex with someone you don't know. These data support the conditions presented in the introduction, in relation to recapitulating the ethnographic data. The students have recreated most of the original domains we derived from the qualitative interview data, in

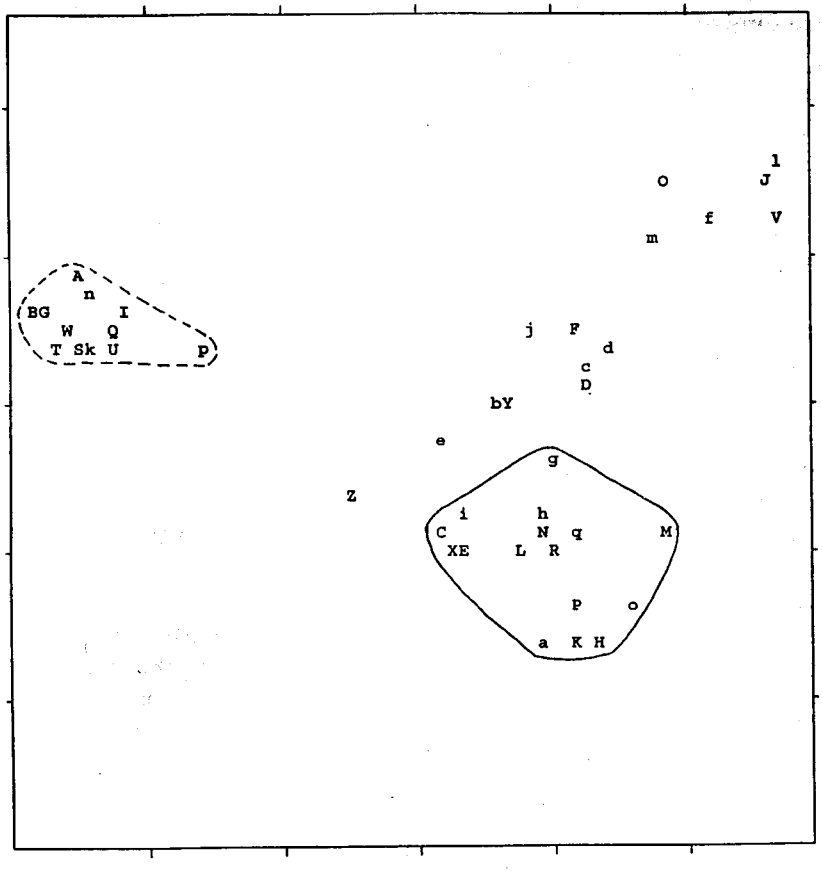
both the cluster analysis and the MDS data above, even when using randomized stimuli.

Pretest plot 2 provides a different dimensional view of the data. In this case, the dimensions chosen for display provide the greatest degree of interpenetration and multiple relationships between the risks. The risk variables enclosed in the dotted lines (Figure 4) come from three risk clusters, sex related risks, school risks, and family and personal violence. This cluster depicts close connections between ditching school ("V") and two sex risks, unprotected sex ("A"), and having lots of sex partners ("G"), as an example. In other clusters there are relationships between drug risks and violence risks, and alcohol and violence risks, all of which are associations between these risks that were embedded in the original ethnographic data collected to define the risks to the students.

Following the NACA AIDS intervention program, we conducted a posttest using the same risk cards and instructions used in the pretest. The following two MDS plots offer a visual representation of the results.

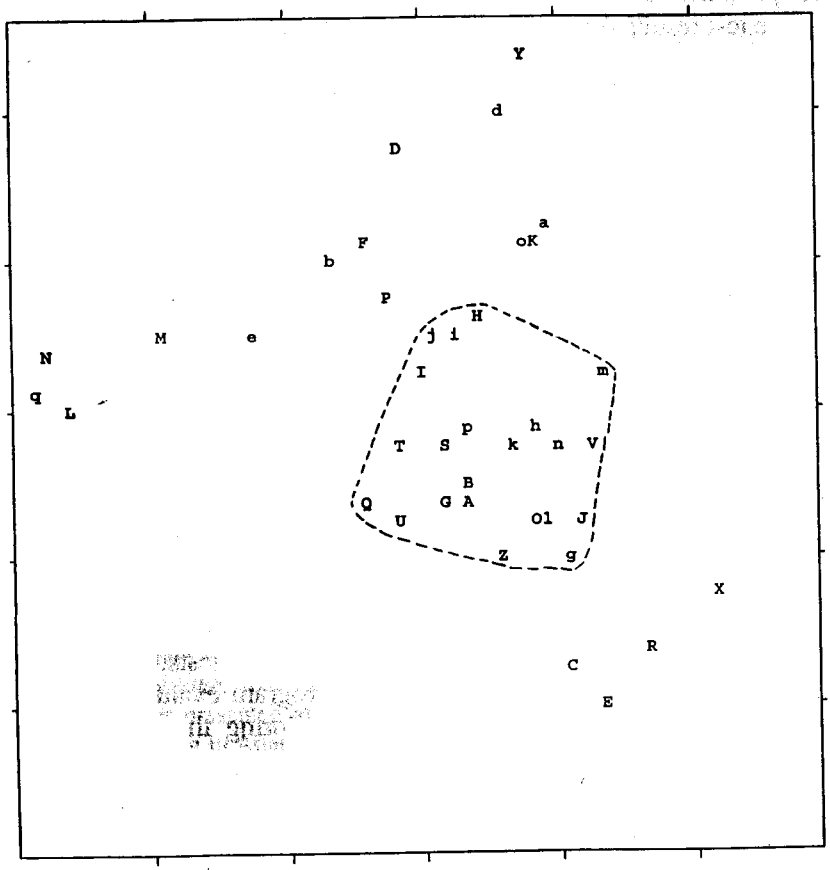
The posttest MDS plots again support the theoretical and practical considerations for this paper. One of the most important findings is that an intervention can build stronger relationships within the risk clusters, at the expense of inter-cluster relationships. The NACA intervention was designed to reinforce the importance of the relationship between unprotected sex and AIDS, and spent far less time showing interrelationships between IV Drugs and AIDS, with the consequence that the IVDU-HIV interconnections at posttest are more tenuous than at pretest, while the sex and alcohol risk domains have been strongly reinforced. There are fewer interrelationships between alcohol and violence risks, in the posttest MDS plots, but more between sex and drugs, which is complimentary to the expected outcome of the intervention. Figure 5 again shows the original clusters, tightened in space by the reinforcement of the NACA intervention. For comparison with the other figures, the sex risks are on the left hand side of the plot, enclosed in dotted lines. The strongest area of integration of variables, enclosed in a solid line, includes the inter-relationships of alcohol, drug, and drunk driving risks.

FIGURE 5. Post-test MDS Plot 1



The posttest MDS data confirms the increased distance between IV Drugs and both AIDS and STD's along all dimensions except the one depicted in Figure 6, where there is a relatively weak relationship visible within the cluster of variables enclosed in the dotted line. Figure 6 also depicts the success of the NACA intervention by showing the students relate sexual risks to other areas of their lives, and in particular alcohol and school problems. For example, having unwanted sex "k" is related to not being able to remember what happened when you were high "h" and to getting raped "n." IV Drugs "Z" are related to dropping out of school "O" and not doing your homework "L." Thus, there is an indication that some new

FIGURE 6. Post-test MDS Plot 2



linkages, present in the intervention materials, have been formed in these posttest plots.

CONCLUSIONS

The cluster and MDS analysis of both the pretest and posttest data demonstrate that the risk clusters which were used to develop the pile sort stimuli are replicable domains, using this technique. This finding cross validates the results of our ethnographic interviewing. Additionally, this study demonstrates that the linkages between risks in one or more other risk areas can be successfully

mapped using this technique, even when the stimuli are randomized and presented as individual risks.

The test results demonstrate that the boundaries between sub-groupings within a domain can be strengthened, and consequently some interconnections can be reduced or eliminated through time. New relationships can also be forged in the data, with concomitantly weaker boundaries and more interconnections. These conditions, creating a stronger boundary mechanism or establishing new linkages, support the utility of this method for the evaluation of prevention and intervention education programs focusing on drugs, alcohol, HIV, and other sexually transmitted diseases at a deep cognitive level.

It should be noted that these are preliminary findings. They are based on small numbers of students, and they were produced in situations where we had very little control over the external educational conditions that affect the students' awareness of the relationships between the risks. This pilot confirmation of the usefulness of the technique is stronger where the risks being explored did not interconnect in the pretest, but linked together in a posttest condition following an education program. The conclusion that we can promote from the data is that the pile sort process appears effective and produced enough defensible results to suggest that it be tried under far more controlled circumstances than those which prevailed in these tests. The process appears to have considerable promise for program evaluation efforts, and provides a possible mechanism for exploring the failure of an intervention program, as well as its success.

ENDNOTES

1. ANTHROPAC 4.0 (1993), by Steve Borgatti, is a program designed to assist in the collection and analysis of cognitive anthropology data sets such as free listings, pile sorts, and consensus theory. It also contains a number of programs for cluster analysis, unilinear scaling, multidimensional scaling, QAP, data management and transformations, and others. It is available from Analytic Technologies, 306 S. Walker St., Columbia, SC 29205.

2. NACA (Native Americans for Community Action) is a local non-profit organization that provides off-reservation services to Native Americans. These services include alcohol and drug counseling, health services, referral, and advocacy for social services. Other services include community educational programs, one of which is the AIDS prevention workshop featured in this pilot study.

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