DRUG ABUSES: PERCEPTIONS OF REGIONAL COLLEGE SCIENCE STUDENTS

by

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ABSTRACT

Ways in which regional college students perceive drug abuses, their levels of moral reasoning, their attitudes toward drug abuses and the interrelationships among these variables were investigated. The intent was to present this information on these variables in such a way that teachers involved in drug education could readily accommodate to these variables to facilitate learning.

Multidimensional scaling, using the INDSCAL model, was employed to determine the number of dimensions that would span perceptions of the drug abuses; to provide the saliences of each dimension; and to describe the qualitative nature of these perceptions. On analysis it was found that the perceptions were three-dimensional in nature and that, generally, the group only differentiated between cigarettes, marijuana and alcohol. The other drugs were grouped together.

The test on moral reasoning placed this group well below the expected level, probably due to the inherent characteristics of this diverse group. The test on attitudes indicated unfavourableness toward drug abuses.

On graphing the perceptions of drug abuses and levels of moral reasoning it was found that those students who demonstrated high levels of moral reasoning on the moral dilemmas test clustered highly on all dimensions. On the other hand, on graphing the perceptions of drug abuses and attitudes toward drug abuses the students who obtained the highest and the lowest scores on the attitude test did not exhibit any clustering on any of the dimensions.
The results of this study stress the lack of discrimination between beneficial drugs and addictive, mind-destroying drugs. This distressing finding, plus the rather low levels of moral reasoning demonstrated by this group, indicates that a strong teaching program, comprising science classes on drug action and a component on the development of moral principles, is urgently required.
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1.1 The General Problem

The general problem of this investigation was to determine what variables are related to how students perceive interrelationships between drug abuses. It would appear that drug abuse education efforts might be more beneficial if these variables were known and understood by teachers. Students, presumably view drug abuses from a different perspective than teachers, from a different perspective than parents, and from each other. Thus it may be necessary for teachers to reconstruct programs to accommodate to these perspectives in order to develop more meaningful drug education programs.

More specifically, three facets of the problem have been dealt with. The first facet was whether or not a diverse group of college students, from various backgrounds and age groups, shared common viewpoints on drug abuse and, if so, to determine the nature and complexities of these viewpoints. It seems reasonable to assume that the viewpoints toward drug abuse of college students are of a multidimensional nature, differing not only quantitatively, but also qualitatively. The second facet concerned the
possible relationship between levels of moral judgement and viewpoints on drug abuse. It may be presumed that those persons who have a high level of moral development would not knowingly cause harm to their bodies, nor to some other person's body, by taking or offering drugs of abuse. The third facet focussed on the attitudes toward drug abuse held by the same group of students. The nature and significance of drug abuse, levels of moral judgement and attitude will be more fully described in the following chapter.

1.2 Definition of Terms

For the purposes of this study the frequently used terms, whose common meaning may be vague or ambiguous are defined as follows:

1.21 **Attitude:** is a learned predisposition to respond to an object or class of objects in a favourable or unfavourable way (Fishbein, 1967, p. 257)

1.22 **Drug Abuse:** is the use, usually by self-administration, of any drug in a manner that deviates from the approved medical or social patterns within a given culture (Jaffe, 1975, p. 284)

1.23 **Moral Judgement:** is the interpretation of social interrelationships and mutual responsibilities (Rest, 1974a, p. 492)
1.3 Importance of the Problem

In the late 1960's drug education was taught in high school in three different curriculum contexts. In the first context drug education was part of general health education in the counselling courses or family life programs, as they are now called. The second context was from a physical fitness point-of-view and was taught by the physical education teachers. And thirdly, special assemblies of medical doctors, pharmacologists, former drug addicts and police officers handed out factual information, personal confessions and exhortations. Unfortunately none of these teaching strategies were effective. Drug abuse increased.

In the early 1970's a fresh approach by N. Barty (1973) was aimed at elementary school children using science classes as the medium. The students were given a background in basic pharmacological principles. That is, studying the effects of various chemicals, drugs and toxic substances on plant and animal development. The objective of this program was to develop in the students the skills of the scientific method and to use this skill for decision-making in the use of drugs. The ultimate goal of the program was to develop the policy of making decisions on the use of any foreign chemical based on weighing potential benefits against potential harm. The emphasis was placed on decision-making. Although this method of attacking drug education at the elementary school level appears to be most fruitful, it does have one real drawback. A medical doctor or pharmacologist is required approximately four times during the program to handle the drugs used in the experiment, a severe constraint.
At the high school level a new approach is being tried. According to M. Grant (1976) the topic has now been integrated into all high school courses in British Columbia. For instance, if the topic of drug abuse arises in English, then the English teacher discusses the problem; if it arises in Social Studies then this teacher discusses the problem. These teachers attempt to place drug abuse in its proper context, not to sensationalize nor to glamourize it. They present facts and try to guide the students to correct decisions. The schools have shifted the emphasis from the drugs themselves and placed it on rational decision-making.

However, one of the major reasons for the failure of earlier drug education programs was the experiential gap between the teacher and the pupils. That is, the pupils had probably experimented with marijuana while the teacher had not, with the result that the pupils placed no credence in the teacher's advice. This problem is still present. In this study, the author attempted to narrow this communication gap. If the ways in which students perceive drugs of abuse can be described, then perhaps the teachers will be able to change their teaching strategies to accommodate to these perceptions. There must be a common ground for the teachers and students in order to facilitate learning (Easley, 1975).

1.4 Specific Problems to be Investigated

The following questions will be addressed in this study:

1. (a) How many dimensions can be assumed to span the space of drug abuses for this group as a whole?
(b) How salient are these dimensions to each member of the group?
(c) What is the qualitative nature of the configurations of drug abuses for the group as a whole?

2. (a) How does the group reason about complex moral issues?
(b) Is there a relationship between how individuals reason about complex moral issues and their perceptions (configurations) of drug abuses?

3. (a) What is the attitude of the group toward various drug abuses?
(b) Is there a relationship between the attitude of individuals toward drug abuses and their perceptions of drug abuses?

The answers to these questions may provide useful information to teachers concerned with drug education. Little research has been conducted which has attempted to identify the nature and complexity of perceptions on drug abuses, although the knowledge of these perceptions would help clarify some of the problems in drug education.

Lawrence Kohlberg (1971) has done intensive research into the area of moral development. He has found that young children solve social-moral problems in a very primitive, hedonistic way. As the children mature their method of solving these problems evolves gradually, in a hierarchical manner. The highest stage of development embraces universal ethical principles. This stage may be reached in the late teens or early twenties. The students in this study are probably near their highest level of moral reasoning, thus it would be of interest to know if there is a relationship between their level of moral judgement and their views on drug abuses.
Lastly, the group's favourableness or unfavourableness toward drug abuse may be a significant factor in their perceptions of drug abuse. It is presumed that if an individual is unfavourable toward drug abuse he will perceive drug abuses in a different manner from an individual who is favourable toward drug abuse.

These three facets of drug abuse were investigated with the intent to delineate the problem facing teachers.

1.5 Research Hypotheses

The basic hypotheses of this study were as follows:

1.51 (a) It is hypothesized that three dimensions will adequately span the group-space of drug abuses. The qualitative nature of these three dimensions will have to do with; their evaluation of the various drug abuses, i.e. whether they are "good" or "bad"; whether or not they would actually become involved in the various drug abuses, i.e. behavioral intent; and their normative beliefs, i.e. what they perceive to be the expectations of others with respect to drug abuse.

(b) These dimensions will not be equally salient to all individuals. The saliences of the hypothesized dimensions will differ for individuals due to, for example, differences in levels of moral development, knowledge, attitudes toward drug abuses, and normative beliefs. For instance, it is hypothesized that those
individuals who abuse drugs will have relatively high weights on the dimension aligned with behavioral intent.

(c) The group configuration of drug abuses will show that there will be significant qualitative differences in the perceptions of the stimuli. It is hypothesized that some individuals will show clear differentiation between the common drug abuses, drinking alcohol, smoking cigarettes and smoking marijuana and the less common drug abuses such as taking tranquilizers and using L.S.D. (acid). It is also hypothesized that some individuals will differentiate between the so-called "soft" drugs, such as amphetamines and sleeping pills, and the "hard" drugs, such as cocaine and heroin. Generally the more common drugs will be seen as "good"; they will be seen as something they "would do"; and they will be seen as something others would expect them to do.

1.52 (a) There will be no significant differences in the levels of moral reasoning of the group when compared to the norm. James Rest (1974b) has normative data on his *Defining Issues Test* for a large number of college students. It is assumed that the students in this study will show parallel levels of moral development to the normative groups at first and second year college levels.

(b) There will be a relationship between levels of reasoning about complex moral issues and perceptions of drug abuses. The investigator hypothesizes this on the basis of Kohlberg's
(1971) theory of the development of moral reasoning and on the
individuals who have considered the physiological and social
effects of drug abuses and their responsibilities to them-
selves and society will have a common viewpoint on drug
abuses. On the other hand those persons who are either
altruistic or have never thought through the problem of drug
abuse will probably share a viewpoint on drug abuse.

1.53 (a) The group as a whole, will have an overall unfavourable attitude
toward the various drug abuses.
This hypothesis is based on the author's conversations with a
variety of people. Generally, people of this age group will
present a conservative attitude toward drugs to the public, and
therefore will be opposed to drug abuse. In private their
attitude may be quite liberal.

(b) There will be no relationship between individuals' attitude
toward drug abuses and their perception of drug abuses.
This assumption is based on the fundamental difference between
the two test instruments, the Attitude Test and the Multi-
dimensional Scaling Test. The Attitude Test is easy to under-
stand and its purpose clear. The Multidimensional Scaling Test
is unfamiliar and its purpose obscure. Consequently some
students may be able to obtain a high score on the Attitude
Test (i.e. unfavourableness toward drug abuse) by intentional
deception or typical response bias, but will be unable to present
1.6 Delimitation of the Study

1.61 A limitation of this study is the generalizability of the results. This study is confined to one small group of first and second year regional college students in Vancouver. These students range in age from 18 to 45 years; come from diverse cultural and socio-economic backgrounds; and are of varying mental ability. The students could be considered to be a sample of one cross-section of the public and thus exhibit all the various views about drug abuse for this section. Individuals under the age of 18 and over 45 years were not included in this study. Taking this into consideration the results may be used as strong indicators of the viewpoints on drug abuse for the 18 to 45 year olds. The results should be used with discretion for individuals not in this age group.

1.62 In terms of scope, the drugs of abuse most frequently encountered in the general population were included in this study. Other drugs that are misused, but not to the same extent, such as antihistamines, antibiotics, Aspirin, mescaline, methylenedioxy-amphetamine (MDA) were not included, due to time limitations with the students. A similar study could widen the scope to include all known and newly discovered drugs of abuse.
The instruments used in this study to identify various viewpoints and attitudes toward drug abuse and stages of moral development were group tests. Evidence of the validity and reliability of the tests is considered in Chapter III, so only a brief discussion on the interpretability of the results will be presented here. Multidimensional Scaling instruments, having been used for some time and over repeated trials indirectly suggest a high degree of reliability. The Defining Issues Test has a test-retest stability of 0.81. The Attitude test has a reliability coefficient of 0.85. From these limited data it may be wise to interpret the results with prudence.
CHAPTER II

CONTEXT OF THE STUDY

2.0 THE PROBLEM OF DRUG ABUSE

2.1 What is Drug Abuse?

Drug abuse, as defined by Jaffe (1975) in an authoritative text, is "the use, usually by self-administration, of any drug in a manner that deviates from the approved medical or social patterns, within a given culture" (p. 284). Drug abuse thus encompasses not only the drugs that affect mood or feeling such as heroin, marijuana or alcohol, but also the misuse of therapeutic agents such as amphetamines, sedatives and antibiotics. The definition also includes the concept that drug abuse varies from culture to culture and also from time to time within a given culture. For instance, in the Western civilization it is normally acceptable to have a few drinks of an alcoholic beverage to celebrate a special event, but it is not acceptable, and hence an 'abuse', to be chronically intoxicated (Jaffe, 1975).

What is the incidence of drug abuse in our society? Is there a need to be concerned? Two surveys by Russell were carried out in Vancouver in
1970 and 1974 to determine the amount of drug usage among secondary school students. The results emphasize the need for our concern. In 1970, 61% of the students used alcohol; in 1974, the figure had increased to 71%.

There was a parallel increase in 1974 in the incidence of cigarette smoking to 64%; marijuana smoking to 42%. The use of other commonly misused drugs appeared to have stabilized. Nevertheless, the survey did find that the incidence of use of most drugs increases with the age of the students (Russell, 1974). Indeed it has been found that the alcohol consumption in all age groups has risen by 30% over the past two years. Liberalization of drinking laws, lowered legal drinking age and greater affluence are cited as the probable reasons for this epidemic (Ward, 1976). Similar statistics for the entire population on other misused drugs are not available, but it may be presumed that these also are on the rise. The increased dependence on tranquilizers to 'get through the day' and the use of barbiturates to 'get a good night's sleep' is common knowledge. Indeed, there is a need to be concerned.

2.2 Portrait of a Drug Abuser

Visual images of the compulsive drug user paints the picture of a seedy, downtrodden derelict. The forgotten, the lonely, the depressed. In reality the compulsive drug user is the confused teenager, the depressed housewife, the anxious business man. There is a compulsive drug user in every corner of society.
The age of initiation into drugs of abuse has gradually sifted downwards so that now it is commonplace to find elementary school children experimenting with tobacco, alcohol and solvents (Hemsing, 1972). Two surveys in high schools included statistics on sex differences in drug usage. In Ontario, males used all drugs more frequently than females, except for tranquilizers (Smart, 1970). While in British Columbia, again, males used all drugs more frequently than females, except for amphetamines and barbiturates (Russell, 1974). Acceptance of this behavior by the peer group appears to have influenced the number of female drug users (McGlothlin, 1975).

Religion is another factor that may be an influence on drug usage, though statistics on this are scant. Reginald Smart, in his paper on alcohol abuse, stated that "Protestants, especially of the strict sects such as Baptists or Methodists, are less likely to be drinkers than are Jews or Roman Catholics. And regular church attenders are far less likely to be drinkers or drink frequently" (Smart, 1970).

In the socio-economic strata heroin is still most frequently encountered in the lower class; marijuana and the psychedelics in the middle class; cocaine is the current fad in the upper class (McGlothlin, 1975).

This investigation was carried out with a diverse group of college students whose demographic data were unknown. However, from the foregoing description of the drug users, it may be presumed that the participants exhibited all these characteristics and thus exhibited all the
viewpoints, behaviors and attitudes of the general population.

2.3 Relation of Drug Abuse to Moral Reasoning

Is there a relationship between drug abuse and moral reasoning? So far no one has specifically researched this hypothesis, although some education specialists have suggested that a values component be taught in conjunction with drug abuse. In 1970, in Vancouver, British Columbia a group of professors, students and concerned citizens organized the Association for Values Education and Research (A.V.E.R.) to study methods of undertaking rational discussions of value issues that arise in school. This Association has developed discussion outlines on such topics as racism, capital punishment and equality for women. Perhaps one on drug abuse should be forthcoming (A.V.E.R., 1974a and 1974b).

In the more general area of morality Lawrence Kohlberg (1971), intrigued with Jean Piaget's work on cognitive development, has traced a parallel growth in moral development in children through to adulthood. He has found that there are six stages in moral development:

1. the punishment and obedience orientation
2. instrumental hedonism and exchange
3. orientation to approval and stereotypes of virtue
4. law and order orientation
5. social-contract legalistic orientation
6. universal ethical principles orientation.
The movement of an individual through the stages is always upwards and occurs in an invariant sequence. A person will not regress, but neither will he skip one stage. Each person must progress through each stage. The maximum level of moral development attainable for a particular person may occur at any stage (Kohlberg, 1971).

In this context 'moral' is a special type of decision-making process or a judgement. It is based on the consideration of how oneself and other people are to be treated and how one's own interests and other people's interests are to be taken into account. Moral judgements assert that the value object is good or bad, right or wrong (Taylor, 1961). These moral judgements must be made prior to using a drug. These decisions involve moral values of society, an individual's own morality and knowledge of empirical evidence about the drug. The last component, knowledge of empirical evidence, is difficult to obtain. Long term effects of most misused drugs have not yet been documented, hence a person would not be acting in a rational manner by using these drugs (Bethell, 1973). The other two components are based on the moral values of society and the individual's moral values. Has our society accepted drug abuse? It is true that tobacco and alcohol are legalized, but this does not imply that they are morally acceptable. On the contrary, the chronic use of both, is implicated in pathological diseases. The treatment of these diseases places a heavy burden on society, a burden that is indefensible.

Would a highly principled person, one at the Stage 6 of moral development, abuse drugs? It is unlikely. A person at this level bases his decisions
on the universality of moral acts. He would be acting against this principle if he approved heroin addiction, cocaine sniffing or alcohol addiction.

2.4 Attitudes toward Drug Abuse

Attitudes toward drug abuse, that is, favourableness or unfavourableness, were studied by M. L. Simpson and F. W. Koenig (1975) at a high school where most of the students were black and from low income families. The authors used the Semantic Differential technique to uncover differences toward the following concepts: 'myself', 'a drug education teacher', 'a marijuana smoker', and 'a drug addict'. As could be expected, the students showed a more favourable attitude toward 'myself' and 'a drug education teacher' than toward the other concepts. The 'marijuana smoker' was more favourable than the 'alcoholic'; the 'drug addict' being the least favourable. Even though the number of participants in this study was small (N = 67) it did indicate the closeness in attitudes between alcohol and marijuana.

Another study on attitudes by R. Staessel (1972) brought to light the disconcerting fact that drug users, contrary to nonusers, agreed that they had an adequate knowledge of drugs. This knowledge proved limited and distorted. Their attitudes were thus coloured by misinformation.
Parental and peer group behavior appear to be the major influencing factors in attitudes toward drugs. This includes all drugs, not only those cited in this study. If a child continually notices his parents reaching for the Aspirin or Valium, then the child will probably repeat the same activity when maturer. Likewise drinking patterns are copied from parents; attitudes toward indiscriminant drug use are copied from parents. The attitude of the peer group appears to have a slightly different influence. Peer groups exert pressure on the individual to comply with their attitudes. For instance, if the peer group is experimenting with L. S. D., then the member is expected to experiment also. Parents accept their own drug abuses, such as social drinking, but do not accept the drug abuses of their child's peer group, such as L. S. D. (Smart, 1970; Russell, 1970; Robbins, 1971).

2.5 Drug Education Today

In the early 1960's a tidal wave of societal unrest hit middle class America. It was caused by the so-called 'hippies', young people disillusioned with middle class standards, aspirations and values. They cast aside the acceptable and embraced the unconventional. They tossed off the accepted dress, the expected behavior. In truth, they began a great upheaval in society which is still in motion. Into this turbulent climate psychedelic drugs were introduced. The youth of America, emulating their heroes, took off on a bizarre trip with such potent chemicals as lysergic acid diethylamide (L. S. D.) and methylenedioxy-amphetamine (M. D. A.)
Schools became the black market for marijuana, L. S. D., amphetamines and barbiturates; students became the primary consumers. Schools had to become involved in combating the use of these toxic chemicals.

Since that early period in the 1960's high schools have tried several approaches to drug education. The earliest was the 'information only' phase; then there was the 'rap sessions' period; and now we are in a 'values' approach. This latest strategy may be the most successful.

In values clarification the students in high school are taught about drugs in an indirect manner. Teachers no longer sit down with the class and announce "Now we are going to discuss drugs". Instead, students are encouraged to investigate social and moral problems; they are encouraged to explore other points-of-view; they are encouraged to become more altruistic; to form judgements only after carefully weighing all the facts. The ultimate goal is to make the students aware of all the factors involved in decision-making. They are made to realize that one wrong decision may affect them for the rest of their lives. It is in this context that the use of drugs may be raised. The students are presented with the empirical evidence about the drugs; they are made aware of the dangers or unknown facts about the drugs and it is in this framework that they arrive at a decision on whether or not to take drugs (Grant, 1976; Wolk, 1973).

It may be noted from the foregoing paragraph that drug education may be discussed in any classroom, with any teacher. This raises a worrisome problem. Are the teachers of Social Studies, Mathematics, English, etc.
qualified to teach the pharmacology of drugs? Are they dispensing truth or hearsay? Is the topic of drug abuse on the curriculum in the Faculties of Education? In the author's opinion it would be a wiser approach to teach the basic principles of drug action at an early age in the Science classroom, then add the values clarification component at a later age.

2.6 Drug Education Tomorrow

In the previous discussion on 'Drug Education Today' all the programs described take place in the high school. It is in the high school where the usage of drugs is most prevalent. But, the usage begins in elementary school (Hemsing, 1972). By the time high school is reached the majority of the pupils have already experimented with marijuana, cigarettes, alcohol, L. S. D. and solvents. No one knows the number of drop-outs or delinquents that may be attributed to drug abuse at the elementary level.

It is essential that drug education be given in the elementary school. Children in their formative years have to be made aware of the good and bad effects of drugs; they must learn the basic principles of drug action; they must learn to weigh the potential benefits against the potential dangers of drugs (Bethell, 1973). As soon as the students enter junior high school values clarification, attitude development and decision-making should begin for this is the age at which students begin to develop a sense of justice. It is in the junior high school where the moral dilemmas should be presented and a discussion of the alternative solutions ensue.
(Bull, 1969). The students must become aware of the probable effect of their taking drugs will have on their parents, their friends, their society. In other words, teachers have to try to educate students in the fullest sense of the word --- to become rational, moral human beings.

This is not an easy task. Teachers will have to find clear and simple methods for teaching about the hazards of drug abuse. They will have to discard their preconceptions of what a child thinks is drug abuse. Teachers will have to learn from the pupils what they perceive as drug abuse. Then the teachers will be able to plan programs that will accommodate to these perceptions (Easley, 1975).

In this study, drug abuse as perceived by college students was investigated. It is hoped that a clearer picture of this complex problem has been attained. The nature, complexity and interrelationships have been investigated to try to unravel the variables involved. This study also investigated the development of moral reasoning and attitudes toward drugs to try to correlate these with perceptions on drug abuse. It was hypothesized that individuals with high moral principles, on weighing all the facts about drugs, would not abuse drugs and would have a unique viewpoint on drug abuse. It was also hypothesized that individuals who are unfavourable toward drug abuse would not exhibit a particular viewpoint. The delineation of these variables should be of great assistance in planning meaningful drug education programs.
CHAPTER III

METHOD OF STUDY

3.1 The Subjects

3.11 Description of the Subjects

The subjects of this study were enrolled in a first or second year biology class at Langara City College, in the city of Vancouver, British Columbia. Sixteen of the students were in first year; thirty were in second year.

Langara City College is a junior regional college which attracts a variety of students. Some, who enrol directly from high school, have not made a firm commitment to complete a university education. Others, usually the older ones who have been working for some years, have decided they want to improve their educational standing, so return to a junior college. There is more direction and guidance given to students at a junior college than at a university, so for those returning to studies after an absence of a few years, the readjustment is facilitated for them.
Demographic data on the subjects could not be obtained due to the limited time allotted for working with the students, however the instructor noted that the range in ages was 18 years to 45 years. It appeared to the investigator that there was an equal ratio of males to females. The subjects appeared to span a wide range of ethnic groups and socio-economic backgrounds.

3.12 Selection of the Subjects

Through the co-operation of the biology instructor at Langara City College this investigator was allowed to conduct this experiment with two of his classes. This occurred at the end of the spring semester, just prior to examinations. Since the tasks required of the subjects were of a somewhat difficult nature and since it was impossible due to time constraints to have a training session, it was thought that this age group would have less difficulty in completing the tasks than younger students. It was also felt that since this was a diverse group of students that the results would be more generalizable to this cross-section of the public.
3.2 Instrumentation

3.21 Variables to be Measured

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of interrelations between common drug abuses.</td>
<td>1. Individual differences in drug abuse.</td>
</tr>
<tr>
<td></td>
<td>2. Reference dimensions</td>
</tr>
<tr>
<td></td>
<td>(a) evaluative dimension</td>
</tr>
<tr>
<td></td>
<td>(b) behavioral intent dimension</td>
</tr>
<tr>
<td></td>
<td>(c) normative belief dimension</td>
</tr>
<tr>
<td></td>
<td>4. Attitude toward drug abuses.</td>
</tr>
</tbody>
</table>

3.22 Description of the Instruments

Multidimensional Scaling Instrument:

The multidimensional scaling instrument was constructed using 16 single stimuli; 7 stimuli constituted terms used to describe the anchors of the reference dimensions and 9 stimuli constituted statements describing common drug abuses. The former stimuli were: me, closest friends, others, would do, would not do, good, bad, while the latter were: drinking alcoholic beverages, taking pep pills, smoking marijuana, taking L. S. D. (acid), taking sleeping pills, taking tranquilizers, using cocaine, smoking cigarettes, shooting heroin. Each pair of possible combinations, \( n(n-1)/2 = 120 \), was typed on a card, randomly mixed, parcelled and placed
in a large envelope that was attached to one side of a filing folder. Attached to the opposite side of the folder in a column were 8 small envelopes, and in line with the numbers 1 to 8. Number 1 was specified as 'Very close agreement', while number 8 as 'Extreme disagreement'. Preliminary trials of the sorting task using different descriptions of the proximity scale (e.g. similar, dissimilar) suggested that the scale finally used in the study made the sorting task somewhat more meaningful.

Each student was given a folder, asked to remove the deck of paired-stimuli cards and the pamphlet containing the directions (Appendix A). The investigator read the "Introduction" and the "Directions" to the students, then instructed the students to begin the sorting task. This consisted of making a judgement on the extent to which each pair of stimuli were in agreement in some way.

The students had to sort the cards into piles, each pile representing one point on the 8-point scale. After carefully sorting the deck the students placed the cards in the corresponding envelopes and then sealed them. The folders were given an identification number so that a subject's scores on the other instruments could be compared with the scale values of the stimuli obtained from an analysis of the responses to the sorting task.

For scoring purposes the investigator used the same numbers that were on the envelopes. That is, 'Very close agreement' was scored as 1, 'Extreme disagreement' was scored as 8, and the other points on the scale in order. Each stimuli-pair had an identification number, thus for collation of the
data, each subject's stimulus-pair was numbered and given its score. No systematic attempt was made to determine the reliability and validity of this instrument, however some indication of these two characteristics may be obtained from the literature. Judgement scales have been used for the past 70 years to investigate personality traits, attitudes, abilities and preferences, thus evidence on validity and reliability is being amassed. A study on colour perception, completed in 1909 and replicated several times, vouches for construct validity. Torgerson (1958) reported that this classic experiment using multidimensional scaling originated by A. H. Munsell in 1909 has been repeated three times by; M. W. Richardson in 1938, W. J. Torgerson in 1951, and S. J. Messick in 1954. These studies had the subjects judge the brightness and saturation of red colour chips. The results of these repetitions were in close agreement with Munsell's original findings of two dimensions. It appears that, since the dimensions arise out of the special characteristics of the data, that they are real and do actually underlie the judgements. In this study the multidimensional scaling model used to analyze the judgements of agreement between stimulus-pairs was INDSCAL, (Appendix B) a more recent development by Carroll and Chang (1972).

Again the literature was searched for evidence on the content validity of this instrument. In this context it was established that the test items (stimuli) were the common drugs of abuse (Hemsing, 1972; Russell, 1974; McGlothlin, 1975).
For indications on statistical reliability of the judgements it was necessary to refer to the INDSCAL model. This program interprets the stimulus-pairs of all the subjects and embeds them in a Euclidean space spanned by r dimensions. INDSCAL then similarly places each individual subject in the same space. The co-ordinates of the stimuli in the group space are dependent on all the subjects, i.e. it is a compromise between each individual's configuration. The results indicate that the group configuration obtained changes very little when the private spaces for individual subjects are constructed, i.e. the configuration seems quite stable across subjects. Although each subject does not constitute an independent trial, the results tend to suggest considerable reliability and agreement in judgements made.

**Defining Issues Test**

The *Defining Issues Test* originated by James Rest (1974b) is an objective test based on Kohlberg's stage theory of moral development. Due to time constraints the shortened version of three stories was used in this study (Appendix C). Each moral dilemma is followed by 12 questions with each question representing a stage of moral development. Prior to taking the test the investigator read the "Introduction" and the "Example" to the students. It was emphasized to the students that if a question did not make sense or sounded like gibberish (e.g. Item 6 in the example) then they should mark such items as 'No importance'. These are meaningless nonsense items which sound lofty and pretentious and may impress some people. After completing the test the students placed the pamphlet in the large envelope.
The subjects' task was to rate the importance of each of the 12 questions in solving the moral dilemma. The ratings were on a 5-point scale ranging from 'Great importance' to 'No importance'. Following this the subjects had to select the four most important questions and rank order them. The rank-scores were punched onto computer cards and analyzed by means of a computer program prepared by the author of the test.

Validity and reliability of this test are discussed by James Rest in the manual (1974b, Sec. 5). The Defining Issues Test is based on the moral development theory and test of Kohlberg (1971), although there are inherent differences in the test characteristics. In Kohlberg's test the subjects have to think through the problem then produce solutions. Whereas, in Rest's test the subjects have to evaluate various solutions given for the problem. It would appear that Rest's version is somewhat easier than Kohlberg's. Nevertheless, the correlation of the Defining Issues Test's P-score (or Principled score which is the sum of Stage 5 and 6 scores) to Kohlberg's is 0.68, a figure that is higher than any other external measure (Rest, 1974a, p. 497).

In 1974 a group of 40 students from junior and senior high schools, colleges and graduate schools were given the D.I.T. Included in the graduate student group were 15 doctoral students in political science and moral philosophy. Thus all the higher stages of moral reasoning and its hierarchical nature should have been manifested. Indeed, the results show evidence of this. The average Principled score for the junior high students was 32.7; senior high 37.4; college 54.9; doctoral 70.3. The correlation
of the P-score with age was 0.62. In another sample the correlation of the P-score with age was 0.67. Since this original study in 1974 a further 1500 subjects have been tested. Again the P-scores were consistent (Rest, 1974b, Sec. 5).

In order to obtain data on reliability Rest (1974a, p. 495) tested 28 grade 9 students. A short time later the D.I.T. was repeated, resulting in a Pearson correlation of 0.81. This is a fairly high test-retest stability.

Attitude Test

Twenty-seven statements related to drug use were selected for this test (Appendix D). Each of the drug uses specified in the multidimensional scaling instrument was included, plus an item on the use of antibiotics, solvents, the concept of drug interaction and behavior regarding general drug use. The investigator read the "Instructions" to the subjects and displayed the Mark Sense Card that was to be used for their responses. On completion of the task the test and the Mark Sense Card were returned to the folder.

In this test the subjects had to decide how strongly they agreed or disagreed with the statements, rated on a 5-point Likert scale. If the subjects 'Strongly disagreed' they filled in '1' on the Mark Sense Card; if they 'Strongly agreed' they filled in '5'; 'Disagreed', 'Uncertain', and 'Agree' were indicated by 2, 3 and 4 respectively.
On scoring the test the positive items, those which should have resulted in a 'Strongly agree' response were given a mark of 5. If the subject rated the positive item as 'Strongly disagree' he was given a mark of 1. Reverse scoring was used for negative statements. It should be pointed out that a high score on this test indicated an unfavourable attitude toward the use of drugs.

For evidence on content validity of this test again the literature must be cited. McGlothlin (1975) reviewed the area of drug abuse. Each of the drugs that he reported on were included in this instrument. Other authors (Russell, 1974; Hemsing, 1972) studied the same drugs. The content validity is ensured. Regarding construct validity the instrument fulfilled the criteria cited by Likert (1967) for statements of an attitude scale. These are; the statements were expressions of desired behavior, the items were clear and concise, the reactions to the items spanned the attitude continuum, and there was an equal number of positive and negative items.

The responses to the instrument were analyzed by means of the computer program LERTAP and yielded the following summary statistics:

Highest score 121.00        Mean score 101.09        Lowest score 53.00
Standard deviation 16.68    Standard error of measurement 6.33
Hoyt estimate of reliability 0.85
Although the reliability coefficient, 0.85, appears satisfactory, the reader is cautioned to note that because of the fairly high standard error, the scores are probably not very precise.
CHAPTER IV

ANALYSIS AND RESULTS

4.1 Multidimensional Scaling of Drug Abuses

The use of multidimensional scaling for describing the underlying structure of the subjects' perceptions toward drug abuses is based on the subjects' perceived distances between stimulus-pairs on an equal-interval scale along an underlying psychological continuum. The continuum may be of one or more dimensions, that is, the bases for the subjects' judgements may be multidimensional in nature. The spaces along the continuum are the proximity or closeness measures for each stimulus-pair. Multidimensional scaling uses these proximity measures for each individual to form matrices of similarity between the stimulus-pairs and embeds them in a Euclidean space (Torgerson, 1958). The INDSCAL (Individual Differences Scaling) model developed by Carroll and Chang in 1970 assumes that the underlying psychological structure of a set of stimuli can be represented by an r-dimensional Euclidean space. Further, the assumption is made that the same r-dimensions will be common to all subjects although not equally salient to each one. Consequently, the INDSCAL model generates a 'group-stimulus space' of r dimensions and a 'subject-space' in which the subjects are
located on the same r dimensions as the stimuli. The 'subject-space' gives the saliences (weights) of each dimension of the 'group-stimulus space' to each subject. A 'private space' for each individual can be constructed by using the subject's weights on the r dimensions and applying them to the co-ordinates of the stimuli in the 'group-stimulus space'. The weights change the group-stimulus configuration in the direction of the axes according to how salient the dimensions are to a particular individual.

A special feature of INDSCAL, not present in other multidimensional scaling models, is that the orientation of the axes do not require rotation and hence are immediately interpretable (Coxon, 1972). The orientation of the axes is unique in that it is, in part, the consequence of the differential weightings of the dimensions for each subject and not, as is usually the case, based on averaged data.

4.12 The data was analyzed to test hypothesis 1.51(a) postulated in Chapter I. In this study the number of dimensions used for judging the stimuli was determined by a computer program for INDSCAL. On examining the first 7 dimensions it was decided that 3 dimensions would be adequate for representing the group's perceptions of drug abuses. The subjects' weights on Dimension 1 were all negative and therefore this dimension was rejected on theoretical grounds (Carroll, 1970). The fifth to seventh dimensions were only slightly salient to a few subjects. The evidence points strongly towards substantiation of the first hypothesis.
4.13 The second hypothesis, 1.51(b), was confirmed in that each individual gave each dimension a different weighting. The subjects' weights and ranges of weights on Dimensions II, III and IV are reproduced in Table 4-1.
<table>
<thead>
<tr>
<th>Graph Code</th>
<th>Subject Number</th>
<th>Dimension II</th>
<th>Dimension III</th>
<th>Dimension IV</th>
</tr>
</thead>
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<td>1</td>
<td>1</td>
<td>0.59</td>
<td>0.24</td>
<td>0.31</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.28</td>
<td>0.36</td>
<td>0.31</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.53</td>
<td>0.27</td>
<td>0.21</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.54</td>
<td>0.68</td>
<td>0.28</td>
</tr>
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<td>5</td>
<td>5</td>
<td>0.10</td>
<td>0.24</td>
<td>0.27</td>
</tr>
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<td>6</td>
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<td>0.43</td>
<td>0.26</td>
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<td>7</td>
<td>7</td>
<td>0.54</td>
<td>0.65</td>
<td>0.27</td>
</tr>
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<td>8</td>
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<td>0.18</td>
<td>0.30</td>
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<td>9</td>
<td>0.61</td>
<td>0.57</td>
<td>0.40</td>
</tr>
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<td>0.47</td>
<td>0.29</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>0.63</td>
<td>0.61</td>
<td>0.35</td>
</tr>
<tr>
<td>C</td>
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<td>0.53</td>
<td>0.54</td>
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</tr>
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<td>D</td>
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<td>0.10</td>
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<td>0.54</td>
<td>0.26</td>
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<tr>
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<td>H</td>
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<td>0.46</td>
<td>0.38</td>
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<tr>
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<td>0.19</td>
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<td>J</td>
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<tr>
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<td>0.49</td>
<td>0.23</td>
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<tr>
<td>M</td>
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<td>0.57</td>
<td>0.30</td>
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<tr>
<td>N</td>
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<td>0.39</td>
<td>0.20</td>
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<tr>
<td>O</td>
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<td>0.65</td>
<td>0.15</td>
</tr>
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<td>P</td>
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<td>0.33</td>
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<td>0.30</td>
<td>0.20</td>
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<td>T</td>
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<td>0.60</td>
<td>0.44</td>
<td>0.27</td>
</tr>
<tr>
<td>U</td>
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<td>0.69</td>
<td>0.27</td>
</tr>
<tr>
<td>V</td>
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<td>0.50</td>
<td>0.27</td>
</tr>
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<td>W</td>
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<td>0.21</td>
</tr>
<tr>
<td>X</td>
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<td>0.56</td>
<td>0.49</td>
<td>0.30</td>
</tr>
<tr>
<td>Y</td>
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<td>0.65</td>
<td>0.60</td>
<td>0.40</td>
</tr>
<tr>
<td>Z</td>
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<td>0.33</td>
<td>0.28</td>
<td>0.30</td>
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<tr>
<td>+</td>
<td>36</td>
<td>0.53</td>
<td>0.46</td>
<td>0.28</td>
</tr>
<tr>
<td>=</td>
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<td>0.48</td>
<td>0.28</td>
</tr>
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<td>*</td>
<td>38</td>
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<td>0.48</td>
<td>0.23</td>
</tr>
<tr>
<td>&amp;</td>
<td>39</td>
<td>0.76</td>
<td>0.74</td>
<td>0.34</td>
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<td>$</td>
<td>40</td>
<td>0.48</td>
<td>0.54</td>
<td>0.22</td>
</tr>
<tr>
<td>@</td>
<td>41</td>
<td>0.35</td>
<td>0.29</td>
<td>0.22</td>
</tr>
<tr>
<td>%</td>
<td>42</td>
<td>0.52</td>
<td>0.29</td>
<td>0.31</td>
</tr>
<tr>
<td>?</td>
<td>43</td>
<td>0.72</td>
<td>0.55</td>
<td>0.31</td>
</tr>
<tr>
<td>#</td>
<td>44</td>
<td>0.61</td>
<td>0.29</td>
<td>0.31</td>
</tr>
<tr>
<td>(</td>
<td>45</td>
<td>0.50</td>
<td>0.40</td>
<td>0.30</td>
</tr>
<tr>
<td>)</td>
<td>46</td>
<td>0.58</td>
<td>0.44</td>
<td>0.26</td>
</tr>
</tbody>
</table>

* Note: These figures have been rounded to 2 decimal places.

Ranges of Weights = 0.10 - 0.76  0.18 - 0.74  0.10 - 0.40
It should be noted that the saliences of Dimension IV is, on the whole, considerably less than the saliences of the other two dimensions.

4.14 The qualitative features of the configuration of drug abuses, hypothesis 1.51(c), are made evident in Figures 4-1, 4-2 and 4-3 which depict the group stimulus-spaces given in Table 4-2.

**TABLE 4 - 2**

**CONFIGURATION OF STIMULI IN THE GROUP SPACE**

<table>
<thead>
<tr>
<th>Graph Code</th>
<th>Stimulus Code</th>
<th>Stimulus (abbreviated)</th>
<th>Dimension II</th>
<th>Dimension III</th>
<th>Dimension IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>me</td>
<td>0.02</td>
<td>0.06</td>
<td>-0.64</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>closest friends</td>
<td>-0.70</td>
<td>0.25</td>
<td>0.13</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>others</td>
<td>-0.31</td>
<td>0.41</td>
<td>-0.05</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>would do</td>
<td>-0.37</td>
<td>0.21</td>
<td>-0.22</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>would not do</td>
<td>0.36</td>
<td>0.32</td>
<td>0.35</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>good</td>
<td>-0.05</td>
<td>0.07</td>
<td>0.50</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>bad</td>
<td>0.11</td>
<td>0.40</td>
<td>-0.25</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>alcoholic beverages</td>
<td>0.20</td>
<td>0.01</td>
<td>0.27</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>pep pills</td>
<td>0.05</td>
<td>-0.19</td>
<td>-0.03</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>marijuana</td>
<td>0.14</td>
<td>-0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>L.S.D. (acid)</td>
<td>0.08</td>
<td>-0.28</td>
<td>-0.05</td>
</tr>
<tr>
<td>C</td>
<td>12</td>
<td>sleeping pills</td>
<td>0.06</td>
<td>-0.18</td>
<td>0.01</td>
</tr>
<tr>
<td>D</td>
<td>13</td>
<td>tranquilizers</td>
<td>0.04</td>
<td>-0.23</td>
<td>-0.10</td>
</tr>
<tr>
<td>E</td>
<td>14</td>
<td>cocaine</td>
<td>0.09</td>
<td>-0.19</td>
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</tr>
<tr>
<td>F</td>
<td>15</td>
<td>cigarettes</td>
<td>0.24</td>
<td>-0.25</td>
<td>0.03</td>
</tr>
<tr>
<td>G</td>
<td>16</td>
<td>heroin</td>
<td>0.05</td>
<td>-0.40</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

* Note: These figures have been rounded to 2 decimal places.

Figure 4-1 is a graph of the group stimulus-space spanned by Dimensions II and III. The subjects who weighted highly on Dimension II appeared to base their judgements on their behavioral intent with respect to drugs. The "would do"-"would not do" referent axis is almost parallel
to Dimension II. These subjects placed cigarette smoking closer to "would not do" than any other drug abuse. Alcohol and marijuana are slightly more favourable, but still closer to "would not do" than to "would do". The other drugs of abuse were not clearly differentiated on this dimension.

Figure 4-2 graphically shows the group stimulus-space spanned by Dimensions III and IV, depicting a different pattern for Dimension IV. These subjects appeared to base their judgements on a "good"-"me" dimension and to a lesser extent on behavioral intent, as on Dimension II. Dimension IV failed to differentiate between the drugs except for alcohol. Alcohol was closely aligned to "good" and "would not do".

In Figure 4-3 Dimension IV again suggests a "good"-"me" basis for judging the drugs. While Dimension II again aligned itself with a behavioral intent axis, but to a lesser degree.

Dimension III did not appear to be related to any of the referent axes. It may be that the subjects' basis of judging the stimuli along Dimension III was acceptability. In Figures 4-1 and 4-2, Dimension III exhibited two clear qualitative differences. Alcohol and marijuana were placed at its origin, suggesting an ambivalence toward them, while all the other drugs of abuse were given differential weighting in the negative direction. Pep pills (amphetamines), sleeping pills and cocaine were judged as similar. The subjects judged L.S.D. as negatively as cigarette smoking. The reason for this may be that a person has a choice between taking L.S.D. or not
taking it. There often is no choice in the inhalation of cigarette smoke, even if one does not smoke. These subjects placed heroin at the most distant point in the negative direction, indicating low acceptability.
Figure 4-1 GROUP STIMULUS-SPACE ON DIMENSIONS II AND III

DIMENSION III
Acceptability

DIMENSION II
Behavioral Intent

Acceptability

0.400
0.133
-0.133
-0.400

Alcohol
Marijuana
Cigarettes

0.400 0.200 0.000 -0.200 -0.400 -0.600
Figure 4-2 GROUP STIMULUS-SPACE ON DIMENSIONS III AND IV

DIMENSION IV A "good" - "me" and behavioral intent dimension

DIMENSION III

Acceptability.
Figure 4-3 GROUP STIMULUS-SPACE ON DIMENSIONS II AND IV

DIMENSION IV A "good" - "me" dimension

DIMENSION II

Behavioral Intent

-0.667 -0.600 -0.400 -0.200 0.000 0.200 0.400 0.600
4.2 **Defining Issues Test**

In this study the **Defining Issues Test** was analyzed using the computer program developed by James Rest. This program, **PROGRAM MORAL**, computes from the four selected rank-order items the stage score, the Principled score (P-score), the Meaningless score (M-score) and the Antiestablishment score (A-score). The P-score, as mentioned previously, is the sum of the Stage 5 and 6 scores. The M-score is the weight the subject gave to the nonsense statements. An A-score signifies that the individual is opposed to the existing social order.

4.21 The data was examined to test the hypothesis 1.52(a) stated in Chapter I. The Manual for the **D. I. T.** (Sec. 5) has a record of average P-scores for high school and university students. These were compared with the P-scores of the experimental group. Table 4-3 reproduces James Rest’s average P-scores and the P-scores obtained by this group.
### Table 4-3

AVERAGE P-SCORES ON THE DEFINING ISSUES TEST from J. Rest (1974b)

**NOTE:** for the purposes of comparison these scores have been divided by two. Rest's groups completed 6 moral dilemmas, while the group in this study completed only 3.

<table>
<thead>
<tr>
<th>Educational Standing</th>
<th>Number of subjects</th>
<th>Average P-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 9</td>
<td>417</td>
<td>10.0</td>
</tr>
<tr>
<td>Grade 11</td>
<td>50</td>
<td>18.0</td>
</tr>
<tr>
<td>Grade 12</td>
<td>17</td>
<td>18.5</td>
</tr>
<tr>
<td>College students, 3rd year</td>
<td>73</td>
<td>20.7</td>
</tr>
<tr>
<td>College students, 1st &amp; 2nd year</td>
<td>113</td>
<td>20.5</td>
</tr>
<tr>
<td>College students, 1st year</td>
<td>146</td>
<td>21.5</td>
</tr>
<tr>
<td>College students, 2nd year</td>
<td>137</td>
<td>23.1</td>
</tr>
<tr>
<td>College students, 4th year</td>
<td>60</td>
<td>27.0</td>
</tr>
</tbody>
</table>

### Table 4-4

P-SCORES ON THE DEFINING ISSUES TEST OF THIS STUDY GROUP

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>P-Score</th>
<th>Subject Number</th>
<th>P-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.0</td>
<td>24</td>
<td>13.0</td>
</tr>
<tr>
<td>2</td>
<td>7.0</td>
<td>25</td>
<td>11.0</td>
</tr>
<tr>
<td>3</td>
<td>2.0</td>
<td>26</td>
<td>17.0</td>
</tr>
<tr>
<td>4</td>
<td>17.0</td>
<td>27</td>
<td>21.0</td>
</tr>
<tr>
<td>5</td>
<td>9.0</td>
<td>28</td>
<td>14.0</td>
</tr>
<tr>
<td>6</td>
<td>15.0</td>
<td>29</td>
<td>17.0</td>
</tr>
<tr>
<td>7</td>
<td>15.0</td>
<td>30</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>3.0</td>
<td>31</td>
<td>15.0</td>
</tr>
<tr>
<td>9</td>
<td>6.0</td>
<td>32</td>
<td>15.0</td>
</tr>
<tr>
<td>10</td>
<td>20.0</td>
<td>33</td>
<td>21.0</td>
</tr>
<tr>
<td>11</td>
<td>11.0</td>
<td>34</td>
<td>9.0</td>
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<tr>
<td>12</td>
<td>13.0</td>
<td>35</td>
<td>14.0</td>
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<tr>
<td>13</td>
<td>9.0</td>
<td>36</td>
<td>14.0</td>
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<tr>
<td>14</td>
<td>17.0</td>
<td>37</td>
<td>8.0</td>
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<td>15</td>
<td>16.0</td>
<td>38</td>
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<td>16</td>
<td>19.0</td>
<td>39</td>
<td>24.0</td>
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<tr>
<td>17</td>
<td>9.0</td>
<td>40</td>
<td>1.0</td>
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<tr>
<td>21</td>
<td>6.0</td>
<td>44</td>
<td>7.0</td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>45</td>
<td>10.0</td>
</tr>
<tr>
<td>23</td>
<td>17.0</td>
<td>46</td>
<td>13.0</td>
</tr>
</tbody>
</table>

**NOTE:** two subjects did not complete the test (No. 22 and 30)
The average P-score for this group was 12.9, thus the hypothesis that there would be no significant differences in the level of moral reasoning of this group when compared to the norm was not substantiated. These subjects were significantly below the expected level.

4.22 To test the second hypothesis, 1.52(b), pertaining to the relationship between the levels of moral reasoning of the subjects and their perceptions of drug abuses, those subjects with the 4 highest P-scores and those with the 4 lowest P-scores were selected for further inspection. These subjects had P-scores of 24, 21, 21 and 21; 6, 3, 3 and 1, respectively. Figures 4-4, 4-5 and 4-6 show these selected subjects' positions on each dimension of the subject-space.

These graphs show that all those subjects with high P-scores loaded highly on every dimension, indicating the diversity of their bases of judgements and the large amount of variance that was accounted for in their judgements. Those subjects, on the other hand, with the lowest P-scores were closer to the origin in all dimensions. This indicated that less variance was accounted for or, more likely, that these subjects responded randomly.

4.3 Attitude Test

This instrument was analyzed using the LERTAP computer program. LERTAP scans the raw data, calculates the scores, correlates the scores on each test item with the score of the total test and then generates summary statistics.
Figure 4-4  SELECTED SUBJECTS IN THE SUBJECTS' SPACE WITH HIGH AND LOW P-SCORES ON DIMENSIONS II AND III

DIMENSION III

<table>
<thead>
<tr>
<th>P-Score</th>
<th>Subject</th>
<th>X</th>
<th>J</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DIMENSION II
Figure 4-5  SELECTED SUBJECTS IN THE SUBJECTS' SPACE WITH HIGH AND LOW P-SCORES
ON DIMENSIONS III AND IV

<table>
<thead>
<tr>
<th>P-Score</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>*</td>
</tr>
<tr>
<td>21</td>
<td>X</td>
</tr>
<tr>
<td>21</td>
<td>R</td>
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<tr>
<td>21</td>
<td>J</td>
</tr>
<tr>
<td>6</td>
<td>L</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>E</td>
</tr>
</tbody>
</table>
Figure 4-6  SELECTED SUBJECTS IN THE SUBJECTS'-SPACE WITH HIGH AND LOW P-SCORES
ON DIMENSIONS II AND IV

DIMENSION IV

<table>
<thead>
<tr>
<th>Subject</th>
<th>P-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>*</td>
</tr>
<tr>
<td>21</td>
<td>X</td>
</tr>
<tr>
<td>21</td>
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<td>J</td>
</tr>
<tr>
<td>6</td>
<td>L</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>E</td>
</tr>
</tbody>
</table>

DIMENSION II
4.31 To test the hypothesis 1.53(a), that the entire group would have an unfavourable attitude toward drug abuses, the summary statistics were examined. As was pointed out previously, a high score indicated an unfavourable attitude toward drug abuse.

<table>
<thead>
<tr>
<th>TABLE 4 - 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUMMARY OF RESPONSES ON THE ATTITUDE SCALE</strong></td>
</tr>
<tr>
<td>Highest possible score</td>
</tr>
<tr>
<td>Lowest possible score</td>
</tr>
<tr>
<td>Mean score obtained</td>
</tr>
</tbody>
</table>

One hundred and twenty-one as the highest score and one hundred and one as the mean score substantiate the hypothesis.

4.32 To test the second hypothesis regarding the relationship between attitude toward drug abuses and perceptions of drug abuses, 1.53(b), those 4 subjects with the highest score and those 4 with the lowest score on this test were scrutinized closely. These 8 subjects were located in the subject-space to ascertain if there was a relationship between attitude and perceptions. Figures 4-7, 4-8 and 4-9 show these subjects' positions in the subject-space.

The hypothesis was confirmed. The subjects with the high scores are interspersed with the subjects who obtained the low scores. There is no commonality or clustering in their locations in the subject-space.
Figure 4-7  SELECTED SUBJECTS IN THE SUBJECTS' SPACE WITH HIGH AND LOW ATTITUDE SCORES ON DIMENSIONS II AND III

<table>
<thead>
<tr>
<th>Dimension III</th>
<th>Attitude Score</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>121</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>121</td>
<td>/</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>.700</td>
<td>120</td>
<td>B</td>
</tr>
<tr>
<td>.600</td>
<td>69</td>
<td>P</td>
</tr>
<tr>
<td>.500</td>
<td>58</td>
<td>@</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>S</td>
</tr>
<tr>
<td>.400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>.100</td>
<td>.200</td>
</tr>
<tr>
<td></td>
<td>.300</td>
<td>.400</td>
</tr>
<tr>
<td></td>
<td>.500</td>
<td>.600</td>
</tr>
<tr>
<td></td>
<td>.700</td>
<td>.800</td>
</tr>
</tbody>
</table>

DIMENSION II
Figure 4-9  SELECTED SUBJECTS IN THE SUBJECTS'-SPACE WITH HIGH AND LOW ATTITUDE SCORES ON DIMENSIONS III AND IV

DIMENSION IV

<table>
<thead>
<tr>
<th>Attitude Scores</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>C</td>
</tr>
<tr>
<td>121</td>
<td>/</td>
</tr>
<tr>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>120</td>
<td>B</td>
</tr>
<tr>
<td>69</td>
<td>P</td>
</tr>
<tr>
<td>58</td>
<td>G</td>
</tr>
<tr>
<td>58</td>
<td>E</td>
</tr>
<tr>
<td>53</td>
<td>S</td>
</tr>
</tbody>
</table>

DIMENSION III

0   .100   .200   .300   .400   .500   .600   .700

DIMENSION IV

.500

.400

.300

.200

.100
Figure 4-8  SELECTED SUBJECTS IN THE SUBJECTS' SPACE WITH HIGH AND LOW ATTITUDE SCORES ON DIMENSIONS II AND IV

<table>
<thead>
<tr>
<th>Attitude Score</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>C</td>
</tr>
<tr>
<td>121</td>
<td>/</td>
</tr>
<tr>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>120</td>
<td>B</td>
</tr>
<tr>
<td>69</td>
<td>P</td>
</tr>
<tr>
<td>58</td>
<td>@</td>
</tr>
<tr>
<td>58</td>
<td>E</td>
</tr>
<tr>
<td>53</td>
<td>S</td>
</tr>
</tbody>
</table>

DIMENSION IV

0 .100 .200 .300 .400 .500 .600 .700 .800 DIMENSION II
CHAPTER V

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

5.1 Multidimensional Nature of Drug Abuses

5.11 (a) The perceptions of drug abuses among the college students of this study appear to be at least three-dimensional in nature. These three dimensions were tentatively named: Dimension II --- behavioral intent (would do-would not do); Dimension III --- acceptability; Dimension IV --- me-good. Whether or not other groups would judge drug abuse in the same manner was not confirmed in this study.

These perceptions of drug abuse were not obvious prior to this study and now when fully explored, yield their own patterns. These patterns are not as varied as was expected, but this may be due to the individual characteristics of this particular group. It is speculated that the group as a whole do not perceive drug abuses as a problem that they have to struggle with. Now being in the 18 to 45-years age bracket they feel that they have already made decisions on whether or not to take drugs. Several students commented to the investigator that teachers in the elementary, junior and senior high schools should be concerned about this problem. This is where the problem arises; this is where it should be solved. Perhaps a study along these lines with young teenagers, that included training sessions,
would result in more than three dimensions.

(b) The evidence obtained indicated that each dimension was not equally salient to each individual. The subjects' weights in the group-space were quite different from each other, moreover, the overall salience on Dimension IV was much less than that of the other two dimensions (Dimensions II and III). It was assumed that individuals would have bases of judgement in common with the group, so it is not clear from this study what other dimensions individuals would have used aside from the group.

(c) The differences in the qualitative nature of the group's perceptions of the stimuli were substantiated, however the differences between the stimuli were not as distinct as had been anticipated. Dimension II, the behavioral intent dimension, was used primarily to indicate opposition to cigarette and marijuana smoking and the drinking of alcoholic beverages. In fact, marijuana smoking was viewed on Dimension II as closer to "would do" than the drinking of alcohol or the smoking of cigarettes. All other drug abuses were clustered together close to the origin, implying irrelevance of the dimension for further differentiation of these drug abuses. It is quite surprising that these students gave nearly equal weightings to pep pills, L.S.D. (acid), sleeping pills, tranquilizers, cocaine and heroin.

Those individuals who weighted highly on Dimension III made somewhat broader distinctions among the drug abuses and tended to group them in more distinct clusters. Of note, from a pharmacological standpoint is the inconsistency in the clustering of pep pills and cocaine, with sleeping pills. The
pharmacological action of cocaine and pep pills (amphetamines) is that of powerful stimulants, while sleeping pills have the opposite effect. It is legally far easier to obtain sleeping pills and pep pills than cocaine. Thus the clustering of these three drugs does not seem to rest on either pharmacological grounds or on legal grounds. It seems plausible, however, that these drug abuses were seen as having the same degree of acceptability.

The second apparently inconsistent cluster was that of tranquilizers, cigarettes and L.S.D. (acid). Again, tranquilizers and L.S.D. have completely opposite effects on the body; and again, tranquilizers and cigarettes are quite legal. On the basis of acceptability, these three drugs were judged to have the same degree of acceptability.

Dimension III was the only dimension in which the subjects clearly separated heroin from all the other drug abuses. To these subjects heroin is perceived as an unacceptable drug.

Dimension IV has two distinguishing features. Firstly, the subjects who weighted highly on this dimension clearly separated alcohol from all the other drugs. Secondly, these subjects made unexpected discriminations among the other drug abuses. They placed taking sleeping pills, using cocaine and shooting heroin at its origin, suggesting irrelevance of the dimension, yet placed taking tranquilizers, taking L.S.D. (acid) and taking pep pills slightly away from the origin, closer to "me" and "would do".
It was rather disconcerting to find many of the students making definite judgements on alcohol, marijuana and cigarettes only. The other drugs of abuse were generally grouped together. This may imply a lack of knowledge and understanding about the drugs of abuse, but more significantly, it may imply a lack of knowledge and understanding about drugs that are commonly used, and not necessarily abused.

It should be noted that cigarette smoking was viewed by all the students as unfavourable. The North American campaign on the dangers of cigarette smoking appears to have been quite effective. It seems clear that similar strong measures are in order with respect to other drug abuses. Perhaps drug education should permeate all areas of the elementary and secondary school curriculum. Science teachers could probably do much toward helping students acquire a clear understanding of the pharmacological differences between the drugs. Twenty years ago one took medication when one was seriously ill; nowadays drug-taking is a part of everyday life. The schools take the time to teach about new developments, such as space travel, surely time could be made available for an in-depth program on all drugs. The need is present. In this study the lack of discrimination between such beneficial drugs, as sleeping pills and such potent, addictive drugs as heroin and cocaine is quite distressing.
5.2 Levels of Moral Reasoning and Perceptions of Drug Abuses

5.21 (a) The results of the Defining Issues Test pointed out the apparent large discrepancy in the levels of moral reasoning between the students in this investigation and other comparable students. This may be, at least in part, due to the fact that these students completed only three stories. Still the differences seem large enough to be attributed to a large extent to differences in levels of moral reasoning.

Another possible explanation for the low Principled scores is that Rest presents evidence in his Manual (1974b, Sec. 5) that high scores on the D. I. T. reflect greater cognitive capacity. The D. I. T. test-scores correlated 0.42 with the I. Q. Quick Test for Adults; it also correlated 0.67 with a comprehension test. Evidence appears to be accumulating to support the hypothesis that levels of moral reasoning are dependent to a significant degree on intelligence. If this is the case then this points to possibly lower mental ability of the group than would normally be expected of regular college students. Regional college students have diverse backgrounds. Some have been out of the educational system for a number of years often for reasons of low marks in high school. If Rest's hypothesis is embraced, then a less than average score on the Defining Issues Test is in order.

(b) That those individuals with a high Principled score would perceive drug abuses in the same manner was substantiated to some degree. The high weights on every dimension indicate that the dimensions were highly
salient to these individuals. The reason for this is not clear.

The second part of this hypothesis was not wholly substantiated, but it may be tentatively concluded that those individuals with low levels of moral reasoning could not, or would not differentiate between the various drug abuses. This is evidenced by the low weightings on each dimension, which suggests that their sorting of the stimulus-pairs was random, casual or the task was too difficult for them.

It appears from this study that these students have not yet learned to solve moral dilemmas rationally, but, as mentioned earlier, it may be that they have already reached their highest level of moral reasoning, if, as Rest suggests, it is linked with intelligence. And Kohlberg also pointed out that the development of moral reasoning usually peaks in the late teens or early twenties. If this is the case and the evidence strongly suggests this, then learning to solve moral-social conflicts must begin at a much earlier age when the child is still maturing.

The current strategy in teaching, the adding of a values component to discussions on moral-social conflicts, such as drug abuse, is urgently required. Discussions of this nature, plus empirical evidence about drugs, should be included at least in the junior secondary school curriculum.
5.31 (a) The unfavourableness of the group toward drug abuse was quite pronounced, as was hypothesized. Perhaps some of this attitude has been acquired in school, certainly the media has reflected the current accepted attitudes toward the 'hard' drug abuses. What seems to be the case in this study is that the group has reflected the accepted stereotype.

(b) There was no relationship between attitude toward drug abuse and perceptions of drug abuses. Graphs of the high and low scorers placed in the subjects' space did not show any evidence of clustering of these selected subjects, supporting the hypothesis.

The multidimensional scaling approach makes it very difficult for the subjects to consistently reflect the accepted attitude toward drug abuse. Also, the overall attitude score does not give any information about the attitude toward specific drug abuses, hence it is unlikely that the overall attitude score be closely related to differentiations on perception of specific drug abuses.

5.4 Recommendations for Further Study

The experimental nature of this study has revealed several improvements that might be integrated into the design of similar studies and suggestions for follow-up studies. One of the serious limitations of this study was
the generalizability of the results, thus several more studies along the same lines, but with different age groups, different backgrounds would add to this field of knowledge. With larger groups the perceptions may be more clearly identified and mapped out.

One of the questions that has arisen in analyzing the results was the length of time given to this group to complete the unfamiliar multidimensional scaling task. Perhaps training sessions, plus less of a time restriction would present clearer discrimininations among the stimulus-pairs.

Another rather important aspect that could not be investigated was the influence of age, sex, socio-economic status, racial origin and religion on the perceptions of drug abuses. If an investigator could obtain demographic data he might find perceptions of drug abuses attributed to one or more of these variables.

The Defining Issues Test was easy for this group of students to complete. It has been used for Grade 9 students (Rest, 1974b, Sec. 5). However, it is recommended that the six stories be used instead of the three, if at all possible. The normative data are based on six stories so that comparisons would be more credible.

Lastly, it is recommended that teaching strategies be adjusted to match the particular perceptions, mental abilities and moral development of the students. Follow-up data and longitudinal studies evaluating these teaching programs
should be initiated. It is hoped that, with the present students knowing, understanding and applying all the moral principles involved in taking a drug, we will not have the problem of drug abuse in the next generation.
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APPENDIX A

MULTIDIMENSIONAL SCALING INSTRUMENT
Introduction

This experiment is an attempt to determine whether there are commonly held views on drug use among a diverse group of regional college students and, if so, to determine the complexity and qualitative nature of these views. It requires you to make judgments about the extent to which pairs of stimuli in the form of words and/or statements are in agreement, i.e., similar or related in some way. There are no right or wrong answers and all responses will remain ANONYMOUS.
The deck of cards you received has 120 cards. Examine the cards. Each one has a pair of stimuli in the form of words and/or statements typed on it. You are to judge the extent to which each pair of stimuli are in AGREEMENT, i.e., SIMILAR or RELATED in some way, on an 8-point scale. It is extremely important to consider EVERY POINT on the scale in distinguishing between each member of a pair of stimuli. When you have finished sorting the cards there should be some cards on EACH POINT of the scale. To help you with this task, proceed as follows:

1. Note the pockets on the eight-point scale. Each pocket has a number on it corresponding to a point on the scale. The numbers represent different degrees of agreement. The number indicating very close agreement is 1, while the number 8 indicates extreme disagreement. Number 2, 3, 4, 5, 6, and 7 indicate intermediary degrees of agreement between these two extremes.

Divide the pile of cards into TWO piles according to whether they belong on the lower end of the scale, pockets 1 - 4, or the upper end of the scale, pockets 5 - 8.

2. Sort the cards in the 1 to 4 pocket pile into TWO piles according to whether the cards belong to pockets 1 and 2 or pockets 3 and 4. Now take the 1 and 2 pocket-pile and sort the cards according to whether they belong in pocket 1 or 2. Put the cards in the appropriate pockets. Treat the 3 to 4 pocket-pile in the same way.

3. Sort the 5 to 8 pocket-pile in a similar way to the 1 to 4 pocket-pile cards. It is important that you use each pocket, if possible.

4. When you have finished sorting, very carefully check to
see that each card is in the right pocket on the scale. You may change the sorting until you are satisfied you have done your best.

5. Seal the pockets and hand in the booklet.

ALL RESPONSES ARE STRICTLY ANONYMOUS
APPENDIX B

INTRODUCTION TO INDSCAL
INTRODUCTION TO INDSCAL
by
J. Douglas Carroll
Bell Laboratories
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(Handout for Bell-Penn MDS Workshop)

I. 2-Way Scaling

Input (usually): Single nxn square symmetric matrix (or half matrix) of similarities or dissimilarities data ($d_{jk} = \text{dissimilarity of objects } j \text{ and } k$).

Model:

\[ F(d_{jk}) = d_{jk} \quad (1) \]

\[ d_{jk} = \sqrt{\sum_t (x_{jt} - x_{kt})^2} \quad (2) \]

(Euclidean metric)
II. 3-Way Scaling (Via INDSCAL)

Input: \( m \geq 2 \) \( n \times n \) square symmetric data matrices (or half matrices), one for each of \( m \) subjects (\( \delta_{jk}^{(i)} \) is dissimilarity of objects \( j \) and \( k \) for subject \( i \)).

Model:

\[
F(\delta_{jk}^{(i)}) = d_{jk}^{(i)} = \sqrt{\sum_{t=1}^{k} w_{it}(x_{jt} - x_{kt})^2}
\]

or

\[
y_{jt}^{(i)} = w_{it}^{1/2} x_{jt}
\]

and

\[
d_{jk}^{(i)} = \sqrt{\sum_{t} (y_{jt}^{(i)} - y_{kt}^{(i)})^2}
\]
Output: Two matrices, an \( nxr \) matrix of coordinates of the \( n \) objects on \( r \) dimensions (group stimulus space) and an \( mxr \) matrix of weights of \( m \) subjects on the \( r \) dimensions (subject space). Both of these can be plotted graphically, as in the figure, and a "private space" for each subject can be constructed, as shown there, by applying (square roots of) the subject weights to stimulus (object) dimensions, as in Eq.(5) above.

III. Metric Version of INDSCAL (Assumes \( F_j \) is a linear function)

A. Conversion from estimated dissimilarities to estimated distances (estimation of additive constant).

Under "metric" assumptions we may assume

\[
d_{jk}^{(i)} = d_{jk} + c^{(i)}
\]  

(7)

Dropping \( (i) \) superscript for now, the smallest constant \( c \) guaranteeing satisfaction of the triangle inequality.
\( d_{jl} \leq d_{jk} + d_{kt} \) for all triples \((j,k,l)\) can easily be shown to be

\[
\begin{align*}
    c_{\text{min}} &= \max_{(j,k,t)} (d_{jl} - d_{jk} - d_{kt}) \\
    \text{(Note: } c_{\text{min}} \text{ may be negative)}
\end{align*}
\]

This is the "additive constant" scheme, for converting "comparative distances" (i.e., interval scale distance estimates) into absolute distances (i.e., ratio scale distance estimates) described in Torgerson's book as the "one dimensional subspace" scheme (assuming at least three points lie exactly on a straight line in the space). It is in many respects the simplest and most straightforward scheme for additive constant estimation, and is the one used in the metric INDSCAL procedure.

B. Conversion from distances to scalar products.

As shown in Torgerson's book, given a set of Euclidean distances, these may be converted into scalar products of vectors about an origin placed (arbitrarily) at the centroid of all the points by the equation:

\[
b_{jk} = -1/2 \left( d_{jk}^2 - d_{k}^2 - d_{j}^2 + d_{..}^2 \right)
\]  \hspace{1cm} (9)

where
This can easily be seen to be equivalent to doubly centering the matrix of $-1/2$ times the squared interpoint distances (i.e., subtracting grand mean and row and column main effects, in analysis of variance sense).

In metric INDSCAL, we apply steps A and B to each symmetric matrix of dissimilarities, thereby converting the three-way array of dissimilarities into a derived three-way array of scalar products.

IV. INDSCAL Model In Its Scalar Product Form

General:

If

$$d_{jk} = \sqrt{\sum_t (x_{jt} - x_{kt})^2}$$

Scalar products are of form:

$$b_{jk} = \sum_t x_{jt} x_{kt}$$
in the INDSCAL model, we have, from Eq. (6)

\[ d_{jk}^{(i)} = \sqrt{\sum_t (y_{jt}^{(i)} - y_{kt}^{(i)})^2} \quad \text{(Eq. (6))} \]

so scalar products are of the form:

\[ b_{jk}^{(i)} = \sum_t y_{jt}^{(i)} y_{kt}^{(i)} \quad \text{(15)} \]

substituting Eq. (5):

\[ y_{jt}^{(i)} = w_{it}^{1/2} x_{jt} \quad \text{(Eq. (5))} \]

into Eq. (15), we have:

\[ b_{jk}^{(i)} = \sum_t w_{it} x_{jt} x_{kt} \quad \text{(16)} \]

which is the scalar product form of the INDSCAL model.

Equation 16 can easily be seen to be a special case of the general CANDECOMP (for CANonical DECOMPosition of N-way tables) model (N = 3, in this case) of the form:

\[ z_{ijk} = \sum_t a_{it} b_{jt} c_{kt} \quad \text{(17)} \]

where
\[ z_{ijk} = b_{jk}^{(i)} \]  
(18)

\[ a_{it} = w_{it} \]  
(19)

\[ b_{jt} = c_{jt} = x_{jt} \]  
(20)

For the INDSCAL special case of this CANDECOMP (3-way) model, we may, however, ignore the symmetry constraint of (Eq. 20) and fit the model in its general form. It turns out that the symmetry of the basic data is sufficient to guarantee that (after appropriate normalization of the solution) \( b_{jt} \) will in fact equal \( c_{jt} \).

V. Brief outline of the CANDECOMP procedure in the 3-way case.

Given the model in (17):

\[ z_{ijk} = \sum_{t} a_{it} b_{jt} c_{kt} \]  
(Eq. 17)

We may, given "current estimates" of two sets of parameters (say the \( b_{jt}'s \) and \( c_{kt}'s \)) find an exact least squares estimate of the third set by linear regression methods.

This can be seen by reformulating the problem as:

\[ z_{is}^* = \sum_{t} a_{it} g_{st} \]  
(21)
where
\[ z_{is}^* = z_i(jk) \]  
(22)

and
\[ S_{st} = b_{jt} c_{kt} \]  
(23)

(in this context, s is a subscript that ranges over all \( n^2 \) values of j and k).

In matrix notation, this can be formulated as
\[ Z^* \sim AG' \]  
(24)

and we can estimate A by
\[ \hat{A} = Z^* G(G'G)^{-1} \]  
(25)

(this amounts to postmultiplying by the right pseudoinverse of \( G' \)).

The NILES (for Nonlinear Iterative Least Squares) procedure for estimation in this case amounts to iterating this least squares estimation procedure, i.e., estimating the a's (with b's and c's fixed) by least square methods, then the b's (with a's and c's fixed) and so on round the iterative cycle until convergence occurs.
The generalization of CANDECOMP to the case of $N > 3$ and some of its possible applications will be discussed in the session on other 3-way and higher way models. See Carroll and Chang (Reference #34) for further details on this, and on INDSCAL generally.

Note: Richard A. Harshman (Reference #70) has independently developed, in collaboration with R. I. Jennrich, a procedure called PARAFAC-1, which is equivalent to the 3-way case of CANDECOMP.

FIGURE CAPTION

Illustration of Carroll-Chang model for individual differences in multidimensional scaling. Weights (plotted in subject space) are applied to "group" stimulus space in appropriate way to produce individual perceptual spaces for subjects 2 and 4. These are shown in bottom of figure.
Derivation of result in section III-B

Given

\[ d_{jk}^2 = \sum_{t=1}^{r} (x_{jt} - x_{kt})^2 \]  
(A-1)

Assume:

\[ \sum_{j=1}^{n} x_{jt} = 0 \quad \text{for all } t=1,2,\ldots,r \]  
(A-2)

(We may do this without loss of generality, since the origin of the x space is arbitrary, and this just fixes it at the centroid of all n points.) Expanding A-1

\[ d_{jk}^2 = \sum_{t} (x_{jt}^2 - 2x_{jt}x_{kt} + x_{kt}^2) \]
\[ = \sum_{t} x_{jt}^2 - 2 \sum_{t} x_{jt}x_{kt} + \sum_{t} x_{kt}^2 \]
\[ = t_j^2 + t_k^2 - 2b_{jk} \]  
(A-3)

where

\[ t_j^2 = \sum_{t} x_{jt}^2 \]  
(A-4)

\[ b_{jk} = \sum_{t} x_{jt}x_{kt} \quad \text{(the scalar product)} \]  
(A-5)
Because of (A-2)

\[ b_{\cdot k} = b_{\cdot j} = b_{\cdot} = 0 \]  

(A-6)

[e.g., \( b_{\cdot k} = \frac{1}{n} \sum_j b_{jk} = \frac{1}{n} \sum_j \sum_t x_{jt} x_{kt} = \frac{1}{n} \sum_t x_{kt} \sum_j x_{jt} = 0 \)]

from (A-3) and (A-6), we have

\[ d_{\cdot k}^2 = \ell_{\cdot}^2 + \ell_{k}^2 \]  

(A-7)

\[ d_{\cdot j}^2 = \ell_{\cdot j}^2 + \ell_j^2 \]  

(A-8)

\[ d_{\cdot}^2 = 2\ell_{\cdot}^2 \]  

(A-9)

where

\[ \ell_{\cdot}^2 = \frac{1}{n} \sum_j \ell_j^2 \]  

(A-10)

then A-3, 7, 8 and 9 together imply that

\[ d_{ij}^2 - d_{\cdot k}^2 - d_{\cdot j}^2 + d_{\cdot}^2 = -2b_{jk} \]

multiplying both sides by \(-1/2\) gives the desired result.

Note that we didn't have to know anything about geometry to derive this result. The law of cosines, for example, was never mentioned.
Quasi-Nonmetric INDSCAL

While a fully nonmetric version of INDSCAL is not currently available, there is a quasi-nonmetric version (i.e., an approximation to a fully nonmetric version). This is implemented by alternating the metric version of INDSCAL, as just described, with use of least squares monotone regression (using Kruskal's MFIT routine) in an iterative fashion. Given data values \( \hat{d}_{jk}^{(i)} \), we first estimate additive constants \( c^{(i)} \) to convert to \( \hat{o}_{jk} \). Then, the \( I \)th iteration of this "outer" iterative process (metric INDSCAL functions essentially as an "inner" iterative process) can be described as follows:

Given

\[ \hat{d}_{jk}^{(i)} \quad \text{and} \quad (I-1)\hat{d}_{jk}^{(i)} \]

Phase One: (a) convert \( (I-1)\hat{d}_{jk}^{(i)} \rightarrow (I-1)\hat{b}_{jk}^{(i)} \) via Eq. (9)

(b) apply CANDECOMP to three-way matrix of \( \hat{b} \)'s, and normalize, to get

\[ \hat{X} = \|x_{jt}\| \quad \text{and} \quad \hat{W} = \|w_{it}\|. \]

Phase Two: (a) Use weighted Euclidean distance formula of equation (4) to calculate \( \hat{d}_{jk}^{(i)} \), for all \( i,j,k \).
(b) Use least squares monotone regression (MFIT) routine) to find

\[ \hat{d}_{jk}^{(i)} = M_{i}^{T} (\hat{d}_{jk}^{(i)}) \sim I_{jk}^{T} \]

where \( \sim \) implies a least squares fit, and \( M_{i}^{T} \) is a monotone nondecreasing function).

Increment I by 1, return to beginning of Phase One. Continue iteratively until no further improvement in fit occurs. Badness of fit, in this case, is measured by a generalization of Kruskal's STRESSFORM2, namely:

\[
\text{STRESS} = \sqrt{\sum_{i} \left[ \frac{\sum_{j} \sum_{k} (d_{jk}^{(i)} - \hat{d}_{jk}^{(i)})^2}{\sum_{j} \sum_{k} (d_{jk}^{(i)} - \hat{d}^{(i)})^2} \right]}
\]

which is essentially a root mean-square over subjects of STRESSFORM2 computed separately for each subject.

(STRESS\(^2\) is the measure actually printed out in the NINDSCAL program, as implemented by Jih-Jie Chang).
Typically STRESS will go down for several "outer" iterations, but will ultimately go up again. This is because the two phases of the algorithm are not optimizing the same criterion. Phase One is least squares in the (derived) scalar products, while Phase Two is least squares in distances.

To make the procedure fully nonmetric, both phases should be optimizing the same criterion. One way is to make Phase One least squares in distances. Another, however, which is in some ways more attractive, is to replace the STRESS measure with what I have, somewhat whimsically, called STRAIN, defined in this case as:

\[
\text{STRAIN} = \sqrt{\sum_i \left[ \frac{\sum_j \sum_k (b_{jk}^{(i)} - \hat{b}_{jk}^{(i)})^2}{\sum_j \sum_k (b_{jk}^{(i)})^2} \right]}
\]

where \( b_{jk}^{(i)} \) is computed by equation (16) (Intro to INDSCAL) while the \( \hat{b}_{jk}^{(i)} \)'s are computed from \( \hat{d}_{jk}^{(i)} \)'s by the obvious analogue of equation (9), with \( \hat{d}_{jk}^{(i)} = D_1(d_{jk}^{(i)}) \). Then Phase Two would entail finding the \( M_1 \) optimizing STRAIN (with other parameters held constant); i.e., Phase Two is made least squares in scalar products. Jih-Jie Chang and I are currently working on such a procedure, (which could also
be applied to provide a new approach to nonmetric 2-way scaling).

Richard Dobson and Allen Yates and possibly others are currently working on other approaches to non-metric versions of INDSCAL.
APPENDIX C

DEFINING ISSUES TEST
OPINIONS ABOUT SOCIAL PROBLEMS

This questionnaire is aimed at understanding how people think about social problems. Different people often have different opinions about questions of right and wrong. There are no "right" answers in the way that there are right answers to match problems. We would like you to tell us what you think about several problem stories. The papers will be fed to a computer to find the average for the whole group, and no one will see your individual answers.

* * * * * * * * * * * *

In this questionnaire you will be asked to give your opinions about several stories. Here is a story as an example. Read it, then turn to the next page.

Frank Jones has been thinking about buying a car. He is married, has two small children and earns an average income. The car he buys will be his family's only car. It will be used mostly to get to work and drive around town, but sometimes for vacation trips also. In trying to decide what car to buy, Frank Jones realized that there were a lot of questions to consider. On the next page there is a list of some of these questions.

If you were Frank Jones, how important would each of these questions be in deciding what car to buy?
PART A. (SAMPLE)

On the left hand side of the page check one of the spaces by each question that could be considered.

1. Whether the car dealer was in the same block as where Frank lives.
2. Would a used car be more economical in the long run than a new car.
3. Whether the color was green, Frank's favorite color.
4. Whether the cubic inch displacement was at least 200.
5. Would a large, roomy car be better than a compact car.
6. Whether the front cunnibilies were differential.

PART B. (SAMPLE)

From the list of questions above, select the most important one of the whole group. Put the number of the most important question on the top line below. Do likewise for your 2nd, 3rd, and 4th most important choices.

Most important 5
Second most important 2
Third most important 3
Fourth most important 1
ESCAPED PRISONER

A man had been sentenced to prison for 10 years. After one year, however he escaped from prison, moved to a new area of the country, and took on the name of Thompson. For 8 years he worked hard, and gradually he saved enough money to buy his own business. He was fair to his customers, gave his employees top wages, and gave most of his own profits to charity. Then one day Mrs. Jones, an old neighbor, recognized him as the man who had escaped from prison 8 years before, and whom the police had been looking for.

Should Mrs. Jones report Mr. Thompson to the police and have him sent back to prison? (Check one)

_____ Should report him
_____ Can't decide
_____ Should not report him
ESCAPED PRISONER

1. Hasn't Mr. Thompson been good enough for such a long time to prove he isn't a bad person?

2. Everytime someone escapes punishment for a crime, doesn't that just encourage more crime?

3. Wouldn't we be better off without prisons and the oppression of our legal system?

4. Has Mr. Thompson really paid his debt to society?

5. Would society be failing what Mr. Thompson should fairly expect?

6. What benefits would prisons be apart from society, especially for a charitable man?

7. How could anyone be so cruel and heartless as to send Mr. Thompson to prison?

8. Would it be fair to all the prisoners who had to serve out their full sentences if Mr. Thompson was let off?

9. Was Mrs. Jones a good friend of Mr. Thompson?

10. Wouldn't it be a citizen's duty to report an escaped criminal, regardless of the circumstances?

11. How would the will of the people and the public good best be served?

12. Would going to prison do any good for Mr. Thompson or protect anybody?

From the list of questions above, select the four most important:

Most important  
Second most important  
Third most important  
Fourth most important
HEINZ AND THE DRUG

In Europe a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost to make. He paid $200 for the radium and charged $2000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together $1000, which is half of what it cost. He told the druggist that his wife was dying, and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and began to think about breaking into the man's store to steal the drug for his wife.

Should Heinz steal the drug? (Check one)

[ ] Should steal it
[ ] Can't decide
[ ] Should not steal it
<table>
<thead>
<tr>
<th>GREAT importance</th>
<th>MUCH importance</th>
<th>SOME importance</th>
<th>LITTLE importance</th>
<th>NO importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Whether a community's laws are going to be upheld.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Isn't it only natural for a loving husband to care so much for his wife that he'd steal?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Is Heinz willing to risk getting shot as a burglar or going to jail for the chance that stealing the drug might help?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Whether Heinz is a professional wrestler, or has considerable influence with professional wrestlers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Whether Heinz is stealing for himself or doing this solely to help someone else.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Whether the druggist's rights to his invention have to be respected.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Whether the essence of living is more encompassing than the termination of dying, socially and individually.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. What values are going to be the basis for governing how people act towards each other.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Whether the druggist is going to be allowed to hide behind a worthless law which only protects the rich anyhow.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Whether the law in this case is getting in the way of the most basic claim of any member of society.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Whether the druggist deserves to be robbed for being so greedy and cruel.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HEINZ STORY

12. Would stealing in such a case bring about more total good for the whole society or not.

From the list of questions above, select the four most important:

Most important
Second most important
Third most important
Fourth most important
THE DOCTOR'S DILEMMA

A lady was dying of cancer which could not be cured and she had only about six months to live. She was in terrible pain, but she was so weak that a good dose of pain-killer like morphine would make her die sooner. She was delirious and almost crazy with pain, and in her calm periods, she would ask the doctor to give her enough morphine to kill her. She said she couldn't stand the pain and that she was going to die in a few months anyway.

What should the doctor do? (Check one)

____ Should give the lady an overdose that will make her die

____ Can't decide

____ Should not give the overdose
1. Whether the woman's family is in favor of giving her the overdose or not.

2. Is the doctor obligated by the same laws as everybody else if giving an overdose would be the same as killing her.

3. Whether people would be much better off without society regimenting their lives and even their deaths.

4. Whether the doctor could make it appear like an accident.

5. Does the state have the right to force continued existence on those who don't want to live.

6. What is the value of death prior to society's perspective on personal values.

7. Whether the doctor has sympathy for the woman's suffering or cares more about what society might think.

8. Is helping to end another's life ever a responsible act of cooperation.

9. Whether only God should decide when a person's life should end.

10. What values the doctor has set for himself in his own personal code of behavior.

11. Can society afford to let everybody end their lives when they want to.
12. Can society allow suicides or mercy killing and still protect the lives of individuals who want to live.

From the list of questions above, select the four most important:

Most important
Second most important
Third most important
Fourth most important
APPENDIX D

ATTITUDE TEST
UNIVERSITY OF BRITISH COLUMBIA

FACULTY OF EDUCATION

A SURVEY OF ATTITUDES TOWARDS DRUG USE

INSTRUCTIONS

The following is a short survey on attitudes and knowledge about drugs. We wish to find out how strongly you agree or disagree with the statements. Please read each statement carefully, then decide whether you STRONGLY DISAGREE, DISAGREE, are UNDECIDED, AGREE or STRONGLY AGREE. Your responses are to be made on the 'Mark Sense' card provided, using the special pencil. You may ignore the left-hand side of the card entitled 'Identification Number', as your answers are strictly anonymous. Fill in the 'Answer Field' for your responses using one column per statement, the first column for the first statement and so on.

If you STRONGLY DISAGREE fill in 1; DISAGREE, fill in 2; are UNDECIDED, fill in 3; AGREE, fill in 4; STRONGLY AGREE, fill in 5. When you have completed this survey, please place the 'Mark Sense' card and the list of statements in the large envelope.
STATEMENTS

1. Encouraging kids to drink wine, teaches them how to handle alcohol when they are older.
2. Taking a drug just for kicks is fun.
3. I would take a pep pill to keep me awake at exam time.
4. Smoking more than one pack of cigarettes a day, is bad for you.
5. Alcoholics turn me off.
6. My friend had tranquillizers prescribed for him, but I wouldn't ask him for one.
7. I would smoke marijuana regularly, if I could get it.
8. Every time I have a pain, I take a drug.
9. If one pill makes me feel good, two will make me feel even better.
10. I would try L.S.D. (acid), if somebody offered me some.
11. People who have a family history of lung cancer, should not smoke cigarettes.
12. If I was depressed, I would take a pill to pep me up.
13. Antibiotics are the best treatment for colds.
14. I would try heroin, if somebody offered me some.
15. There is no harm in taking Dristan for a cold, before having a few beers.
16. Taking L.S.D. (acid) is a bad trip.
17. Most drugs have both good and bad effects.
18. Even if it was easier to get, I would not use cocaine.
19. Having a beer once or twice a week is overdoing it.
20. If I had not had a good night's sleep for days, I would take a sleeping pill.
21. Smoking marijuana at a party is stupid.
22. I definitely would never take amphetamines just to control my appetite.
23. Cocaine is a good drug.
24. Drinking a few beers every night is fun.
25. If kids want to sniff glue, let them.
26. Tranquillizers and booze should not be taken together.
27. If I could get them, I would take a sleeping pill every night.