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SELF REPORTS OF DAYDREAMING AND MINDWANDERING: A CONSTRUCT VALIDATION

by

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ABSTRACT

Popular lore has often associated daydreaming with distractibility and mindwandering or attention difficulties. This investigation explores dimensions of Daydreaming and Mindwandering derived from self report inventories, to determine the characteristics of persons representing extremes on both dimensions. A major question raised was whether or not content analysis of verbal reports of ongoing thought would support the distinction between Daydreaming and Mindwandering based on a self report inventory.

In the first of two studies, 191 undergraduates at the University of Bridgeport completed the 400 item Imaginal Processes Inventory (IPI) of Singer and Antrobus. A factor analysis of the data produced a replication of three factors reported in previous research: Negative Emotional Daydreaming, (Positive) Daydreaming, and Mindwandering. The latter two factors were explored in more detail in the second study. In this study, 108 items of the IPI were selected to form a Daydreaming -Mindwandering Test. This test was administered to a second sample of 209 students. As expected, factor analysis of the results yielded the Daydreaming and Mindwandering factors. Subjects whose factor scores were at the extremes of these factors were selected to form four experimental groups: High Daydreamers, Low Daydreamers, High Mindwanderers, and Low Mindwanderers. There were 15 subjects in each group. In Phase 1 of a laboratory experiment, they performed an auditory signal

detection task. At the end of each 30 second trial, they reported any thoughts which had occurred to them into the microphone of a tape recorder. In Phase 2 of this experiment, the subjects were allowed to choose between sitting quietly or performing signal detections. In both cases, they were asked to report their thoughts.

Twenty-eight categories of thought were scored in a content analysis. These categories were divided into two main classes: stimulus-dependent thoughts and stimulus-independent thoughts. The major distinguishing characteristics for each group were as follows.

The High Daydreamers showed the greatest amount of stimulus-independent thought, including analogical thinking. The Low Daydreamers reported the greatest amount of stimulus-bound thought and of no thought. The High Mindwanderers showed the highest incidence of shifting from one category to another and of negative affect. The Low Mindwanderers were most attentive to performance on the signal detection task.

This congruence between responses to a self report inventory and reports of ongoing thought supports the proposition that Daydreaming and Mindwandering can serve as separate constructs.

The computer assisted method of content analysis used is called modular analysis. It utilizes an on-line editor and programs written in SNOBOL4.

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I wish to express a very special thanks to Dr. Jerome L. Singer, Dissertation Chairman, for giving me the benefit of his professional knowledge and personal support.

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INTRODUCTION

In 1890, William James added the phrase "stream of thought" to American psychology and described many of the phenomena which characterize human mental activity. During the last decade, a renewed interest in the investigation of these phenomena has occurred with the rapid development of the field of cognitive psychology. This thesis consists of two studies which focus on the topic of daydreaming. They are based on extensive work in this area by Jerome L. Singer, John S. Antrobus and their associates.

Chapter I discusses the background of these studies and presents the hypotheses which they are to test. The starting point in this research is the Imaginal Processes Inventory of Singer and Antrobus. Previous factor analytic studies of this inventory have suggested the validity of a distinction between "daydreaming" and "mindwandering." These two factors are replicated in Study 1. Study 2 explores in greater detail the factors demonstrated in Study 1. Four groups (called High Daydreamers, Low Daydreamers, High Mindwanderers, and Low Mindwanderers) are selected on the basis of their factor scores. These subjects are then studied in a laboratory experiment. In Phase 1 of the experiment, the subjects are asked to perform a signal detection task and to report the thoughts which occur to them during this task. In Phase 2 of the experiment, they may choose to continue with the signal detection task or to sit quietly. In either case they are asked to report their thoughts.

Chapter II describes the factor analytic study of the Imaginal Processes Inventory (Study 1). The remaining chapters deal with Study 2.

Chapter III describes the factor analysis of a subset of the Imaginal Processes Inventory called the Daydreaming -Mindwandering Test. It then discusses the apparatus, subjects, and procedure used in Study 2.

Chapter IV describes a computer assisted method of content analysis which is called modular analysis. It reports the results of Study 2 as assessed by measures of modular analysis and signal detection.

Chapter V discusses the above results and their implications for further research.

CHAPTER I

BACKGROUND

Daydreaming

Our language and culture label some mental processes as "daydreams" and frequently regard them as undesirable. This is reflected in Webster's definition of the word. "n. A reverie filled with pleasing, often illusory, visions or anticipations. - v.i. To indulge in daydreams."

Parents and teachers admonish children not to waste their time daydreaming but to "pay attention" and work. Daydreaming is not useful work and admission of daydreaming is an admission that one has lapsed from "proper" activity. If the socialization process has been effective, this lapse will be accompanied by feelings of guilt.

Despite this social disapproval, daydreaming is a widespread phenomenon. Singer and McCraven (1961) found that 96% of their sample of 240 normal adults reported that they engaged in some form of daydreaming daily.

The term "daydreaming" is a global one which encompasses a variety of cognitive activities. In studying these processes, Singer and Antrobus employed an information processing model. This model distinguishes between "stimulus-independent" and "stimulus-dependent" thought. Antrobus (1968) made the distinction in the following way.

> These ... emphasize the large fraction of one's cognitive activity that is independent of the concurrent external stimuli to which one is exposed. This cognitive activity corresponds, in the vernacular, to thought, imagery and fantasy, as distinct from sensations and perceptions. The

> distinction concerns the extent to which conscious cognitive activity 'follows,' or covaries in time, with stimulus events external to the cognitive system. Perceptual events are highly correlated; fantasy may be almost independent. The contrast is sharpened by an analogous distinction in computer systems. To the extent that the human cognitive system not only receives and stores but also carries out subsequent transformations on its information input, it behaves like a computer that operates sometimes on information as it arrives in 'real time,' sometimes on information previously stored in memory,or simultaneously on both.

The present study will examine individual and group differences in daydreaming through an information processing model.

The Imaginal Processes Inventory

The methods which have been used to study daydreaming range from projective tests, such as the Rorschach, to self descriptions of mental processes. The latter method was employed as early as 1883 by Sir Francis Galton in his famous "Breakfast questionnaire." This consisted of a series of questions which asked the respondent to rate an image (e.g. the recollection of his breakfast table) on such dimensions as brightness, definition, and susceptibility to voluntary control.

Regardless of method used, research on daydreaming was sparse until the last decade. (For an overview of the early research, see Klinger (1971), Singer (1966).) During the 1960's, Singer and Antrobus applied the self report method to the construction of their Imaginal Processes Inventory (IPI). This inventory consisted of 400 items which related to many aspects of the daydreaming phenomenon. It is discussed more extensively in the next chapter.

In 1963, Singer and Antrobus included the IPI in a battery of other tests of creativity and personality. Analysis of the total battery (100 variables) yielded 12 major factors. Their Factor J was labelled "Enjoyment of Daydreaming-Positive Daydreams." Singer and Antrobus state the following about Factor J:

> A qualitative observation may further support the fairly constructive attitude characteristic of this factor. Listening again to the tapes of Ss whose factor scores were high for J, one is struck by the warm appreciation and pleasure taken in fantasy, its use for planning and for seeing achievement possibilities. The loss of time it occasions is taken rather casually. It seems likely, therefore, that at least one daydreaming pattern exists that reflects a rather healthful acceptance, enjoyment, and use of inner experience for both pleasure and need-solution.

Singer and Antrobus label Factor E as "Psychasthenia, Poorly Controlled Thought or Mind Wandering." They comment on it as follows:

> To some extent one may speculate that Factor E represents a lack of control of one's own mental processes... The Ss representative of high scorers on the scales of Factor E seem to have suffered since childhood from difficulty in sustaining attention. One feels that for them, memories, perceptions, imaginal representations of affects and fleeting associations flit more or less uncontrollably across their consciousness, producing a somewhat chaotic and distracting effect. One occasionally thinks in this connection of mental 'weakness' of 'laziness,' a disturbance of will and directional capacity, albeit perhaps not as serious as certain psychotic intrusions of repressed material.

In 1970, Singer and Antrobus again used the IPI in a larger battery of tests. In a four factor solution to this battery, the Daydreaming and Mindwandering factors were again represented. Similarly, Starker (1971) discovered Daydreaming and Mindwandering factors when he included the IPI in his battery of tests. Starker comments upon the similarity of these factors to those earlier discovered by Singer and Antrobus.

Study 1, described in the next chapter, was undertaken to determine whether or not the Daydreaming and Mindwandering factors would emerge when the IPI was analyzed by itself (rather than included in a battery) and with a population somewhat different from that originally studied.

Construct Validation

Assuming the reliability of Daydreaming and Mindwandering as separate factors, the next logical step is an exploration of their validity and meaning as theoretical constructs. In their seminal paper on construct validity, Cronbach and Meehl (1955) noted that the underlying processes to which theoretical constructs refer vary in complexity. Daydreaming and Mindwandering are most reasonably regarded as complex processes which will only gradually become understood.

Our present knowledge of Daydreaming and Mindwandering as separate processes is based solely on the Imaginal Processes Inventory. Two possible weaknesses in this inventory (and other self report inventories) should be noted: 1) Replies may be influenced by variables other than daydreaming experiences. One such variable is response style. It and related concepts have been discussed by numerous authors. E.g., Block (1965), Rorer (1965). 2) Replies require the recollection and characterization of past mental processes.

In order to supplement and verify the picture given by the IPI, it is desirable to obtain data on the daydreaming process as it is occurring. This is done in Study 2 where reports of ongoing daydreams are recorded. These reports are then examined through content analysis.

The method of content analysis which has been developed for this purpose is called modular analysis and is described in Chapter IV. It was suggested by Brentano's contention that the act of thought can serve as a basic unit for analyzing mental processes (see Boring, 1950).

It is assumed that subjects who show clearly different response patterns on the IPI are reporting differences in type and/or frequency of their naturally occurring acts of thought. This assumption is tested in the validation procedure by analyzing the verbal reports of their mental processes in terms of acts of thought.

Significance of Extreme Scorers

In Study 2, subjects whose scores are at the extreme ends of the Daydreaming and Mindwandering factors are asked to perform on a laboratory task which elicits daydreaming. This strategy of selecting extreme scorers for intensive study has been advocated by Luchins and Luchins (1959). They called it the "extremum principle." By seeing a phenomenon in its extreme form, it is possible to obtain a clearer understanding of it than when it is less strongly demonstrated. Maslow (1962) has advocated a similar strategy. He argued that in order to understand psychological health, the investigator should select "best specimens," (i.e., those who are most healthy according to specified criteria). More can be learned from them than from average specimens.

Signal Detection Task

Singer, Antrobus, and their students have made extensive use of the signal detection task in the study of daydreaming. For this purpose, the task has two main advantages: 1) it permits control of the external environment and 2) the monotony of the task causes many subjects to process information from internal channels; i.e., daydream. In a representative experiment, S is presented with a series of low and high tones in random order. He presses one button to indicate that he has heard the low tone and another button to indicate that he has heard the high tone. After a trial of 15 tones, S reports whether or not he had any thoughts during the trial. Then, he proceeds to the next trial, and so on through a series of trials. In a number of studies, subjects have been taught to discriminate between stimulus-dependent thoughts and stimulus-independent thoughts; they were then asked to indicate in which category their thoughts fell on each trial. As noted above, stimulus-dependent thoughts are those related to task performance. Stimulus-independent thoughts are unrelated to task performance and are congruent with Singer's (1966) definition of daydreaming as involving a shift of attention from external to internal stimulation.

Hypotheses

The distinction between internal and external channels of information which Singer and Antrobus have employed may be used to hypothesize about the thought processes of the subjects in Study 2 and to make predictions about their behavior. The following hypotheses assume that daydreams are influenced by the variables of self control, interest, and affect. Some of these hypotheses are necessarily stated at a general level. Their translation to specific acts of thought is made later as the content analysis is implemented. We shall consider each group in turn.

High Daydreamers. It is postulated that the internal channel for a high daydreamer contains thoughts and feelings to which he enjoys attending. They are a source of positive affect, entertainment, and purposeful planning, In addition, this type of subject has sufficient control over the information in this internal channel to maintain it as a source of positive affect. For this group, it is hypothesized that

1) Verbal reports will be the longest, most varied, most indicative of positive affect in comparison with all other groups.

It may be noted that a similar hypothesis was made and confirmed by Antrobus, Coleman, and Singer (1967) who compared subjects scoring high and low on the General Daydreaming Scale of the IPI and the "Thoughtfulness" subscale of the Guilford-Zimmerman Temperament Survey. They found that the amount of stimulus-independent thought was significantly greater for the subjects highly disposed to daydreaming.

2) Accuracy of signal detection will be greater than that of the High Mindwanderers, but not as good as either the Low Daydreamers or the Low Mindwanderers.

In predicting that their high daydreamers would be less accurate than the low ones, Antrobus, Coleman, and Singer found that the trend of the data supported their prediction but did not reach statistical significance. This may have been due to a ceiling effect. Their rate of presentation was 1 per second and overall accuracy was 95.9%. A similar ceiling effect may occur in Study 2. This could probably be reduced by using a faster rate of presentation of signals, but that, in turn, would reduce the amount of verbal report. Since verbal report is the variable of primary interest in this study, the 1 second rate will be maintained.

3) Time spent in signal detection during Phase 2 will be least for this group. Attention to internal information processing is a greater source of positive affect than any other source of stimulation available in the experimental situation.

Low Daydreamers. It is postulated that the thoughts and feelings in the internal channels of the Low Daydreamers are not as great a source of positive affect as they are for the

High Daydreamers. Neither are they as great a source of negative affect as they are for the High Mindwanderers. For the Low Daydreamers, it is postulated that

1) Verbal reports, compared to the High Daydreamers, will be shorter, less varied, less indicative of positive affect.

2) Accuracy of signal detection will be greater than for the High Daydreamers.

3) Time spent in signal detection during Phase 2 will be more than for the High Daydreamers. As sources of positive affect, the difference between external and internal channels is not as great for this group as it is for the High Daydream group.

<u>High Mindwanderers</u>. The information which flows in the internal channel for this group is not very self-controlled, not well organized, frequently shifting, and often productive of negative affect. For the High Mindwanderers, it is hypothesized that

1) Verbal reports will be short, disorganized, lacking in positive affect. In addition, there will be more complaints of mind wandering and inability to concentrate on the signal detection task than occur in any other group.

2) Accuracy of signal detection will be poorest of all groups because these subjects lack the ability to prevent information from the internal channel from interfering with attention to the external channel.

3) Time spent in signal detection during Phase 2 will be approximately the same as that spent sitting quietly. Neither

task will provide much positive affect and subjects will alternate between them.

Low Mindwanderers. These subjects have a high degree of self control over both internal and external channels. The information in the internal channel is not as abundant and positive as it is for the High Daydreamers. For this group, it is hypothesized that

1) Verbal reports on the measures of length, variety, and positive affect will indicate lower scores than the High Daydreamers, but higher scores than both the Low Daydreamers and the High Mindwanderers.

2) Accuracy of signal detection will be greatest in this group.

3) Time spent in signal detection during phase 2 will be greatest for this group. The signal detection task provides an opportunity to demonstrate accuracy, which is a source of positive affect for these subjects.

CHAPTER II

STUDY 1: A FACTOR ANALYSIS OF THE IMAGINAL PROCESS INVENTORY

The IPI

The Imaginal Processes Inventory (IPI) is a 400 item paper and pencil test. The respondents are asked to rate each item on the degree to which it describes their own mental processes. A five point rating scale is used. The items are divided into the following 29 scales.

Scale 1 General Daydreaming
Scale 2 Absorption in Daydreaming
Scale 3 Acceptance of Daydreaming
Scale 4 Positive Reactions in Daydreams
Scale 5 Frightened Reactions in Daydreams
Scale 6 Visual Imagery in Daydreams
Scale 7 Auditory Imagery in Daydreams
Scale 8 Problem Solving through Daydreams
Scale 9 Present Orientation in Daydreams
Scale 10 Future Orientation in Daydreams
Scale 11 Past Orientation in Daydreams
Scale 12 Bizarre Improbable Daydreams
Scale 13 Mind Wandering
Scale 14 Night Dream Frequency
Scale 15 Daydream Frequency
Scale 16 Achievement-oriented Daydreams
Scale 17 Hallucinatory Vividness of Daydreams
Scale 18 Fear of Failure in Daydreams
Scale 19 Hostile Aggressive Daydreams
Scale 20 Sexual Daydreams
Scale 21 Heroic Daydreams
Scale 22 Guilt Daydreams
Scale 23 Curiosity: Interpersonal
Scale 24 Curiosity: Impersonal - Mechanical
Scale 25 Boredom
Scale 26 Mentation Rate
Scale 27 Distractibility
Scale 28 Need for External Stimulation
Scale 29 Self-Reporting Tendencies

As the above list indicates, these scales cover a variety of aspects of the daydreaming phenomenon. Most of these scales are discussed in detail in Singer and Antrobus (1972). The actual items for those scales which were also used in Study 2 are given in Appendix A.

Procedure

The Imaginal Processes Inventory was administered to 191 students in introductory psychology courses at the University of Bridgeport. Most of these subjects were: 1) 18 - 20 years of age, 2) from southern New England, New York and New Jersey, 3) from urban-suburban background, 4) from lower or middle economic class.

The first 200 items of the IPI were given during one class period and the remaining 200 items at another. Instructions were similar to those reported in Appendix A for the DD-MW Test. The data was factor analyzed with programs from the Statistical Package for the Social Sciences (Nie et. al., 1970).

Results

Using Varimax rotation, the analysis yielded four factors. Three of these were clearly interpretable. They are presented in Tables 1 thru 3. Scales loading below .20 are omitted from these tables. The appearance of the Daydreaming and Mindwandering factors (I and II) is further confirmation of earlier research reported in Chapter I. These factors formed the basis for Study 2 which is reported in the following chapters. Factor III, Negative Emotional Daydreaming, is similar to another factor discovered by Singer and Antrobus (Factor C in their 1963 study, Factor 3 in their 1970 study). It is not further analyzed in this thesis. Communalities and eigenvalues for Study 1 are reported in Appendix D.

TABLE 1

IPI Factor I: Daydreaming

Scale	Name	Loading
2	Absorption in Daydreaming	.63
6	Visual Imagery in Daydreams	.63
8	Problem Solving	.63
4	Positive Reaction in Daydreams	.60
7	Auditory Imagery in Daydreams	.56
3	Acceptance of Daydreaming	.53
23	Curiosity: Interpersonal	.50
10	Future Orientation in Daydreams	.46
14	Night Dream Frequency	.45
26	Mentation Rate	.44
29	Self reporting Tendencies	.42
1	General Daydreaming	.40
17	Hallucinatory Vividness of Daydreams	.39
15	Daydream Frequency	.38
16	Achievement oriented Daydreams	.36
25	Boredom	-.34
20	Sexual Daydreams	.25
11	Past Orientation in Daydreams	.25
21	Heroic Daydreams	.20

TABLE 2

IPI Factor II: Mindwandering

Scale	Name	Loading
13	Mind Wandering	.81
25	Boredom	.69
15	Daydream Frequency	.68
27	Distractibility	.57
20	Sexual Daydreams	.50
2	Absorption in Daydreams	.48
12	Bizarre Improbable Daydreams	.45
11	Past Orientation in Daydreams	.32
1	General Daydreaming	.32
18	Fear of Failure in Daydreams	.32
9	Present Orientation in Daydreaming	-.27
14	Night Dream Frequency	.25
19	Hostile Aggressive Daydreams	.24
5	Frightened Reactions to Daydreams	.21
16	Achievement-oriented Daydreams	.21
27	Guilt Daydreams	.21

TABLE 3

IPI Factor III: Negative Emotional Daydreaming

Scale	Name	Loading
22	Guilt Daydreams	.71
5	Frightened Reactions to Daydreams	.67
18	Fear of Failure in Daydreams	.64
19	Hostile Aggressive Daydreams	.48
6	Visual Imagery in Daydreams	.44
28	Need for External Stimulation	-.42
17	Hallucinatory Vividness of Daydreams	.41
20	Sexual Daydreams	.37
11	Past Orientation in Daydreams	.30
26	Mentation Rate	-.25
21	Heroic Daydreams	.27
2	Absorption in Daydreaming	.23
10	Future Orientation in Daydreams	-.20

Chapter III

STUDY 2: DAYDREAMING AND MINDWANDERING

This chapter discusses the following aspects of Study 2: 1) the Daydreaming-Mindwandering Test, 2) subjects, 3) apparatus, 4) procedure. Comparisons among the experimental groups are made in Chapter IV.

The DD-MW Test

Most subjects take approximately 75 minutes to complete the 400 items of the Imaginal Processes Inventory. Because many of these were not needed for Study 2 and because it was desired to have a test which could be administered in a class period of 50 minutes, an inventory consisting of 9 scales from the IPI was constructed. Each scale contained 12 items. These are reported in Appendix A. Six of these scales load heavily on the Daydreaming Factor (Factor I of Study 1). They are scales 3, 4, 6, 7, 10, and 26. Three scales load heavily on the Mindwandering Factor (Factor II of Study 1). They are scales 13, 25, and 27. The DD-MW test is a random listing of all of the items of these 9 scales.

The DD-MW test was administerd to 209 students in introductory psychology courses at the University of Bridgeport. The instructions which accompanied the test are reported in Appendix A.

As with the IPI, subjects rated each item on a 5 point scale. This rating was done on an answer sheet which was subsequently submitted to an optical scanner. The scanner transformed the data to punch cards.

The data was tabulated and factor analyzed using a program based on the I.B.M. Scientific Subroutine Package. On the basis of the evidence discussed earlier, it was anticipated that the two factors of Positive Daydreaming and Mindwandering would emerge. They are reported in Tables 4 and 5. Communalities and eigenvalues are reported in Appendix D.

Selection of Experimental Subjects

Each subject's factor score on the Daydreaming and Mindwandering factors was calculated and punched on computer cards. This was done by an optional subroutine of the program which computed the factors. The resultant deck of 209 cards was then run through a rank ordering program written for this purpose. This program listed the factor scores from lowest to highest and gave the identifying number of the subject who made each score.

From the ranked list of subjects, four experimental groups were formed. These were designated the High Daydreamers, Low Daydreamers, High Mindwanderers, and Low Mindwanderers. Their locations in factor space are shown in Figure 1. The 15 subjects in each group came from among the 30 most extreme scorers. Some of these 30 people were unable or unwilling to serve as subjects. Those who had extreme scores on both factors were excluded from consideration as experimental subjects.

Addresses and phone numbers for the total pool of subjects were available from the psychology department. The

TABLE 4

DD-MW Factor I: Daydreaming

Scale	Name	Loading
6	Visual Imagery in Daydreams	-.71
4	Positive Reaction in Daydreams	-.70
7	Auditory Imagery in Daydreams	-.62
10	Future Orientation in Daydreams	-.53
3	Acceptance of Daydreaming	-.49
26	Mentation Rate	-.36
25	Boredom	.22
13	Mindwandering	-.18
27	Distractibility	-.14

TABLE 5

DD-MW Factor II: Mindwandering

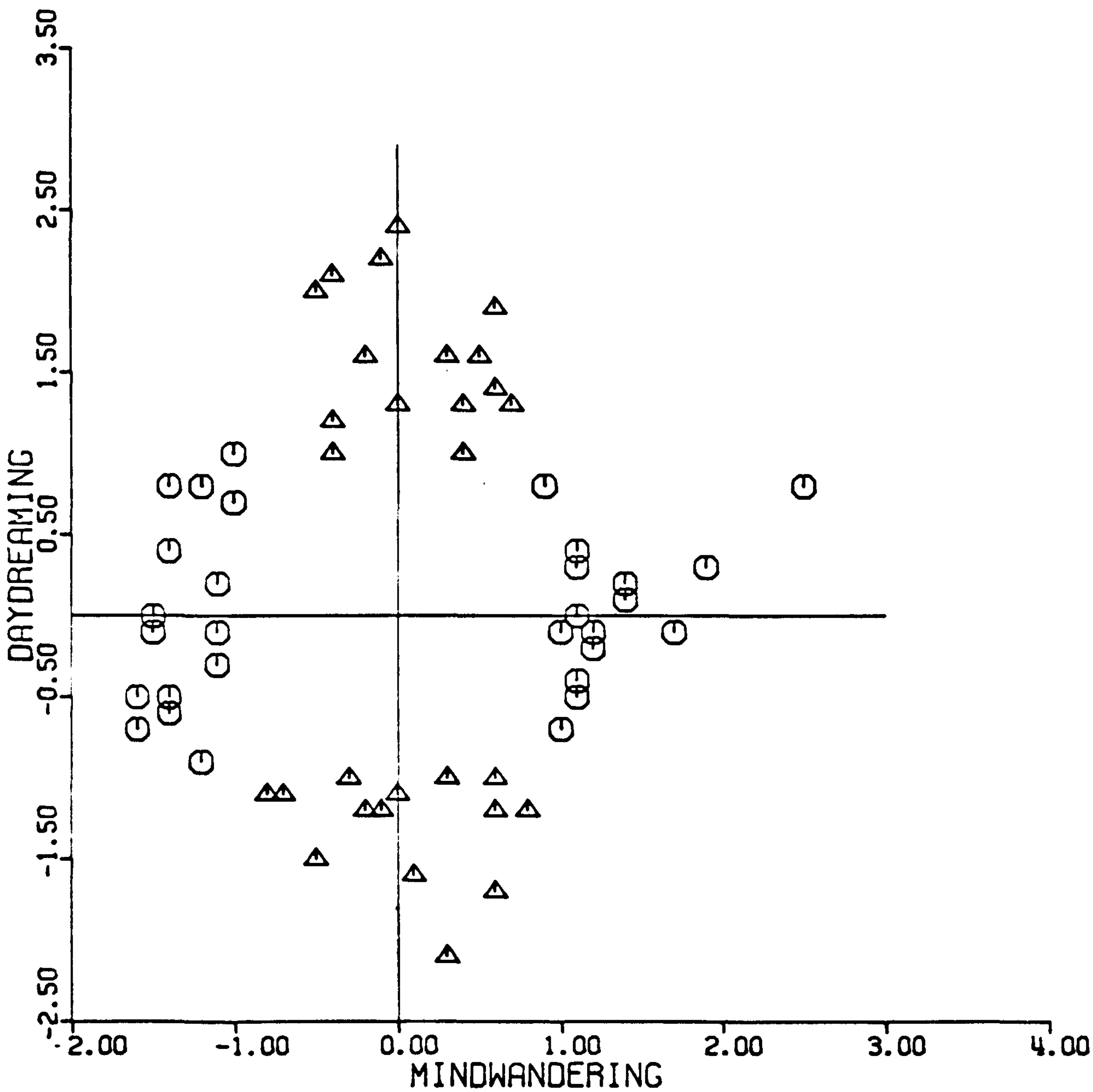
Scale	Name	Loading
13	Mindwandering	.75
27	Distractibility	.65
25	Boredom	.64
7	Auditory Imagery in Daydreams	.35
4	Positive Reaction in Daydreams	.24
6	Visual Imagery in Daydreams	.24
26	Mentation Rate	-.10
3	Acceptance of Daydreaming	-.05
10	Future Orientation in Daydreams	.02

FIGURE 1

Location of Experimental Groups in Factor Space

FIGURE 1

Location of Experimental Groups in Factor Space



experimental subjects were contacted and requested to report to the laboratory for testing. They were paid two dollars for participation in the experiment which lasted approximately one hour.

Apparatus

During the experiment, the subject was seated at a table in a room whose floor area was approximately ten feet square. It was made of cinder block and contained two wooden closets and two bookcases. There was a large window in one wall, covered by a venetian blind which was drawn. On the subject's table were a headset, microphone, and a small aluminum box containing three buttons.

The rest of the experimental apparatus was in an immediately adjacent room. The signal detection equipment was mounted on a relay rack. Its major components were:

1) A Foringer Multiple-Stimulus Panel which produced two tones. The low tone was constant at approximately 560 c.p.s. The high tone could be varied and was set at approximately 1,600 c.p.s. This was its highest setting and was chosen to provide maximum discriminability between tones.

2) An interval timer whose relevant settings were 1 and 2 pulses per second.

3) A predetermining counter which was used to set trial length.

4) A tape drive which presented the low and high tones in random order.

5) A four channel counter which recorded the number of high tones presented, the number of high tones detected, the number of low tones presented, and the number of low tones detected. The count was cumulative and each counter had to be reset manually.

6) A cumulative digital printer with three channels. This was used to print the number of correct detections per trial.

7) A generator which sent white noise to the subject's earphones.

8) Miscellaneous pulse formers and other modular programming equipment.

A Uher tape recorder was used to record the subject's speech. This speech was monitored through a headset worn by the experimenter.

Experimental Procedure

The experiment was divided into two phases of 25 minutes each. The first phase began soon after the subject arrived at the laboratory. He was seated at the testing table and the experimenter read the following instructions to him.

> In this experiment you will be asked to do two things: First, discriminate between two tones, a low tone and a high tone, by pressing a correct button. Second, report on any thoughts which occur to you while you are performing this task.
>
> When you place these earphones on (E pointed to earphones), you will hear a low hissing noise. Do not pay any attention to it. Its purpose is to keep out some of the noise from the room so that you can concentrate on the tones.

> When you press this switch (E pointed), you will hear a series of tones. If the tone you hear is low, press the button on the right; if the tone is high, press the button on the left. The low tones and high tones are presented in random order. There is no systematic pattern to them. When the series of tones stops, you can report on any thoughts which you have had. Make your report directly into the microphone. It will be recorded. Describe everything that has gone through your mind during the just completed series of tones. You need not detail any possibly embarrassing thoughts, but it would be helpful if you simply remark on their presence. When you have finished reporting, press this switch again (E points) and continue to the next series of tones. If you have no thoughts during a series, simply say 'None' into the microphone, press the switch and continue to the next series. Are there any questions?

After answering any questions, E told S, "The experiment will continue until I come back." He then asked S to place his earphones on and went into the adjoining room.

Phase 1 of the experiment continued for 25 minutes after the first tones were presented. The tones were presented at the rate of 1 per second. Each trial lasted 30 seconds. S had to press the appropriate button to activate another 30 second trial. Previous research (Green, 1970) had shown a tendency for the amount of stimulus independent thought to increase with increasing trial length. The 30 second trial was chosen to provide significant opportunity for stimulus independent thought.

After 25 minutes, E shut off the tones and prepared the equipment for phase 2 of the experiment. He then returned to S and read him the following instructions.

> We are now going to start the second phase of the experiment. The tones will be presented at a more rapid rate. If you wish, you may continue to discriminate the tones and make your reports into the microphone. On the other hand, you may just sit

without pressing any buttons or listening to any tones. You may simply sit quietly. Any thoughts which occur to you may then be reported into the microphone. If you choose to sit quietly, do not press this button (E pointed) because that will start the tones.

If you wish, you may alternate between discriminating the tones and sitting quietly.

It does not make any difference which you do. Sitting quietly, responding to the tones, or shifting between the two are all acceptable behavior for this part of the experiment. Whichever you do, you will be expected to report your thoughts or whatever else you have been doing into the microphone.

Please keep your earphones on, even if you are just sitting quietly. Are there any questions?

In Phase 2 of the experiment, the tones were presented at the rate of 2 per second. E terminated the experiment at the end of 25 minutes.

After each subject was run, the printout of his signal detection performance was taken from the digital printer and labelled with his subject number. The audio tape of the subject's verbal reports was similarly labelled and subsequently transcribed for content analysis.

CHAPTER IV

MODULAR ANALYSIS OF STUDY 2

This chapter describes a computer assisted method of content analysis which is more objective and efficient than general rating procedures. In their discussion of computers and content analysis, Stone et. al. (1966) stress the importance of the theoretical base which leads to the establishment of scoring categories. In the present study, this base is the act of thought which is referred to as a "module." Analysis of verbal reports of the stream of thought in terms of modules emphasizes both the processes and content of thought. This differs from many other methods of content analysis which limit their inquiry to the various themes which are found in the content of thought. The first three sections of this chapter describe the theoretical and empirical aspects of modular analysis. Section one discusses some general points regarding computer analysis of protocols which reflect the stream of thought. Section two presents some specific assumptions which form the basis for the categorization procedure used in this study. Section three describes in detail the main steps of a modular analysis. The remaining three sections of this chapter describe the application of modular analysis to the data of Study 2.

Computer Analysis of The Stream of Thought

The application of computer technology to the problems of psychology has been growing steadily in recent years. Tomkins

(1963) has compared the computer to the microscope. He suggested that the computer might eventually be as beneficial for psychology as the microscope has been for other sciences. Tomkins pointed out that the computer is a "complexity amplifier" as the microscope is a "space amplifier." The latter permits scientists to view spatial relationships otherwise invisible. The computer permits him to find order among complex interconnections otherwise undetectable.

Two complementary methods of applying the computer to the investigation of complex mental processes are of major importance for the present study. These are 1) the simulation of mental processes and 2) the content analysis of verbal protocols. In simulation, there is an attempt to specify, step by step, the pattern of an individual's thought in a given situation. Examples of this approach may be found in Reitman (1965), Loehlin (1966), Newell and Simon (1972), and Uhr (1973). In content analysis, the computer searches verbal protocols for key words and phrases. Decisions as to which words and phrases are to be regarded as "key" ones are usually determined by some theoretical position.

In modular analysis, the theoretical position is based on the simulation of thought. It is this position that dictates which words are to be regarded as key ones. They, in turn, determine how the verbal protocol is divided into segments (modules).

Assumptions of Modular Analysis

Modular analysis makes several interrelated assumptions regarding the nature of thought processes. Among the authors whose writings have led to these assumptions are Franz Brentano, Eugene Gendlin, and John Lilly. The dominant suggestion was Franz Brentano's proposal, in 1874, for an "act" psychology (Boring, 1950). The main feature of this proposal was that the central unit in psychological analysis should be the act of thought.

Modular analysis is based on the following assumptions:

1. There are four levels at which one may conceptualize an act of thought:

a. Physiological. Conceptualization at this level is exemplified by the work of Hebb.

b. Phenomenological. This is the level of feeling and immediate experience. The relationship between thought and feeling has been discussed by various authors through the centuries. For a novel and penetrating analysis, see Gendlin (1962).

c. List processing. A number of recent computer simulations of memory, thought, and personality have used list processing techniques to describe these phenomena. Information which is hypothesized to be stored in the brain is represented by lists of words stored in the computer. The brain's processing of information is represented by transformations of the stored list structures, such as the movement of items within and across lists. This descriptive method is used in the present study.

d. Linguistic description. This is the level at which protocols are obtained from subjects who have been instructed to report their thoughts. It is assumed that the same basic thought, as it might be represented in a list processing model, may be expressed in a variety of linguistic forms. This assumption is similar to that made by psycholinguists when they distinguish between "surface" structure and "deep" structure. Modular analysis is a method for analyzing varied forms of linguistic expression in terms of a common underlying act of thought.

2. An act of thought has three major components: Program, Topic, and Outcome. In the present system, these are the components of each module. They are the underlying events whch are described by the protocols.

The Program is frequently represented in the protocol by a verb (e.g. see, wish, search). It is this activity, described by the verb, which Brentano regarded as an "act." The term "Program" is used in the present study partially because of the metatheory described by John Lilly in his book Programming and Metaprogramming in the Human Biocomputer. Lilly suggested that it is fruitful to regard the brain as operating on the basis of thousands of programs and subprogams. Modular analysis attempts to identify some of these programs.

At the physiological level, each program represents a different pattern of neural firing. Hence, the neurons which are recruited when an individual is "looking" are different from those used when he is "choosing."

The Topic in an act of thought is frequently represented by a noun or substantive. It is the item toward which the program is directed. It is frequently what is "on the mind" of a subject.

The Outcome is often represented by an adjective or adverb. It may be regarded as representing a conclusion. In the sentence, "I see the red book" The program "seeing" operates upon the topic "book" and concludes that it is "red." The term "Outcome" signifies that a program has a result. (An act of thought accomplishes something).

3. Thought is the activity of a continuously self-modifying structure (or network) of information. This structure is the person or thinker. A major goal of computer simulation in the field of cognitive psychology is to describe this structure in as much detail as possible. Modular analysis may serve as a complement to this objective. Conversely, the construction of specific modules is facilitated by reference to simulation.

4. The topics about which an individual thinks are determined by both temporary and long term factors. An extensive simulation would attempt to specify the reasons why a specific topic is thought about at a specific point in time. (Lewin may have offered us an important clue in this direction with his concept of "tension system." Gendlin's more recent work contains a variety of possible

clues.) Many of the topics which an individual thinks about can be influenced experimentally. A large number of a subject's acts of thought are responses to the demands of the experiment. One major consequence in such a situation is that the range of possible meanings of his utterances is greatly narrowed. For example, in the present study, when a subject says "buttons," it is highly probable that he is referring to a noun and not a verb. It is also highly probable that the referent of the noun is two specific objects before him on the table.

Steps in Modular Analysis

Modular analysis employs a combination of string processing and on-line editing languages. In the present study, these were SNOBOL4 (Griswold, et. al., 1971) and TSO Command Language (for an I.B.M. system) respectively.

Table 6 outlines the main steps in modular analysis. The program (P) used in each step is indicated in brackets and listed in Appendix C.

Each paragraph in a subject's protocol is numbered and an end of paragraph symbol (>) added. Headers are then added to these paragraphs (Step 6). These headers equate the paragraph with the first module. Additional modules which may be in the paragraph are called "imbedded" modules. The paragraph is split and headers added to these imbedded modules in Step 9.

Files are created on permanent disk storage and are accessible on-line. The process of analyzing the data may be

TABLE 6

Main Steps in Modular Analysis

Data Preparation

Step 1: Protocols were transcribed from audio tape to typescript.

Step 2: Protocol decks were keypunched from typescript.

Step 3: Card image files were created (C-Files) and the protocols were printed (P1).

Preliminary Editing

Step 4: The number of words spoken was tabulated (P2) and stored in W-Files. Results are shown in Table 8.

Step 5: A mastertable, listing in alphabetical order the frequency of occurrence of each word in each group, was constructed. (P4, I.B.M. Sort Program, P5).

Step 6: Headers were added to each paragraph in the C-Files. Example: 110-04-1 (#label) @
The numbers identify group, subject, paragraph and module. A dummy label is stored between the brackets. The "@" is a break character which assists in programming. The files which are created in this step are called H-Files.

Development of Modules

Step 7: Development of modules by successive approximation. (See text)

Step 8: Edit H-Files to change "#label" or current designation to final category. (TSO Editor, "change" subcommand)

Step 9: Add headers to imbedded modules and make appropriate changes in "#label." (P8, TSO Editor, "change" subcommand). Resultant files are referred to as I-Files.

Summary of Results

Step 10: Group modules in each I-File according to type to form M-File (P9) and print.

Step 11: Compute percentage of occurrence of each module in each group (P11, P12). Results are shown in Tables 11 and 12.

thought of as creating accurately labelled files. This involves successive modification of the files until the analysis is complete. Table 6 describes a progression from C-Files to H-Files to I-Files to M-Files as headers are added and the labels modified.

Step 7 refers to the process of deciding which of many possible modules best describes the data. This is a trial-and-error process. The mastertable of word frequencies (created in Step 5) is of some help here. For example, it might be asked if one Topic which subjects discuss is their daydreams. The mastertable tells whether or not there is enough reference to "daydreams" to pursue this possibility.

As the modules are developed, so is the dictionary of keywords which define them. The final dictionary for this study is reported in Appendix B.

The final step in the analysis (Step 11) involves calculating the percentage of occurence of each module in each group.

Development of The Modules

Stone et. al. (1966) have pointed out that the construction of a content analysis dictionary is an empirical as well as a theoretical procedure. The categories which are intended to give meaning to the data are the result of extensive examination of that data. The preceding sections of this chapter described some of the theoretical assumptions associated with the concept of the module. In listing the steps

TABLE 7

LIST OF MODULAR COMPONENTS

Program	Topic	Outcome
observe	performance	various
concentrate	experiment	adjective
wonder	affect	adverb
hypothesize	motivation	
comment	mind	
consider	choice	
analogize	environment	
recall	self	
anticipate	body	
imagine	past	
reason	present	
	future	
	time	

Note: Entries for Programs and Topics include all of those categorized in this study. Outcomes were too diverse to give a complete listing. Many possible combinations of Program, Topic and Outcome were not represented in the data.

in a modular analysis, it was stated that Step 7 involved empirical development of the modules by successive approximation. This section discusses the implementation of that step in the present study. As the data was analyzed and reanalyzed in order to divide it into modular form, certain facts gradually became clear and certain additional assumptions became desirable. These were as follows.

1) Simulation. Though detailed simulation of a subject's stream of thought was not an objective of the present study, a start in this direction facilitated construction of the modules. Relevant content of each subject's information network was represented by three lists: a list of Programs, a list of Topics, and a list of Outcomes. During the experiment, the subjects emitted a specific number of thoughts. Table 7 summarizes the components of the thoughts reported by subjects during the experiment. Each act of thought may be regarded as involving the activation of one item from each of these lists. Transformation of the subjects' protocols into modules was thought of as a transformation to list structure.

2) Empathy, attention, retrieval. In constructing the modules, it was essential to empathize with the subject and try to think as he thought. This task was facilitated by reference to the lists of modular components. Shifts in the stream of thought were conceptualized as shifts in attention from one Topic to another (or from one complete module to another). The manner in which a subject attended to a Topic was represented by a Program; i.e., the Program was seen as operating upon the

Topic. Different Programs involved different degrees of retrieval from memory storage.

3) Fundamental structures and processes. The complexities of the stream of thought were seen as involving certain fundamental structures and processes. The structures were regarded as omnipresent and the processes as occurring with high frequency. The subject's references to these structures and functions were inferred through the appearance of keywords in their protocols. These fundamental aspects of the stream of thought include:

3a) Combining. Thought is a combinatorial process. Many of the modules reflect this fact. In terms of the list processing model presented above, this involves the combining of items from different lists or, in some cases, from the same list.

3b) Observing. Observing the feelings associated with thought is a frequently occurring Program. (For a discussion of this level of "felt meaning," see Gendlin (1962).) Observing-Combining may be thought of as a dimension along which Programs fall. The statement "I am bored." represents one end where the only combining is the match between the verbal symbol "bored" and the felt meaning. A lengthy fantasy would represent the other end of this dimension.

3c) Attribution. Attribution is a frequent Outcome. Many acts of thought involve the assignment of adjectives or adverbs to a Topic, e.g., "My performance is bad," The room is beige," "The experiment is stupid."

3d) Time. The dimension of time provides an important background for the analysis of thought. Past, present, and future may be represented by different Programs. Past events involve recall or retrieval from storage. Future events involve projection (nonclinical sense) or anticipation. Imagining new combinations may often be primarily oriented in the present.

3e) Reasoning. Reasoning is a frequently occurring subprogram (See below). It is easily identified by the keyword "because" or its synonyms. Many acts of thought are followed by reasons.

3f) Self. The "self" is an important structure in simulating thought. Many statements refer to roles, preferences, beliefs, motivations. These are most readily grouped as attributes of a Topic called "Self."

4) Standardized expression. Generality across individual acts of thought was obtained by using class words for Program, Topic, and Outcome names. Instances of these classes are reported in the dictionary (Appendix B).

5) Subprograms. Some modules were subordinate to others. They could be thought of as subprograms which would not have been activated had the main program not been activated.

6) Instructions. The instructions which were read to the subject determined a number of his acts of thought. This is reflected in the construction of the modules. The instructions to the subject may be thought of as a series of commands: 1) Listen to the tones, 2) Discriminate high tone from low tone,

3) Push the appropriate button, 4) Report your thoughts into the microphone. Many of the thoughts which the subjects describe are related to these instructions.

Description of The Modules

Following are the 29 modules of this study with examples of each.

1: Concentrating on | Performance

I am just concentrating on the buttons.

2: Observe | Performance | Unable, Difficult, Impossible

Its kind of hard to concentrate on it.

3: Observe | Performance | Negative, Mistake, Deteriorating

I was thinking about the mistakes I made - pressing the wrong button at the wrong time to the wrong sound.

4: Observe | Performance | Positive, Accurate, Improving

I have become accustomed to it - it's not as hard as doing it the first time. It's not as frightening either.

5: Observe | Discrimination | Difficult, Impossible

It's hard to distinguish at first which is high and which is low.

6: Describes | Performance

It seems to slow down except my fingers wanted to go faster.

7: Observe | Stimulus | Fast

Things are coming at you so fast.

8: Observe | Stimulus Attribute

I was thinking of the stiffness of the buttons. The only feeling that I have is that the high and low are completely unpredictable.

9: Wonders about | Performance

I was wondering how I was doing so far.

10: Wonders about | Experiment

I'm wondering why I'm sitting at this desk pressing three little buttons and talking into a microphone. I'm wondering what it's all about, you know, what this whole experiment is about.

11: Hypothesizes about | Experiment

Maybe this part of the experiment is actually to see how you fill your time or whether you avoid filling your time. I just filled it by discovering the drawer and looked at the ugly room instead of my pushing the buttons. I played right into the hands of the experimenters.

12: Comments on | Experiment

I think everybody takes part in an experiment must get a common affinity with monkeys, you know cause after a while - you know- what's man but a glorified monkey - you know. Experiments are naturally associated with monkeys and man. Sometimes I think monkeys perform better - at least the pay is cheaper for the psychology department - right - what am I thinking?

13: Comments on | Duration of Experiment

And I wish this would hurry up and be over cause I want to get out of here.

14: Observe |Affect | Bored

The test is getting increasingly boring as I go along - I don't know.

15: Observe | Affect | Negative

uh - I got a little frustrated on that last series.

16: Observe | Affect | Positive

Just concentrating on that sound, it is so soothing and relaxing.

17: Observes | Mind

Again my mind is wandering - I wish I could focus on my thoughts but I really can't pick out any one train of thought that I followed.

18: Observe | Mind | Blank

No thoughts.

20: Consider | Choice

It's hard for me to think of anything to say now. But you see I don't want to go on pressing the buttons anymore, but like I just can't sit here - can't think of anything to say. I'm really getting mixed up now - you know - I don't know - really getting weird.

21: Consider | Choice | Presses

Well, let's give it another shot here.

22: Consider | Choice | Does not press

I think I am just going to sit here for the rest of the time.

23: Observes | Environment

The wall in front of me is - cinder blocks are creating some very interesting patterns to look at some shadows - and the corners of the table against the wall here are casting some very interesting shadows - and if I squint my eyes and look at them - they seem to be shifting.

24: Observes | Body

I got sore fingers from pressing the dumb buttons.

25: Analogizes |

It's just so foggy you want to clear it up like when somebody talks and they have a coarse voice -like you know it's kind of hoarse - and you always feel like clearing your own throat because it's annoying to listen to them. That's how the sound is in the earphones.

26: Recall | Past

I was thinking about how long it's been since I saw my cousin and all the crazy things we used to do - and the same about my sister, I haven't seen her in quite a while.

27: Observe | Future

Oh, what I'm going to do this weekend and next weekend. Next weekend is our spring weekend, and I hope it turns out nice. I hope it doesn't rain. I hope there are a lot of kids here.

28: Describe | Self

I am not used to sitting and doing nothing - I wish I had my knitting here or something.

29: Combine | Topic

Just thought of an amazing way I could learn if anybody was listening to me now while I say this. I could sit here and pretend that I was having an epileptic seizure, and then if the tester came running in to help me, I would know that he had been listening, but I'm not going to do that.

TABLE 8

Mean Number of Words Spoken

	High Daydreamers		Low Daydreamers		High Mindwanderers		Low Mindwanderers	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Phase 1	448	335	465	399	532	400	539	229
Phase 2	756	645	612	489	730	638	775	410
Combined (Phase 1 & Phase 2)	1204	870	1077	862	1262	1007	1314	600

TABLE 9

Mean Number of Correct Signal Detections

	High Daydreamers		Low Daydreamers		High Mindwanderers		Low Mindwanderers	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Phase 1	25.4	4.6	24.2	7.1	23.5	8.3	26.6	2.9
Phase 2	30.5	22.8	41.0	14.3	40.7	20.3	42.8	16.8

TABLE 10

Mean Number of Decisions to Activate Tones During Phase 2

High Daydreamers		Low Daydreamers		High Mindwanderers		Low Mindwanderers	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
21.2	16.6	22.0	10.8	13.8	10.8	14.6	11.1

TABLE 11

Modules of Phase 1
Mean Percentage Frequency Within Groups

MOD	HDD	LDD	HMW	LMW		
1:	2.5	.6*	3.5	2.3	(#)	concentrating | on performance
2:	1.4	3.5	1.4	.3*	(.08)	observe | performance | unable, difficult, impossible
3:	3.3	3.6	4.0	3.1		observe | performance | negative, mistake, deteriorating
4:	.7	3.2	1.9	.8		observe | performance | positive, accurate, improving
5:	1.9	1.9	2.1	1.3		observe | discrimination | difficult, impossible
6:	3.4*	7.0	10.8	19.2+	(.001)	describe | performance
7:	1.4	.4	.9	1.8		observe | stimulus | fast
8:	4.0*	9.1+	5.1	4.8	(#)	observe | stimulus attribute
9:	1.6	.4	1.2	.4		wonder | about performance
10:	3.7	3.8	2.5	3.0		wonders about | experiment
11:	.2	.0	.8	.7		hypothesizes about | experiment
12:	.8	3.4	2.4	1.4		comments about | experiment

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TABLE 11 continued

MOD	HDD	LDD	HMW	LMW		
13:	2.3	1.4	4.0	1.7		comments on | duration of experiment
14:	4.0+	2.4	2.9	3.1	(#)	observe | affect | bored
15:	1.4	1.6	3.9+	.0*	(.03)	observe | affect | negative
16:	.8	.3	.6	.3		observe | affect | positive
17:	1.4	1.0	3.5+	.5*	(.08)	observes | mind
18:	40.5	44.9+	33.8*	37.0	(#)	observes | mind | blank
19:	21.6+	10.9*	13.1	16.0	(#)	stimulus independent thought

TABLE 12

Modules of Phase 2
Mean Percentage Frequency Within Groups

MOD	HDD	LDD	HMW	LMW		
1:	1.0	.2	1.4	.4		concentrating | on performance
2:	.6	3.1+	.7	1.4	(.10)	observe | performance | unable, difficult, impossible
3:	1.8	1.7	3.8+	.8	(#)	observe | performance | negative, mistake, deteriorating
4:	.3	.7	.8	.3		observe | performance | positive, accurate, improving
5:	.2	.3	.7	.2		observe | discrimination | difficult, impossible
6:	2.4*	6.0	[illegible].5	6.9+	(#)	describe | performance
7:	.9	1.1	.2	1.1		observe | stimulus | fast
8:	3.1	9.7+	3.4	1.0	(.05)	observe | stimulus attribute
9:	.2	.0	.3	.0		wonder | about performance
10:	5.1	4.4	2.0	4.9		wonders about | experiment
11:	.4	1.4	1.5	.7		hypothesizes about | experiment
12:	1.9	.6	2.9	1.3		comments about | experiment

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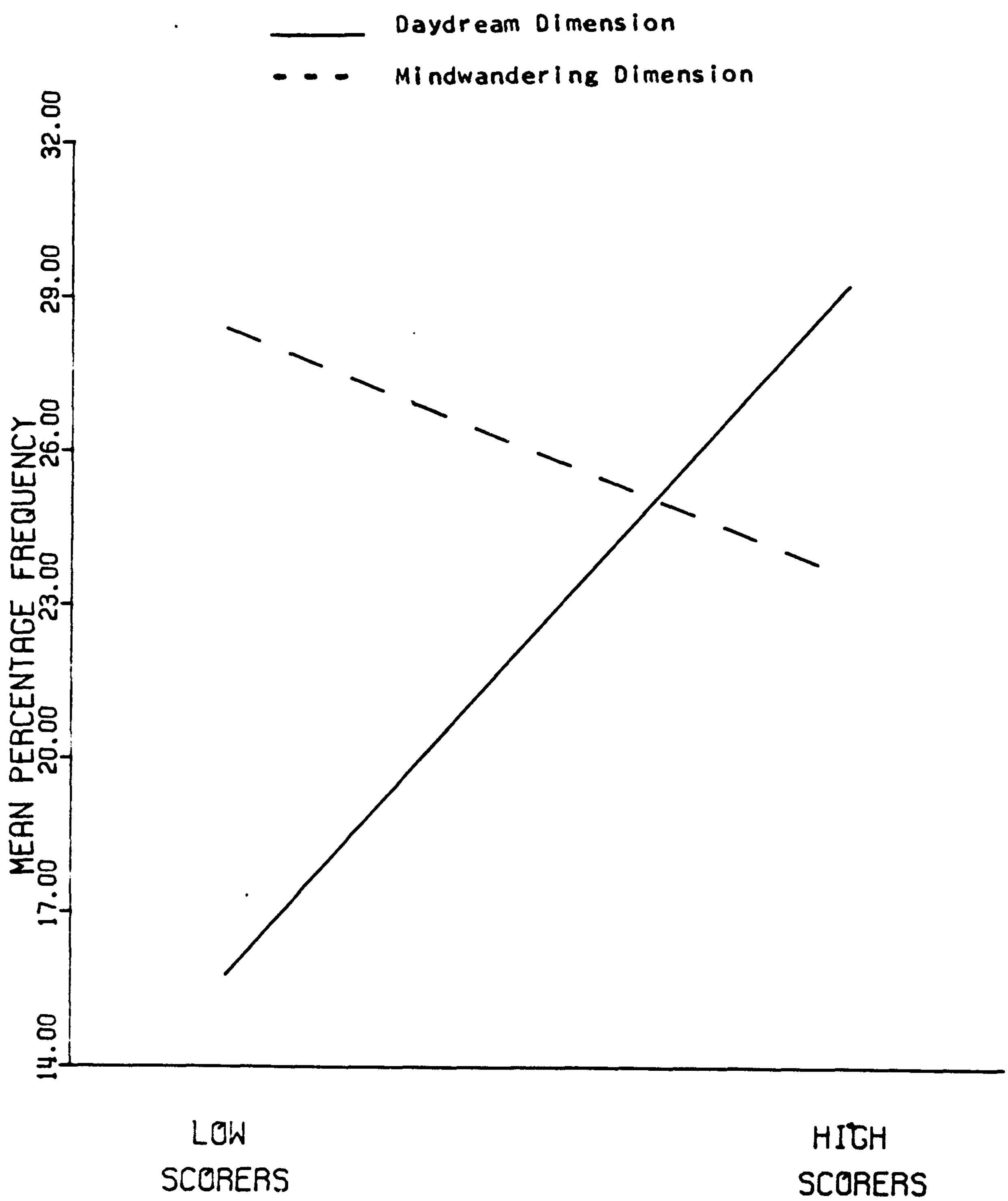
TABLE 12 continued

MOD	HDD	LDD	HMW	LMW		
13:	6.3+	4.4	5.1	4.2	(#)	comments on | duration of experiment
14:	1.3*	3.9	3.8	4.2	(#)	observe | affect | bored
15:	.7*	1.3	2.4+	1.0	(#)	observe | affect | negative
16:	.0	.2	1.0	.0		observe | affect | positive
17:	3.4	2.1	6.8	6.4		observes | mind
18:	21.0	25.1+	11.7*	10.3	(#)	observe | mind | blank
19:	29.2	15.8*	23.7	28.5	(#)	stimulus independent thought
20:	1.3	1.4	1.8	2.1		consider | choice
21:	4.8	2.5	3.5	3.6		considers | choice | presses
22:	2.1	.7	5.1	3.4		considers | choice | does not press
23:	7.6	6.1	9.2	11.0		observes | environment
24:	2.7	.9	1.8	2.0		observes | body
25:	8.2+	1.6	2.8	3.3	(.02)	analogizes
26:	7.5	3.7	6.7	7.8		recalls | past
27:	5.3	3.7	5.3	6.5		anticipates | future
28:	6.9	1.6	2.8	7.3	(#)	describes | self
29:	1.3	5.2	6.1	3.6		combine | topic

FIGURE 2

Amount of Stimulus-Independent Thought in Phase 2



Comparison of Experimental Groups

Tables 8 thru 12 form the basis for comparing the experimental groups and testing the hypotheses stated in Chapter I.

Table 8 reports the mean number of words spoken during the experiment. Intragroup variability was large and an F-test showed no significant difference among groups. The tendency for the Low Daydreamers to be less loquacious than the other groups is consistent with their response pattern as described below.

Table 9 gives the mean number of correct signal detections during both phases of the experiment. Again, intragroup variability was large and F-tests were nonsignificant. The tendency for the Low Mindwanderers to be more accurate is consistent with their response pattern. The low number of detections by the High Daydreamers in Phase 2 is due to the fact that four subjects in this group did not activate the tones at all.

Table 10 gives the mean number of decisions to activate the tones during Phase 2. An F-test showed the results to be nonsignificant. The trends will be commented upon below.

Tables 11 and 12 present data which bear on the central question of this study: Do the experimental groups show a relative difference in their use of specified acts of thought? These tables report the mean percentage of occurrence of each module for each group. This was determined by calculating the percentages for each subject and averaging across the 15 subjects of a group.

The characteristic pattern of thought for each group is described by noting those modules where its frequency of usage differed most from other groups. On the basis of an F-test, some of these differences reached standard levels of statistical significance and some did not. In the former case, the associated alpha level is reported in brackets. In the latter case, a "#" indicates that the obtained differences also fit into a logical overall interpretation of the data. A "+" indicates that the module was used most frequently by that group; a "*" indicates that it was used least frequently.

In Table 12, it should be noted that module 19 (stimulus independent thought) is formed by summing the data of modules 25 thru 29 (the subcategories of stimulus independent thought). The results of this summation are shown graphically in Figure 2.

The response patterns of each experimental group will now be examined in turn. For each group, the key modules will be noted; first, for Phase 1, then for Phase 2. The pattern which emerges will then be compared to the hypotheses given in Chapter I and comments made.

High Daydreamers. In Phase 1, those modules which define the characteristic pattern of the High Daydreamers are M19, M14, M8, and M6. They indicate a high frequency of stimulus independent thought and boredom with the signal detection task. Correspondingly, observations of the stimulus and descriptions of performance are low.

In Phase 2, a low frequency of describing performance continues to characterize this group. Their expressions of boredom now shift from highest to lowest, but they comment most on the duration of the experiment (M13). They analogize more than any other group (M25).

In some ways, the performance of the High Daydreamers was disappointing. The enjoyment of fantasy which Singer and Antrobus regarded as characteristic of this group was only weakly represented in the data. It was the experimenter's opinion that a significant number of the subjects in this group were uncomfortable in the laboratory situation and that this inhibited their thoughts, their reports, or both. On many relevant modules, this group was higher than both the Low Daydreamers and High Mindwanderers, but not higher than the Low Mindwanderers when they were expected to be above this group. Much of this is accounted for by the fact that in Phase 2 (where they had the greatest opportunity to daydream) they reported their minds blank 21% of the time. This is almost as much as the 25% for the Low Daydreamers where it is expected. It contrasts with an approximate 10% level for the other two groups. It will be suggested below that the frequent occurrence of the mind-blank module (M18) in the Low Daydream group is associated with a weak sense of self. This is not the case for the High Daydreamers. They are second only to the Low Mindwanderers on self reference (M28) and clearly above the other two groups.

Following are the hypotheses which have been made for this group and the evidence bearing on them.

1) Verbal reports will be the longest, most varied, most indicative of positive affect.

The reports were not significantly longer than those of any other group and they did not indicate any greater amount of positive affect during the experiment (M15). The hypothesis was supported by the high frequency of stimulus independent thought (which is more varied than stimulus dependent thought). This stimulus independent thought included a high degree of analogical thought which emerges as a distinguishing characteristic of the High Daydream pattern.

2) Accuracy of signal detection will be greater than that of the High Mindwanderers, but not as good as either the Low Daydreamers or the Low Mindwanderers.

There were no significant differences among groups on this measure.

3) Time spent in signal detection during Phase 2 will be least for this group.

There were no significant differences among groups on this measure. Examination of the trends show a tendency in the opposite direction of the hypothesis. The hypothesis had some support in that this group contained four individuals who did not activate the tones at all. This compares with two High Mindwanderers, one Low Mindwanderer, and no Low Daydreamers in this category.

Low Daydreamers. In Phase 1, the Low Daydreamers are characterized by frequent reports of mind-blank (M18) and observation of the stimulus (M8). They are lowest in reports of concentrating on the performance (M1) and stimulus independent thought (M19).

In Phase 2, this group is again highest on mind-blank (M18) and observation of the stimulus (M8). In addition, they are highest in reporting difficulty with their performance (M2). Again, they are lowest in reports on concentration on performance (M1) and stimulus independent thought (M19). They are lowest in all categories of stimulus independent thought and in verbalizations concerning the choice between signal detection and sitting quietly (M20, M21, M23).

The Low Daydreamers are characterized by a weak sense of self (M28) and a low degree of mental activity. When activity does occur, it tends to be stimulus bound.

Following are the hypotheses which were made about this group and the data which bear on them.

1) Verbal reports, compared to the High Daydreamers, will be shorter, less varied, less indicative of positive affect.

As was reported above, there was a trend for the Low Daydreamers to be the least loquacious group, but it did not reach statistical significance. Using stimulus independent thought as the measure of variability, the hypothesis was clearly supported. Reports of positive affect were not significantly different from the other groups.

2) Accuracy of signal detections will be greater than for the High Daydreamers.

There was no significant difference between the two groups.

3) Time spent in signal detection during Phase 2 will be more than for the High Daydreamers.

There was no significant difference between the two groups. It is possible that this result is partly due to the unexpectedly high reluctance of those in the High Daydream group to express their thoughts and the use of the signal detection task as a substitute activity. Examination of Table 10 shows a strong trend for both the High and Low Daydreamers to choose the signal detection task more often than the other two groups.

High Mindwanderers. In Phase 1, the High Mindwanderers are characterized by a low frequency of mind-blank reports (M18), a high frequency of negative affect (M15) and a high frequency of observing their own minds (M17). It is also noteworthy that they are not the most or least frequent users of the other modules. This is consistent with a pattern of wandering from module to module.

In Phase 2, this group's reports of mind-blank are again low and the frequency of negative affect high (M15). They also report mistakes in their performance (M3) most frequently. Their reference to self is relatively low (M28).

The response pattern of the High Mindwanderer is consistent with the description given by Singer and Antrobus for their Factor E which was reported in Chapter I. In the High Mindwanderer, the sense of self is weak (M28), the mind is seldom blank (M18), shifts in thought are frequent, and significant negative affect is present (M15).

The original hypotheses and the data which bear upon them are as follows.

1) Verbal reports will be short, disorganized, lacking in positive affect. In addition, there will be more complaints of mind wandering and inability to concentrate on the signal detection task than occur in any other group.

As already indicated, this group is not less loquacious than other groups. There are more complaints of mind wandering (M17) and in Phase 2 they report more mistakes in their performance than do other groups. Frequent reports of positive affect are not given by any group, the High Mindwanderers are noted for the presence of negative affect.

2) Accuracy of signal detection will be the poorest of all groups because these subjects lack the ability to prevent information from the internal channel from interfering with attention to the external channel.

There was a very slight trend in this direction, but it did not reach statistical significance.

3) Time spent in signal detection during Phase 2 will be approximately the same as that spent sitting quietly. Neither task will provide much positive affect and subjects will alternate between them.

The amount of time spent in signal detection may be estimated by multiplying the number of decisions to activate the tones (reported in Table 10) by the 30 second duration of each series. For the High Mindwanderers, this works out to approximately 7 minutes and does not support the hypothesis. This measure does not differentiate among any of the groups.

Low Mindwanders. In Phase 1, the dominant characteristic of the Low Mindwanderers is the frequency with which they describe their performance (M6). They are also lowest on observations that performance is difficult (M2), negative affect(they report none), and observations of the mind (M17).

In Phase 2, they are again highest in describing their performance (M6), but by a much less dramatic margin. They generate a high amount of stimulus independent thought (M19) and indicate the greatest sense of self (M28).

The response pattern of the Low Mindwanderer both confirms expectations and adds surprises. In Phase 1, as expected, he is absorbed in his performance. It should be noted that, unlike the Low Daydreamer, he is not stimulus bound. In Phase 2, there is still high attention to performance, but also a high degree of stimulus independent thought. The Low Mindwanderer is highest in self awareness and processes considerable information.

The hypotheses for this group and the related data are as follows.

1) Verbal reports on the measures of length, variety, and positive affect will indicate lower scores than the High Daydreamers, but higher scores than both the Low Daydreamers and the High Mindwanderers.

The Low Mindwanderers were not more loquacious than any other group. Using stimulus independent thought as the measure of variety, the hypothesis with respect to the Low Daydreamers and High Mindwanderers was confirmed in both phases of the experiment. In comparison with the High Daydreamers, the hypothesis was confirmed in Phase 1 but not in Phase 2. This is probably due to the inhibitions of the High Daydreamers, previously mentioned.

2) Accuracy of signal detection will be greatest in this group.

Trends in both Phase 1 and Phase 2 support this hypothesis, but do not reach statistical significance.

3) Time spent in signal detection during Phase 2 will be greatest for this group. The signal detection task provides an opportunity to demonstrate accuracy, which is a source of positive affect for these subjects.

This hypothesis was not confirmed.

CHAPTER V

DISCUSSION

This chapter will discuss three major aspects of Study 2: 1) design, 2) attributes of the experimental groups and, 3) modular analysis. Relations to previous research and implications for future research will be noted.

Design

It will be recalled that there were four major phases in the design of Study 2. These were:

1) Mass administration of a self report inventory (DD-MW Test).

2) Selection of subjects whose self report indicated that they were extreme scorers on specified dimensions (daydreaming and mindwandering factors).

3) Collection of verbal reports on the stream of thought from these extreme scorers under laboratory conditions (signal detection task).

4) Modular analysis of the verbal reports.

This design permitted a validation of "Daydreaming" and "Mindwandering" as separate constructs. Study 1 and previously cited research had demonstrated two separate factors when self reports of imaginal processes were analyzed. In Study 2, the subjects were given the opportunity to daydream under experimental conditions. Their verbal reports under these conditions were congruent with their earlier self ratings of their mental processes.

This design may be used to study the construct validity of tests used to assess other mental traits such as suggestibility and self esteem.

Experimental Groups

In Study 2, four distinct groups of subjects were formed and studied: High Daydreamers, Low Daydreamers, High Mindwanderers, and Low Mindwanderers. Some interesting comparisons may be made between these four groups of subjects and certain experimental groups studied by other researchers under other conditions. These include studies of cognitive style and operant versus respondent thinking. This section of the chapter will make these comparisons and then consider the meaning of the group differences obtained in the present study in more detail.

Cognitive style. Among those who have conducted research or written about "cognitive style" are: Gates (1971), Gorman (1971), Warr (1970), and Witkin (1965). The term "style", as used by these authors, has two major connotations: 1) it is transsituational; that is, it is a mental process which will influence performance on a variety of tasks (e.g., Rod and Frame Test, Embedded Figures Test, Human Figure Drawing Test) 2) there are significant individual differences in the possession and utilization of a style.

The style which has been most extensively studied has been field articulation (field dependence vs. field independence). Witkin (1965) has summarized the differences as follows:

> Reviewing the evidence ... a tendency toward a more global or more articulated cognitive style has been shown to be associated with differences in body concept, in sense of separate identity, and in nature of defenses. It is now our view that the characteristics which make up the contrasting constellations described may be conceived as diverse manifestations of more developed or less developed psychological differentiation. Thus, we consider it more differentiated if, in his perception of the world, the person perceives parts of the field as discrete and the field as structured. We consider it more differentiated if, in his concept of his body, the person has a definite sense of the boundaries of the body and of the interrelation among its parts. We consider it more differentiated if the person has a feeling of himself as an individual distinct from others and has internalized, developed standards to guide his view of the world and of himself. We consider it more differentiated if the defenses the person uses are specialized. It is our view that these various characteristics, which we have found to cluster together, are not the end-products of development in separate channels, but are diverse expressions of an underlying process of development toward greater psychological complexity. 'Level of differentiation' is a concept which encourages us to look across psychological areas and provides a basis for thinking about self-consistency in individual psychological make-up.

Parallels between the Low Daydreamer and the field dependent subject can readily be drawn. Both have a weak self concept and a tendency to be dominated by their immediate stimulus situation. Similarly, there is a parallel between the Low Mindwanderer and the field independent subject. Both have relatively strong self concepts and are not stimulus bound. From these parallels, appropriate predictions can be made and tested regarding the performance of the Low Daydreamers and Low Mindwanderers on the traditional tests of cognitive style. The relative performance of the High Daydreamers and the High

Mindwanderers is, perhaps, less predictable.

Operant vs. respondent thought. A comparison between the results of the present study and a recent experiment by Klinger (1974) is of interest. Klinger studied differences between operant and respondent thinking. The former is goal directed and was elicited by problem solving tasks in logic and manual puzzles. The latter thinking is not directed at the solution of a particular problem and was elicited by instructing the subjects to let their minds wander. The subjects were instructed to think out loud and their verbal protocols on the two types of tasks were compared. Two categories of thinking, evaluation and control of attention, distinguished operant from respondent thinking. Evaluation was measured by such words as "Yep, Dammit, Now wait;" control, by such words as "Let's see, Where was I?"

These categories were found significantly more frequently when the subjects were engaged in the operant task. Similar results were obtained in the present study. Module 1 measured control of attention (concentrating on performance) and Modules 2 thru 6 measured various evaluations of performance (improving, deteriorating, etc.). It will be noted that these modules helped to define stimulus dependent thought. This categorization of thought overlaps considerably with Klinger's concept of operant thinking.

Meaning of group differences. In order to facilitate visualization of the differences among the four experimental groups of this study, we will borrow and modify two concepts from Newell and Simon (1972). These are the concepts of "problem space" and "problem behavior graph." The former represents the possible moves which a subject could make in solving a problem. The latter represents the moves he actually makes. We will use the term "modular space" to represent the possible acts of thought which our subjects could emit. A "modular graph" refers to those acts which were actually emitted.

It is now necessary to consider the possible reasons for group differences in movement through modular space. These reasons must be based on an examination of the general function of thought and the specific function of each module.

The general function of thought may be discussed in terms of several concepts referred to by White (1959) in his integrative paper on motivation and competency. White included "thinking" in his list of organismic activities which promoted adaptation to the environment and mastery over it. He argued for a concept of "effectance motivation" which states that organisms take pleasure in expressing and developing their competencies. This implies a concept of internal control (for which White gives examples) and an important association between it and effectance motivation. It should be noted that White stresses an affective (as distinct from a drive) component of effectance motivation. He speaks of "feelings of efficacy." These feelings may be understood as occurring at the phenomenological level of thought, mentioned in Chapter IV. It is along these dimensions of competency and control that the experimental groups of the present study differ.

The degree to which an individual controls his own thought has been a topic of continuing interest in psychology. Lack of voluntary control is sometimes regarded as undesirable (e.g. obsessions) and sometimes as desirable (e.g. sudden insights). In both cases, the controlling mechanism is often discussed as self or ego.

In comparing our experimental groups, it should be noted that the High Daydreamers and Low Mindwanderers demonstrated greater self awareness (M28) than the other two groups. It is reasonable to assume that they also had greater control over their thoughts. This control, however, was exercised in different ways. The Low Mindwanderers spent far more time describing their performance than did the High Daydreamers. It is assumed that this concern and interest in performance stems from competency and not fear of failure. This interpretation is supported by the fact that they were lowest in observing the task to be difficult and in reporting negative affect. The High Daydreamers, on the other hand, exercised their control by turning to stimulus independent thought. The high degree of analogizing in this group may represent a competency warranting special additional investigation. It should be noted that the Miller Analogies Test is frequently used to aid in the selection of graduate students. Since the natural level of analogizing is highest in this group, it could be predicted that they would do best on the Miller Analogies Test.

The Low Daydreamers and the High Mindwanderers are significantly lower than the other two groups on self awareness and its correlated process, control of thought. However, their lack of control is manifested in distinctly different ways. The Low Daydreamer accepts a blank state of mind relatively frequently. Many of the thoughts which do occur are simple observations of impinging external stimuli. The High Mindwanderers, on the other hand, have the most active minds of any of the experimental groups. However, since they lack control over their thoughts, they are subject to the greatest incidence of negative affect. In addition, they do not develop any distinguishing mental competency.

This discussion of the four experimental groups leads to the conclusion that the Daydreaming factor may be regarded as one which measures relatively controlled information processing and the Mindwandering factor as one which measures relatively uncontrolled information processing.

Future research on the patterns of thought demonstrated in this study can deal with at least two major questions: 1) What is the range of tasks for which the demonstrated competencies are relevant? 2) Can techniques of control be taught to Low Daydreamers and High Mindwanderers?

Modular Analysis

Computerized methods of content analysis are in their early stages of development. The most extensive work has been done with the General Inquirer series of programs (Stone et. al., 1966). Goldhamer (1969) has reviewed the major problems in this area and some of the proposed solutions. He describes the basic problem as follows.

> As is true with other contemporary programs, the investigator is able to express his theory only in terms of the restricted elements directly observable in the text. This contrasts with the ability of a human content analyst to apply immense implicit knowledge of the structure of the language and the context of the text's source as he identifies content categories in the text.

Goldhamer then outlines several procedures for having the computer utilize context to deal with such problems as ambiguity, metaphor, and humor. It should be noted that the degree to which such procedures are necessary is dependent upon the body of data to be analyzed and the purpose of the analysis. In the present study, most of the modules could be classified on the basis of the keywords listed in the dictionary of Appendix B. A small percentage required the utilization of context which extended beyond the keywords. Modular analysis could be refined by developing computer programs to utilize this additional context along the lines described by Goldhamer.

Two aspects of modular analysis which are most important to its further development are: 1) its use of the act of thought as the basic unit of analysis and 2) its linkage to computer simulation of mental processes. It is planned to develop these aspects in future studies.

Conclusion

In Chapter I, it was pointed out that the term "daydreaming" is used in our culture as a global one which refers to a variety of unclearly defined mental processes. The methodology employed in this study (factor analysis and modular analysis) has shown the feasibility of studying these processes in detail. When this is done, qualitative and quantitative differences in those acts of thought which constitute daydreaming can be delineated. Consequently, individual and group differences in the emission of these acts of thought can also be described. The description of these differences makes it possible to begin a search for their causes and to more clearly understand and control the phenomena of daydreaming.

APPENDIX A

Daydreaming - Mindwandering Test

INSTRUCTIONS

This is a questionnaire on daydreaming. Different forms of this questionnaire are being distributed among hundreds of students at Bridgeport as part of a continuing project to learn more about a common mental process. Your participation will aid in this basic research in psychology.

You are asked to write your name on your answer sheet so that you may be contacted and invited to participate in additional research planned for the near future. The answers which you give are kept strictly confidential according to the same ethical standards which apply in the medical and legal professions. The particular data which you supply will be grouped with that of other students and referred to only as a statistic.

Please note that when we use words like "daydreams" we are using popular terminology for which there is no "official" definition. You may have your own particular idea of what you mean by a daydream or fantasy. Try to answer these items as they seem most to apply to you. Make a distinction between *thinking* about an immediate task you're performing, e.g. working, doing schoolwork and thinking directly about it while you are doing it and *daydreaming* which involves thoughts unrelated to a task you are working on or else thoughts that go on while you are getting ready for sleep or on a long bus ride.

Each of the items in this questionnaire says something about daydreams or daydreaming. Indicate to what extent each item applies to you, or describes you or your opinion. Make your judgment on a 5 point scale (A,B,C,D,E).

A stands for "definitely not true for me" or "Strongly uncharacteristic of me."

E stands for "very true for me" or "strongly characteristic of me."
The middle letters in the scale stand for intermediate degrees between "definitely not true " and "very true."

The wording of some of the items may seem unclear to you. Please answer each item even if you have difficulty in making a judgment on it. Make your judgment on your initial impression without spending too much time thinking about an item.

Please indicate only your *name* and *sex* on the heading of the answer sheet and then proceed to item 1.

SCALE 3

ACCEPTANCE OF DAYDREAMING

Scale Item #	DD-MW #	Scoring Direction	Item
1	66	-	Daydreaming in an adult is really childish.
2	72	-	I feel badly about daydreaming because it may indicate a weakness in character.
3	6	+	A really original idea can sometimes develop from a really fantastic daydream.
4	25	-	Daydreams are unreal and seldom come true.
5	42	-	I feel guilty about my daydreams.
6	1	-	Because daydreaming often takes me away from my work, I try to avoid it even when I have no specific task to complete.
7	39	-	The fewer daydreams one has, the more time there is to really "live."
8	74	-	Daydreams accomplish nothing more than a temporary escape and just avoid things that must be done.
9	82	-	Daydreaming never solves any problems.
10	92	+	Daydreaming is a common experience for great scientists and artists as well as for the average person.
11	102	+	Daydreaming is normal for adults as well as for adolescents and children.
12	48	+	I find my daydreams are worthwhile and interesting to me.

SCALE 4

POSITIVE REACTIONS IN DAYDREAMING

Scale Item #	DD-MW #	Scoring Direction	Item
1	45	+	I can be aroused and excited by a daydream.
2	56	+	A "happy" daydream helps me "snap out of" a spell of unhappiness.
3	63	+	My daydreams are often stimulating and rewarding.
4	96	+	My daydreams often cheer me up when I feel blue.
5	5	+	Sometimes a thrill goes up my spine as I reflect on a great amount of triumph and achievement.
6	20	+	I often relive happy or exciting experiences in my daydreams.
7	107	-	My daydreams often leave me with feelings of sadness.
8	51	+	A daydream can bring a smile to my face.
9	77	+	I usually feel content and quite excited after a daydream.
10	86	+	Daydreams are more likely to arouse pleasant than unpleasant emotions within me.
11	23	+	My daydreams often leave me with a warm, happy feeling.
12	14	+	My fantasies usually provide me with pleasant thoughts.

SCALE 6

VISUAL IMAGERY IN DAYDREAMS

Scale Item #	DD-MW #	Scoring Direction	Item
1	21	-	The "scenes" in my daydreams are sort of fuzzy and unclear.
2	46	+	I can see the people or things in my daydreams as if they were moving around.
3	52	+	I sometimes have a very clear, lifelike picture of what I am imagining.
4	70	+	I can often "see" a large number of things or people in my fantasies.
5	78	-	I do not really "see" the objects in a daydream.
6	87	+	My fantasies often consist of black-and white or color images.
7	97	-	My daydreams are mostly made up of thoughts and feelings rather than visual images.
8	7	+	Visual scenes are an important part of my daydreams.
9	15	+	The "pictures in my mind" seem as clear as photographs.
10	27	-	The scenes of my daydreams are never longer than brief flashes.
11	32	+	The "scenes" in my daydreams are so vivid and clear to me that my eyes seem actually to follow them.
12	60	+	I can still remember scenes from recent daydreams.

SCALE 7

AUDITORY IMAGES IN DAYDREAMS

Scale Item #	DD-MW #	Scoring Direction	Item
1	41	+	In a daydream, I can hear a tune almost as clearly as if I were actually listening to it.
2	71	-	When people speak in my daydreams, I cannot really hear their voices.
3	54	+	My daydreams are usually accompanied by the sounds of the subjects of my daydreams.
4	108	+	I can hear music with shades of both softness and loudness in my daydreams.
5	3	+	During a daydream, voices seem to come in loudly and clearly and then fade away.
6	12	+	I sometimes seem to be able to hear the characters in my fantasies talking to one another.
7	49	+	The sounds I hear in my daydreams are clear and distinct.
8	65	+	A piece of music sometimes runs through my head as clearly as if I were listening to it on a transistor radio.
9	75	-	When I do hear voices in my thoughts, they are not really very clear or recognizable.
10	84	+	I can hear conversations between myself and other people very clearly in my mind during a daydream.
11	94	+	Sometimes sounds I've heard in the past come into my mind during a daydream as if I could almost hear them again.
12	103	+	The voices of people who are important to me sound very clear when I daydream about them.

SCALE 11

FUTURE IN DAYDREAMS

Scale Item #	DD-MW #	Scoring Direction	Item
1	9	+	Before going somewhere, I imagine the scene and what I will be doing.
2	17	+	I picture myself as I will be several years from now.
3	29	+	I am more likely to think about to-morrow than wonder about yesterday.
4	68	+	I think about how "the world of the future" will look.
5	90	-	I never plan where I'll be or what I'll be doing several years from now.
6	100	-	I do not think about what the future will be like
7	34	+	I daydream about what is about to happen.
8	37	-	I seldom think about what I will be doing in the future.
9	58	+	My thoughts are of the future rather than of the past.
10	80	+	I daydream about what I would like to see happen in the future.
11	104	+	I find myself imagining what I will be doing a year from now.
12	62	+	I tend to daydream about the events of the coming weeks and months more than of the happenings of the past.

SCALE 13

MIND WANDERING

Scale Item #	DD-MW #	Scoring Direction	Item
1	10	-	My mind seldom wanders while I am working.
2	59	+	At times it is hard for me to keep my mind from wandering.
3	67	-	My mind seldom wanders from my work.
4	83	+	During a lecture or speech, my mind often wanders.
5	88	-	I have seldom found my mind wandering during a speech, concert, show, radio, or TV program.
6	106	-	My thoughts seldom drift from the subject before me.
7	26	+	I am the kind of person whose thoughts often wander.
8	40	-	I have little difficulty in keeping my mind focused on a long, tedious task.
9	43	-	I can work at one thing for a long time with relatively little effort.
10	93	+	No matter how hard I try to concentrate, thoughts unrelated to my work always creep in.
11	98	+	I have difficulty in maintaining concentration for long periods of time.
12	2	+	During a speech, meeting, or lecture, I often "come to," realizing that I have not heard a word the speaker was saying.

SCALE 25

BOREDOM

Scale Item #	DD-MW #	Scoring Direction	Item
1	19	+	Most of the things I do are not important or interesting.
2	44	-	Each day is full of things which keep me interested.
3	64	+	I find that I easily lose interest in things I have to do.
4	73	+	Most things that are interesting to start with lose their appeal after a while.
5	95	-	I like to finish what I am doing before starting something new.
6	4	+	I tend to be easily bored.
7	13	+	I seldom get really interested and involved in what I am doing.
8	50	+	I often find it quite difficult to finish something that I was initially quite interested in.
9	53	-	I can work at something for a long time without feeling the least bit bored or restless.
10	76	-	Most of my time is filled with exciting, interesting things.
11	85	-	I tend to be quite wrapped up and interested in whatever I am doing.
12	30	-	I am seldom bored.

SCALE 26

MENTATION RATE

Scale Item #	DD-MW #	Scoring Direction	Item
1	16	-	Sometimes during the day, I am not particularly aware of anything within my mind.
2	22	-	My mind is often blank.
3	36	+	When alone, thoughts do not stop racing through my mind.
4	61	+	My thoughts often seem to race through my mind.
5	89	+	I think about a subject only for a few seconds before the next thought appears in my mind.
6	99	+	There is always something going through my mind.
7	8	+	I find thoughts chasing through my mind at a great speed.
8	28	-	Many times there is nothing at all going through my mind.
9	33	-	My thoughts often come to me slowly.
10	47	-	I often have periods where I am not particularly conscious of my thoughts.
11	69	+	My mind is always on the go.
12	79	+	My mind is always active.

SCALE 27

DISTRACTIBILITY

Scale Item #	DD-MW #	Scoring Direction	Item
1	18	-	My attention is seldom diverted by what others around me are doing.
2	24	+	I am always glad to find an excuse to take me away from my work.
3	81	+	Faced with a tedious job, I notice all the other things around me that I could be doing.
4	91	+	When sitting in a large lecture or meeting, I usually find myself looking around a great deal at the people or objects in the room.
5	105	+	When stuck with one job for a long time, I begin to pay attention to my fingernails or some aspect of my personal appearance.
6	55	+	Even when I am listening to an interesting speaker, my mind wanders.
7	11	+	I find it hard to read when someone is on the telephone in a neighbor ing room.
8	31	+	I find it difficult to concentrate when the TV or radio is on.
9	35	-	I can study quite well under noisy, disruptive circumstamces.
10	38	-	My ability to concentrate is not impaired by someone talking in another part of my house or apartment.
11	57	-	I am not easily distracted.
12	101	-	When I am deeply engrossed in my work, it is difficult for someone to catch my attention.

APPENDIX B

Dictionary for Modules

Note: Some suffixes have been omitted.

1: Concentrating on | Performance

concentrat
keep up with
keep pressing
just pushing
just pressing
following...pattern
thoughts...stay with it
all I think about is...pressing
just listening...and responding

2: Observe | Performance | Difficult, Unable, Impossible

can't
not...able
not...concentrate
can't respond
hard doing
hard to press
losing concentration
trouble
difficult
hard...concentrat
can't...concentrat
really...hard
very...hard
more...hard
get...hard
isn't getting...easier

3: Observe | Performance | Negative, Mistake, Deteriorating

mistake
wrong
worse
miss
mess...up
bad
sloppy
mixed up
overanticipate
can't anticipate
throws me off
fooled me
lost track

take more and more time
notice mistake
lose...timing
get...slower
I...slow down
reflex...worse
got careless
lost...self
got lost
botched
goof it up
got...out of kilter
I...uncoordinated

4: Observe | Performance | Positive, Accurate, Improving

best
better
improv
well
easier
get...used to it
becom...easy
not as hard
getting...hang of it

5: Observe | Discrimination | Difficult, Impossible

confus
so close together
can't distinguish
problem...discriminat
hard...discriminat
sound...alike
sound...same
harder to tell...apart
hard...distinguish
mix up tones
can't distinguish

6: Describes | Performance

Code if keywords for performance are present and keywords for other modules are not.

7: Observe | Stimulus | Fast

fast
really coming

8: Observe | Stimulus | Attribute

the first ones are
each new series
the noises seem
low...seem
low are
low...always
noticed this time
more low...than
about the sound
start...low
looking at...button
seem...to be
click
noise sounded
random sound
equal number
more high
always...high
no pattern
seem...short
get...short
lot high
this series
thirty beeps
sound...different
stiffness of...button
seem...louder
count
seem...slower
seem...same

9: Wonder about | Performance

wonder...I am doing
wonder...supposed to
whether...right

10: Wonders about | Attribute of Experiment

wonder...experiment
wonder...measuring

wonder...purpose
wonder...suppose
wonder...about
wonder...test
wonder...prove
have to do with
why...doing it
what...purpose
what...sense
what...importance
what...prove
what...experiment
curious
don't see...point
wonder...done
about experiment
what all about
figure...purpose

11: Hypothesizes about | Attribute of Experiment

maybe
whether...could be
beginning...theory

12: Comments on | Attribute of Experiment

it would seem
discovered something
I can stop it
it would be
this takes
it seems
wish...buttons
wish...someone in here

13: Comments on | Duration of Experiment

wish...out of here
waiting for...experiment
wish...experiment
wish...end
when...stop
when...out of here
seem...forever

14: Observe | Affect | Bored

bored
boring
monotonous
tired
tedious
want...sleep

15: Observe | Affect | Negative

anxi
frustrat
irritat
angry
anger
fluster
nervous
stupid
uncomfortable
painful
fingers...hurt
depressed
getting...warm
impatient
urge to push wrong one on purpose

16: Oberve | Affect | Positive

relaxing
lulling
fun
interesting
amusing

17: Observes | Mental Processes

thoughts...random
thoughts...scattered around
mind...wander
won't be able to concentrate
I was in a daze
daydreaming
whole mess of thoughts
thinking of so many things
thinking about other things
hard to distinguish thought
not sure what thinking of
things went through my head
mind's drifting

can't remember

18: Observe | Mind | Blank

none
nothing
no...thought
didn't...any thought
wasn't...thinking of anything

19: Stimulus Independent Thought

Generic Category for Modules 25-29.

20: Consider | Choice

don't want...press
choice
on the other hand
then again
whether...press
seem...yet
don't know what...do
whether...push
try...decide

21: Consider | Choice | Presses

prefer to play
try...hang of it
try...again
try...one more time
try...once
what do you say...we press
I'll push
might as well do
beats...sitting around
lot better...push
give...try
willing...try
give...shot
I'll...try
we'll...try
I...try
start again

22: Consider | Choice | Does not Press

rest
quit...press
decide not
won't...touch
not...push
sit this out
not hit...buttons
will relax
not...press

23: Observes | Environment

room
wall
cement
block
chair
door
desk
drawer
floor
blinds
microphone
static
ceiling
box
tape
day out
outside
headphones
hall
wires
hear...outside
warm
closet
plug
screw
bookcase
shelves
cabinet
cables

24: Observe | Body

finger
stomach
hand

shoulder
knuckle
heart
arm
I'm hungry
beard
foot
eye
head
ear

25: Analogizes | |

look...like
like...when
sound...like
I am like
almost like
seem...like
as...if
just...like
sort of like
comparing
remind...of
remind...me

26: Recall | Past

Form from leftover list when other stimulus independent thoughts categorized.

27: Observes | Future

rest of my life
tonight
I have to
weekend
when I get out of
going to
tomorrow
next class
will never believe
Easter vacation
later on

28: Describe | Self

I...like
I...always
I...probably
I felt...because
I am a
I could
I was
I'm so
I...hate to feel
everything that has happened to me
all my life

29: Combine I Topic

I wish
I would like to be
I want to be
I should have
I could...pretend
what...if
I wonder
I...imagine

APPENDIX C

Programs for Modular Analysis

P1

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.F1C,DISP=SHR
//SYSIN DD *
*P1.  Prints all or part of file.
*SEARCHES DATA SET FOR APPROPRIATE SUBJECT NO. AND PRINTS
*SUBSEQUENT DATA.
    INPUT('DATA',10,80)
    DEFINE('PAROUT(PAR)')
    OUTPUT('OUT', ,'(1H1,132A1)')
    PAT = LEN(*I) FENCE BREAK('.?!: ') @CF SPAN('.?!: ') @C
    PAT2 = LEN(*A) . FIRST FENCE LEN(*B) . SECOND
    ENDPAR ='>'
    PATSNO = 'SUBJECT NO.'
    BEGIN = 'SUBJECT NO. 188'
START PAR =
    PAR = PAR DATA   :F(END)
    PAR BEGIN   :F(START)
NEXPAG OUT = PAR
START1 PAR =
START2 PAR = PAR DATA   :F(END)
    PAR PATSNO   :S(NEXPAG)
    PAR ENDPAR    :F(START2)
    PAROUT(PAR)   :(START1)
PAROUT I =
    A =
    B =
SEARCH PAR PAT  :F(TESTA)
    CURLAST  = I
    I = C
    ESTRIP = A + 125
    GT(C,ESTRIP)  :F(SEARCH)
    B = CURLAST - A
    PAR PAT2
    OUTPUT =
    OUTPUT = SECOND
    I = CURLAST
    A = CURLAST  :(SEARCH)
TESTA EQ(A,0)    :S(OUTF)F(OUTS)
OUTF A = CF + 1
    PAR PAT2
    OUTPUT =
    OUTPUT = FIRST :(RETURN)
OUTS B = (CF - A) + 1
    PAR PAT2
    OUTPUT =
    OUTPUT = SECOND   :(RETURN)
END
```

P2

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.F4C,DISP=SHR
//FT20F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
// SPACE=(1300,(1,1),RLSE),DCB=(LRECL=130,BLKSIZE=1300,RECFM=FB),
// DSN=ISAACSD.F4W.DATA
//SYSIN DD *
*P2.LISTS WORD COUNT FOR EACH TRIAL FOR EACH SUBJECT IN A GROUP
*FILES MATRIX FOR FURTHER ANALYSIS
*Output: F1W F2W F3W F4W S1W S2W S3W S4W
    INPUT('DATA',10,80)
    OUTPUT('FILE',20,'(130A1)')
    &STLIMIT = 80000
    H = ARRAY(15)
    EX = ARRAY('50,15')
    DIG = '0123456789'
    ALPHA = 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
    SNO = 'SUBJECT NO.' BREAK(DIG) FENCE BREAK(' ') . S
    ENDPAR = '>'
    ENDW = '. '
    PAT = BREAK(ALPHA) SPAN(ALPHA) BREAK(ENDW) SPAN(ENDW)
    BLANKS = '       '
STRT PAR =
READ PAR = PAR DATA    :S(TEST1)F(PRINT)
TEST1 PAR SNO     :S(NAME)F(TEST2)
TEST2 PAR ENDPAR =   :S(COUNT)F(READ)
NAME C = C + 1
   T = 0
    H<C> = S      :(STRT)
COUNT T = T + 1
C1 PAR PAT =      :F(STRT)
    EX<T,C> = EX<T,C> + 1     :(C1)
PRINT P = 1
    HEAD = '      '
PR HEAD = HEAD H<P> '  '
    P = LT(P,15) P + 1    :S(PR)
    FILE = HEAD
    OUTPUT = HEAD
    FILE =
   OUTPUT =
    I = 1
    K = 1
    ROW = '1    '
LOOP D = EX<I,K>
    B = SIZE(D)
    BB = 5 - B
    BLANKS LEN(*BB) . F
    J = F D
    ROW = ROW J
    K = LT(K,15) K + 1     :S(LOOP)
    FILE = ROW
    OUTPUT = ROW
    I = I + 1
```

```
        EQ(I,50)      :S(END)
        I2 = I '          '
        I2 LEN(5) . I3
        ROW = I3
        K = 1     :(LOOP)
END
```

P3

```
// EXEC WATFIV
//GO.SYSIN DD *
$JOB
C P3. Computes Statistics on Number of Words Spoken.
C       Input: F1W F2W F3W F4W S1W S2W S3W S4W
      DIMENSION KEAD(15)
      DIMENSION IEX(48,15)
      DIMENSION NN(15),ISUM(15),ISUMX2(15),XBAR(15)
      READ(10,15) (KEAD(K),K=1,15)
   15 FORMAT(7X,15(I3,2X),/)
      DO 30 I = 1,48
      READ(10,20) (IEX(I,K),K=1,15)
   20 FORMAT(7X,15(I3,2X),48X)
   30 CONTINUE
      READ(10,35) (NN(K),K=1,15)
   35 FORMAT(7X,15(I3,2X))
C     ZERO VARIABLES
      DO 50 IZ = 1,15
      ISUM(IZ) = 0
      ISUMX2(IZ) = 0
      XBAR(IZ) = 0
   50 CONTINUE
C     CALCULATE SUM,SUMX2
      DO 80 L = 1,15
      JSUM = 0
      JSUMX2 = 0
      N = NN(L)
      DO 70 J = 1,N
      JSUM = JSUM + IEX(J,L)
      JSUMX2 = JSUMX2 + (IEX(J,L) * IEX(J,L))
   70 CONTINUE
      ISUM(L) = JSUM
      ISUMX2(L) = JSUMX2
      XBAR(L) = ISUM(L)/N
   80 CONTINUE
C     CALCULATE VAR & SD
      NSUM = 0
      NSUMX2 = 0
      NT = 0
      DO 100 K = 1,15
      NT = NT + NN(K)
      NSUM = NSUM + ISUM(K)
      NSUMX2 = NSUMX2 + ISUMX2(K)
  100 CONTINUE
      GMEAN = NSUM/15
      VAR = ((NT*NSUMX2)-(NSUM*NSUM))/(NT*(NT-1))
      SD = SQRT(VAR)
C     PRINT RESULTS
      WRITE(6,110) (KEAD(K),K=1,15)
  110 FORMAT('1',7X,15(I3,4X),/)
      DO 140 I = 1,48
      WRITE(6,120) (IEX(I,K),K=1,15)
```

```
  120 FORMAT(' ',7X,15(I3,4X),18X)
  140 CONTINUE
      WRITE(6,150) (NN(J),J=1,15)
      WRITE(6,155) (ISUM(J),J=1,15)
      WRITE(6,160) (XBAR(J),J=1,15)
  150 FORMAT('0','N=',5X,15(I3,4X))
  155 FORMAT(' ','SUM=',3X,15(I4,3X))
  160 FORMAT(' ','MEAN=',2X,15(F6.2,2X))
      WRITE(6,170) GMEAN,VAR,SD
  170 FORMAT(' ','GMEAN= ',F7.3,5X,'VAR= ',F12.4,5X,'SD= ',F9.4)
      WRITE(6,180) NSUM,NSUMX2
  180 FORMAT(' ','NSUMX= ',I6,5X,'NSUMX2= ',I8)
      STOP
      END
$DATA
//FT10F001 DD DSN=ISAACSD.F1W.DATA,DISP=SHR
```

P4

```
//EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.F1C,DISP=OLD
//SYSIN DD *
*P4. Creates Nonalphabetized list of each different word and
*frequency of occurrence.
*GIVES NUMBER OF DIFFERENT WORDS IN GROUP.
*OUTPUT IS PUNCHED TO GIVE DATA FOR CONSTRUCTION OF MASTERTABLE.
*Input: F1C F2C F3C F4C S1C S2C S3C S4C
*PUN IS ASSOCIATED WITH OUTPUT BECAUSE PUNCH ABORTS TOO SOON.APPEARS
*TO BE COMPILER ERROR.
*PARAMETER: G = GROUP NO.
     G = 'G4P2'
     INPUT('DATA',10,80)
     OUTPUT('PUN',11,'(80A1)')
     SEPARATOR = ' .,;:?!'
     END = BREAK(SEPARATOR)
     GAP = SPAN(SEPARATOR)
     TOKEN = END . WORD GAP
     COUNT = TABLE(100,30)
     ENDPAR = '>'
     PAT = '                                         '
START &ANCHOR =
START1 PAR = PAR DATA  :F(PRINT)
     PAR ENDPAR  :F(START1)
     &ANCHOR = 1
     PAR GAP =
NEXTT PAR TOKEN =    :F(START)
     COUNT<WORD> = COUNT<WORD> + 1  :(NEXTT)
PRINT OUTPUT =
     OUTPUT = 'WORD COUNTS ARE:'
     OUTPUT =
     COUNT = CONVERT(COUNT,'ARRAY')  :F(END)
*TRANSFORM WORD TO CONSTANT LENGTH BY ADDING BLANKS
     I = 1
LOOP PAT1 = COUNT<I,1> PAT  :F(PRINT2)
     PAT1 LEN(35) . PAT2  :F(END)
     X = SIZE(COUNT<I,2>)
     L = 8 - X
     PAT LEN(*L) . PAT3
     OUTPUT = PAT2 '=' COUNT<I,2> PAT3 G   :F(PRINT2)
     PUN = PAT2 '=' COUNT<I,2> PAT3 G
     I = I + 1  :(LOOP)
PRINT2 OUTPUT = 'THE NUMBER OF DIFFERENT WORDS IN THIS GROUP IS  ' I
END
```

P5

```
//EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT35F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
//  SPACE=(1600,(1,1),RLSE),DCB=(LRECL=80,BLKSIZE=1600,RECFM=FB),
//  DSN=ISAACSD.TEMP.DATA
//SYSIN DD *
*P5.Creates Mastertable
*GIVES ALL WORDS IN ALPHABETICAL ORDER AND FREQUENCY OF OCCURRENCE
*IN EACH GROUP.FORMAT OF INPUT CARDS IS:
*ABOUT                              =15      G4
*TAKES DATA FROM FILE ALPHABETIZED BY SORT PROGRAM.
*CARD MUST BE SET AT APPROPRIATE VALUE.
    INPUT('DATA',30,80)
    OUTPUT('FILE',35,'(80A1)')
    PAT = BREAK(' ') $ WOR SPAN(' ') BREAK('=') SPAN('=') LEN(8) $ FREQ
+BREAK('G') SPAN('G') LEN(1) $ G
    PAT1 = '        '
    PAT2 = '                            '
    WORD = BREAK(' ') . WORD1
    WORDD = BREAK(' ') . WORD2
    A = ARRAY(1900)
    BARN = ARRAY('1900,5')
    P = 1
STRT A<P> = DATA  :F(SET)
    P = P + 1
    N = N + 1  :(STRT)
SET AP = 1
    BP = 1
    NN = N
*FILL ROW OF BARN WITH PATTERNS OF 8 BLANKS.
ZERO Z = 1
ZERO1 BARN<BP,Z> = PAT1
    Z = LT(Z,5) Z + 1  :S(ZERO1)F(SET1)
SET1 A<AP> PAT  :F(PRINT)
    BARN<BP,5> = WOR
    BARN<BP,G> = FREQ
    L = AP
    AP = AP + 1
    A<L> WORD
    A<AP> WORDD
    IDENT(WORD1,WORD2)   :F(FIX)
    NN = NN - 1  :(SET1)
FIX BP = BP + 1  :(ZERO)
PRINT BP = 1
    CARD = 2372
PRINT1 X = SIZE(BARN<BP,5>)
    L = 28 - X
    PAT2 LEN(*L) . PAT3
    OUTPUT = BARN<BP,5> PAT3 BARN<BP,1> BARN<BP,2> BARN<BP,3> BARN<BP,4>
+PAT1 CARD
      FILE = BARN<BP,5> PAT3 BARN<BP,1> BARN<BP,2> BARN<BP,3> BARN<BP,4>
+PAT1 CARD
    V = LT(V,NN) V + 1  :F(PRINT2)
```

```
     CARD = CARD + 1
     BP = BP + 1  :(PRINT1)
PRINT2 OUTPUT = 'I AM HERE'
END
```

P6

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.S1H.DATA,DISP=SHR
//SYSIN DD *
*P6. PRINTS PARAGRAPH CONTAINING KEYWORD
      INPUT('DATA',10,90)
     A = ARRAY(100)
     KEY = 'CAUSE'
ST P = 1
ST1 A<P> = DATA   :F(END)
     CT = LT(CT,200) CT + 1    :F(END)
     A<P> '>'       :S(LA)
     P = P + 1    :(ST1)
LA I = 1
LB A<I> KEY    :S(PRINT)
     I = LT(I,P) I + 1     :S(LB)F(ST)
PRINT I = 1
PA OUTPUT = A<I>
     I = LT(I,P) I + 1   :S(PA)F(ST)
END
```

P7

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.S1C.DATA,DISP=SHR
//FT20F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
//   SPACE=(TRK,(10,1),RLSE),DCB=(LRECL=90,BLKSIZE=1800,RECFM=FB),
// DSN=ISAACSD.S1H.DATA
*P7. ADDS HEADERS TO C-FILES.
*PARAMETER G = GROUP NUMBER
     G = '2'
     INPUT('DATA',10,80)
     OUTPUT('FILE',20,'(90A1)')
     DIG = '0123456789'
     ALPHA = 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
     CHAR = DIG ALPHA
     R = BREAK(CHAR) LEN(80) . OUT
     RL = BREAK('$') . OUT2
     TR = FENCE BREAK(DIG) BREAK('.') . T SPAN('.')
     SUBJ = 'SUBJECT NO.' BREAK(DIG) FENCE BREAK(' ') . S
STRT LINE = DATA    :F(END)
     LINE SUBJ   :S(STRT)
     LINE TR =   :S(PRINT)
     ROW = ROW LINE   :(STRT)
PRINT ROW = G SP '-' TP '-1' '  (#LABEL)  @  ' ROW '$'
CH2 ROW R =   :F(CH3)
     FILE = OUT   :(CH2)
CH3 ROW RL
     FILE = OUT2
     SP = S
    TP = T
     ROW =
     ROW = LINE  :(STRT)
END
```

P8

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.TEMP80.DATA,DISP=SHR
//FT20F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
//    SPACE=(TRK,(10,1),RLSE),DCB=(LRECL=90,BLKSIZE=1800,RECFM=FB),
// DSN=ISAACSD.S21.DATA
*P8. ADDS HEADERS TO IMBEDDED MODULES
*DATA FROM LINE NUMBERED SETS IS COPIED TO RECL=80 TO ELIMINATE
*NUMBERS.
      INPUT('DATA',10,80)
      OUTPUT('FILE',20,'(90A1)')
      PAT = BREAK('-') . S SPAN('-') BREAK('-') . T
     PAT2 = LEN(80) . AA LEN(*R) . BB
      MOD = BREAK('¢') . FIRST SPAN('¢') BREAK('>') . SECOND
      BLANK = DUPL(' ',80)
      DEFINE('PAROUT(PAR)')
PSTRT PAR =
      M = 1
      FILE =
STRT PAR = PAR DATA   :F(END)
      PAR BLANK   :S(PSTRT)
      PAR '>'   :F(STRT)
      PAR PAT   :F(ERROR)
CUT PAR MOD   :S(CHANG)
      PAROUT(PAR)   :(PSTRT)
CHANG PAR = FIRST '>'
      PAROUT(PAR)
      M = M + 1
      PAR = S '-' T '-' M '  (#LABEL)  @  ' SECOND '>'  :(CUT)
PAROUT L = SIZE(PAR)
PA GT(L,80)   :F(PB)
     R = L - 80
      PAR PAT2
      FILE = AA
      PAR = BB
      L = R   :(PA)
PB FILE = PAR   :(RETURN)
END
```

P9

```
// EXEC SNOBOL4,TIME=3,R=35000,H=300000,REGION=350K
//FT10F001 DD DISP=OLD,UNIT=DISK,
// DSN=ISAACSD.RED.DATA
//FT20F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
// SPACE=(TRK,(9,1),RLSE),DCB=(LRECL=90,BLKSIZE=1800,RECFM=FB),
// DSN=ISAACSD.ORDK.DATA
//FT30F001 DD DISP=(NEW,CATLG,DELETE),UNIT=SYSDA,
// SPACE=(TRK,(15,1),RLSE),DCB=(LRECL=90,BLKSIZE=1800,RECFM=FB),
// DSN=ISAACSD.MISS.DATA
//SYSIN DD *
*P9. SPLITS H- or I- FILES INTO SEPARATE FILES FOR
*EACH TYPE OF MODULE.
*COMPLETE FILE IS LOADED INTO CORE
      LABELS = '14.1,14.2,14.3,14.4,8.1,8.2,8.3,'
     INPUT('DATA',10,90)
     OUTPUT('HFILE',20,'(90A1)')
     OUTPUT('MFILE',30,'(90A1)')
      LAB = BREAK(',') . H SPAN(',')
      HPAT = *H BREAK('@')
      BLANK = '*'
       DC = ARRAY(1250)
       P = 1
LOAD DC<P> = DATA   :F(FIRST)
       P = LT(P,1250) P + 1   :S(LOAD)
FIRST LABELS LAB =   :F(PMISS)
       I = 1
LP DC<I> HPAT   :F(ZE)
      A = I
LOOP DC<I> '>'   :S(NXT)
       I = I + 1   :(LOOP)
NXT B = I
L2 HFILE = DC<A>
       DC<A> = '*'
      A = LT(A,B) A + 1   :S(L2)
ZE I = LT(I,P) I + 1   :S(LP)F(FIRST)
PMISS I = 1
PA DC<I> BLANK   :S(PB)
       MFILE = DC<I>
PB I = LT(I,P) I + 1   :S(PA)
END
```

P10

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.S31.DATA,DISP=SHR
*P10. SEARCHES HEADER FOR SPECIFIED LABEL.  PRINTS MODULE.
     LABELS = 'COMB,OM,'
     ALPHA = 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
     TYPE = BREAK(ALPHA) BREAK(',') . LAB
      INPUT('DATA',10,90)
     A = ARRAY(100)
     DIG = '0123456789'
      TOP = FENCE BREAK(DIG) LEN(25) . HEAD
     OUTPUT('NEXPAG', ,'(1H1,132A1)')
FIRST LABELS TYPE =   :F(END)
     REWIND(10)
     NEXPAG =
ST P = 1
ST1 A<P> = DATA   :F(FIRST)
      A<P> TOP   :F(ST)
     HEAD LAB    :F(ST)
ST2 A<P> '>'   :S(PRINT)
      P = P + 1
      A<P> = DATA  :(ST2)
PRINT I = 1
PA OUTPUT = A<I>
      I = LT(I,P) I + 1  :S(PA)F(ST)
END
```

P11

```
// EXEC SNOBOL4,TIME=2,R=35000,REGION=350K
//FT10F001 DD DSN=ISAACSD.S2M.DATA,DISP=SHR
//FT20F001 DD DISP=(NEW,CATLG,DELETE),UNIT=DISK,
//  SPACE=(TRK,(1,1),RLSE),DCB=(LRECL=130,BLKSIZE=1300,RECFM=FB),
// DSN=ISAACSD.S2X.DATA
//SYSIN DD *
*P11.COUNTS FREQUENCY OF EACH MODULE PER SUBJECT
*INPUT: H-FILES OR M-FILES
*OUTPUT: X-FILES
     INPUT('DATA',10,90)
      OUTPUT('FILE',20,'(130A1)')
      CAT = 'S2.7,S2.2,S2.3,S2.4,S2.5,S7.1,S2.6,S6.2,S6.1,'
+'S2.10,S2.8,S14.1,S14.2,S14.3,S14.4,S8.1,S8.2,S8.3,'
+'S13.1,S13.2,S13.3,S1.4,S1.2,S1.3,'
+'CH,CY,CN,OX,OM,OB,ANA,PAS,FUT,GSA,BIN,SMB,#LABEL,'
      TCAT = TABLE(40)
      SUBJ = '3,16,85,95,99,104,120,147,162,180,182,188,192,201,202,'
      TSUB = TABLE(15)
      A = ARRAY('38,16')
      PAT = BREAK(',') . C SPAN(',')
      PAT2 = BREAK(',') . S SPAN(',')
      PAT3 = LEN(1) BREAK('-') . S BREAK('(') SPAN('(') FENCE
+BREAK(')') . C BREAK('@')
      BL8 = '        '
*FORM TCAT
LOOP CAT PAT =    :F(LOOP2)
      N = N + 1
      TCAT<C> = N    :(LOOP)
LOOP2 SUBJ PAT2 =    :F(COUNT)
      K = K + 1
      TSUB<S> = K    :(LOOP2)
COUNT LINE = DATA    :F(TALLY)
      LINE PAT3    :F(COUNT)
      CP = TCAT<C>
      SP = TSUB<S>
      A<CP,SP> = A<CP,SP> + 1    :(COUNT)
*TOTAL MODULES ACROSS SUBJECTS
TALLY I = 1
      J = 1
TA T = T + A<I,J>
      J = LT(J,15) J + 1    :S(TA)
      A<I,16> = T
      T = 0
      J = 1
      I = LT(I,37) I + 1    :S(TA)
*TOTAL MODULES FOR EACH SUBJECT
      C = 1
      R = 1
      TM = 0
EA TM = TM + A<R,C>
      R = LT(R,37) R + 1    :S(EA)
      A<38,C> = TM
```

```
      TM = 0
      R = 1
      C = LT(C,16) C + 1  :S(EA)
*PRINT HEADER
      TYP = CONVERT(TCAT,'ARRAY')
      SUB = CONVERT(TSUB,'ARRAY')
      TROW = TROW BL8
      D = 1
P1 HEAD = SUB<D,1> BL8
      HEAD LEN(6) . H
      TROW = TROW H
      D = LT(D,15) D + 1   :S(P1)
      TROW = TROW 'TOT'
      OUTPUT = TROW
      FILE = TROW
      OUTPUT =
      FILE =
*PRINT RAW SCORES
      TYP<38,1> = 'TMOD'
      I = 1
      J = 1
LOOP4 LAB = TYP<I,1> BL8
      LAB LEN(8) . LABA
      ROW = ROW LABA
LOOP3 CEL = A<I,J>
      L = SIZE(CEL)
      GT(L,1)  :S(FILL)
      CEL = ' ' CEL
FILL CEL = CEL BL8
      CEL LEN(6) . CELA
      ROW = ROW CELA
      J = LT(J,16) J + 1  :S(LOOP3)
      OUTPUT = ROW
      FILE = ROW
      ROW =
      J = 1
      I = LT(I,38) I + 1  :S(LOOP4)
END
```

P12

```
// EXEC WATFIV
//GO.SYSIN DD *
$JOB
C      P12. CONVERTS FREQUENCIES TO PERCENTAGES. INPUT: X-FILES.
       DIMENSION HEAD(16),TYPE(38),TM(16),SCORE(37,16)
       REAL*8TYPE
       DIMENSION AVPROP(37)
       READ(10,11) (HEAD(J),J=1,16)
    11 FORMAT(6X,16(A6),/)
       DO 20 I = 1,37
       READ(10,16) TYPE(I),(SCORE(I,J),J=1,16)
    16 FORMAT(A8,16(F2.0,4X))
    20 CONTINUE
       READ(10,24) (TM(J),J=1,15)
    24 FORMAT(8X,16(F2.0,4X))
       WRITE(6,32) (HEAD(J),J=1,16)
    32 FORMAT('1',16(A6))
       WRITE(6,36) (TM(J),J=1,16)
    36 FORMAT('0',16(F4.0))
       DO 40 L =1,37
       WRITE(6,38) (SCORE(L,N),N=1,15)
    38 FORMAT('0',15(F4.0))
    40 CONTINUE
C      CONVERT CONTENTS OF SCORE TO PROPORTIONS
       DO 60 IC = 1,15
       DO 50 IR = 1,37
       SCORE(IR,IC) = SCORE(IR,IC)/TM(IC)
    50 CONTINUE
    60 CONTINUE
C      COMPUTE MEAN PROPORTIONS
       T = 0
       DO 80 KR = 1,37
       DO 70 KC = 1,15
       T = T + SCORE(KR,KC)
    70 CONTINUE
       AVPROP(KR) = T/15
       T = 0
    80 CONTINUE
C      PRINT PROPORTIONS
       WRITE(6,84)
    84 FORMAT('1',10X,'PROPORTIONS')
       WRITE(6,86) (HEAD(J),J=1,16)
    86 FORMAT('0',8X,16(A6))
       DO 100 K = 1,37
       WRITE(6,92) TYPE(K),(SCORE(K,J),J=1,15),AVPROP(K)
    92 FORMAT('0',A8,15(F6.4),F6.4)
   100 CONTINUE
       STOP
       END
$DATA
//FT10F001 DD DSN=ISAACSD.F3X.DATA,DISP=SHR
$STOP
```

APPENDIX D

Communalities and Eigenvalues of Studies 1 & 2

STUDY 1

			COMMUNALITY
Scale	1	General Daydreaming	.41452
Scale	2	Absorption in Daydreaming	.69129
Scale	3	Acceptance of Daydreaming	.31907
Scale	4	Positive Reactions in Daydreams	.43271
Scale	5	Frightened Reactions in Daydreams	.54222
Scale	6	Visual Imagery in Daydreams	.62242
Scale	7	Auditory Imagery in Daydreams	.34788
Scale	8	Problem Solving through Daydreams	.49171
Scale	9	Present Orientation in Daydreams	.08395
Scale	10	Future Orientation in Daydreams	.34675
Scale	11	Past Orientation in Daydreams	.27114
Scale	12	Bizarre Improbable Daydreams	.23615
Scale	13	Mind Wandering	.70068
Scale	14	Night Dream Frequency	.29666
Scale	15	Daydream Frequency	.62872
Scale	16	Achievement-oriented Daydreams	.40692
Scale	17	Hallucinatory Vividness of Daydreams	.36766
Scale	18	Fear of Failure in Daydreams	.69770
Scale	19	Hostile Aggressive Daydreams	.59651
Scale	20	Sexual Daydreams	.51450
Scale	21	Heroic Daydreams	.62143
Scale	22	Guilt Daydreams	.77860
Scale	23	Curiosity: Interpersonal	.26368
Scale	24	Curiosity: Impersonal - Mechanical	.13445
Scale	25	Boredom	.61677
Scale	26	Mentation Rate	.26012
Scale	27	Distractibility	.40464
Scale	28	Need for External Stimulation	.19818
Scale	29	Self-Reporting Tendencies	.24472

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	6.74850	53.9	53.9
2	3.05227	24.4	78.2
3	1.60069	12.8	91.0
4	1.13019	9.0	100.0

STUDY 2

		COMMUNALITY
Scale 3	Acceptance of Daydreaming	.24072
Scale 4	Positive Reactions in Daydreams	.54783
Scale 6	Visual Imagery in Daydreams	.56552
Scale 7	Auditory Imagery in Daydreams	.51698
Scale 10	Future Orientation in Daydreams	.28060
Scale 13	Mind Wandering	.60922
Scale 25	Boredom	.46801
Scale 26	Mentation Rate	.14150
Scale 27	Distractibility	.45304

FACTOR	EIGENVALUE	CUM PCT
1	2.5245	70.6891
2	1.2988	107.0578

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