The Demographic Correlates of Task Difficulty

1977

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THE DEMOGRAPHIC CORRELATES OF TASK DIFFICULTY

BY

IVAN RONALD APPLEBAUM
M.C.S., Rollins College, 1970

THESIS

Submitted in partial fulfillment of the requirements for the degree of Master of Science: Psychology in the Graduate Studies Program of the College of Social Sciences of Florida Technological University

Orlando, Florida
1977
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Introduction

The influence of an adult student's background (demographic variables) on his ability to perform on easy vs. difficult cognitive tasks is important for the understanding of classroom performance when we consider that it is necessary to understand cause before we can apply treatment. It is necessary to understand why some students do just enough to get by, why some students overwhelm any level of task, why some students do better on easy vs. difficult tasks and vice versa. If we were able to isolate a consistent personality or demographic characteristic (or combination of characteristics) of individuals that related to performance on cognitively difficult tasks, we would be able to:

1. Make more appropriate assignments.
2. Understand what skills need to be improved.
3. Know who is not satisfied by intrinsic motivators alone.
4. Group people more effectively for response to assignments.
5. Develop selection tests that would isolate demographics for the purpose of using
appropriate teaching methodology.

Support for this use of demographics to redesign school activities comes from Roth (1965) who, in a study of simple and complex task interference related to socio-economic-status level, concluded that if culturally deprived children cannot attend to complex stimuli, then the education system related to teaching at that level needs to be redesigned. The idea may be a function of the unique characteristics of his background is supported by research and information from Friedlander (1963) and Tannenbaum (1968).

Hannum (1974) presents hypothetical arguments that tasks occur in five different domains; intellectual skills, motor skills, attitudes, verbal information, cognitive strategies, and that you cannot generalize from activities or research in one area to any of the others. In an experimental demonstration of Hannum's hypothesis, Ash (1975) demonstrated that with third graders on three tasks of category clustering, paired-associates, and size transposition, performance on one type of task does not generalize to describe performance on other types of tasks.

The current study involved the processes of attending, learning, remembering, thinking, and thus was probably in the domain of cognitive strategy, defined by
Thus we must take into account that the studies quoted subsequently from different domains are at best limited predictors of performance in this study.

From the studies of Ash (1975) and the hypothesis of Hannum (1974), it seemed to be appropriate to make the assumption that the background variables influencing task performance would, or could, differ at the college student level from those studies on pre-schoolers and elementary school students, in that the ability levels in each domain are so different after ten or twelve years of additional schooling and other environmental experiences.

The task difficulty topic has, to a large extent, been unstudied from the point of view of using a heterogeneous mixture of adult student subjects and evaluating the complex interaction of multiple background variables on the performance of these students on cognitively easy and difficult tasks. Most studies have approached the task ease-difficulty question by identifying extreme levels of a single independent variable and then an evaluation was made of the subjects' performance on a task difficulty experimental variable. Studies which have been run in this general format and which provide inferences for elements of this current study are as follows:

Rhetts (1974) in a study of the performance of
reflective vs. impulsive second graders (males and females) on difficult and easy paired-associate and matched learning tasks, found that both impulsive and reflectives performed well on the easy task; however, impulsives made fewer errors than reflectives on easy items and more on the difficult items.

As a result of the Rhetts study, the current study measured Sc, self control, on the California Psychological Inventory (CPI), which included a component of impulsiveness to see whether there was a performance difference as a function of this variable.

Ruble and Nakamura (1974) found that boys were more affected than girls by task difficulty (two puzzles on the Wechsler Adult Intelligence Scale, first and second graders) but only approaching significance (.05 < p < .10). It was of interest to see whether after changing task domain and age (longer sexual socialization) there would be a sex difference in the current study.

In a study by Wolk and Ducette (1974) people with a higher degree of perceptual-cognitive processing ability (or internal as measured by the Rotter internal-external scale and operational definition) had a higher degree of incidental learning in a scanning and locating of typographical error tasks, although task difficulty moderated performance. The current study measured Ie, intellectual
efficiency, on the CPI, to further verify whether the performance related to intellectual level was moderated by task difficulty.

Kukla (1974) in an arithmetic problems task, found that when the task was thought to be difficult, subjects high in achievement motivation (Nach) performed better than those low in Nach. However, when the task was perceived as easy, the high Nach group performed worse than the low Nach group. The current study used Ac, achievement, on the CPI as a measure of achievement.

In the Kukla (1974) study, subjects were told that a task was hard or easy. The current study differs in that subjects had to make that judgement on their own (measured directly after task completion).

Mortenson (1967) found that in a pre-reading discrimination task given to beginning first graders, performance was associated with all three socio-economic-status levels (SES) (with intelligence held constant). For this study, SES was measured by parental income and occupational status level to ascertain whether these results hold for adult students.

Review of the literature for the current study included reviews of the allied topics of Persistance and Under/Over achievers, in order to evaluate previous research as completely as possible. In a study of
persistance related to the current study, Feather (1962) found that high Nach subjects work longer at final exams than low Nach subjects.

Studies have been performed evaluating the characteristics of under and over achievers and resultant task performance. The high achievers produce more and persist longer (Tamagini, 1969; Tennen, 1973). Overachievers tend to be motivated to a greater extent by factors inherent in the performance of the task (Haywood, 1968). Under and over producers may be related to middle class values and alienation from middle class values (Blood & Hulin, 1967). Perceived difficulty was found to be largely related to performance (Bratfisch, 1967). Data was obtained in this current study which would be additionally useful in providing support for the conclusions of the aforementioned studies, specifically that perceived difficulty would be correlated with: performance, quantity of output as a relative measure of persistance, elements of middle class values, perceived difficulty in the study, and achievement level.

In contrast to the studies previously identified, where one predictor was related to performance on a task difficulty problem, it was the intent of this study to take a different approach to understanding why people perform differently on difficult and easy tasks. This
study looked at a heterogeneous mixture of students and attempted to evaluate the predictor, or combinations of contributing predictor variables, that would predict performance on difficult and easy tasks. This study was performed in an in-context classroom activity (essay type quiz—typical of other quizzes taken by this group in this class at other times in the semester). The subjects remained naive regarding the experimental purpose during the experimental response on the criterion variable and during measures of the predictor variables. The evaluation rated both operationally defined difficult tasks and contrast that with performance on self-perceived task difficulty levels.

Hypothesis - Performance by adult students on high and low ease cognitive tasks are moderated by the demographic categories of: self-control, sex, ability (Ic, GPA), task easy perception, achievement, SES, race, introversion, self-concept.

Keeping in mind the Hannum (1974) and Ash (1975) disclaimers with regard to the problems involved in being able to predict the performance in one domain from the performance in another domain, the following predictions of the directions of the effect of each of the hypothesized variables were made with limited confidence:
Self-control - From the Rhett (1974) study it was anticipated that high Sc subjects would perform better on the difficult question than low Sc subjects and that both would perform well on the easy task.

Sex - Mohan and Shashi (1972), in an inverted writing task, found that sex by itself did not affect performance. However, from Ruble and Nakamura (1974) we saw that there was a limited relationship between sex and task difficulty. No directional prediction was made due to variability of references.

Ability - From the study by Wolk and Ducette (1974), it was predicted that ability, herein measured by Intellectual Efficiency (Ie) on the CPI, high school and college Grade Point Average (GPA), which contain elements of ability, would be positively correlated with performance on both hard and easy tasks.

Task Ease Perception - Bratfisch (1967), in a perceptual difficulty task in which subjects judged the complexities of various types of intelligence tests, subjects perceived
tasks that were more intellectually complex as more difficult. This study measured whether subjects corroborated the operationally defined difficult question as functionally difficult.

Achievement - Tennen (1973), in an unsoluble anagram task of persistence, demonstrated that high Nach subjects persisted for a significantly longer period of time than did subjects of low Nach. On a task ease assignment, Entin and Raynor (1973) found that high Nach subjects were better than low Nach subjects in both high and low task ease activities. Feather (1962) and Tamagini (1969) tend to corroborate while Kukla (1974) does not (see previous notation). Therefore, the prediction was that high Nach subjects would outperform low Nach subjects on both high and low ease tasks.

Race and SES - Grimmett (1967), in a problem-solving task, found that middle class whites produced higher on cognitive level tasks but found no difference in races on rate of processing. Burnes (1969) found that children's
performance on the Wechsler Intelligence Scale for Children was generally related to a child's SES, not race. Kohn (1974) found that performance by second graders on an achievement test was related to social class (.30 to .34**) and to race (.20 to .27**). The achievement tests covered word knowledge, reading, arithmetic. For this study, it was therefore predicted that SES would positively correlate with performance. Also, it was predicted that race would not relate to performance on any tasks. We measured race, however, to determine whether the results from other studies in other domains were generalizable.

Introversion - Mohan et al. (1972) on inverted writing task and substitution tasks found extroverts performed better than introverts. Generalizing from the Mohan et al. (1972) study to this current study is that extroverts would also outperform introverts on both difficult and easy tasks even though it is recognized that the applicability of the reference is limited.
Self-concept - On a word sort task (Wiener, 1973), it was found that high self-esteem subjects produced high performance. Keller (1969) studied fifth and sixth graders and found that higher self-concept leads to higher productivity. Therefore, the prediction was that in the current study, high self-esteem would correlate with high performance. The study itself evaluated whether self-esteem correlates positively with both high and low difficulty tasks.
Method

Subjects

Eighty-six college freshmen and sophomores at a Central Florida community college (Valencia Community College) in four classes of "Psychology in Business and Industry" participated in the experiment.

Of the 86 subjects, 78 were white, 8 were black, 58 were male, 28 were female, the mean age was 25.06 years with a standard deviation of 9.07.

An additional 27 subjects were exposed to the treatment but did not complete all demographic data sheets and due to computer requirement for complete data were eliminated from the study.

Ten subjects acted as an informal control group in that they produced all data but were absent on the day of the treatment and thus did not receive the experimental treatment. (Maslow Hierarchy Lecture)

Materials

Materials used included: overhead transparencies during treatment (see Appendix 1), test questionnaires (Appendix 2), a perceptual difficulty data sheet
(Appendix 3), a demographic data sheet (Appendix 4), and the California Psychological Inventory test booklet and hand scoring answer sheets.

The California Psychological Inventory (CPI) used in this study was authored by Harrison G. Gough, Ph.D., Consulting Psychologist Press, Inc., Palo Alto, California.

The intent of the CPI was to develop a set of scales for use with normal subjects, not patients, for identifying personality characteristics important for social living and social interaction. The CPI draws mixed reviews from the Mental Measurement Yearbooks, among such distinguished testing specialists as Cronbach, Thorndike, Kelly, and Goldberg. Primary criticism centers around the excess of scales, which can be lowered by factor analysis, the criteria oriented mode of construction limiting generality. On the positive side are the larger and mixed norm groups and scales which fit the requirements for this study. The reliabilities and validities are modest as shown (only for the scales used) in Table 1.

Procedure

The study consisted of providing a Maslow's hierarchy lecture (see Appendix 1) to all subjects. The lecture was conducted by the author, control was maintained on content, examples, pace, and order. No
Table 1
CPI Characteristics

<table>
<thead>
<tr>
<th>CPI</th>
<th>Reliability</th>
<th>Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H.S. Females N=125</td>
<td>H.S. Males N=101</td>
</tr>
<tr>
<td>Sc</td>
<td>.68</td>
<td>.75</td>
</tr>
<tr>
<td>Ie</td>
<td>.77</td>
<td>.74</td>
</tr>
<tr>
<td>Ac</td>
<td>.73</td>
<td>.60</td>
</tr>
<tr>
<td>Do</td>
<td>.72</td>
<td>.64</td>
</tr>
<tr>
<td>Wb</td>
<td>.72</td>
<td>.71</td>
</tr>
</tbody>
</table>
questions were allowed in order to maintain a consistency of input to the subjects (treatment). The next class period following the Maslow lecture, a five-question essay quiz was administered (see Appendix 2) with a 50-minute time limit. The first two questions were the experimental questions. The questions were counterbalanced to account for recency-primacy effects, but there were no controls over a student deciding on his own to work on the questions in a different order. The amount of points was equal for each question allowing extrinsic reward to be constant. The two experimental questions were at the beginning of the test to counter any gross fatigue effects.

The test questions were:

a. Why is it true that the needs of people do not always occur in the order that Maslow predicted?

b. Discuss how the knowledge of Maslow's hierarchy of needs could be used to motivate students to improve their performance.

In this study "a" was defined operationally to be the easy question since the material had all been presented in class. The question "b" had the background of the hierarchy of needs presented but not the applications called for and therefore, this has been defined the difficult task since it, in effect, calls for a higher
cognitive processing, that of integrating and applying, not just learning and playing back.

Performance on these two tasks was made based on idea count and word count. There was no attempt to qualitatively judge ideas, rather a raw count of ideas good or bad. Raters (3) evaluated (measured) idea count. the raters were trained by showing them the same three tests and a review of what constitutes an idea. The guidelines for raters is seen in Appendix 5.

In line with previous justifications, the demographic data obtained on each subject is shown in the next section. (Note: difficulty level was measured directly after the test was completed by each subject, Appendix 3.) The demographic evaluation and the CPI were administered three weeks after the dependent variable measure. The major timing consideration was that three groups were tested (dependent measure) two days after exposure to treatment and one group (a night class) was tested seven days after treatment.

Additional Experimental Controls

1. The subjects were not familiar with the purpose of the experiment during the measurement of the dependent variables and during the taking of the CPI and the demographic data form. Subjects
were told during the CPI that it was for experimental purposes but not the nature of the experiment.

2. The experimenter trained the people who in turn rated the dependent variables but did not participate in any other way in evaluating a scale which was subjective. The raters also remained naive as to the nature of the experiment until after the rating was completed.

Subjects were debriefed at the end of the experiment.

The following demographic data was obtained for this study: self-control, Sc on the CPI; sex-self report; ability, GPA high school and college-self report; intellectual efficiency, Ie on the CPI; task ease perception-task difficulty measure-self report; achievement, Ac on the CPI; SES-parents income-self report, parental occupation-self-report; race-self-report; introversion, Do on the CPI; and self-concept, Wb on the CPI.

**Scoring and Statistics**

1. Word count was measured on the two experimental questions.

2. Three independent raters, trained by the experimenter, counted ideas on each experimental question.
3. A correlation between raters was computed to determine the reliability of the counting idea task.

4. A multiple regression was run on the IBM 370 Model 125 computer using the BMD 02R Stepwise Regression program. This regression used demographic variables as predictors for each of the four dependent measures, word count and idea count under both the high and low task difficulty conditions. This operation demonstrated the individual and combined effect, if any, each independent variable had on performance.

5. Statistical measures performed.

A. The following independent variables were correlated with the dependent measures independently, and a "t" test of significance performed:

1. Int-Ext
2. Race
3. Socio-economic status-job status
4. Parental income
5. Self-control
6. Sex
7. Intellectual efficiency
8. Grade Point Average
9. Achievement

B. The demographics of the following groups were evaluated by the "difference between means" and a "t" test of significance:

1. Group which perceived hard question as hard
   vs.
   Group which perceived easy question as hard
   both vs.
   Group which perceived both questions as same difficulty level

2. Group which was assigned hard question first
   vs.
   Group which was assigned hard question second

3. Top 20% performers on the hard question
   vs.
   Bottom 20% performers on the hard question

4. Day class total
   vs.
   Night class total
a. All day classes compared to each other

5. Experimental group

vs.

Control group

6. Significance Statistics Techniques

a. For testing significant differences between means:

\[
t = \frac{x_1 - x_2}{\sqrt{\frac{N_1 s_1^2 + N_2 s_2^2}{N_1 + N_2 - 2} \left[ \frac{1}{N_1} + \frac{1}{N_2} \right]}}
\]

For \(N_1 + N_2 - 2\) degrees of freedom

b. For testing significance of correlations:

\[
t = r \sqrt{\frac{N - 2}{1 - r^2}}
\]

For \(N-2\) degrees of freedom

c. For testing significance of multiple regression \(F\) calculated by computer was used.

d. A WANG computer was also used to calculate significant difference between means.

Additionally: Mean and standard deviation data were obtained from BMD and WANG programs.
Results

There were 113 subjects who participated in this experiment. The subjects were distributed across four sections (classes) of a Psychology in Business and Industry course at Valencia Community College, Orlando, Florida. Three of the sections were day classes; one was a night class. Data as noted in the method section was acquired. Twenty-seven subjects were dropped from the experiment due to incomplete data, leaving 86 subjects. This dropping was necessary since the multiple regression computer program used does not accommodate "no data." No other systematic rejection of subjects was used.

Table 2 shows the demographic range of the subjects participating in the study.

Table 3 is the correlation matrix involving the variables examined in this study.

Table 4 is the correlation matrix of independent variables relating to the dependent variables examined in this study.

Dependent Variable Scoring

The dependent measures, word count, and idea count
Table 2
Demographic Range of Subjects

<table>
<thead>
<tr>
<th>School Class No.</th>
<th></th>
<th></th>
<th></th>
<th>(PM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td>(class)</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>White</td>
<td>20</td>
<td>21</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>14</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>$\bar{x}$</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA - college</td>
<td>3.10</td>
<td>.57</td>
</tr>
<tr>
<td>GPA - high school</td>
<td>2.67</td>
<td>.71</td>
</tr>
<tr>
<td>College hours completed</td>
<td>30.03</td>
<td>21.74</td>
</tr>
<tr>
<td>Age Range (in years)</td>
<td>$\bar{x}$</td>
<td>S.D.</td>
</tr>
<tr>
<td>Total group</td>
<td>25.06</td>
<td>9.07</td>
</tr>
<tr>
<td>4th class (PM)</td>
<td>29.80</td>
<td>11.88</td>
</tr>
<tr>
<td>3 day classes</td>
<td>24.03</td>
<td>7.65</td>
</tr>
</tbody>
</table>
Table 3
Overall Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Hard Question Word Quantity</th>
<th>Easy Question Word Quantity</th>
<th>Hard Question Idea Quantity</th>
<th>Easy Question Idea Quantity</th>
<th>Sex</th>
<th>Race</th>
<th>GPA College</th>
<th>GPA High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Question Word Quantity</td>
<td>1.000</td>
<td>0.405</td>
<td>0.730</td>
<td>0.340</td>
<td>0.243</td>
<td>0.134</td>
<td>0.187</td>
<td>0.126</td>
</tr>
<tr>
<td>Easy Question Word Quantity</td>
<td></td>
<td>1.000</td>
<td>0.474</td>
<td>0.385</td>
<td>0.248</td>
<td>0.225</td>
<td>0.139</td>
<td>0.143</td>
</tr>
<tr>
<td>Hard Question Idea Quantity</td>
<td></td>
<td></td>
<td>1.000</td>
<td>0.316</td>
<td>0.119</td>
<td>0.139</td>
<td>0.214</td>
<td>0.154</td>
</tr>
<tr>
<td>Easy Question Idea Quantity</td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
<td>0.229</td>
<td>0.194</td>
<td>0.280</td>
<td>0.212</td>
</tr>
<tr>
<td>Sex</td>
<td>1.000</td>
<td>-0.005</td>
<td>0.046</td>
<td>0.461</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>1.000</td>
<td>0.290</td>
<td>0.132</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA College</td>
<td>1.000</td>
<td></td>
<td>0.257</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA High School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 (continued)

Overall Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Parental Job Type</th>
<th>Parental Income</th>
<th>Introversion-Do</th>
<th>Self-Concept-Wb</th>
<th>Achievement-Ac</th>
<th>Intellectual Efficiency-Ie</th>
<th>Self-Control Sc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Question Word Quantity</td>
<td>-0.117</td>
<td>-0.125</td>
<td>0.081</td>
<td>-0.116</td>
<td>0.083</td>
<td>0.185</td>
<td>-0.077</td>
</tr>
<tr>
<td>Easy Question Word Quantity</td>
<td>0.040</td>
<td>0.004</td>
<td>-0.026</td>
<td>-0.122</td>
<td>0.008</td>
<td>0.041</td>
<td>-0.058</td>
</tr>
<tr>
<td>Hard Question Idea Quantity</td>
<td>-0.118</td>
<td>-0.040</td>
<td>0.132</td>
<td>-0.210</td>
<td>0.075</td>
<td>0.067</td>
<td>-0.105</td>
</tr>
<tr>
<td>Easy Question Idea Quantity</td>
<td>-0.002</td>
<td>-0.062</td>
<td>0.079</td>
<td>-0.050</td>
<td>0.042</td>
<td>0.155</td>
<td>0.005</td>
</tr>
<tr>
<td>Sex</td>
<td>0.056</td>
<td>0.068</td>
<td>-0.124</td>
<td>-0.041</td>
<td>0.046</td>
<td>0.061</td>
<td>0.090</td>
</tr>
<tr>
<td>Race</td>
<td>0.003</td>
<td>0.140</td>
<td>0.170</td>
<td>0.138</td>
<td>0.075</td>
<td>0.196</td>
<td>0.131</td>
</tr>
<tr>
<td>GPA College</td>
<td>-0.059</td>
<td>-0.331</td>
<td>0.150</td>
<td>0.020</td>
<td>0.157</td>
<td>0.280</td>
<td>0.066</td>
</tr>
<tr>
<td>GPA</td>
<td>0.046</td>
<td>-0.045</td>
<td>0.119</td>
<td>0.088</td>
<td>0.203</td>
<td>0.315</td>
<td>0.217</td>
</tr>
<tr>
<td>High School</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 3 (continued)

**Overall Correlation Matrix**

<table>
<thead>
<tr>
<th>Parental Job Type</th>
<th>Parental Income</th>
<th>Introversion-Do</th>
<th>Self-Concept-Wb</th>
<th>Achievement-Ac</th>
<th>Intellectual Efficiency-Ie</th>
<th>Self-Control-Sc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental Job Type</td>
<td>1.000</td>
<td>0.378</td>
<td>0.075</td>
<td>0.004</td>
<td>0.124</td>
<td>-0.032</td>
</tr>
<tr>
<td>Parental Income</td>
<td>1.000</td>
<td>-0.051</td>
<td>0.011</td>
<td>0.054</td>
<td>-0.053</td>
<td>-0.004</td>
</tr>
<tr>
<td>Introversion-Do</td>
<td>1.000</td>
<td>0.233</td>
<td>0.325</td>
<td>0.380</td>
<td>0.062</td>
<td></td>
</tr>
<tr>
<td>Self-Concept-Wb</td>
<td>1.000</td>
<td>0.619</td>
<td>0.555</td>
<td>0.689</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement-Ac</td>
<td>1.000</td>
<td>0.656</td>
<td>0.670</td>
<td></td>
<td></td>
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<tr>
<td>Intellectual Efficiency-Ie</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.507</td>
</tr>
<tr>
<td>Self-Control-Sc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td>Variable</td>
<td>Dependent Variable</td>
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<td>Easy Question Word Quantity</td>
<td>Sig</td>
<td>Hard Question Word Quantity</td>
<td>Sig</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
<td>-----</td>
<td>----------------------------</td>
<td>-----</td>
<td>----------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Sex</td>
<td>.24</td>
<td>.02</td>
<td>.25</td>
<td>.02</td>
<td>.12</td>
<td>.229</td>
</tr>
<tr>
<td>Race</td>
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<td></td>
<td>.22</td>
<td>.02</td>
<td>.139</td>
<td>.19</td>
</tr>
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<td>.05</td>
<td>.139</td>
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<td>.21</td>
<td>.02</td>
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<td>GPA-High School</td>
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<td></td>
<td>.143</td>
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<td>.15</td>
<td>.1</td>
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<td>.04</td>
<td></td>
<td>-.12</td>
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</tr>
<tr>
<td>Parental Income</td>
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<td></td>
<td>.00</td>
<td></td>
<td>-.04</td>
<td></td>
</tr>
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<td>Introversion-Do</td>
<td>.08</td>
<td></td>
<td>-.03</td>
<td></td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Self-Concept-Wb</td>
<td>-.12</td>
<td></td>
<td>-.12</td>
<td></td>
<td>-.21</td>
<td>.02</td>
</tr>
<tr>
<td>Achievement-Ac</td>
<td>.08</td>
<td></td>
<td>.01</td>
<td></td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>Intellectual Efficiency-Ie</td>
<td>.18</td>
<td>.05</td>
<td>.04</td>
<td></td>
<td>.07</td>
<td></td>
</tr>
<tr>
<td>Self-Control-Sc</td>
<td>-.08</td>
<td></td>
<td>-.06</td>
<td></td>
<td>-.10</td>
<td></td>
</tr>
</tbody>
</table>
were scored by three independent raters. These raters were of a similar age group, 20-22; they were "A" level students in a Psychology in Business and Industry class. The semester after the experiment, they had been exposed to treatment type lecture material; the raters were naive with relationship to the nature of the experiment. All three were trained by being shown examples of ranges of performance and were given scoring guidelines. The correlations between their ratings are in Table 4. A previous set of raters, of dissimilar age, education, and experience, produced the correlations shown in Table 4.

Given the relationships in Table 5, the results of the trained raters were averaged and that single score used as the dependent variables in the experiment. The data of the trained raters were used, since they produced the highest single set of average correlations.

Mathematical Limitation

A mathematical artifact occurred during the evaluation of the data from this experiment. This artifact was related to the effect that occurs when too high a number of independent variables are used with too low a number of subjects. In effect when approaching a one-for-one relationship, an almost perfect correlation will occur regardless of data content. This artifact presented
Table 5
Rater Correlation

<table>
<thead>
<tr>
<th>Untrained Raters</th>
<th>Idea Count</th>
<th>Easy Question</th>
<th>Hard Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-B</td>
<td>.62</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>A-C</td>
<td>.70</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>B-C</td>
<td>.61</td>
<td>.56</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trained Raters</th>
<th>Idea Count</th>
<th>Easy Question</th>
<th>Hard Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>.50</td>
<td>.70</td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>.58</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>.64</td>
<td>.61</td>
<td></td>
</tr>
</tbody>
</table>
itself when subsets were examined in order to evaluate the contributory effects of the study's independent variables. In the perceptual groups 18 and 19 subjects were available, in the high and low performing groups 16 and 17 subjects were available, and in class-by-class performers 20 to 23 subjects were available, all in the presence of 11 dependent variables. Thus in evaluating subsets of data, statistics were limited to difference between means or significance of correlations.

**Introversion-Extroversion vs. Performance**

The Do scale on the CPI is used to measure introversion-extroversion. In this study there was no significant relationship between Intro-Extro and the performance variables (dependent variables).

**Self-Concept vs. Performance**

Self-concept measured by Wb on the CPI was related to the performance variables. There was a consistently inverse relationship with a single significant correlation, $-.21^*$ between Wb and hard ideas. Inverse in the self-concept variable refers to a lack of sense of well being, being related to a higher productivity of ideas.

**Race vs. Performance**

In this study there were 6 black subjects and 80
white subjects. The college's racial mix approximates 12% black, 88% white. There were two significant racial correlations, .225** with easy question word count, .194* with easy idea count. The meaning of positive correlation is that white performance exceeds black performance. Correlations between race and the difficult question were: difficult question ideas, .14; difficult word count, .13; neither were significant. The quantity of black subjects in this study (N=6) is very low to infer major significance related to allowing race to affect (or predict) the performance variable. However, doubling the black population in the sample (N=12) does not produce any significant change in the performance variables (see Table 6). A slight increase in both hard question and easy question word count was not statistically significant. No difference occurred in idea count in either hard or easy questions. This lack of difference, when adding subjects, gives credibility to the subjects' performance in the study even at a low N.

Although the addition of the 6 subjects to the race data did not have a significant change in the performance variables, the direction of the data was toward reducing the significance of the already low correlations.

Note: The additional 6 subjects came from previous subjects that had completed the dependent variables and
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>N=12</th>
<th>N=6</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>S.D.</td>
<td>x</td>
</tr>
<tr>
<td>Hard Question Word Quantity</td>
<td>64.58</td>
<td>39.74</td>
<td>57.17</td>
</tr>
<tr>
<td>Easy Question Word Quantity</td>
<td>49.58</td>
<td>25.18</td>
<td>42.33</td>
</tr>
<tr>
<td>Hard Question Idea Quantity</td>
<td>2.28</td>
<td>1.04</td>
<td>2.28</td>
</tr>
<tr>
<td>Easy Question Idea Quantity</td>
<td>1.12</td>
<td>0.41</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Note: There are additional statistics of interest with regard to race. They are as follows:

Race correlates with ability
- .196 (with Ie)
- .290 (with GPA college)
- .132 (with GPA high school)

Race correlates with SES
- .140 (parental income)
had been exposed to treatment, but had not completed all information for the independent variable data sheets and could not be handled for multiple regression evaluation. However, the 6 subjects had completed the dependent variables so that in this isolated case, a look at increasing subject size could be made.

Socio-Economic-Status (SES) vs. Performance

The relationship between SES and performance was measured by relating parental occupational status and parental income, individually, with the performance variables. Neither of these two measures of SES correlated with the measures of performance.

Perceived Difficulty vs. Performance

In terms of perception, there were three groups identified:

Group 1. Agreed with the perceptual directions of the experiment.

Group 2. Perceived the stimulus questions as equal in difficulty level.

Group 3. Perceived the operationally defined hard questions as easy and vice versa.

The group which agreed with the perceptual directions of the experiment (operational definition of hard and easy) outproduced the other two groups on three of
four dependent variables. The group with reversed perception outproduced the agreeable group on the dependent variable of hard question word count. The group which saw the questions as equal was higher on three measures than the inverted group. In a "t" test between means of the three groups, the major significant difference lies between the people who had inverted perception and those who saw equality amongst the variable of easy question idea count.

Table 7 identifies means of performance variables and means of demographics of the three groups.

Self-Control vs. Performance

There was, in this study, no significant correlation demonstrated between the variable self control, measured by Sc on the CPI, and the four dependent variables (Table 4).

Sex vs. Performance

There was a significant relationship demonstrated between sex and specific performance variables (Table 4). Sex correlated .24** with the word count on both hard and easy tasks. Sex correlated .23** with the easy question idea count. There was not a sex-related correlation with the hard question idea dependent variable. Positive correlation is indicative of female performance exceeding
Table 7
Perceptual Performance Data

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Group 1 H=H</th>
<th>Group 2 H=E</th>
<th>Group 3 H as E (inverted)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \bar{x} )</td>
<td>S.D.</td>
<td>( \bar{x} )</td>
</tr>
<tr>
<td>Hard Question Word Quantity</td>
<td>101.04</td>
<td>76.16</td>
<td>66.11</td>
</tr>
<tr>
<td>Easy Question Word Quantity</td>
<td>75.91</td>
<td>34.30</td>
<td>72.78</td>
</tr>
<tr>
<td>Hard Question Idea Quantity</td>
<td>3.15</td>
<td>1.40</td>
<td>2.81</td>
</tr>
<tr>
<td>Easy Question Idea Quantity</td>
<td>1.77</td>
<td>0.85</td>
<td>1.91</td>
</tr>
</tbody>
</table>
Table 7 (continued)

Significant Demographic Differences
Between Perceptual Groups

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>S.D.</td>
<td>$\bar{x}$</td>
<td>S.D.</td>
</tr>
<tr>
<td>Parental Income</td>
<td>2.51 1.12</td>
<td>3.11 1.32</td>
<td></td>
<td>.1</td>
</tr>
<tr>
<td>Parental Job Type</td>
<td>3.51 2.13</td>
<td>2.26 1.85</td>
<td></td>
<td>.05</td>
</tr>
<tr>
<td>Introversion</td>
<td>52.49 12.30</td>
<td>46.74 11.56</td>
<td></td>
<td>.1</td>
</tr>
<tr>
<td>Intellectual Efficiency</td>
<td>46.04 9.62</td>
<td>38.74 13.16</td>
<td></td>
<td>.02</td>
</tr>
<tr>
<td>Parental Job Type</td>
<td>4.06 2.34</td>
<td>2.26 1.85</td>
<td></td>
<td>.02</td>
</tr>
<tr>
<td>Parental Income</td>
<td>3.11 1.32</td>
<td>2.21 .79</td>
<td></td>
<td>.02</td>
</tr>
</tbody>
</table>

Note--Number of subjects:  
Group 1 = 45  
Group 2 = 18  
Group 3 = 19  
Not included due = 4  
to errors in data collection.
male performance. In the study, there were 58 males and 28 females.

**Ability vs. Performance**

Several independent variables related to ability (operationally) were used as predictors of the dependent variables; intellectual efficiency, Ie on the CPI, GPA in high school and GPA in college (GPA's were self reported). There were slight correlations, .18* between Ie and hard question word count and .15+ between Ie and the easy question idea variable. Correlations between college GPA and the dependent performance variables were as follows: .19+ with hard question word count, .21** with hard question idea count, .28** with easy question idea count. High school GPA correlated with the dependent variables as follows: .14+ with easy question word count, .15+ with hard question idea count, .21** with easy question idea count. (+p<.1, *p<.05, **p<.01)

**Achievement vs. Performance**

There was, in this study, no significant correlation demonstrated between the variable achievement, measured by Ac on the CPI, and the four dependent variables.

**Counterbalancing**

The results indicate that there was a significant
ordering effect in that the hard question, when presented first, produced both a higher word count and a higher idea count in three out of four cases. See significance in Table 8.

**Experimental Group vs. Control Group**

This study was designed to not require a control group. However, it turned out that ten subjects took the dependent measure who were not given the treatment (absent on the day of the lecture) and formed a natural control group to evaluate the effect of the treatment of performance. The experimental group exceeded that of the control group, although only performance on the easy question was significant. Table 9 shows the difference in performance between control and experimental groups.

**Top vs. Bottom Performers**

Approximately the top and bottom 20% on the hard question idea count were evaluated to determine whether any significant demographics relate to the top and bottom performers. The significant demographics between the two groups were: sex, college GPA, self-concept. Top performers were higher on GPA, had a higher percentage of females, and had a lower self-concept (see Table 10).
Table 8
Counterbalancing

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Easy First N=44</th>
<th>Hard First N=42</th>
<th>Difference Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \bar{x} )</td>
<td>( \bar{x} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>S.D.</td>
<td></td>
</tr>
<tr>
<td>Hard Question Word Quantity</td>
<td>72.98</td>
<td>103.45</td>
<td>.01</td>
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<tr>
<td>Easy Question Word Quantity</td>
<td>69.64</td>
<td>73.71</td>
<td>.02</td>
</tr>
<tr>
<td>Hard Question Idea Quantity</td>
<td>2.74</td>
<td>3.26</td>
<td>.05</td>
</tr>
<tr>
<td>Easy Question Idea Quantity</td>
<td>1.70</td>
<td>1.70</td>
<td>None</td>
</tr>
</tbody>
</table>

\( \bar{x} \) represents the mean, and S.D. represents the standard deviation.
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Experimental Group N=86</th>
<th>Control Group N=10</th>
<th>Difference Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>S.D.</td>
<td>$\bar{x}$</td>
</tr>
<tr>
<td>Hard Question</td>
<td>87.9</td>
<td>62.9</td>
<td>76.6</td>
</tr>
<tr>
<td>Word Quantity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy Question</td>
<td>71.6</td>
<td>35.9</td>
<td>43.1</td>
</tr>
<tr>
<td>Word Quantity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hard Question</td>
<td>3.0</td>
<td>1.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Idea Quantity</td>
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<td></td>
</tr>
<tr>
<td>Easy Question</td>
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<td>1.0</td>
</tr>
<tr>
<td>Idea Quantity</td>
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<td></td>
</tr>
</tbody>
</table>
Table 10

Mean Differences Amongst Significant Demographics of High and Low Performers

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Top N=16</th>
<th>Bottom N=17</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>S.D.</td>
<td>x</td>
</tr>
<tr>
<td>Sex</td>
<td>1.41</td>
<td>.51</td>
<td>1.12</td>
</tr>
<tr>
<td>GPA-College</td>
<td>3.24</td>
<td>.44</td>
<td>2.87</td>
</tr>
<tr>
<td>Self-Concept-Wb</td>
<td>38.41</td>
<td>11.16</td>
<td>48.06</td>
</tr>
</tbody>
</table>
**Class Sections vs. Performance**

Amongst the class sections there is a consistently higher production in both word count and idea count for the hard question over the easy question, which is consistent with the studies overall results. There was not any consistency amongst classes in superiority of production, in that no class consistently was superior in productivity of ideas or word count. This gives rise to the thought that there were no consistent differences amongst class sections even though class 4 differed from the others in age, 5 years, and delay of measure after being tested. Table 11 shows differences in dependent variables between the sections.

**Multiple Regression**

On the following chart, Table 12, the independent variables were added one at a time in decreasing order of significance in their contribution to the multiple regression correlation with the dependent variables. The data presented herein are limited to those variables that reach significance. Additional data are available but the addition of additional variables does not contribute more than .01 to the correlation. The regression was computed by the BMD program previously noted and described in Appendix 6.
# Table 11

## Class by Class Performance

<table>
<thead>
<tr>
<th></th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\bar{x}$</td>
<td>S.D.</td>
<td>$\bar{x}$</td>
<td>S.D.</td>
</tr>
<tr>
<td>Hard Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word Quantity</td>
<td>89.81</td>
<td>43.03</td>
<td>93.35</td>
<td>68.15</td>
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<tr>
<td>Easy Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word Quantity</td>
<td>78.42</td>
<td>32.89</td>
<td>71.34</td>
<td>42.41</td>
</tr>
<tr>
<td>Hard Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idea Quantity</td>
<td>3.15</td>
<td>1.22</td>
<td>2.82</td>
<td>1.38</td>
</tr>
<tr>
<td>Easy Question</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idea Quantity</td>
<td>1.62</td>
<td>0.55</td>
<td>1.70</td>
<td>0.94</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>N</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N=21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=22</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>N=20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The largest difference in Class 1-4 on dependent variable, hard question, word quantity, is only significant to .1.
Table 12
Summary Multiple Regression

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Hard Question Multiple Word Quantity Correlation Sig.</th>
<th>Easy Question Multiple Word Quantity Correlation Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>.24 .05</td>
<td>Sex</td>
</tr>
<tr>
<td>GPA-College</td>
<td>.30 .025</td>
<td>Race</td>
</tr>
<tr>
<td>Self-Concept</td>
<td>.36 .025</td>
<td>Self-Concept</td>
</tr>
<tr>
<td>Intellectual Efficiency</td>
<td>.42 .01</td>
<td></td>
</tr>
<tr>
<td>Parental Job Type</td>
<td>.44 .01</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Hard Question Idea Quantity Multiple Correlation Sig.</th>
<th>Easy Question Idea Quantity Multiple Correlation Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Concept</td>
<td>.39 .01</td>
<td>GPA-College</td>
</tr>
<tr>
<td>GPA-College</td>
<td>.44 .01</td>
<td>Sex</td>
</tr>
<tr>
<td>Achievement</td>
<td>.47 .01</td>
<td>Race</td>
</tr>
<tr>
<td>Parental Job Type</td>
<td>.49 .01</td>
<td>Self-Concept</td>
</tr>
<tr>
<td>Sex</td>
<td>.41 .01</td>
<td></td>
</tr>
<tr>
<td>Introversion</td>
<td>.52 .01</td>
<td></td>
</tr>
</tbody>
</table>

Sig. based on F test.
The independent variables in the study account for from 16% to 27% of the variance of the dependent variables.

In summary, the multiple regression demonstrates that sex, GPA in college generally, and self-concept are the major predictors of performance within this study. However, an overwhelming amount, 83%, of the cause of performance has not been accounted for.
Discussion

The hypothesis that high and low ease cognitive tasks will be moderated by a number of demographic variables was partially demonstrated. Partially in the sense that several of the demographic variables correlated with performance. However, no variable predicted performance selectively on either the high or low ease task, rather the predictor variables demonstrated increased or decreased performance on both the high and low ease tasks.

High and low cognitive tasks are moderated by the independent variables of: sex, ability, and self-concept.

Ability, it was predicted, would be positively correlated with performance on both tasks, indeed the results corroborate this prediction.

The studies predicting sex were not consistent; the results, however, were positive in that sex was positively correlated (females above males) to the results of both hard and easy tasks. In three of the four dependent variables, there was a significant sex-related difference in performance.

Self-concept was predicted to positively correlate with the high performance without regard to difficulty.
In fact, an inverse correlation was seen on all measures, with only the correlation with hard ideas being significant. A more complete explanation is seen in subsequent paragraphs.

None of the independent variables used in this study discriminated between hard and easy tasks. A corollary analysis was made on the top and bottom 20% of performers (see Table 10) on the hard ideas variable to determine whether we could isolate those independent variables that would predict high and low performance on a single task. The results showed that sex, college GPA, and self-concept again were the significant variables predicting high and low performance on the difficult task.

Thus, we see three factors which predict performance, but they do not discriminate between easy and difficult tasks, rather these independent variables simply predict performance on both tasks. The conclusion that is made is that this experiment has not shown that an independent variable can adequately discriminate between people in a population, at least not in the population used in this experiment, who will perform well on an easy task and those who will perform well on a difficult task. A measure of whether the tasks were truly difficult comes from the perceptual data taken, which show that 55% of those tested agreed with the operational definition,
while 22% perceived the tasks as equal and 23% perceived them in an inverted manner.

There were two sets of results that were contrary to prediction; the correlations related to self-concept vs. performance and race vs. performance.

**Self-Concept**

The prediction for self-concept vs. performance was one of positive correlation; the results were just the reverse. Self-concept consistently correlated negatively with all dependent measures. In a study by Bailey and Bailey (1974) an inversion is not unusual, since the results of their study which measured self-concept against the Otis quick scoring test of mental ability at the 4th, 8th, 12th, and college levels showed an increasing correlation between self-concept and performance up to and including the 12th grade (.71***) but there was a turnaround in correlation, although still positive (.02) but not significant at the college level.

According to Leviton (1975), self-concept has been generally studied on gifted or under and over achievers; little data is available on normal children. Further, according to Leviton, academic achievement is classically GPA, not on more objective criterion measures. There is a corroboration of this thought from the results of the
current study (see Table 3), in that self-concept in the current study correlates positively (but not significantly) with GPA, but when a performance based criterion is used, such as the idea and word count, then the correlations are consistently and significantly negative.

In summary: a self-concept turnaround at college level, predicted by Bailey and Bailey (1974) occurs in this study and serves to substantiate the inverted correlation between self-concept and performance.

Race

It is obviously improper to make inferences about racial differences on the basis of six subjects. As the data in the results section show, a doubling of black subjects did not have significant effect on changing the performance measurement. We, unfortunately, do not have complete independent variable data on the six additional subjects to make that same statement about the independent measures.

Experimental Design Evaluation

One way to evaluate a design is inferentially, i.e., if it produces a similar or expected result to other designs. Since in this study sex and ability appear to follow anticipated directions, it is assumed that the current experimental design is an appropriate technique
for predicting difficulty level performance. The fact that self-concept and race go contrary to prediction has already been discussed.

A number of critiques of the experimental design are tabulated below:

1. There are subjectivities in the experimental design which take away some of the credibility of the results. First, and foremost, is the idea rating technique. The reliability amongst raters is marginal, .50 to .70.

   There are several reforms that could be instituted to eliminate rater unreliability.

   a. A check list for each question, an objective test wherein all the potential ideas are integrated in a summarized test and the subjects asked to select the appropriate ones for each question the test could be computer graded.

   b. A more intense training of raters, including a series of scoring by the raters, and frequent feedback until a satisfactory proficiency is demonstrated.

   c. Group rating, with interaction on scoring.

   d. A test to predict the ability of people to discern ideas.
2. The design was apparently sufficiently powerful in that it was not influenced by a delay time difference (2-4 days) between treatment and measure, since there was not a significant difference in performance between day and night classes.

3. The major advantage of the design as presently constituted is that it is a behavioral measure, one which we do not have to subjectively interpret or place a goodness-badness evaluation on. In this design there are no constraints for effort (other than an overall time limit, divided according to the student's desires). With regard to the questions themselves, there is a confounding factor with regard to counter-balancing, in that there were five questions in the test questionnaire (three to establish consistency in local test methods and mask the experiment), and they were not controlled in which order a student might select to work them. They were stacked in appropriate order, but this does not preclude a student from doing questions in different than a prescribed order.

From the study by Dodd, Wollowick and McNamara (1970), it may be that if a difference
between performance on easy and difficult tasks does occur, it may be due to the fact that not enough time was allowed on the more difficult task. However, this was self regulated by the subjects in this study, since they were allowed to apportion time with total discretion.

4. There are limitations in a measure such as this in that study time between treatment and measurement is not controlled. On the other hand, in a heterogeneous mixture, neither is learning ability or acquisition time, that theoretically a motivated student can compensate for by additional study time.

5. The control group demonstrates that the treatment was effective in changing knowledge, in that the experimental group outperformed the control group in a statistically significant fashion.

6. The independent variable, GPA, could have been qualitatively improved as a measure by using records instead of student memory with attendant halo problems. This same argument also holds true for all measures obtained through self report, i.e., parental income.

7. The data obtained on perception of easy vs.
difficult question is not clear cut, as seen by the fact that not all subjects viewed the operationally defined difficult question as difficult. Perhaps it would have improved the dichotomy of the design if the experimental group is given a set of questions and allowed to evaluate them and the absolute easy and difficult questions used. Exposures to the questions would potentially eliminate the spontaneity, which is resolved when subjects are masked from the experiment.

8. With regard to the thought that modifying the experimental design to move to a CPI or MMPI format in which a large number of questions is asked about each of the two questions to get continuum of response with no rater error would in fact limit the response to the pre-established answers as addressed previously in this section.

The high CPI intercorrelation between scales indicate a lack of independence from each other. When investigating future independent relationships, individual tests of each variable might be more appropriate; however, the correlation between psychological components might not then be known. Even though there is a high
intercorrelation between scales of the CPI, independent variables acted (apparently) uniquely in predicting dependent variable performance; that is, they did not all predict every time one of them did, although this certainly limited the degree of prediction. The apparent quality, or consistency, of the CPI is noted by the following table, where the results of the study consistently are in the same regime as the CPI manual intercorrelations.

a. It was noted in the study that college GPA is closer in correlation with performance than high school GPA, giving credence to the thought that the most current data continues to be the best predictor of performance.

b. The results of this study demonstrated that counterbalancing in this type of design is mandatory and that perception of task difficulty influences performance.

Conclusion

It has not been possible to isolate independent variables which predict ability to perform on discriminate difficulty level tasks.

What we have proven here, or uncovered, is verifica-
### Table 13

CPI-Study Data Relationships

<table>
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<tr>
<th></th>
<th>Do 14</th>
<th>Wb 15</th>
<th>Ac 16</th>
<th>Ie 17</th>
<th>Sc 18</th>
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<td>.58-.66</td>
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<td>.57-.60</td>
<td>.60-.62</td>
<td>.22-.29</td>
</tr>
<tr>
<td>Ie 17</td>
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<td></td>
<td></td>
<td>1.0</td>
<td>.34-.40</td>
<td>.21-.24</td>
</tr>
<tr>
<td>Sc 18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
<td>.08-.14</td>
</tr>
<tr>
<td>Cm 19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

Lower numbers - from study
Upper numbers - from CPI manual
(range male-female)
tion that demographic factors can be isolated which predict performance. Action which logically should be taken in the future should be along the following planes:

1. Replicate the current study, on other populations, to verify that task difficulty variables do not appear and that performance predictors are reliable. If results are consistent, abandon further research on the demographic correlates of task difficulty.

2. Examine in depth the characteristics of maturity and how it is influenced in order to improve performance from individuals.

3. Replicate the current study to determine whether the correlations relating to sex, race, and self-concept are unique to the group of people studied or are valid for a larger population.
Appendix 1

Treatment-Maslow's Hierarchy Lecture
The following material represents the treatment that the subjects in this experiment received. It is a lecture on Maslow's hierarchy of needs. The material in this appendix is an intensive outline of the material presented. There is no deviations made from this outline.

1. Motivation is an energy in a direction. The direction is supplied by intensity of the need. Definition: Need—an urge that motivates behavior (causes the energy level of motivation to be high-low and directional)

2. Maslow's hierarchy of needs was empirically derived—through the observation of people.

3. Figure 1, shown on overhead projector.

4. The class and instructor developed what items comprised the steps of Maslow's hierarchy. These were written on the blackboard as follows:
   a. Physiological—food, clothing, shelter, sex, sleep*
   b. Safety—security, stability, dependency, freedom from fear, need for law and order
   c. Social—love, affection, belongingness, place in the group, to overcome loneliness
   d. Ego—self respect, self esteem, reputation, status, dignity, glory
Figure 1
Maslow's Hierarchy of Needs
e. Self actualization—self fulfillment, doing what you are fitted for

*Additionally, during the physiological portion of this lecture, this material was presented verbally:

There is a drive within the body to maintain homeostasis, to maintain a constancy of the normal internal environment. The elements that the body attempts to balance are: hunger, thirst, pain, sleep, temperature, breathing, elimination, sex. The deprivation of some of these elements will overwhelm most others. It may be the reason that people in concentration camps did not rise up against their captors—because of food deprivation.

5. Higher order need—lower order need

Maslow classified the Physiological, safety, and social needs as lower order needs. This categorization is due to the fact that man shares these needs with a significant portion of the animal kingdom.

6. The possibilities of self actualization

Maslow felt that it was not possible for people to generally become self-actualized until
they had reached their mid-thirties. The reasoning behind this logic is that it takes some significant sorting out of one's life to be able to develop a rational hierarchy of values. Also, it takes some tragedy in life, loss of a loved one, business and career reversal to be able to identify the important things in life.

7. Examples and evidence of self actualization

Positive evidence of self actualization:

- Full use and exploitation of talents
- Capacities
- Potentialities
- Ref: Nietzsch's exhortation, "Become what thou art"
- Developed to the full stature of their capability
- Gratification of or conquest of lower order needs

People that Maslow studied for characteristics of self actualization included the following and many others:

- Lincoln
- Jefferson
- Eleanor Roosevelt
- Huxley, James, Schweitzer
G. W. Carver
Adlai Stevenson

8. Characteristics of self actualized people—show overhead slide Figure 2.

a. More efficient perception of reality
   Unusual ability to detect the spurious, the fake
   Absence of neurosis is inherent here

b. Acceptance
   Accepts shortcomings without concern
   Uncritical evaluation without value judgment
   Lack of defensiveness

c. Sponteneity
   Lack of artificiality
   Impulsiveness without conventional limitations

d. Problem centering
   Strong focus on problems outside themselves
   Not much concern about themselves
   These people have a mission in life

e. Detachment; need for privacy
   Likes solitude
   Remain undistrubed by things that disturb others
Figure 2
Self-Actualized People

More efficient perception of reality
Acceptance
Sponteneity
Problem centering
Detachment; need for privacy
Autonomy
Continued freshness of appreciation
Mystic experience
Identification with mankind
Interpersonal relationships
Democratic character structure
Means-ends discrimination
Unhostile sense of humor
Creativeness
Resistant to enculturation
Self disciplined, make up own mind

f. Autonomy
Independent of physical and social environment
Dependent upon own development
Independent of the opinions of others

g. Continued freshness of appreciation
Continue to appreciate the basic goodness of nature

h. The mystic experience
Loss of place and time
Conviction that something extremely important and valuable has happened

i. Identification with mankind
Deep sympathy and affection for people

j. Interpersonal relations
Deeper and more profound interpersonal relations
Obliteration of ego boundaries

k. Democratic character structure
Friendly with people of all classes—and often not aware of differences
Learns from others at all levels

l. Discrimination between means and ends, good and evil
Sure of right and wrong
No ethical conflicts
Strongly ethical

m. Philosophical, unhostile sense of humor
No hostile humor
Pokes fun at foolishness
Pokes fun at self

n. Creativeness
Originality
Inventiveness
Direct way of looking at life

o. Resistance to enculturation
Not held down by culture
Detached somewhat from culture

p. Imperfections of self-actualized people
Superficial vanity
Temper outbursts
Ruthlessness
Surgical coldness
Independence of conventions—can be shocking
Absent-mindedness
Not interested in party chatter
Shocking language
Too sorry for sick in our society

9. Exceptions to the fixity of the hierarchy—show
The steps in Maslow's hierarchy are not necessarily fixed to the order that he presented. The following represent several reasons for exceptions to the order of the hierarchy.

a. Individual differences— for some self-esteem is more important than lover.

b. Creative people—innately creative people for whom the drive to create overwhelms other needs, in spite of the lack of basic need satisfaction. Starving artist in a garrett.

c. Aspiration level— the level of aspiration may be permanently deadened or lowered, i.e., the chronically unemployed may be satisfied forever with enough food.

d. Psychotic personality— may have lost the ability and desire for love needs, perhaps due to lack of maternal loving during early development.

e. Martyrdom— people will give up anything for a cause, i.e., Patty Hurst gave up basic creature comforts, love, security for a cause.

f. Need eradication— no matter what need level you are at, you never completely wipe out basic physiological needs and therefore these
have to be continuously addressed when operating at any level.

g. Alternate reasons—there are often more than one reason for the same activity, i.e., eating may solve:

Hunger
Comfort
Oral gratification
Appendix 2

Test Questionnaire
1. Discuss how the knowledge of Maslow's hierarchy of needs could be used to motivate students to improve their performance.
2. Why is it true that the needs of people do not always occur in the order that Maslow predicted?
3. How does an individual acquire high motivational levels according to the theory of achievement motivation?
4. Name and explain at least three (3) categories of job satisfiers that are different than money.
5. What might an individual be motivated to do if he was treated unfairly? (Explain in terms of Equity Motivation.)
Appendix 3

Perceptual Difficulty Data Sheet
QUESTION

a. Why is it true that the needs of people do not always occur in the order Maslow predicted?

b. How does an individual acquire high motivational levels according to the theory of achievement motivation?

c. What might an individual be motivated to do if he was treated unfairly?

d. Discuss how the knowledge of Maslow's hierarchy of needs could be used to motivate students to improve their performance.

e. Name and explain at least three categories of job satisfiers that are different than money.

Please give an indication of the difficulty of each individual question.

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<td>___</td>
<td>___</td>
</tr>
<tr>
<td>b--------</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>c--------</td>
<td>___</td>
<td>___</td>
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</tr>
<tr>
<td>d--------</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
<tr>
<td>e--------</td>
<td>___</td>
<td>___</td>
<td>___</td>
</tr>
</tbody>
</table>
Appendix 4

Demographic Data Sheet
Biographical Inventory

Name

Age

Sex male female

Race Negroid Caucasian Mongoloid

Grade Point Average (in college) A B C D (high school)

Parental (or guardian) job type (when you were growing up) (see attached sheet)

Parental (or guardian) income (when you were growing up)

0 - $5,000 $5,000 - $10,000 $10,000 - $15,000

$15,000 - $20,000 $20,000 - $30,000 $30,000 +
Occupational Categories

BCS - Blue collar skilled - machinist, tradesman
   (carpenter, plumber, etc.)
BCU - Blue collar unskilled - truck driver, laborer, maid
P - Professional - doctor, lawyer, teacher, professional engineer, accountant, nurse
WCU - White collar unskilled - salesman, salesclerk
WCS - White collar skilled - engineer, manager, optometrist, librarian
SEE - Self employed entrepreneur (owner)
Appendix 5
Guidelines for Raters
1. Read paper before beginning to count ideas.
2. A "1" idea paper is just as important to the research as a "7" idea paper.
3. Do not be generous, do not be tough, be fair.
4. Do not base your count on the quality of the idea but just whether it is there or not.
5. This is not an idea--

   ![Diagram]

   Self Actualization
   Ego
   Social
   Safety
   Physiological

6. Don't be influenced by grammar.
7. Don't count examples as ideas.
Appendix 6

Computer Program Description
This program computes a sequence of multiple linear regression equations in a stepwise manner. At each step, one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum or squares. Equivalently, it is the variable which has the highest partial correlation with the dependent variable partialed on the variables which have already been added; and equivalently, it is the variable which if it were added, would have the highest F value.
Appendix 7

Summary Table of Dependent and Independent Variable Means
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<th>Standard Deviation</th>
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<tr>
<td>Easy Question Word Quantity</td>
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References


Tannenbaum, A. S. *Social psychology of the work organization.* Belmont, California: Wadsworth, 1966.
