A STATISTICAL ANALYSIS OF SOME ASPECTS
OF
THE JOHNSON TEMPERAMENT ANALYSIS
by
JOSEPH FRANCIS HAMMETT

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
IN THE DEPARTMENT
OF
EDUCATION

THE UNIVERSITY OF BRITISH COLUMBIA
OCTOBER, 1948
A Statistical Analysis of Some Aspects of The Johnson Temperament Analysis

Abstract

This study examines a number of aspects of the Johnson Temperament Analysis based on the responses of 48 male graduates in the Department of Education at the University of British Columbia.

Item difficulty is considered from the reports of 39 students. The mean number of difficult items per student is 21.6 or 12% of the total. It is found that the difficulties can be classified under five headings:

(a) Lack of experience with the topic.
(b) Difficulties of comprehension.
(c) Difficulties of evaluation.
(d) Response dependent upon circumstance.
(e) Two or more notions in one question.

It would appear that a number of these difficulties could be avoided if a revision of the Analysis were undertaken.

The adjustment of the group in terms of the Analysis is considered. The means are in the acceptable zone or better in all traits except Cordial, where the mean lies at the borderline between acceptable and improvement desirable.
Age differences are not found to be statistically significant. There is some slight advantage of better adjustment in terms of the Analysis for the older group.

Reliabilities of the trait tests, calculated by the split half technique are found to range from .32 to .82. In general these support the published figures of the test author.

A phenomenon of difference between the first and second halves of the Analysis is noted. No definite conclusions are presented to account for this, but it is suggested that further research might determine the advisability of having unscored practice items at the beginning of such inventories.

The inter-correlations of the trait tests are calculated by the product-moment formula and are found to be comparable to the tetrachoric r's reported in the Manual of Directions. The former are factored by the Centroid Method and five factors extracted. The axes are rotated by the single-plane method and a simple structure obtained. This is discussed in terms of Thurstone's criteria and is considered to be reasonably satisfactory.

An attempt is made to identify the factors obtained, one being named with a high degree of assurance. It is Factor II, Social Introversion-Extraversion. Factors I and III are identified with some assurance as Emotionality.
and Rathymia respectively. The remaining two factors are most tentatively, and with considerable reluctance, named as Objectivity and Co-operativeness.

It is suggested that, if a shorter form of the Analysis be required, traits D and H would give a fair index of the general adjustment of the individual in terms of the five factors named. It is felt that, in the case of the 48 students used as the basis of this study, the nine traits defined by the test author are not distinctly measured. Since the group is small and homogeneous, no generalizations to the general population are made.
Table of Contents

Chapter 1, Introduction.................................page 1
Chapter 2, The Subjects.................................page 5
Chapter 3, The Difficulty of Response to Items of the Analysis.................................page 7
Chapter 4, Results and Reliability..................page 15
Chapter 5, Factor Analysis of the Johnson Temperament Analysis.................................page 26
Chapter 6, Identification of Factors...............page 32
Chapter 7, Summary........................................page 42
List of Tables

---

Table I  Frequency Distribution of Weights........page 3
Table II Standard Deviations of Weights..............page 4
Table III Age Distribution of Subjects..............page 5
Table IV Total Number of Items Reported Difficult by Students.........................page 7
Table V Reported Difficulties in Terms of Items....page 8
Table VI Total Reported Difficulties by Traits.....page 13
Table VII Weighted Scores, Means and Standard Deviations.........................page 15
Table VIII Percentile Zones of Acceptability......page 18
Table IX Comparison of Older and Younger Students..........................page 19
Table X Reliabilities of Traits.........................page 20
Table XI Recapitulation of Certain Results........page 21
Table XII Inter-correlations of Traits.................page 26
Table XIII Factor Matrix and Residuals..............page 27
Table XIV Rotated Factor Matrix.........................page 28
---
Appendices

Appendix A, The Johnson Temperament Analysis

Appendix B, The Identification of Items by Traits

Appendix C, Full Factor Matrix and Residual Matrices

Bibliography
A Statistical Analysis of Some Aspects of The Johnson Temperament Analysis

Chapter 1

1. Introduction

Personality 'tests' are being increasingly used as aids to counselling in schools, in industry, and in clinics. Evaluations of these personality inventories are being made continuously. That this is so is most desirable, in view of their frequent use as diagnostic aids. A search of the literature shows no report on the Johnson Temperament Analysis which was copyrighted in 1944. Inter-correlations and reliability coefficients are quoted in the Manual of Directions, but no outside evidence is apparently available to support or refute the figures given.

It would appear that an investigation of the Analysis is overdue. To that end this study was undertaken. By no means a complete evaluation has been attempted, some aspects only having been examined. The sample to whom the Analysis was administered is small and relatively homogeneous, hence no sweeping generalizations can or will be made.

2. The Make-up of the Analysis

Owing to the peculiar nature of some of the results of this investigation, it is necessary to describe the make-up of the Johnson Temperament Analysis in some detail.
The Analysis, a copy of which is to be found in Appendix A, consists of 182 items to which the subject, or someone who knows the subject well, is required to respond in one of three ways: 'plus,' 'middle' or 'minus,' representing 40%, 20%, 40% respectively of the population of the age and sex of the subject. The 'plus' response can be interpreted as "decidedly yes," while the 'minus' means "decidedly no." The 'middle' reply indicates lack of assurance one way or the other.

Of the 182 items only 176 are used in the scoring keys. By means of them nine traits are measured, no item being used more than once. The nine traits are as follows:

- Trait A Nervous - composed............20 items
- Trait B Depressive - gay hearted.......20 items
- Trait C Active - quiet..................18 items
- Trait D Cordial - cold..................20 items
- Trait E Sympathetic - "hard boiled"...20 items
- Trait F Subjective - objective.........20 items
- Trait G Aggressive - submissive.......18 items
- Trait H Critical - appreciative........20 items
- Trait I Self-mastery - impulsive.......20 items

Appendix B shows the items which go to make up each trait. Two further items, No. 181 and No. 182, are used to indicate periodicity in traits C and B respectively. These items are:

181 Does S have spells of liveliness (lasting at
least several days) rather than staying at about the same level?

182 Does S have spells of being sad and depressed (lasting at least several days) rather than staying at about the same level?

Traits A, C, E and G are scored from items in the first 90, while traits B, D, F and H are marked from items in the second 90. The questions measuring trait I are dispersed throughout the whole inventory. Scores for each response to the items are weighted, the weights varying from 2 to 7. Frequency distributions of the weights assigned in each trait appear below in Table I.

Table I
Frequency Distributions of Weights

<table>
<thead>
<tr>
<th>Traits</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>
Standard deviations of weights are set out in Table II below.

Table II

Standard Deviations of Weights

Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Trait</th>
<th>S.D.</th>
<th>Trait</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.33</td>
<td>B</td>
<td>1.42</td>
</tr>
<tr>
<td>C</td>
<td>1.10</td>
<td>D</td>
<td>1.58</td>
</tr>
<tr>
<td>E</td>
<td>1.02</td>
<td>F</td>
<td>1.24</td>
</tr>
<tr>
<td>G</td>
<td>1.07</td>
<td>H</td>
<td>1.35</td>
</tr>
<tr>
<td>I</td>
<td>1.41</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It will be noted that the variability of weighting is greater in the traits scored in the second half of the Analysis. None of the differences in standard deviations is statistically significant, the largest Critical Ratio being 2.41, that between the differences in S.D's. of weights of traits D and E. In view of what follows in later chapters, this difference is at least interesting, if not significant in a statistical sense.

Tables of percentiles for weighted scores are given in the Manual of Directions for the Analysis. The subject's profile is plotted on an individual profile sheet in terms of these percentiles. Computations in this investigation are based upon the weighted scores.
Chapter 2

The Subjects

The subjects were 48 male graduate students in the Department of Education of the Faculty of Arts and Science at the University of British Columbia. Table III gives the age distribution of the subjects.

Table III

<table>
<thead>
<tr>
<th>Age</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>39-40</td>
<td>1</td>
</tr>
<tr>
<td>37-38</td>
<td>2</td>
</tr>
<tr>
<td>35-36</td>
<td></td>
</tr>
<tr>
<td>33-34</td>
<td></td>
</tr>
<tr>
<td>31-32</td>
<td>2</td>
</tr>
<tr>
<td>29-30</td>
<td>3</td>
</tr>
<tr>
<td>27-28</td>
<td>5</td>
</tr>
<tr>
<td>25-26</td>
<td>9</td>
</tr>
<tr>
<td>23-24</td>
<td>11</td>
</tr>
<tr>
<td>21-22</td>
<td>13</td>
</tr>
<tr>
<td>19-20</td>
<td>1</td>
</tr>
</tbody>
</table>

The Analysis was administered to the group by Dr. F. T. Tyler, then of the University of British Columbia, on 9 October, 1947 as an integral part of the Teacher Training Programme. It was explained to the subjects that the
results might prove useful in the prediction of success in teaching and as a basis for further research. Each student was promised,--and received,--a personal interview concerning his scores on this test and two others, namely, the Minnesota T. S. E. and the Minnesota Personality Scale.

Since these students were in training for their chosen profession, it can be assumed, in the light of the above explanation to them, that their responses would be as honest as they could make them. That this was in fact the case is further borne out by their reaction to the Analysis after they had finished it. As a group they complained that many of the questions were difficult to answer honestly or correctly. In order to objectify this complaint, each student was asked to go through the items and list which were difficult. For each one so marked, the student was required to give a reason. Not all found time to do this. Replies of 39 students are considered in the next chapter.
Chapter 3

The Difficulty of Response to Items of the Analysis

Students are prone to complain about examinations of any kind. It was thought, therefore, that when put to the task of making their objections specific, they would find but little substance behind their criticisms. There is no way of knowing if this were the case with those who failed to turn in a report. For those who did it was rather the other way. They found a considerable number of items to be difficult. Table IV shows this.

Table IV

Total Number of Items Reported Difficult by Students

Johnson Temperament Analysis U. B. C. Data

<table>
<thead>
<tr>
<th>No. of items</th>
<th>No. of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>46-50</td>
<td>1</td>
</tr>
<tr>
<td>41-45</td>
<td></td>
</tr>
<tr>
<td>36-40</td>
<td>2</td>
</tr>
<tr>
<td>31-35</td>
<td>2</td>
</tr>
<tr>
<td>26-30</td>
<td>6</td>
</tr>
<tr>
<td>21-25</td>
<td>9</td>
</tr>
<tr>
<td>16-20</td>
<td>8</td>
</tr>
<tr>
<td>11-15</td>
<td>9</td>
</tr>
<tr>
<td>6-10</td>
<td>2</td>
</tr>
</tbody>
</table>

N = 39 \bar{x} = 21.6
In other words a little over half the group found at least 20 items, or more than 1 in 10, difficult to answer accurately. Such a proportion could markedly affect scores. The same information can be displayed in another way which is more fruitful for investigational purposes. Table V shows the difficulty distribution in terms of items.

Table V

Reported Difficulties in Terms of Items

Johnson Temperament Analysis U. B. C. Data

<table>
<thead>
<tr>
<th>S's. reporting</th>
<th>Items</th>
<th>S's. reporting</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>3</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

Only 12 items presented no difficulty to any subject. 23 items were found to be difficult by at least one-quarter of the total reporting. It will be interesting and instructive to look at these questions and the reasons given for their difficulty.
31-G-17 Is S so sure of himself that it sometimes annoys others?

Typical reasons:
"Not easy for S to know this about himself."
"S's opinion biased."

33-C-17 Is S less attentive than most individuals to things going on around him?

Typical reasons:
"Depends upon what, where, why and preoccupation."
"Attention varies markedly."

37-C-16 Is S the kind of person one might call a "self starter"?

Typical reasons:
"Varies from time to time."
"Usually very little chance to exhibit it."

41-G-16 Does S sometimes say things that are dominating so that peoples' feelings are sometimes hurt?

Typical reasons:
"Meaning of 'dominating'?"
"How often is sometimes?"

60-E-15 Would S probably resort to corporal punishment in the case of deliberate disobedience by his own child at age ten?

Typical reasons:
"Have no children!"
"Depends on the circumstances."

93-D-15 In social contacts is S thought to be warm-hearted?

Typical reasons:
"For someone else to say."
"S may not know what his contacts think."

* Code meaning: Item 31 of the Analysis, indicative of trait G and found to be difficult by 17 students.
85-G-14 Does S think less well of his ability than the facts warrant?

Typical reasons:
"Difficult to form a just opinion."
"Needs an outsider."

5-G-14 Does S resent efforts of others to tell him what to do?

Typical reasons:
"Depends on what is under consideration."
"Depends on the approach of the teller."

151-D-14 Do companions like to be with S?

Typical reasons:
"Better to be answered by someone else."
"Hard to be objective."

15-A-13 Does S have a voice that flows evenly and smoothly?

Typical reasons:
"Difficult to judge one's own voice."
"Affected by the emotional state of S."

49-E-13 Does S think that modern prisons coddle the prisoner too much so as to interfere with needed punishment?

Typical reasons:
"No idea what prison treatment is like."
"Prisons differ."

10-G-12 Is S easy going in the matter of discipline?

Typical reasons:
"Practice teaching caused confusion here."
"External or self-discipline?"

104-B-12 Is S sometimes thought of as a "wet blanket"?

Typical reasons:
"Meaning?"
"Might not know."

90-E-12 In an automobile accident in which S is involved does he really try to see that any damage he did is made good?
Typical reasons:
"The court will probably solve S's problem for him."
"No experience."

82-C-12 Does S talk less than his share when with others?

Typical reasons:
"Depends on the group he is in."
"Conditional on the topic of conversation."

67-G212 Is S emphatic in voice and manner?

Typical reasons:
"Could be one and not the other."
"Depends on circumstances."

46-E-11 Is S as much influenced in his behavior by consideration of general welfare as by consideration of his own advantage?

Typical reasons:
"Difficult to analyze motives objectively."
"This could have been worded more simply."

59-G-10 Does S accept defeat easily without any evidence of his disappointed feeling?

Typical reasons:
"Depends on the kind of defeat."
"One can be unaware of what one is showing."

105-D-10 Is S considered cheery by some people?

Typical reasons:
"Everyone is so considered by some."
"How can S know this?"

117-H-10 Does S take criticism easily without resentment?

Typical reasons:
"Depends on the person giving the criticism."
"Depends on the kind of criticism."

131-D-10 Does S show a uniform rather than a varied expression in talking?

Typical reasons:
"Hard to know one's own voice."
"Not constant."
173-F-10 Does S succeed in preventing his emotions swaying his judgment much?

Typical reasons:
"'Much' confused me."
"Difficult to analyze."

The responses given here, and those made to less difficult questions, can be classified into five categories.

(1) Lack of experience in the matter.
(2) Difficulty of comprehension.
(3) Difficulty of evaluation.
(4) Response depends upon circumstance.
(5) Two or more notions in one question.

It would seem that the students' points are well made. Questions could be framed that are dependent on experiences common to everyone. (It is to be hoped that not all of us have had automobile accidents!) Difficulties in comprehension could be avoided by rewording. 173-F-10 might be rewritten with advantage as, "Does S succeed in preventing his judgment from being much swayed by his emotions?" In personality inventories 'evaluation' of oneself is always a problem. With further research of type items, it might be possible to avoid questions of this kind. To get around the problem of circumstances affecting the answer, requires only the making of more precise statements. 5-G-14 could be reworded, "Does S resent efforts of his superiors to tell him what to do, if it is done tactfully?" This would not have quite the same implication as the original item,
hence it might be necessary to have additional items representing the other possibilities. This would require lengthening the Analysis, a procedure which has disadvantages. Taking as it does nearly an hour, to lengthen it would probably affect the subject's rapport. Two or more notions in one question can be disposed of by splitting. This again would lengthen the test.

It was noted in Chapter 1, (p. 4), that the variability of weighting distributions was in general smaller in the traits measured in the first half of the Analysis than in those measured in the second. This same discrepancy occurs in the case of difficulty. Table VI shows this fact.

Table VI

Total Reported Difficulties by Traits

<table>
<thead>
<tr>
<th>Trait</th>
<th>Difficulties</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Nervous</td>
<td>78</td>
<td>1.62</td>
</tr>
<tr>
<td>B Depressive</td>
<td>50</td>
<td>1.04</td>
</tr>
<tr>
<td>C Active</td>
<td>107</td>
<td>3.94*</td>
</tr>
<tr>
<td>D Cordial</td>
<td>95</td>
<td>1.98</td>
</tr>
<tr>
<td>E Sympathetic</td>
<td>117</td>
<td>2.44</td>
</tr>
<tr>
<td>F Subjective</td>
<td>82</td>
<td>1.71</td>
</tr>
<tr>
<td>G Aggressive</td>
<td>135</td>
<td>3.12*</td>
</tr>
<tr>
<td>H Critical</td>
<td>61</td>
<td>1.26</td>
</tr>
<tr>
<td>I Self-mastery</td>
<td>63</td>
<td>1.31</td>
</tr>
</tbody>
</table>

*Corrected as for 20 items.
An obvious explanation of this phenomenon is that students reporting on 182 items were more thorough in the early stages of the task,—in other words, that they just got tired. It may well be that the matter cannot be disposed of so easily. Further discussion will be postponed, however, until a later chapter, since there are facts still to be presented which appear to have a bearing on the question.
Chapter 4
Results and Reliability

The distributions of weighted scores, means and standard deviations for each of the traits is set out in Table VII on this and the following page.

Table VII
Weighted Scores, Means and S.D's
48 Male Students in Teacher Training

<table>
<thead>
<tr>
<th>Trait A Score</th>
<th>Trait B Score</th>
<th>Trait C Score</th>
<th>Trait D Score</th>
<th>Trait E Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-97 2</td>
<td>105-108 1</td>
<td>87-88 2</td>
<td>111-114 2</td>
<td>98-99 4</td>
</tr>
<tr>
<td>92-94 101-104</td>
<td>85-86 4</td>
<td>107-110 2</td>
<td>96-97 3</td>
<td></td>
</tr>
<tr>
<td>89-91 97-100</td>
<td>83-84 4</td>
<td>103-106 5</td>
<td>94-95 5</td>
<td></td>
</tr>
<tr>
<td>86-88 93-96</td>
<td>81-82 3</td>
<td>99-102 6</td>
<td>92-93 10</td>
<td></td>
</tr>
<tr>
<td>83-85 89-92</td>
<td>79-80 4</td>
<td>95-98 4</td>
<td>90-91 7</td>
<td></td>
</tr>
<tr>
<td>80-82 85-88</td>
<td>77-78 4</td>
<td>91-94 4</td>
<td>88-89 6</td>
<td></td>
</tr>
<tr>
<td>77-79 81-84</td>
<td>75-76 4</td>
<td>87-90 7</td>
<td>86-87 6</td>
<td></td>
</tr>
<tr>
<td>74-76 77-80</td>
<td>73-74 7</td>
<td>83-86 3</td>
<td>84-85 4</td>
<td></td>
</tr>
<tr>
<td>71-73 73-76</td>
<td>71-72 2</td>
<td>79-82 3</td>
<td>82-83</td>
<td></td>
</tr>
<tr>
<td>68-70 69-72</td>
<td>69-70 6</td>
<td>75-78 4</td>
<td>80-81 2</td>
<td></td>
</tr>
<tr>
<td>65-67 65-68</td>
<td>67-68 5</td>
<td>71-74 5</td>
<td>78-79</td>
<td></td>
</tr>
<tr>
<td>62-64 61-64</td>
<td>65-66 1</td>
<td>67-70 1</td>
<td>76-77 1</td>
<td></td>
</tr>
<tr>
<td>59-61 57-60</td>
<td>63-64 63-66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>53-56 4</td>
<td>61-62 2</td>
<td>59-62 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>55-58 1</td>
<td></td>
</tr>
</tbody>
</table>
**Table VII (continued)**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Score</th>
<th>Trait</th>
<th>Score</th>
<th>Trait</th>
<th>Score</th>
<th>Trait</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>95-97</td>
<td>G</td>
<td>94-96</td>
<td>H</td>
<td>106-108</td>
<td>I</td>
<td>106-108</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>92-94</td>
<td></td>
<td>91-93</td>
<td></td>
<td>103-105</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>89-91</td>
<td></td>
<td>88-90</td>
<td></td>
<td>100-102</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>86-88</td>
<td></td>
<td>85-87</td>
<td></td>
<td>97-99</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>83-85</td>
<td></td>
<td>82-84</td>
<td></td>
<td>94-96</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80-82</td>
<td></td>
<td>79-81</td>
<td></td>
<td>91-93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>77-79</td>
<td></td>
<td>76-78</td>
<td></td>
<td>88-90</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>74-76</td>
<td></td>
<td>73-75</td>
<td></td>
<td>85-87</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>71-73</td>
<td></td>
<td>70-72</td>
<td></td>
<td>82-84</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>68-70</td>
<td></td>
<td>67-69</td>
<td></td>
<td>79-81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>65-67</td>
<td></td>
<td>64-66</td>
<td></td>
<td>76-78</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>62-64</td>
<td></td>
<td>61-63</td>
<td></td>
<td>73-75</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>59-61</td>
<td></td>
<td>58-60</td>
<td></td>
<td>70-72</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>63-64</td>
<td></td>
<td>55-57</td>
<td></td>
<td>67-69</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>64-66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trait A, $\bar{x}=72.94$ s=9.66  Trait B, $\bar{x}=68.43$ s=9.72

Trait C, $\bar{x}=75.44$ s=6.80  Trait D, $\bar{x}=88.50$ s=13.44

Trait E, $\bar{x}=90.46$ s=4.88  Trait F, $\bar{x}=74.15$ s=7.86

Trait G, $\bar{x}=73.58$ s=6.22  Trait H, $\bar{x}=69.44$ s=8.76

Trait I, $\bar{x}=88.19$ s=10.38

-----
The peculiarity noted in regard to weighting and difficulty manifests itself again in the standard deviations of weighted scores. The relationship between the S.D's. of weightings and the S.D's. of scores in the nine traits is \( \rho = .97 \). This is to be expected, but its importance will not be apparent until later.

The means obtained, in terms of percentiles given in the Manual of Directions, is as follows:

- Trait A 60th. percentile
- Trait B 53rd. percentile
- Trait C 43rd. percentile
- Trait D 38th. percentile
- Trait E 70th. percentile
- Trait F 28th. percentile
- Trait G 34th. percentile
- Trait H 43rd. percentile
- Trait I 59th. percentile

The 50th. percentile is not necessarily what the profile shows as the most desirable. The percentage range for each trait is divided into zones. How these zones were determined is unknown, no explanation being given either on the profile or in the Manual of Directions. Table VIII shows the Zones of Acceptability.
Table VIII
Percentile Zones of Acceptability
Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Zone</th>
<th>Trait</th>
<th>Excellent</th>
<th>Acceptable</th>
<th>Improvement desirable</th>
<th>Improvement urgent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>0-41</td>
<td>14-85</td>
<td>85-95</td>
<td>95-100</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0-38</td>
<td>38-71</td>
<td>71-94</td>
<td>94-100</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>19-96</td>
<td>13-19</td>
<td>3-13</td>
<td>0-3</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>86-96</td>
<td>37-86</td>
<td>17-37</td>
<td>0-17</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>78-96</td>
<td>30-78</td>
<td>14-30</td>
<td>0-14</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>12-40</td>
<td>6-12</td>
<td>0-6</td>
<td>99-100</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>7-62</td>
<td>6-7</td>
<td>5-6</td>
<td>0-5</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>3-58</td>
<td>0-3</td>
<td>87-95</td>
<td>95-100</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>80-100</td>
<td>22-80</td>
<td>3-22</td>
<td>0-3</td>
</tr>
</tbody>
</table>

It will be seen that the group forming the basis of this study exhibit a mean within the excellent range on four traits, namely, Active, Subjective, Aggressive and Critical. In four others the mean lies in the acceptable area. These traits are Nervous, Depressive, Sympathetic and Self-mastery. In the trait Cordial the mean for the group is at the borderline between acceptable and improvement desirable.
The scores of older students were compared with those of a younger group. 14 subjects were 27 years of age or over and 14 were 22 years of age or less. Table IX summarizes these results.

Table IX

Comparison of Older and Younger Students

Johnson Temperament Analysis U. B. C. Data

<table>
<thead>
<tr>
<th>Trait</th>
<th>0</th>
<th>Y</th>
<th>0</th>
<th>Y</th>
<th>Mean</th>
<th>S.  D.</th>
<th>C.R.</th>
<th>%ile.</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>69.64</td>
<td>72.22</td>
<td>8.46</td>
<td>8.43</td>
<td>.78</td>
<td>46</td>
<td>52</td>
<td>A  A</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>66.21</td>
<td>77.93</td>
<td>7.46</td>
<td>8.08</td>
<td>.57</td>
<td>42</td>
<td>49</td>
<td>A  A</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>74.79</td>
<td>77.64</td>
<td>5.84</td>
<td>7.34</td>
<td>1.10</td>
<td>58</td>
<td>73</td>
<td>E  E</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>91.64</td>
<td>93.93</td>
<td>9.60</td>
<td>13.92</td>
<td>.49</td>
<td>48</td>
<td>54</td>
<td>A  A</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>90.50</td>
<td>92.36</td>
<td>5.54</td>
<td>3.58</td>
<td>1.02</td>
<td>80</td>
<td>86</td>
<td>E  E</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>70.28</td>
<td>75.43</td>
<td>6.39</td>
<td>10.26</td>
<td>1.54</td>
<td>40</td>
<td>59</td>
<td>E  A</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>74.21</td>
<td>72.36</td>
<td>5.50</td>
<td>6.70</td>
<td>.77</td>
<td>39</td>
<td>29</td>
<td>E  E</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>69.93</td>
<td>70.36</td>
<td>9.30</td>
<td>8.64</td>
<td>.12</td>
<td>57</td>
<td>57</td>
<td>E  E</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>92.90</td>
<td>86.14</td>
<td>11.04</td>
<td>11.46</td>
<td>1.56</td>
<td>57</td>
<td>33</td>
<td>A  A</td>
<td></td>
</tr>
</tbody>
</table>

In no case is the difference in means statistically significant, though this could hardly be expected with such small groups. If the percentiles are considered in relation to the Zones of Acceptability, (See Table VIII, p. 18), the older group has the advantage in four of the traits, A, B, F and I; is equal in four, C, E, G and H and inferior in one, D. This supports in some measure Boynton's findings.
Boynton, using a home-made inventory, tested 1022 women teachers. Statistically significant results showed the age group 16 to 20 years to be the most "maladjusted." Older teachers were generally better than other groups.

Differences in variability were not found to be statistically significant. The highest critical ratio was 1.63 for trait F.

The reliabilities of the nine trait tests were calculated by the split half technique. They are presented in Table X, together with those reported in the Manual of Directions.

Table X

<table>
<thead>
<tr>
<th>Trait</th>
<th>This study</th>
<th>Johnson</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.58</td>
<td>.76</td>
</tr>
<tr>
<td>B</td>
<td>.77</td>
<td>.75</td>
</tr>
<tr>
<td>C</td>
<td>.65</td>
<td>.72</td>
</tr>
<tr>
<td>D</td>
<td>.82</td>
<td>.77</td>
</tr>
<tr>
<td>E</td>
<td>.31</td>
<td>.57</td>
</tr>
<tr>
<td>F</td>
<td>.75</td>
<td>.71</td>
</tr>
<tr>
<td>G</td>
<td>.57</td>
<td>.65</td>
</tr>
<tr>
<td>H</td>
<td>.79</td>
<td>.78</td>
</tr>
<tr>
<td>I</td>
<td>.56</td>
<td>.76</td>
</tr>
</tbody>
</table>

The reliabilities found in this study are in general comparable with those quoted by the test author. Johnson's results are based on the responses of 100 men and 100 women. The lower figures of this investigation may be accounted for by the greater homogeneity of the group used.

Once again the difference between the first and second halves of the Analysis shows itself, markedly in the case of the reliabilities calculated in this study, but still apparent in Johnson's figures. Before discussion is undertaken, it will be desirable to recapitulate the data in tabular form. Table XI does this.

Table XI
Recapitulation of Certain Results
Johnson Temperament Analysis U. B. C. Data

<table>
<thead>
<tr>
<th>Trait</th>
<th>S.D., weights</th>
<th>Difficulties</th>
<th>S.D., scores</th>
<th>r's</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.33</td>
<td>1.62</td>
<td>9.66</td>
<td>.58</td>
<td>.15</td>
</tr>
<tr>
<td>B</td>
<td>1.42</td>
<td>1.04</td>
<td>9.72</td>
<td>.77</td>
<td>.23</td>
</tr>
<tr>
<td>C</td>
<td>1.10</td>
<td>3.94</td>
<td>6.80</td>
<td>.65</td>
<td>.17</td>
</tr>
<tr>
<td>D</td>
<td>1.58</td>
<td>1.98</td>
<td>13.44</td>
<td>.82</td>
<td>.29</td>
</tr>
<tr>
<td>E</td>
<td>1.02</td>
<td>2.44</td>
<td>4.88</td>
<td>.31</td>
<td>.10</td>
</tr>
<tr>
<td>F</td>
<td>1.24</td>
<td>1.71</td>
<td>7.86</td>
<td>.75</td>
<td>.17</td>
</tr>
<tr>
<td>G</td>
<td>1.07</td>
<td>3.12</td>
<td>6.22</td>
<td>.57</td>
<td>.15</td>
</tr>
<tr>
<td>H</td>
<td>1.35</td>
<td>1.27</td>
<td>8.76</td>
<td>.79</td>
<td>.23</td>
</tr>
<tr>
<td>I</td>
<td>1.41</td>
<td>1.31</td>
<td>10.38</td>
<td>.56</td>
<td>.15</td>
</tr>
<tr>
<td>Column</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
<td>V</td>
</tr>
</tbody>
</table>

*P is the sum of the percentages of students using the Mid. response not at all of 50% or more of the time.
The rank difference inter-relationships of the columns of Table XI are as follows:

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>.97</td>
<td>.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>.67</td>
<td>.33</td>
<td>.52</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>.73</td>
<td>.35</td>
<td>.58</td>
<td>.97</td>
</tr>
</tbody>
</table>

This matrix was factored by two different methods, viz. the centroid and direct summation. The centroid was first used, one general factor being shown to account for most of the variance. The first factor residuals did not completely vanish as might be expected with estimated communalities in so small a matrix. In order to determine more accurately the factor loadings, the matrix was then factored by direct summation which does not require the estimation of communalities. Below are given the factor loadings:

<table>
<thead>
<tr>
<th></th>
<th>Centroid</th>
<th>Summation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>.97</td>
<td>1.00</td>
</tr>
<tr>
<td>II</td>
<td>.65</td>
<td>.57</td>
</tr>
<tr>
<td>III</td>
<td>.87</td>
<td>.83</td>
</tr>
<tr>
<td>IV</td>
<td>.83</td>
<td>.77</td>
</tr>
<tr>
<td>V</td>
<td>.86</td>
<td>.82</td>
</tr>
</tbody>
</table>

This only helps to prove the obvious: that each of these five columns is a function of the test itself. The other possibility must be discarded since the difficulty of the items cannot be a function of the weighting.
The high relationship between the standard deviations of weights and the standard deviations of weighted scores is worthy of consideration. Quite obviously the former conditions to some extent the latter. However it is inconceivable that, if the nine traits are in effect measurably distinct in terms of the items used, a group of 48 subjects would be equally variable in those characteristics. What is more likely is that the traits are by no means distinct but are instead a combination of common factors. This prediction is verified by the factor analysis discussed in the next chapter.

The high relationship between reliability and the sum of the percentages of subjects using the mid-interval not at all or more than 50% of the time may be completely fortuitous. It might be however that this sum would give a rapid approximation to the reliability of a three alternative test. It was not possible to carry out the necessary research for justification or refutation of this hypothesis.

With regard to the peculiar differences noted between the two halves of the test, no definite answer can be given. It may well be that the subject's reactions are responsible. In the early part of the Analysis his enthusiasm is likely to be high, hence he pays more attention to shades of meaning and to honest answers. Towards the end, having struggled with a fair number of nebulous questions, he cares less and the first response that comes to mind is marked.
It was noted, for example, that the number of erasures and changes of response was higher in the first half of the Analysis. Test-wiseness may also be a factor, the peculiar use of 'S' in the questions becoming easier to deal with as one has experience. The writer found it to be so in his own case.

Trait I runs throughout the whole inventory. It seemed desirable, therefore, to examine the reliabilities of the two halves of this trait. The first half $r$ was found to be .60, and the second to be .29. This is the reverse of what was found in the other traits. In an effort to account for the lowness of $r$ in the second half of trait I, the weighting distribution was considered. This distribution is bi-modal at the extremes. It is surprising in view of this that the reliability is as high as it is. The distribution follows:

**Distribution of Weights, Second Half, Trait I**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

The difficulties reported in the two halves of trait I follow the general pattern, 35 being noted in the first
and 28 in the second. It seems reasonable to suggest that further investigation of long personality questionnaires is in order. It may be that early items should be disregarded. They might be looked on as training or practice, such as is often given in group intelligence tests.
Chapter 5

Factor Analysis of the Johnson Temperament Analysis

The inter-correlations of the nine sub-tests were calculated by the product-moment formula from weighted scores translated into standard scores. Table XII shows these inter-correlations. The figures below the diagonal are those found in this study, while those above the diagonal are reported in the Manual of Directions. Johnson's figures represent tetrachoric r's, which assume normality of distribution. Normal distributions were not found in this investigation. The test author does not state whether or not his distributions were normal.

Table XII

Inter-correlations of Traits, Johnson Temperament Analysis

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.74</td>
<td>-.31</td>
<td>-.38</td>
<td>-.26</td>
<td>.48</td>
<td>-.15</td>
<td>.56</td>
<td>-.40</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.68</td>
<td>-.46</td>
<td>-.49</td>
<td>-.09</td>
<td>.58</td>
<td>-.05</td>
<td>.63</td>
<td>-.33</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-.04</td>
<td>-.27</td>
<td>.69</td>
<td>.11</td>
<td>-.22</td>
<td>.49</td>
<td>-.20</td>
<td>.19</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-.01</td>
<td>-.29</td>
<td>.47</td>
<td>.19</td>
<td>-.29</td>
<td>.30</td>
<td>-.34</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.03</td>
<td>-.26</td>
<td>.14</td>
<td>.48</td>
<td>-.35</td>
<td>-.01</td>
<td>-.25</td>
<td>.29</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.66</td>
<td>.54</td>
<td>.16</td>
<td>.07</td>
<td>-.20</td>
<td>.06</td>
<td>.72</td>
<td>-.48</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.31</td>
<td>-.30</td>
<td>.42</td>
<td>.23</td>
<td>.01</td>
<td>.03</td>
<td>.08</td>
<td>.22</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>.45</td>
<td>.65</td>
<td>.12</td>
<td>.11</td>
<td>-.13</td>
<td>.69</td>
<td>-.08</td>
<td>-.49</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>-.48</td>
<td>-.37</td>
<td>-.09</td>
<td>.27</td>
<td>.32</td>
<td>-.58</td>
<td>.03</td>
<td>-.32</td>
<td></td>
</tr>
</tbody>
</table>

Below the diagonal, this study.
Above the diagonal, Johnson's figures.
The agreement between these two sets of inter-correlations is marked. As in the case of reliability Johnson's results are confirmed by this study.

The matrix of inter-correlations was factored by the centroid method. Five factors,—the most possible from nine tests,—were extracted before the residual matrix vanished sufficiently. The factor loadings of the last two factors were small. Table XIII sets out the factor matrix and residuals. The full factor matrix and the residual matrices are to be found in appendix C.

Table XIII
Factor Matrix and Residuals

Johnson Temperament Analysis U. B. C. Data

<table>
<thead>
<tr>
<th>Trait</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>Residuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.68</td>
<td>.41</td>
<td>.25</td>
<td>-.33</td>
<td>.07</td>
<td>.04</td>
</tr>
<tr>
<td>B</td>
<td>.84</td>
<td>.12</td>
<td>.27</td>
<td>-.14</td>
<td>-.25</td>
<td>.05</td>
</tr>
<tr>
<td>C</td>
<td>-.30</td>
<td>.58</td>
<td>-.28</td>
<td>.07</td>
<td>.08</td>
<td>.05</td>
</tr>
<tr>
<td>D</td>
<td>-.42</td>
<td>.58</td>
<td>.25</td>
<td>.10</td>
<td>.27</td>
<td>-.04</td>
</tr>
<tr>
<td>E</td>
<td>-.41</td>
<td>.27</td>
<td>.46</td>
<td>-.21</td>
<td>.11</td>
<td>.03</td>
</tr>
<tr>
<td>F</td>
<td>.64</td>
<td>.59</td>
<td>-.16</td>
<td>.05</td>
<td>.12</td>
<td>.01</td>
</tr>
<tr>
<td>G</td>
<td>-.37</td>
<td>.31</td>
<td>-.43</td>
<td>.22</td>
<td>-.16</td>
<td>.02</td>
</tr>
<tr>
<td>H</td>
<td>.58</td>
<td>.49</td>
<td>.10</td>
<td>.39</td>
<td>.11</td>
<td>-.05</td>
</tr>
<tr>
<td>I</td>
<td>-.59</td>
<td>-.21</td>
<td>.41</td>
<td>.23</td>
<td>-.13</td>
<td>.03</td>
</tr>
</tbody>
</table>
Rotation of axes was undertaken by the single-plane method. It proved to be somewhat laborious for five factors, but it has three advantages: (1) calculation is fairly straightforward, (2) the procedure is self-correcting and (3) one hyper-plane is determined at a time. Point (3) is particularly nice, since it is possible to postpone the determination of the remaining hyper-planes while carrying out the more exciting and creative task of identifying the factor. Simple structure was achieved after much effort. The rotated factor matrix is presented in Table XIV.

Table XIV

Rotated Factor Matrix

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trait</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>$\Lambda_a$</td>
<td>$\Lambda_b$</td>
<td>$\Lambda_c$</td>
<td>$\Lambda_d$</td>
<td>$\Lambda_e$</td>
<td>$\Lambda_a$</td>
<td>$\Lambda_b$</td>
<td>$\Lambda_c$</td>
<td>$\Lambda_d$</td>
</tr>
<tr>
<td>A</td>
<td>.55</td>
<td>.06</td>
<td>.31</td>
<td>.32</td>
<td>.17</td>
<td>.58</td>
<td>.01</td>
<td>.18</td>
<td>.35</td>
</tr>
<tr>
<td>B</td>
<td>.13</td>
<td>.54</td>
<td>.19</td>
<td>.26</td>
<td>.00</td>
<td>.28</td>
<td>.41</td>
<td>.55</td>
<td>.34</td>
</tr>
<tr>
<td>C</td>
<td>.29</td>
<td>.14</td>
<td>.57</td>
<td>.05</td>
<td>.02</td>
<td>.41</td>
<td>.58</td>
<td>.09</td>
<td>.53</td>
</tr>
<tr>
<td>D</td>
<td>-.02</td>
<td>.51</td>
<td>-.01</td>
<td>.14</td>
<td>.02</td>
<td>.47</td>
<td>.27</td>
<td>.19</td>
<td>.72</td>
</tr>
<tr>
<td>E</td>
<td>.00</td>
<td>.00</td>
<td>.29</td>
<td>.02</td>
<td>.18</td>
<td>.00</td>
<td>.00</td>
<td>.29</td>
<td>.02</td>
</tr>
</tbody>
</table>
The uniqueness of the simple structure attained must be considered. Traits D and H are of complexity 'r', that is, every factor contributes to their variance, hence they are eliminated from consideration as regards uniqueness (1). The five criteria which Thurstone (2) gives to evaluate the 'compellingness' of the simple structure are as follows:

(1) "Each row of the oblique factor matrix $V$ should have at least one zero."

The above matrix, (Table XIV), meets this first criterion. $F_{Ac} = 0.09$ is sufficiently small to be considered zero.

(2) "For each column, $p$, of the oblique factor matrix $V$ there should be some tests whose factor loadings are zero."

At least two tests in each column of the factor matrix under consideration meet this requirement.

(3) "For every pair of columns of $V$ there should be several tests whose entries vanish in one column but not in another."

This criterion is well met by the factor matrix developed in this investigation. In every combination this occurs with at least three of the seven tests being considered.

(4) "For every pair of columns of $V$, a large proportion of the tests should have zero entries in both columns."

This requirement apparently is not met by the matrix


(2) Ibid., p. 335.
shown in Table XIV. However, in this case the matter is not serious. Thurstone is considering situations where a large number of tests are used to determine the factors. Here there are only seven tests to consider. Obviously if more than one pair of tests satisfied this objective, the previous one, (3), would not be attained. It is surprising rather that the criterion applies at all and since it does in eight out of ten possible combinations, there is reason to be well satisfied.

(5) "For every pair of columns of V there should preferably be only a small number of tests with non vanishing entries in both columns."

With so small a matrix this case can hardly be expected to apply. The word 'preferably' too gives room for leeway. The simple structure is not invalidated because this requirement is only partially met.

It can be concluded that the simple structure obtained in this study measures up reasonably well to Thurstone's criteria. He, himself, states, "Actually, we do not often attain uniqueness." (1) In the fabricated examples in his book this does occur, but in the case of the box problem, (p. 140, pp. 329ff., and pp. 453ff.), uniqueness is not obtained by factorial methods.

The degree of determination of the hyperplanes varies. \( \Lambda_a \) and \( \Lambda_b \) can be considered as being over determined, in each case four of the nine traits being fairly heavily

(1) Ibid., p. 336.
loaded with the factor. Since Trait G is practically collinear it is possible to identify $b$ with a fairly high degree of assurance. Traits A and B with their comparatively small loadings of the other factors help to make the identification of factor A reasonably likely. Hyperplanes $\Lambda_c$ and $\Lambda_d$ are determined and probably can be identified with some assurance. Hyperplane $\Lambda_e$ is relatively indeterminate. But for the fact of several zero loadings of this factor in the various traits and the high loading in trait H nothing could be said for it. As it is only tentative identification will be suggested.
Chapter 6

Identification of Factors

To facilitate the problem of identification of factors, each item of the Analysis was typed on a separate card. For the identification of factor I the cards of traits A and B were placed side by side on a large table. Adjacent to them were put the cards of traits H and F respectively. At the other side of the table the cards of traits G and I were spread out. Trait B was first considered. The following items seemed to go together:

94  Do his failures come hard to S?
116 Does S get over bad news quickly?
130 Does S often ponder on the misfortunes of his past?
137 Is S bothered at times with the idea that nobody cares for him?
138 Does S find that a minor failure of poor showing of his can be quickly forgotten?
152 Does S often have the blues?
169 Does S often feel sad because of his inferiority in some respects?

The items of trait A were next examined. The first question essentially the same as those of trait B was:

75 Does S worry more than the circumstances warrant?

Next to it in order was:

80 Does S take necessary risks of misfortune without undue worry?

This seemed to fit with the others. Several more items
which admitted of the same psychological explanation were found:

3  Is S relatively calm when others are getting rattled?

25  Can S make a speech at a public performance without stage fright?

44  Does S have some thought pressing itself on his attention too much of the time to his annoyance?

72  Does S become so scared of apprehensive at times so as to feel hot, or shivering or have skin get goose-pimples, (goose-skin, goose-flesh)?

Traits G and I were read through carefully to see if any of their items fitted into this pattern. If the above questions are taken to indicate inferiority, which was the original direction of the investigator's thinking, three items in trait G help to dispel the notion:

59  Does S accept defeat easily without any evidence of his disappointed feelings?

67  Is S emphatic in voice and manner?

85  Does S think less well of his ability than the facts warrant?

None of the items of trait I seemed to be similar to those listed from traits A and B. They are concerned largely with action of one sort or another.

Traits F and H were then considered. A number of items appear to fit in with those from traits A and B. In trait F there are:

134  Is S likely to be jealous?

136  Is S "touchy" on several things about himself?
160 Can S see things as others see them, when he wishes to?

165 Does S give too high importance to his own interests and fields of knowledge in comparison with others?

167 Does S find it annoying to have any criticism made of himself even though justified and from which he could profit?

In trait H the following occur:

92 Is it very hard for S to take the blame so that he avoids it?

117 Does S take criticism easily without resentment?

125 Does S tend to exaggerate his grievances?

147 Does S feel abused not being able to do something instead of adapting to it by some substitute activity?

149 Does S only seldom express any grievances?

161 Does S, when he has a grievance straightened out, continue disgruntled for a while?

What sort of person would respond 'correctly' to each of these questions? One who is emotionally mature seems most likely. This factor is therefore tentatively identified as Emotionality. The Guilfords reported such a factor in 1936 (1).

It will be recalled from the previous chapter that there is reason to expect that Factor II can be identified fairly easily and with some certainty. This proved to be so. For the recognition of this factor traits G, F, C and

D were considered together. Typical items from each trait are collected below:

14-G Does S give in or stop during a controversy to "keep the peace?"

31-G Is S so sure of himself that it sometimes annoys others?

41-G Does S sometimes say things that are dominating so that peoples' feelings are sometimes hurt?

50-G Would you consider S a "go-getter"?

52-G Is S likely to give way to the wishes of others rather than to seek to have his own way?

102-F Is S much interested in the affairs of other people?

107-F Does S nearly always find it easy to take an interest in other peoples' interests in conversation?

140-F Is S prejudiced in favor of his own club, state, etc.?

175-F In disagreements with associates does S find it hard to understand how the other can possibly differ from him, so very one sided does the matter seem?

179-F Does S estimate his friends too favorably, in comparison with others whom he judges severely?

13-C Does S usually try to avoid being made chairman of a committee or an officer of an organization?

24-C Does S move about a good deal at a social gathering?

26-C Is S likely to stay on the veranda by preference when some of the others go for tennis or a swim?

28-C Is S good at "breaking the ice" in a social gathering?

82-C Does S talk less than his share when with others?

93-D In social contacts is S thought of as warm-hearted?
100-D Is S really fond of only a few people?
121-D Is S hearty in greeting people?
151-D Do companions like to be with S?
178-D Does S think he has many warm friends?

In traits A, B and I there occur no items similar to the above. The factor is readily identified as Social Introversion-Extraversion. It was also found by Guilford and Guilford in 1936 (1). A somewhat similar factor, K, "trained, socialized cultured mind vs. boorishness," is reported by Cattell (2).

For the identification of Factor III, traits D, E and I were considered. The last mentioned, while its loading is not high, has three zero loadings and a fourth very small. Typical questions which appear to make a pattern are set out below:

98-D Does S express his emotions readily?

128-D Does S live an easy-going life with only a few enthusiasms to express?

131-D Does S show a uniform rather than a varied expression when talking?

141-D Does S smile much?

143-D Is S unsuccessful in acting, impersonating, or relating incidents effectively?

(1) Ibid., pp. 107-127.

12-E Does S think the government is spending too much money on relief and pensions?

18-E Is S considerate in his demands on employees, relatives, or pupils?

49-E Does S think that modern prisons coddle the prisoner too much so as to interfere with needed punishment?

71-E Does S favor zoning the city to control residence areas for negroes and orientals?

73-E Is S impatient with a child's strong desire for a worthless object?

20-I Does S sometimes surprise his acquaintances by unexpected actions?

22-I Does S act deliberately rather than impulsively?

61-I Does S get into scrapes occasionally?

83-I Does S break out in more explosive action or words than would be expected from the cause?

120-I Does S "put his foot in it" often (make a tactless blunder)?

Trait A also, while not heavily loaded with the factor, provides items which appear to go with those already listed:

15-A Does S have a voice that flows evenly and smoothly?

38-A Can S enjoy a rest when there are distracting noises and movements around him?

47-A Does S sleep well?

56-A Does S become disturbed by harmless rattles, crickets or the wind?

70-A Can S relax easily when sitting or lying down?

These questions appear to contrast happy-go-lucky or a carefree disposition with inhibition or over-control. This factor is tentatively named Rhathymia, reported by
the Guilfords in preliminary fashion in 1936 and more
definitely in 1939 (1).

Traits H, F and B were used to determine the
characteristics of the fourth factor. The questions which
make a pattern are set out below:

106-H Does S think that someone is definitely
unfriendly to him and works against him?

122-H Is S almost free from being suspicious of the
actions of others?

129-H Does S think as well of those with whom he
has a disagreement, as before?

158-H Does S think someone does not like him and
speaks critically about S to others?

164-H When S loses something, is he almost free
from the tendency to think that someone else
stole or mislaid it?

109-F Does S give judgments only after a weighing
of the pros and cons?

119-F Does S find it easy to be impartial when
called on to judge?

144-F Is S logical and scientific in his thinking?

154-F Are personal interests unable to sway S from
sound decisions?

173-F Does S succeed in preventing his emotions
swaying his judgment much?

127-B Do death, sickness, pain, sorrow enter largely
into S's dreams?

(1) Guilford, J. P. and Guilford, R. B., Personality
pp. 21-36 and 239-248.
146-B Does S find that the memories of illness or pain pass out of his mind fairly soon?

171-B Does S prefer not to pass a cemetery, so as not to be reminded of death?

176-B Does S find that grief over war victims and refugees comes to mind often?

180-B Is S almost free from being disturbed by either his immaturity or aging?

An examination of traits E and I shows no items of this type. Each of those listed above answers, in some measure, the question, "Does the subject view himself and his surroundings objectively?". Together they may be taken as representing the personality trait, Objectivity. This factor is by no means positively determined in this investigation. The best that can be said is that Factor IV could be Objectivity.

The same situation obtains with regard to Factor V. It is with a considerable degree of hesitation that any attempt is made to define it. The following items from trait H seem to go together:

96-H Does S put into his conversation quite a few "knocks" about others?

108-H When S does criticize, is it always tactful and really meant to be helpful?

132-H Is S hard to please?

145-H Does S comment on many shortcomings in the shows he sees and the books he reads?

156-H Does S think well of most people, as to only rarely speak slightlyingly of them?
Three items from each of traits B and D appear to fit in with those listed above:

101-B Does S make efforts to get others to laugh and smile?
104-B Is S sometimes thought of as a "wet blanket"?
135-B Is S rather optimistic about opportunities for young people?
157-D Does S show a cordial attitude only to close friends if at all?
170-D Does S show a friendly attitude in his voice and expression?
174-D Is S appealed to strongly by young lovers who are hampered by opposition?

These questions centre around the idea of accepting things and people as they are as opposed to over critical reactions and intolerance. Since Factor III was examined before this one, some items in trait E which would have mitigated against the identification, had already been allocated. Nevertheless, as judgment regarding the placing of items is very likely to be faulty,—the Guilfords found this in attempting to make questions to identify their factors R and T,—the decision about this factor is in considerable doubt. With reluctance it will be called Co-operativeness.

It will be recalled that all the five factors contribute to the variance of traits D and H. Furthermore the reliabilities of these two tests were the highest in the battery. It is suggested that these two traits could be
combined into a short test of 40 items which might well give as good a general index as does the larger Analysis. In so far as the factoring in this study can be trusted, it does not appear that, for the group used, the Johnson Temperament Analysis measures the nine traits defined by the test author.
Chapter 7

Summary

This study of the Johnson Temperament Analysis was made on the basis of the responses of 48 male graduates in teacher training at the University of British Columbia. A number of different aspects of the Analysis were examined:

(1) The difficulty of response to items as reported by subjects. The mean number of difficult items was 21.6. The kinds of difficulties were classified as five:
   (a) Lack of experience with the topic.
   (b) Difficulties of comprehension.
   (c) Difficulties of evaluation.
   (d) Response dependent upon circumstances.
   (e) Two or more notions in one question.

It is thought that some of these difficulties could be overcome if a revision of the Analysis were undertaken.

(2) The general adjustment of the group on the basis of the Analysis was considered. The means were in or above the 'acceptable' zones in all traits except Cordial, where the mean was at the borderline between 'acceptable' and 'improvement desirable'.

(3) Age differences were considered and were not found to be statistically significant. There was some slight advantage in favor of the older group.

(4) Test reliabilities were calculated by the split
half technique and found to range from $r = .82$ to $r = .32$. The reliabilities found were in general similar to those quoted by the test author.

(5) A phenomenon of difference between the first and second halves of the Analysis was noted in all aspects of the investigation. No definite conclusions could be drawn, but it was suggested that a change in attitude on the part of the subjects might be responsible. It is felt that further research might determine the desirability of having a series of practice items prior to those scored.

(6) The inter-correlations of the nine traits were factored by the centroid method. Five factors were found to account for most of the variance. Axes were rotated by the single-plane method and a reasonably compelling simple structure obtained. The uniqueness of this structure was discussed in terms of Thurstone's five criteria.

(7) An attempt was made to identify the factors discovered. One is offered with a fairly high degree of assurance, namely Factor II,—Social Introversion-Extraversion. Two factors are identified with some assurance, Factors I and III as Emotionality and Rhathymia respectively. Factors IV and V are defined with some reluctance as Objectivity and Co-operativeness.

(8) If a shorter measure of the five factors were required, it is suggested that traits D and H might be used without the remainder of the Analysis, since each
factor contributes to their variance. Their reliabilities, too, are the highest in the battery.

These findings are made from a very small sample, hence no great credence can be placed in them. Further investigation on other samples is necessary before definite conclusions can be drawn.
JOHNSON TEMPERAMENT ANALYSIS
Devised by Roswell H. Johnson

Directions

1. The questions on the following all refer to the person about whom the questions are answered, called the subject or S. They do not refer to any other person who may be describing S.

2. The word “he” is to be taken as applying to the subject whether a man or woman.

3. Be sure you understand the question, reading it twice if necessary.

4. Do not ponder too long on any one question, but answer as soon as you have thought it through and pass on to the next question. If you are uncertain about the answer, make the best estimate you can.

5. If the answer would be different as of some period in the past rather than of the present, answer as of the present, unless the question is expressly stated otherwise.

6. Be sure your name and other requested data are on the answer sheet.

7. On the Answer Sheet you are given three columns on which to mark your answer as follows:

   +40%; “Yes” to the extent of the highest 40% of the population of the age and sex of S in response to that question; this means “decidedly yes” or “mostly so”.

   Mid. 20%; that “S” is average or belonging to the middle 20% in regard to this question.

   —40%; S considers his answer is “No” to the extent of the lowest 40%, or “decidedly no” in regard to this question.

   The “mid” column is sometimes used by apparently lazy persons to evade the labor of making a decision. Please do not mark the “mid” column, unless the answer really belongs here to describe the subject.

8. Your answer is indicated by making a heavy black line between the pair of dotted lines in the column which will show your answer. Be sure that the answer row number on the Answer Sheet agrees with the number of the question in the test booklet.

9. Keep your Answer Sheet on a hard surface while marking your answers. Make your marks heavy and as long as the dotted lines, completely blackening the space. When the answers are to be machine scored, a special pencil adapted for this purpose must be used.

10. If you change your mind, erase your first mark completely.

11. Explanations or other comment are desirable and may be recorded on the reverse side of the answer sheet, but not elsewhere.

12. Please do not omit any answer. Guess or estimate if you do not know.

Copyright, 1941, by Roswell H. Johnson
Published by California Test Bureau
Questions

Mark answers on answer sheet. Please do not mark these questions. Any comment should go on back of answer sheet.

1. Does S decline to interfere to protect some animal from needless suffering?
2. Is one motive for S to go places so that he can talk about having been there?
3. Is S relatively calm when others are getting rattled?
4. When hunting or fishing is S free from being disturbed by the pain inflicted on living bait or the fish caught?
5. Does S resent efforts of others to tell him what to do?
6. Does S make a considerable use of the telephone, dictionary, or atlas when not necessary?
7. Does S sometimes have sudden unexpected jerks of some of his muscles even though nothing has happened?
8. Is S very eager to have his own business, or be an independent professional man, or if in an organization to be in a position to give orders rather than to take them?
9. Does S write in for samples, catalogs, solve puzzles, or submit questions to radio programs at times?
10. Is S easy-going in the matter of discipline?
11. Does S tend to say what comes to mind without enough thought as to whether it would be better left unsaid?
12. Does S think the government is spending too much on relief and pensions?
13. Does S usually try to avoid being made a chairman of a committee or an officer of an organization?
14. Does S give in or stop during a controversy to “keep the peace”?
15. Does S have a voice that flows evenly and smoothly?
16. Is S inclined to say little except in response?
17. Does S have jerking motions of some muscles when unexpected things happen?
18. Is S considerate in his demands on employees, relatives, or pupils?
19. Does S talk slowly (making due allowance for age)?
20. Does S sometimes surprise his acquaintances by unexpected actions?
21. Would S buy an article at the cheaper price if he noticed that the clerk has asked less than the price tag indicates, apparently having misread it?
22. Does S act deliberately rather than impulsively?
23. Does S often keep his views to himself because they do not seem important enough to tell others?
24. Does S move about a good deal at a social gathering?
25. Can S make a speech or public performance without stage fright?
26. Is S likely to stay on the veranda by preference when some of the others go for tennis or a swim?
27. Does S have phobias, i.e., an unwarranted and disturbing hatred or fear of any object or group of objects or situations?
28. Is S good at “breaking the ice” in a social gathering?
29. Does S have the same religion, politics, philosophy as his parents?
30. Is S constantly careful to protect his health?
31. Is S so sure of himself that it sometimes annoys others?
32. Does S quickly recover his composure after an accident or similar disturbing incident?
33. Is S less attentive than most individuals to things going on around him?
34. Is S rather indifferent to maintaining the dignity and privileges of his job or place in life?
35. Can S work in a room with many others talking and work efficiently without strain?
36. Does S maintain uniformly, courteous behavior to other members of his family?
37. Is S the kind of a person one might call a “self starter”?
38. Can S enjoy a rest when there are distracting noises and movements about?
39. Does S love to travel and when on a trip does he seek new experiences characteristic of the country?
40. Does S chew pencils or bite fingernails?
41. Does S sometimes say things that are dominating so that peoples’ feelings are sometimes hurt?
42. Does S have few interests or activities of his own choosing?
43. Does S “stick-to-it” at the cost of much inconvenience rather than give up?
44. Does S have some thought pressing itself on his attention too much of the time to his annoyance?
45. Does S eat slowly (making due allowance for age)?
46. Is S as much influenced in his behavior by consideration of general welfare as by considerations of his own advantage?
47. Does S sleep well?
48. Does S take responsibility with reluctance, because he is doubtful of his fitness for it?
49. Does S think that modern prisons coddle the prisoner too much so as to interfere with needed punishment?
50. Would you consider S a “go-getter”?
51. Is S so sympathetic with those he sees in pain as to want to do something about it?
52. Is S likely to give way to the wishes of others rather than to seek to have his own way?
53. Would S feel sympathetic with conscientious objectors in time of war, where it is a war of invading other countries by one’s own country?
54. Does S try to convert people to his views in several fields in which he is not an expert?
55. Does S prefer to take a passive role in the clubs to which he belongs?
56. Does S become disturbed by harmless rattles, crickets or the wind?
57. Does S make a practice of offering help to motorists who need help, but do not ask for it?
58. Does S use all reasonable precautions to prevent accidents?
59. Does S accept defeat easily without any evidence of his disappointed feeling?
60. Would S probably resort to corporal punishment in the case of deliberate disobedience by his own child at age ten?
61. Does S get into scrapes occasionally?
62. Does S have a habit of blinking eyes or pulling at ears?
63. Does S fail to finish what he sets out to do, often enough to be a bother to him?
64. Does S incline to ride rather than walk when the distance is intermediate?
65. Do S’s “teeth get on edge” when hearing some noises?
66. Does S buy on credit to excess?
67. Is S emphatic in voice and manner?
68. Can S get along with children of various ages without becoming irritated by them?
69. Has S made more than one loan out of kindheartedness in which he was “worked” and never repaid?
70. Can S relax easily when sitting or lying down?
71. Does S favor zoning the city to control residence areas for negroes or orientals?
72. Does S become so scared or apprehensive at times so as to feel hot, or shivering or have skin get goose-pimples, (goose-skin, goose-flesh)?
73. Is S impatient with a child’s strong desire for a worthless object?
74. Does S feel strongly convinced of the correctness of his views when in a controversy, excluding those in which he is expert?
75. Does S worry more than the circumstances warrant?
76. Does S sometimes get quite “keyed-up” (exclusive of drinking)?
77. Does S make plans well in advance of the event and carry them out?
78. Does S often get so wakeful as to be disinclined to go to bed at the usual time?
79. Does S tend to put off doing things past the time that would be best?
80. Does S take necessary risks of misfortune without undue worry?
81. In traveling does S watch out to help the aged, infirm, or those with children rather than leave such acts to the officials?
82. Does S talk less than his share when with others?
83. Does S break out in more explosive action or words than would be expected from the cause?
84. Does S want to have no children or one or two (not more) (assuming adequate health and income)?
85. Does S think less well of his ability than the facts warrant?
86. Is S opposed to the parole system for criminals?
87. Does S try to “get things going” in the community to which he belongs?
88. Is S almost always truthful to others?
89. Is S lively enough so someone might refer to him as “always-on-the-go”?
90. In an automobile accident in which S is involved does he really try to see that any damage he did is made good?
91. Is S inclined to have a few select friends rather than a large circle of friends and speaking acquaintances?

92. Is it very hard for S to take blame, so that he seeks to avoid it?

93. In social contacts is S thought of as warm-hearted?

94. Do his failures come hard to S?

95. Is S usually able to steady a difficult situation where “others lose their heads”?

96. Does S put into his conversation quite a few “knocks” about others?

97. Is singing or whistling often started by S out of the joys of life?

98. Does S express his emotions readily?

99. Is S independent in making a judgment uninfluenced by whether he likes or dislikes the leading supporter of the proposal in question?

100. Is S really fond of only a few people?

101. Does S make efforts to get others to laugh and smile?

102. Is S much interested in the affairs of other people?

103. Does S refrain from complaining, when the other is late to an appointment?

104. Is S sometimes thought of as a “wet blanket”?

105. Is S considered cheery by some people?

106. Does S think that someone is definitely unfriendly to him and works against him?

107. Does S nearly always find it easy to take an interest in other peoples’ interests in conversation?

108. When S does criticize, is it always tactful and really meant to be helpful?

109. Does S give judgments only after a weighing of the pros and cons?

110. Is S relatively unaffected in listening to emotional music?

111. Does S think less well of rivals than they deserve?

112. Does S express his satisfaction when he sees beautiful things?

113. Does S give very little time in his conversation to the criticism of people and things?

114. Does S sometimes think people are looking at him or talking about him when they are really not doing so?

115. Does S pay his debts and keep his promises when it is possible?

116. Does S get over bad news quickly?

117. Does S take criticism easily without resentment?

118. Do various satisfactions keep S’s life so full that life seems very much worth living?

119. Does S find it easy to be impartial when called on to judge?

120. Does S “put his foot in it” often (make a tactless blunder)?
121. Is S hearty in greeting people?
122. Is S almost free from being suspicious of the actions of others?
123. Does S sometimes get the experience in hearing speakers of thinking that the speaker is referring to S?
124. Does S have a tendency to do some things beyond what good judgment would indicate?
125. Does S tend to exaggerate his grievances?
126. Does S adapt readily to new difficult conditions and situations?
127. Do death, sickness, pain, and sorrow enter largely into S's dreams?
128. Does S live an easy-going life with only few enthusiasms to express?
129. Does S think as well of those with whom he has a disagreement, as before?
130. Does S often ponder on the misfortunes of his past?
131. Does S show a uniform rather than a varied expression in talking?
132. Is S hard to please?
133. Does S carry out assignments promptly and systematically?
134. Is S likely to be jealous?
135. Is S rather optimistic about opportunities for young people?
136. Is S "touchy" on several things about himself?
137. Is S bothered at times with the idea that nobody cares for him?
138. Does S look ahead and fail to smile and show interest when passing a beautiful child?
139. Is S well pleased with life and so never considered committing suicide?
140. Is S prejudiced in favor of his own club, college, state, etc.?
141. Does S smile much?
142. Does S find that a minor failure or poor showing of his can be quickly forgotten?
143. Is S unsuccessful in acting, impersonating or relating incidents effectively?
144. Is S logical and scientific in this thinking?
145. Does S comment on many shortcomings in the shows he sees and the books he reads?
146. Does S find that the memories of illness or pain pass out of mind fairly soon?
147. Does S feel abused not being able to do something, instead of adapting to it by some substitute activity?
148. Does S prefer to be with adults nearly all the time rather than with children part of the time?
149. Does S only seldom express any grievances?
150. Does S have his opinions influenced by looking at things from the standpoint of his experience, occupation, or training?
151. Do companions like to be with S?
152. Does S often have the blues?
153. After seeing a tragic motion picture or drama, does S quickly return to normal, rather than continue being disturbed for a while?
154. Are personal interests unable to sway S from sound decisions?
155. Does S, when on a picnic find himself sometimes unable to share the good spirits of the others?
156. Does S think well of most people, as to only rarely speak slightlyingly of them?
157. Does S show a cordial attitude only to close friends if at all?
158. Does S think someone does not like him and speaks critically about S to others?
159. Does S smile or laugh a good deal?
160. Can S see things as others see them, when he wishes to?
161. Does S, when he has a grievance straightened out, continue disgruntled for a while?
162. In voting does S study the personalities and issues, sometimes voting for a candidate of the other party, rather than regularly voting the same party ticket straight?
163. Does S refrain from giving a kiss, hug, pat on the back or otherwise manifesting pleasure in meeting friends, except as needed for politeness, after an absence of a fortnight or so?
164. When S loses something, is he almost free from the tendency to think that some one else stole or mislaid it?
165. Does S give too high an importance to his own interests and fields of knowledge in comparison with others?
166. Does S find it hard to get started on a task that needs to be done?
167. Does S find it annoying to have any criticism made of himself even though justified and from which he could profit?
168. Can S “stand-up” under adversity well?
169. Does S often feel sad because of his inferiority in some respects?
170. Does S show a friendly attitude in his voice or expression?
171. Does S prefer not to pass a cemetery, so as not to be reminded of death?
172. Does S spend only very little time or no time grumbling about the condition of his work?
173. Does S succeed in preventing his emotions swaying his judgment much?
174. Is S appealed to strongly by young lovers who are hampered by opposition?
175. In disagreements with associates does S find it hard to understand how the other can possibly differ from him, so very one sided does the matter seem?
176. Does S find that grief over war victims and refugees comes to mind often?
177. Does S spend too freely in view of his income?
178. Does S think he has many warm friends?
179. Does S estimate his friends too favorably, in comparison with others whom he judges more severely?
180. Is S almost free from being disturbed by either his immaturity or aging?
181. Does S have spells of liveliness (lasting at least several days) rather than staying at about the same level?
182. Does S have spells of being sad and depressed (lasting at least several days) rather than staying at about the same level?

Now look back over your answer sheet to make sure you have an answer for every question. If you do not know, make the best guess you can.

Be sure to look to make sure you filled in the blanks at top of answer sheet showing your name, etc.
Appendix B

Johnson Temperament Analysis

Item Numbers Classified by Traits

<table>
<thead>
<tr>
<th>Trait A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>94</td>
<td>6</td>
<td>91</td>
<td>1</td>
<td>99</td>
<td>5</td>
<td>92</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>97</td>
<td>13</td>
<td>93</td>
<td>4</td>
<td>102</td>
<td>8</td>
<td>96</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>101</td>
<td>16</td>
<td>98</td>
<td>12</td>
<td>107</td>
<td>10</td>
<td>103</td>
<td>22</td>
</tr>
<tr>
<td>17</td>
<td>104</td>
<td>19</td>
<td>100</td>
<td>18</td>
<td>109</td>
<td>14</td>
<td>106</td>
<td>30</td>
</tr>
<tr>
<td>25</td>
<td>116</td>
<td>24</td>
<td>105</td>
<td>21</td>
<td>114</td>
<td>23</td>
<td>108</td>
<td>58</td>
</tr>
<tr>
<td>27</td>
<td>118</td>
<td>26</td>
<td>110</td>
<td>36</td>
<td>119</td>
<td>31</td>
<td>111</td>
<td>61</td>
</tr>
<tr>
<td>32</td>
<td>127</td>
<td>28</td>
<td>112</td>
<td>46</td>
<td>123</td>
<td>34</td>
<td>113</td>
<td>66</td>
</tr>
<tr>
<td>35</td>
<td>130</td>
<td>33</td>
<td>121</td>
<td>49</td>
<td>134</td>
<td>41</td>
<td>117</td>
<td>77</td>
</tr>
<tr>
<td>38</td>
<td>135</td>
<td>37</td>
<td>128</td>
<td>51</td>
<td>136</td>
<td>43</td>
<td>122</td>
<td>79</td>
</tr>
<tr>
<td>40</td>
<td>137</td>
<td>42</td>
<td>131</td>
<td>53</td>
<td>140</td>
<td>48</td>
<td>125</td>
<td>83</td>
</tr>
<tr>
<td>44</td>
<td>139</td>
<td>45</td>
<td>138</td>
<td>57</td>
<td>144</td>
<td>50</td>
<td>129</td>
<td>95</td>
</tr>
<tr>
<td>47</td>
<td>142</td>
<td>55</td>
<td>141</td>
<td>60</td>
<td>150</td>
<td>52</td>
<td>132</td>
<td>115</td>
</tr>
<tr>
<td>56</td>
<td>146</td>
<td>64</td>
<td>143</td>
<td>69</td>
<td>154</td>
<td>54</td>
<td>145</td>
<td>120</td>
</tr>
<tr>
<td>62</td>
<td>152</td>
<td>76</td>
<td>148</td>
<td>71</td>
<td>160</td>
<td>59</td>
<td>147</td>
<td>124</td>
</tr>
<tr>
<td>65</td>
<td>155</td>
<td>78</td>
<td>151</td>
<td>73</td>
<td>162</td>
<td>63</td>
<td>149</td>
<td>126</td>
</tr>
<tr>
<td>68</td>
<td>159</td>
<td>82</td>
<td>157</td>
<td>81</td>
<td>165</td>
<td>67</td>
<td>156</td>
<td>133</td>
</tr>
<tr>
<td>70</td>
<td>169</td>
<td>87</td>
<td>163</td>
<td>84</td>
<td>167</td>
<td>74</td>
<td>158</td>
<td>153</td>
</tr>
<tr>
<td>72</td>
<td>171</td>
<td>89</td>
<td>170</td>
<td>86</td>
<td>173</td>
<td>85</td>
<td>161</td>
<td>166</td>
</tr>
<tr>
<td>75</td>
<td>176</td>
<td>88</td>
<td>175</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>180</td>
<td>90</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

----
Appendix C  
Correlation Matrix  
Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.68</td>
<td>-.04</td>
<td>-.01</td>
<td>.03</td>
<td>.66</td>
<td>-.31</td>
<td>.45</td>
<td>-.48</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.68</td>
<td>-.27</td>
<td>-.29</td>
<td>-.26</td>
<td>.54</td>
<td>-.30</td>
<td>.65</td>
<td>-.37</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-.04</td>
<td>-.27</td>
<td>.47</td>
<td>.14</td>
<td>.16</td>
<td>.42</td>
<td>.12</td>
<td>-.09</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-.01</td>
<td>-.29</td>
<td>.47</td>
<td>.48</td>
<td>.07</td>
<td>.23</td>
<td>.11</td>
<td>.27</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.03</td>
<td>-.26</td>
<td>.14</td>
<td>.48</td>
<td>-.20</td>
<td>.01</td>
<td>-.13</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.66</td>
<td>.54</td>
<td>.16</td>
<td>.07</td>
<td>-.20</td>
<td>.03</td>
<td>.69</td>
<td>-.58</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.31</td>
<td>-.30</td>
<td>.42</td>
<td>.23</td>
<td>.01</td>
<td>.03</td>
<td>-.08</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>.45</td>
<td>.65</td>
<td>.12</td>
<td>.11</td>
<td>-.13</td>
<td>.69</td>
<td>-.08</td>
<td>-.32</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>-.48</td>
<td>-.37</td>
<td>-.09</td>
<td>.27</td>
<td>.32</td>
<td>-.58</td>
<td>.03</td>
<td>-.32</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>s</th>
<th>.38</th>
<th>.91</th>
<th>1.33</th>
<th>.39</th>
<th>1.37</th>
<th>.03</th>
<th>1.49</th>
<th>-1.22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>aj</td>
<td>.68</td>
<td>-.30</td>
<td>-.42</td>
<td>-.41</td>
<td>.64</td>
<td>-.37</td>
<td>.58</td>
<td>-.59</td>
</tr>
</tbody>
</table>
## Appendix C

First Factor Residuals

Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.11</td>
<td>.16</td>
<td>.28</td>
<td>.31</td>
<td>.23</td>
<td>-.06</td>
<td>.06</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.11</td>
<td>-.02</td>
<td>.06</td>
<td>.08</td>
<td>.00</td>
<td>.01</td>
<td>.16</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.16</td>
<td>-.02</td>
<td>.34</td>
<td>.02</td>
<td>.35</td>
<td>.31</td>
<td>.29</td>
<td>-.27</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>.28</td>
<td>.06</td>
<td>.34</td>
<td>.31</td>
<td>.34</td>
<td>.07</td>
<td>.35</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.31</td>
<td>.08</td>
<td>.02</td>
<td>.31</td>
<td>.06</td>
<td>-.14</td>
<td>.11</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.23</td>
<td>.00</td>
<td>.35</td>
<td>.34</td>
<td>.06</td>
<td>.27</td>
<td>.32</td>
<td>-.20</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.06</td>
<td>.01</td>
<td>.31</td>
<td>.07</td>
<td>-.14</td>
<td>.27</td>
<td>.13</td>
<td>-.19</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>.06</td>
<td>.16</td>
<td>.29</td>
<td>.35</td>
<td>.11</td>
<td>.32</td>
<td>.13</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>-.08</td>
<td>.13</td>
<td>-.27</td>
<td>.02</td>
<td>.08</td>
<td>-.20</td>
<td>-.19</td>
<td>.02</td>
<td></td>
</tr>
</tbody>
</table>

| s     | 1.01  | .53   | 1.18  | 1.77  | .83   | 1.37  | .40   | 1.44  | -.49  |
| aj    | .41   | .12   | .58   | .58   | .27   | .59   | .31   | .49   | -.21  |
Appendix C

Second Factor Residuals

Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.06</td>
<td>-.08</td>
<td>.04</td>
<td>.20</td>
<td>-.01</td>
<td>-.19</td>
<td>-.14</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.06</td>
<td>-.09</td>
<td>-.01</td>
<td>.05</td>
<td>-.07</td>
<td>-.03</td>
<td>.10</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-.08</td>
<td>-.09</td>
<td>.00</td>
<td>-.14</td>
<td>.01</td>
<td>.13</td>
<td>.01</td>
<td>-.15</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>.04</td>
<td>-.01</td>
<td>.00</td>
<td>.15</td>
<td>.00</td>
<td>-.11</td>
<td>.07</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.20</td>
<td>.05</td>
<td>-.14</td>
<td>.15</td>
<td>-.10</td>
<td>-.22</td>
<td>-.02</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>-.01</td>
<td>-.07</td>
<td>.01</td>
<td>.00</td>
<td>-.10</td>
<td>.09</td>
<td>.03</td>
<td>-.08</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.19</td>
<td>-.03</td>
<td>.13</td>
<td>-.11</td>
<td>-.22</td>
<td>.09</td>
<td>-.02</td>
<td>-.12</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>-.14</td>
<td>.10</td>
<td>.01</td>
<td>.07</td>
<td>-.02</td>
<td>.03</td>
<td>-.02</td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>.01</td>
<td>.16</td>
<td>-.15</td>
<td>.14</td>
<td>-.14</td>
<td>-.08</td>
<td>-.12</td>
<td>.12</td>
<td></td>
</tr>
</tbody>
</table>

| s    |-.11 | .17 |-.31| .28 | .06 |-.13 |-.47 | .15 | .22 |
| a_j  |.25  | .27 |-.28| .25 | .46 |-.16 |-.43 | .10 | .41 |
## Appendix C

### Third Factor Residuals

**Johnson Temperament Analysis**

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-.01</td>
<td>-.01</td>
<td>-.02</td>
<td>.08</td>
<td>.03</td>
<td>-.08</td>
<td>-.16</td>
<td>-.09</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-.01</td>
<td>-.01</td>
<td>-.09</td>
<td>-.07</td>
<td>-.03</td>
<td>.09</td>
<td>.07</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-.01</td>
<td>-.01</td>
<td>.07</td>
<td>-.01</td>
<td>-.03</td>
<td>.01</td>
<td>.04</td>
<td>-.04</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-.02</td>
<td>-.09</td>
<td>.07</td>
<td>.04</td>
<td>.04</td>
<td>.00</td>
<td>.04</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.08</td>
<td>-.07</td>
<td>-.01</td>
<td>.04</td>
<td>-.03</td>
<td>-.02</td>
<td>-.07</td>
<td>-.05</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.03</td>
<td>-.03</td>
<td>-.03</td>
<td>.04</td>
<td>-.03</td>
<td>.02</td>
<td>.05</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.08</td>
<td>.09</td>
<td>.01</td>
<td>.00</td>
<td>-.02</td>
<td>.02</td>
<td>.02</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>-.16</td>
<td>.07</td>
<td>.04</td>
<td>.04</td>
<td>-.07</td>
<td>.05</td>
<td>.02</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>-.09</td>
<td>.05</td>
<td>-.04</td>
<td>.04</td>
<td>-.05</td>
<td>-.01</td>
<td>.06</td>
<td>.08</td>
<td></td>
</tr>
</tbody>
</table>

| s     | -.25| .00 | .02 | .12 | -.13| .04 | .10 | .07 | .04 |
| aj    | -.33| .14 | .07 | .10 | -.21| .05 | .22 | .39 | .23 |
# Appendix C

**Fourth Factor Residuals**

*Johnson Temperament Analysis*

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.03</td>
<td>.01</td>
<td>.01</td>
<td>.01</td>
<td>.05</td>
<td>-.01</td>
<td>-.03</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.03</td>
<td>-.02</td>
<td>-.10</td>
<td>-.04</td>
<td>-.04</td>
<td>.06</td>
<td>.02</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.01</td>
<td>-.02</td>
<td>.06</td>
<td>.00</td>
<td>-.03</td>
<td>.00</td>
<td>.01</td>
<td>-.06</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>.01</td>
<td>-.10</td>
<td>.06</td>
<td>.06</td>
<td>.03</td>
<td>-.02</td>
<td>.00</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.01</td>
<td>-.04</td>
<td>.00</td>
<td>.06</td>
<td>-.02</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.05</td>
<td>-.04</td>
<td>-.03</td>
<td>.03</td>
<td>-.02</td>
<td>.01</td>
<td>.03</td>
<td>-.02</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>-.01</td>
<td>.06</td>
<td>.00</td>
<td>-.02</td>
<td>.02</td>
<td>.01</td>
<td>-.07</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>-.03</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
<td>.01</td>
<td>.03</td>
<td>-.07</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>-.01</td>
<td>.02</td>
<td>-.06</td>
<td>.02</td>
<td>.00</td>
<td>-.02</td>
<td>.01</td>
<td>-.01</td>
<td></td>
</tr>
</tbody>
</table>

| s     | .06 | -.07| -.03| .06 | .04 | .01 | .00 | -.04| -.05|
| a_j   | .07 | -.25| .08 | .27 | .11 | .12 | -.16| .11 | -.13|
Appendix C

Fifth Factor Residuals

Johnson Temperament Analysis

<table>
<thead>
<tr>
<th>Trait</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.05</td>
<td>.00</td>
<td>-.01</td>
<td>.00</td>
<td>.04</td>
<td>.00</td>
<td>-.04</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.05</td>
<td>.00</td>
<td>-.04</td>
<td>-.01</td>
<td>-.01</td>
<td>.02</td>
<td>.05</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.00</td>
<td>.00</td>
<td>.04</td>
<td>-.01</td>
<td>-.04</td>
<td>.01</td>
<td>.00</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-.01</td>
<td>-.04</td>
<td>.04</td>
<td>.03</td>
<td>.00</td>
<td>-.02</td>
<td>-.03</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.00</td>
<td>-.01</td>
<td>-.01</td>
<td>.03</td>
<td>-.03</td>
<td>.04</td>
<td>.00</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>.04</td>
<td>-.01</td>
<td>-.04</td>
<td>.00</td>
<td>-.03</td>
<td>.03</td>
<td>.02</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>.00</td>
<td>.02</td>
<td>.01</td>
<td>-.02</td>
<td>.04</td>
<td>.03</td>
<td>-.05</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>-.04</td>
<td>.05</td>
<td>.00</td>
<td>-.03</td>
<td>.00</td>
<td>.02</td>
<td>-.05</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>.00</td>
<td>-.01</td>
<td>.05</td>
<td>-.01</td>
<td>.01</td>
<td>.00</td>
<td>-.01</td>
<td>.00</td>
<td></td>
</tr>
</tbody>
</table>

s .04 .05 .05 -.04 .03 .01 .02 -.05 .03
Bibliography


