The Roodt Report

Reliability and Validity Study on the *Discus* Personality Profiling System

Compiled from the report by

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Abstract

The purpose of the investigation was to determine whether the Discus measuring instrument could be considered a reliable and valid instrument. The test-retest method was used in the reliability study and was administered to 90 employees from a variety of companies in Kwa Zulu-Natal and Gauteng. The Pearson's product-moment correlation coefficient was used and correlation scores of 0.728 (Dominance), 0.645 (Influence), 0.730 (Steadiness) and 0.550 (Compliance) were established. The p-value in all the cases was as low as 0.0001. This indicates significance at alpha = 0.001. It can therefore be concluded with 99.9 % level of confidence that the Discus instrument is reliable.

In the validity exercise criterion-related validity was used. An exploratory study was undertaken in order to determine which of the 15 Factors (Factor B excluded) of the 16-PF correlated with the four dimensions of the Discus. One hundred and twenty respondents in South Africa were involved for this purpose. The Pearson's product-moment correlation coefficient was applied. It was found that Factors Q1, $\underline{X}$=G,L,Q1 and $\underline{X}$=Q2,E; E, Q2 and -I show significant correlations with Dominance at the 1% and 5% level of significance. Factors A, -Q2, H, F and -Q3 show significant correlations with Influence at the 1% and 5% level of significance. Factors -E and -Q1 show a correlation with Steadiness at the 5% level of significance. Factors -E, Q2, -H, -G and O show significant correlations with Compliance at the 1% and 5% level of significance. It can therefore be concluded that the correlations were significant.

CONTENTS

PREFACE

What follows is the outcome of a reliability and validity study as performed by Karin Roodt, M Ed (Counselling and Guidance) UNISA, Registered Psychologist (SAMDC), Senior Lecturer, Technikon Natal (serving as Project Manager), assisted by Charles Robert, BSc (Hons)(Stats): Statistician, Director of South Africa on Line.

I would like to thank the following companies and individuals for participating in this study and in some way contributing to the final report:

Edgars Group Gauteng	Wayne Suelz, Recruitment and Assessment Specialist: Human Resources Department
Toyota SA.	François Viljoen, Mark de Wet and the rest of the dynamic team in the Department of Human Resources Management
BB Cereal	Gill Gibson (Mrs)
NBS	Natasha Carsens (Mrs)
Technikon Natal	Leslie Jordaan, Director: Personnel (Durban), Craig Stewart: Personnel (Pietermaritzburg) and Ann du Toit (editing)
HSRC	Barbara Miller and Berryll McIntyre for assisting with the marking of Technikon Natal's 16-PF answer sheets
Labour Lawyer	Graham Giles for scrutinising this report from a law perspective.

As well as Peter Mitchell and Associates for their patience and support.

A study of this nature must be approached with caution because no single psychological tool is able to yield everything about a person's personality. A test battery, i.e. a collection of several tests, reveals far more about an individual than does any single test of personality, preference, interests, intelligence or general personality dynamics.

K. Roodt
31.01.1997

1. INTRODUCTION

The Discus personality profiler is a completely computerised assessment tool, designed to describe the different roles a person fulfils in the work environment (Axiom 1994:1). This tool is owned by Axiom Software Limited of whom PJ Mitchell Associates (Pty)Ltd are the sole distributors in South Africa.

The word ' personality' has been debated for centuries. Everybody has their own idea about exactly what it means. In Discus terms a personality is defined as the sum of all a person's varying response styles to varying stimuli (Swanepoel 1995:1). In practical terms, however, it is impossible to measure and evaluate every one of a person's possible responses to every possible stimulus.

2. PROBLEM STATEMENT

The purpose of this study is to determine whether the Discus instrument may be considered a reliable and valid instrument for assessing personality.

3. METHOD

3.1 RELIABILITY

In the reliability exercise, the test-retest reliability technique was used. According to this method the same instrument is applied to the same respondents at a later stage and the correlation between the two scores is then calculated (Huysamen 1980:54; Mulder 1981:211).

The questionnaire was administered by the respective people participating in the exercise. All of these participants are trained in Discus and how to administer the instrument. The instrument was administered for the first exercise to obtain a pretest score. The exercise was then repeated with the same respondents after a period of three months in order to obtain a post-test score.

A statistical evaluation of the raw data, resulting from the exercise, was then obtained by using the SAS system, reflecting Pearson's Product-moment correlation coefficient (coefficiency of stability).

3.1.1 The Questionnaire

The questionnaire consists of 24 questions each of which presents the respondents with four options. The respondents' task is to select one of the options that most closely resembles themselves, and one that least closely describes them. The respondents are required to focus on the role they fulfil in their work environment and answer all the questions in relation to that role.

Phrase-based	The phrase-based question set contains questions of the form 'Behaving compassionately towards others' or 'Persuading others to your point of view'.
Adjective-based	The adjective-based question set contains words such as 'kind-hearted', 'persuasive' and 'modest'.

For the purpose of this exercise the phrase-based questionnaire was used because it is easier to understand.

3.1.2 Sampling technique and size

Various companies were approached to assist with the exercise as reflected in table 1.

TABLE 1: COMPANIES USED

Technikon Natal	Edgars Group (Gauteng)
Toyota South Africa (KZN)	NBS
BB Cereal	

The questionnaire was administered to 90 respondents. These respondents were randomly selected from the respective companies reflected in table 1. A statistical evaluation of the raw data resulting from the testing was then obtained by using the SAS system reflecting Pearson's product-moment correlation coefficient.

3.1.3 Results

The correlation analyses are reflected in table 2.

TABLE 2: CORRELATION MATRIX: BEFORE AND AFTER SCORES
PEARSON'S PRODUCT-MOMENT CORRELATION COEFFICIENT
r = values
p= values

	Dominance before	Influence before	Steadiness before	Compliance before
Dominance After	r=0.72831 p=0.0001	r=-0.11048 p=0.2972	R=-0.61917 p=0.0001	r=-0.16192 p=0.1252
Influence After	r=-0.22558 p=0.0325	r=0.64578 p=0.0001	r=-0.5282 p=0.6210	r=-0.33619 p=0.0012
Steadiness After	r=0.58452 p=0.0001	r=-0.14199 p=0.1819	r=0.73004 p=0.0001	r=0.22517 p=0.0329
Compliance After	r=-0.17989 p=0.0898	r=-0.36256 p=0.0004	r=0.17270 p=0.1036	r=0.55000 p=0.0001

The significance level chosen for this instrument is alpha = 5%. Where the p-value is less than 0.05, the scores show a significant correlation. In the reliability analysis the p-value in all the cases is as low as 0.0001. This indicates significance at alpha = 0.001. It can therefore be said the correlation is significant at 1% level.

The reliability coefficient of the measuring instrument is close to 1 and can therefore be seen as reliable.

3.2 VALIDITY

3.2.1 Content Validity

Content validity of the instrument is determined when the instrument is designed. Content validity refers to the extent in which the instrument measures what it is suppose to measure (De Wet, De K Monteith, Steyn & Venter 1981:146; Huysamen 1980:95; Mulder 1989:219).

Each question in the Discus instrument was evaluated by the designers of the instrument, namely Axiom. Although content validity was done by Axiom, the researcher also decided to measure validity in terms of criterion-related validity.

3.2.2 Criterion-related validity

By applying the method of criterion-related validity, an exploratory study was done by correlating all 15 Factors in Cattell's 16-PF with the four dimensions in the Discus. Factor B was not considered as doubts exist in the literature as to the validity of Factor B (intelligence) within a personality test.

Criterion-related validity was restricted to validation procedures in which the test scores of a group of respondents are compared with ratings of other measurements (Aiken 1994:96).

Nunally (1978) claims that it is unrealistic to expect exceptionally high correlation coefficients and Anastasi (1976) says that coefficients of 0.20 and higher can be significant.

3.2.3 Sampling technique and size

In this exercise employees of the Edgars group, Toyota South Africa and Technikon Natal were used. It was therefore decided to use the Discus and Cattell's 16-PF (Form A) for this exercise.

In an attempt to determine a correlation between the Discus dimensions and Cattell's 16-PF, scores on the 16-PF were obtained from 120 employees employed by the abovementioned companies. These respondents were randomly selected from line managers, middle managers, professionals and junior officials. The sample was drawn from all organisational functions and cultural groups within the organisations.

3.2.4 Measuring instruments

3.2.4.1 The Discus questionnaire

This questionnaire has already been discussed in paragraph **3.1.1.**

3.2.4.2 Cattell's 16-PF

The 16-PF is specifically constructed for the purpose of determining individual attitudes, perceptions and personality characteristics. It was developed by R.B. Cattell and published in 1949. The A and B Forms of the test consist of 187 items each and are suitable for adults with at least standard 10 or equivalent education. The 16-PF can be used for the evaluation of personality in people of different population groups because it is culture friendly (Prinsloo 1992:21-22).

Cattell applied the technique of factor analysis and obtained a set of 16 primary factors. The rationale behind the 16-PF is that a questionnaire which is based on revealed traits, obtained through mathematical techniques from a large pool of possible personality descriptions, is capable of measuring reliably and validly the true constructs present in humans.

The general purpose of the 16-PF is to describe testees' personality and predict behaviour using a set of selected, structured items. The test has many practical applications, some of which are mentioned below:

- Career counselling
- Fruitful employment in industrial and career settings
- Counselling
- Clinical settings
- Extremely useful research.

The results of a factor analysis completed by Cattell identified the following 16 factors (table 3).

TABLE 3: THE HIGH AND LOW FACTORS OF THE 16-PF

LOW SCORES	FACTOR 1 2 3 4 5 6 7 8 9 10	HIGH SCORES
Reserved	A	Outgoing
Dull	B	Bright
Easily upset	C	Calm
Submissive	E	Dominant
Serious	F	Impulsive
Frivolous	G	Responsible
Shy	H	Bold
Tough-minded	I	Tender-minded
Trusting	L	Suspecting
Practical	M	Fanciful
Forthright	N	Calculating
Secure	O	Apprehensive
Conservative	Q1	Liberal
Group-dependent	Q2	Self-sufficient
Uncontrolled	Q3	Controlled
Relaxed	Q4	Tense
	1 2 3 4 5 6 7 8 9 10	

For interpretation purposes, factor scores of 1 to 3 and 8 to 10 are considered. The low numbers of each factor are pictured as portraying one extreme of the profile and the high numbers as portraying the other. It should be pointed out that Cattell, in analysing all 16 factors, came up with clusters of several adjectival descriptors for each factor. Table 3 depicts words representative of factor clusters. The Kuder-Richardson 8-method was used to determine the reliability of the 16-PF. Table 4 reflects the reliability figure for each factor.

TABLE 4: RELIABILITY SCORES FOR 15 FACTORS OF 16-PF REFLECTING THE KR-8 SCORE

16-PF FACTORS	KR-8
A	0.647
C	0.561
E	0.563
F	0.662
G	0.661
H	0.741
I	0.585
L	0.487
M	0.353
N	0.352
O	0.549
Q1	0.370
Q2	0.631
Q3	0.476
Q4	0.720

Source: Prinsloo 1991:23

3.2.5 Procedure

The Discus and the 16-PF were administered by trained and registered psychologists. The marking and interpretation of the 16-PF questionnaires were done manually by the researcher, a registered psychologist, and by psychologists from the HSRC.

3.2.6 Statistical analysis

Pearson's product-moment correlation coefficient was computed, using the SAS-system to determine a correlation between the identified fifteen 16-PF factors and the Discus dimensions.

3.2.7 Results

The 120 questionnaires that were returned were statistically analysed. Scores for each of the fifteen 16-PF factors as well as the Discus dimensions were correlated. The individual Discus variable scores were then correlated with all the fifteen factors of the 16-PF, resulting in significant correlations at 1% level of significance and at 5% level of significance. The results of these findings are reflected in tables 5A (p-values) and 5B (r-values).

TABLE 5A: COMPARISON BETWEEN THE DISCUS DIMENSIONS AND THE FIFTEEN FACTORS OF THE 16-PF. PEARSON'S PRODUCT-MOMENT CORRELATION COEFFICIENT (5% LEVEL OF SIGNIFICANCE)

(1% LEVEL OF SIGNIFICANCE)

p-values

DISCUS DIMENSION	**16-PF FACTOR**	**1% LEVEL OF SIGNIFICANCE (99%)**	**16-PF FACTOR**	**5% LEVEL OF SIGNIFICANCE (95%)**
Dominance	Q1 X (Q2, E) X (G, L, Q1)	0.0004 0.0003 0.0083	E Q2 -I	0.0141 0.0331 0.0110
Influence	A -Q2 H	0.0011 0.0011 0.0070	F -Q3	0.0146 0.0426
Steadiness	None	None	-E -Q1	0.0363 0.0231
Compliance	-E Q2 -F -H	0.0095 0.0092 0.0045 0.0025	-G O	0.0244 0.0446

TABLE 5B: COMPARISON BETWEEN THE DISCUS DIMENSIONS AND THE 16-PF FACTORS

r-values

DISCUS DIMENSIONS	**16-PF FACTORS**	**1% LEVEL OF SIGNIFICANCE r-values**	**16-PF FACTOR**	**5% LEVEL OF SIGNIFICANCE r-values**
Dominance	Q1 X (E, Q2) X (G,L,Q1)	0.32128 0.32846 0.24180	E Q2 -I	0.22442 0.19551 0.23320
Influence	A -Q2 H	0.29825 0.29593 0.24791	F -Q3	0.22519 0.18776
Steadiness	None	none	-E -Q1	0.19215 0.20907
Compliance	-E Q2 -F -H	0.23678 0.23768 0.26000 0.27583	-G O	0.20715 0.18529

4. DISCUSSION AND CONCLUSION

It was found that the Discus instrument is reliable at a significance level = 0.01

In the validity exercise it was found that the majority of the factors of the 16-PF show a significant correlation with all four dimensions of the Discus using the p-values. The second order factors of the 16-PF were not used for the purpose of this study.

Suelz (1997) is currently busy with a validation study on the Discus using respondents from the Edgars group in Gauteng as his sample size. He has not yet published his masters thesis. It would be interesting to compare the findings of his research with the findings in this study.

5. LIMITATIONS AND RECOMMENDATIONS

The following recommendations have been identified which could open avenues for further research:

The Zulu questionnaire of the Discus instrument was withdrawn from the study because respondents indicated difficulty in understanding the standard of language used in the questionnaire. It is therefore recommended that the Zulu questionnaire be drafted on the basis of day-to-day language use.

For future research it would be interesting to include other instruments to determine whether Discus also correlates with other instruments. It needs to be pointed out that the study of criterion-related validity is based on the measuring of criteria against each other. If any two criteria are not perfectly matched, the validity analysis may be affected. For this reason, this type of study has always proved difficult.

A factor analysis on the Discus could be undertaken for further research.

It is recommended that the instructions to the questionnaire be amended, so as to reflect a specific role in terms of which the individual must complete the questionnaire. It was found that the general manner in which the instructions are presently set out caused individuals to be uncertain as to the role that was being measured, especially those who had more than one role to fulfil in the work situation.

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7. PROFESSIONALS CONSULTED

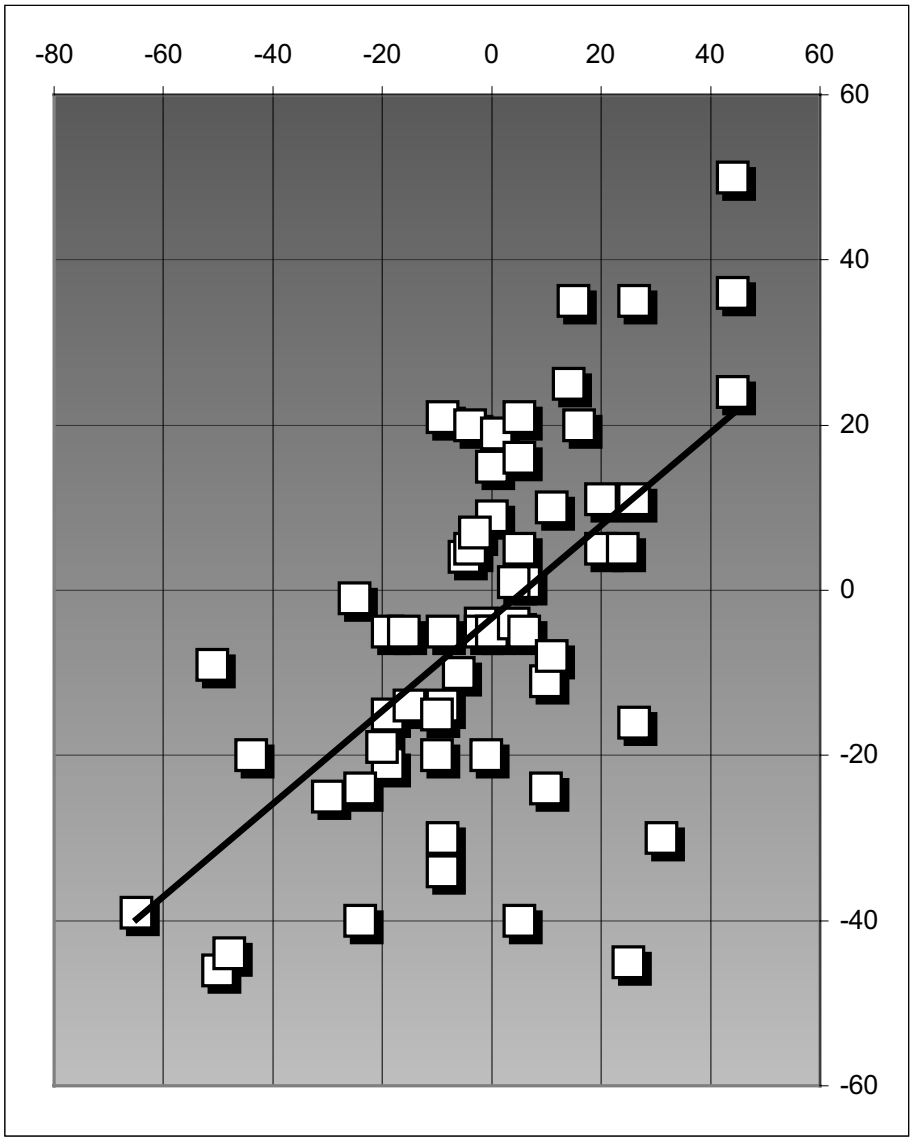
Prof. G. Bester, Department Psychology of Education, UNISA.

Dr. Landman, Human Science Research Council Pretoria.

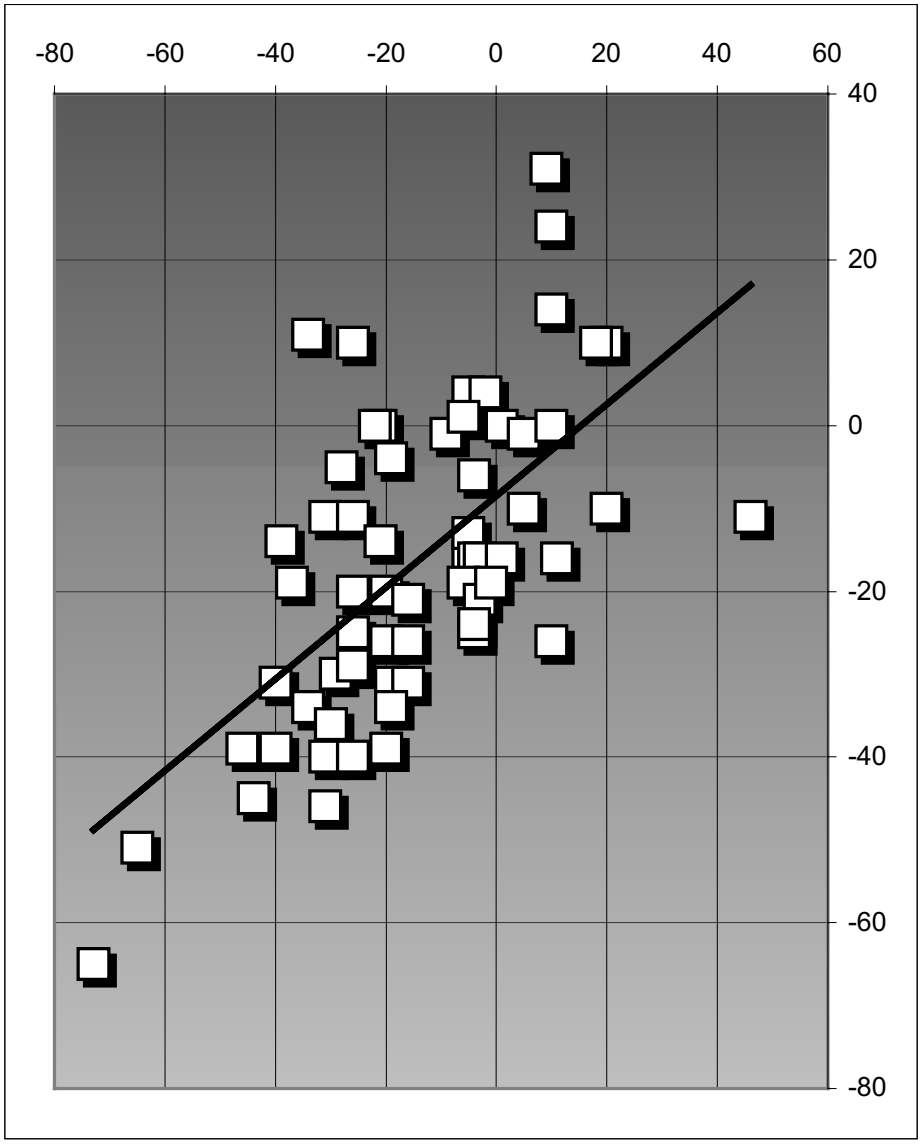
Their advice is gratefully acknowledged.

APPENDIX I: SCATTER PLOTS

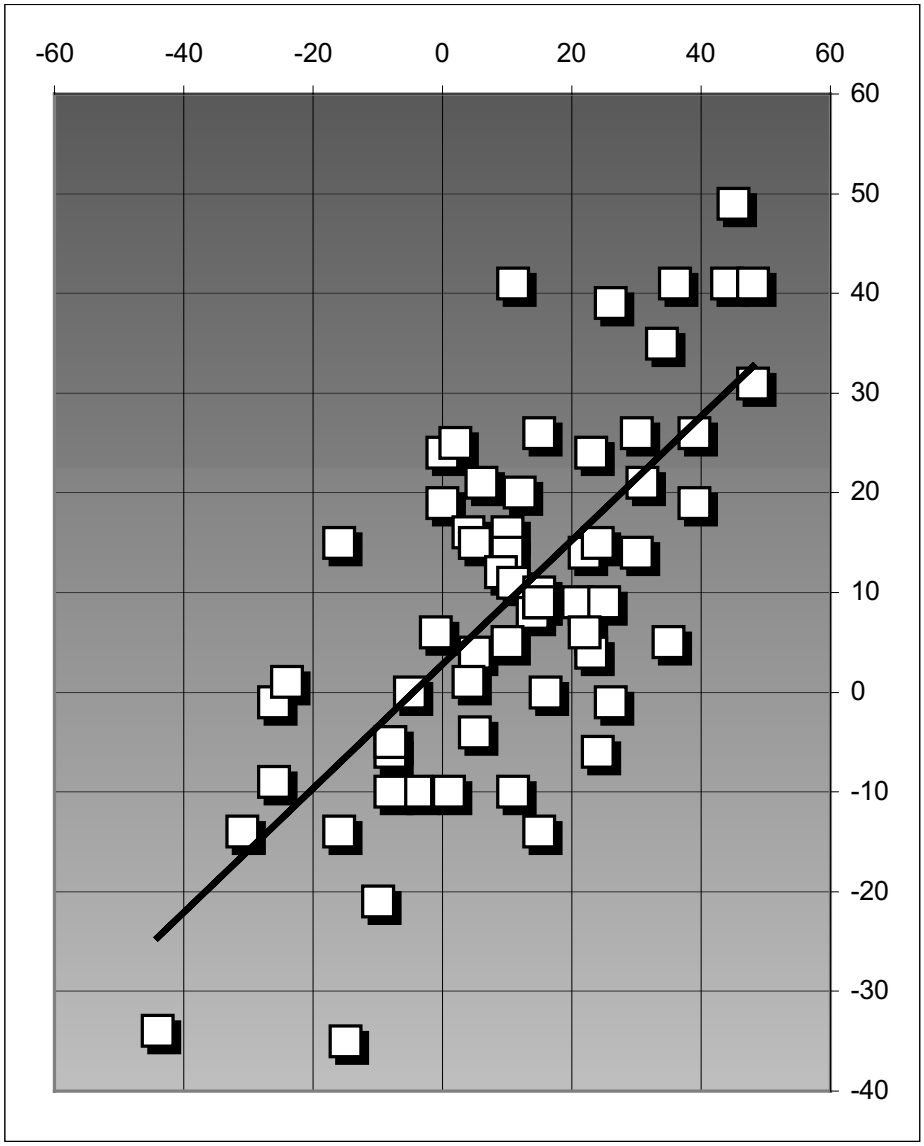
GRAPH 1: RELIABILITY ANALYSIS: SCATTER PLOT DOMINANCE BEFORE vs. DOMINANCE AFTER



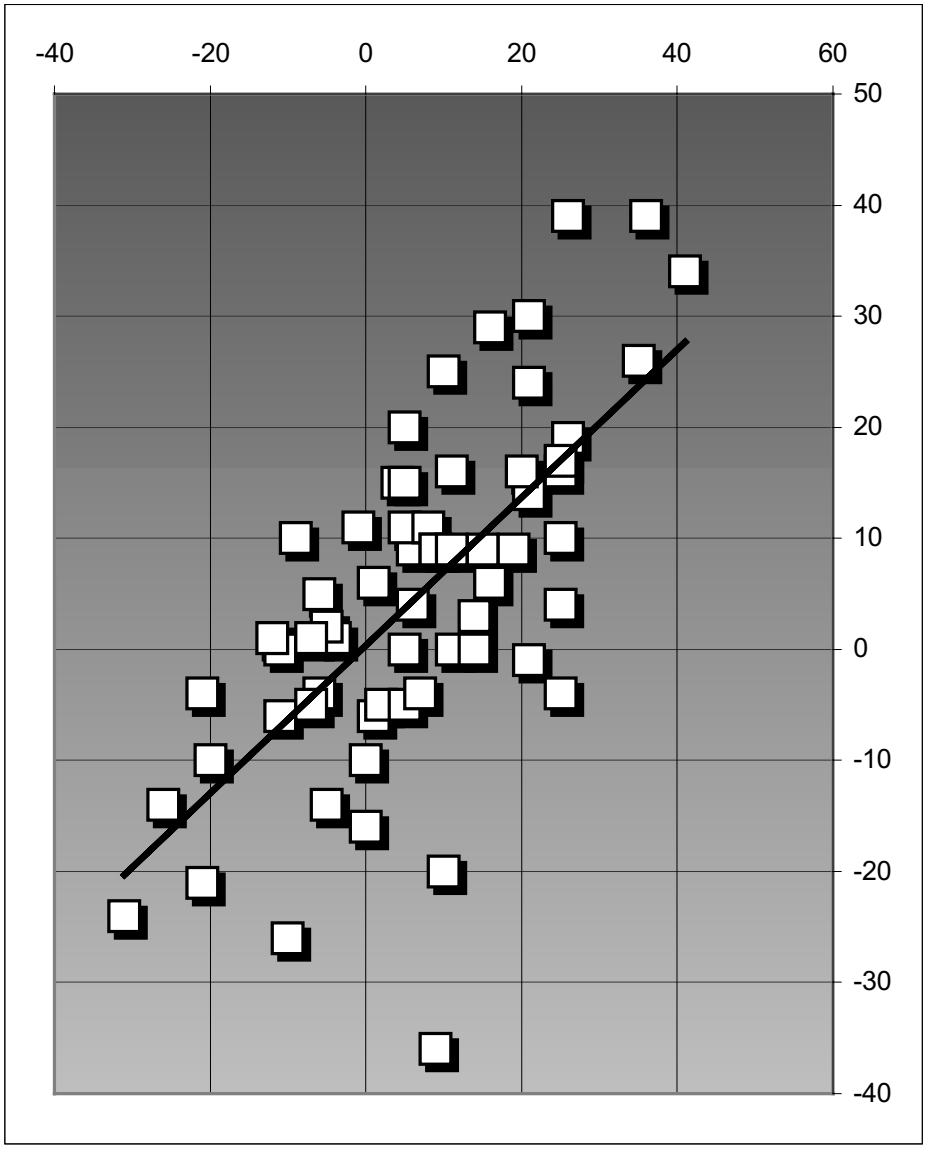
GRAPH 2: RELIABILITY ANALYSIS: SCATTER PLOT INFLUENCE BEFORE vs. INFLUENCE AFTER



GRAPH 3: RELIABILITY ANALYSIS: SCATTER PLOT STEADINESS BEFORE vs. STEADINESS AFTER



GRAPH 4: RELIABILITY ANALYSIS: SCATTER PLOT COMPLIANCE BEFORE vs. COMPLIANCE AFTER



APPENDIX II: FUNDAMENTALS OF DISC

Each full system of *Discus* is complete with a comprehensive Owner's Manual and extensive electronic bookshelf, which give detailed information on both the DISC theory and personality profiling in general, thus ensuring our users have everything to make the most of the software.

II.1 Origins

The basic form of the DISC test was developed by American psychologist William Marston in his *The Emotions of Normal People*. Marston actually developed the test only to prove his theory of emotions, but its potential was quickly spotted and from its humble roots it has now developed into probably the most widely used assessment and development tool in the world.

Although Marston was probably not aware of it, his ideas have their roots in the ideas of the Greeks. The division of the personality into four basic areas was their conception, and the types assigned by them (sanguine, choleric, phlegmatic and melancholic) are remarkably close to the modern interpretations of the four DISC factors.

II.2 The DISC Questionnaire

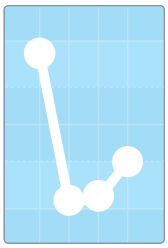
A standard DISC questionnaire consists of only twenty-four questions. This represents a significant advantage of the technique as opposed to many of the other personality inventories available, as it allows a person's DISC profile to be constructed quite rapidly (typically within less than twenty minutes).

Each question within the questionnaire presents the testee with four options. Of these, they are asked to select one that is closest to their own view of themselves, and one that is least representative of their personality.

Following Marston's original specification, the options given on a DISC questionnaire have traditionally consisted of simple adjectives, such as 'brave', 'considerate' or 'enthusiastic'. In recent years, however, a trend has developed towards the clarification of questionnaires, which often now present phrases or sentences. This makes the questionnaire much easier to understand for those completing it.

Once a questionnaire has been completed, its results are compiled by the test supervisor (or, more commonly, by a computer program designed for the task, such as *Discus*). The result of this operation is a series of DISC Profiles, which can be read and interpreted to reveal details of an individual's personality.

II.3 The DISC Profile



The illustration on the left shows a typical 'DISC Profile' – this is a graph showing the relative values of four components of the personality. From left to right, these are Dominance, Influence, Steadiness and Compliance. It is from the initial letters of these four factors that the DISC system takes its name.

Dominance, as its name suggests, is the factor of directness, assertiveness and control. As with each of the DISC factors, Dominance is a blend of positive and negative traits. On the positive side, highly Dominant individuals are independently-minded, motivated to succeed, and generally very effective at getting their own way. They can, however also be hot-tempered and even aggressive under certain conditions.

Influence is associated with a sunny, friendly and extrovert personality, warm and open to other people, sociable and gregarious. As you might expect from this, personalities with a high Influence score are gregarious and sociable, and often possess well-developed social skills and an urge to meet and talk with other people.

Steadiness is found in personalities who take a measured, steady approach to life. They are patient and undemanding, often showing sympathy for and loyalty to those around them. They are patient and sympathetic listeners, with a real interest in the problems and feelings of others, and are particularly capable of fulfilling supportive roles.

Compliance, the final factor of the four, relates to structure, detail and fact, and personalities displaying high levels of Compliance are interested in precision and accuracy. Individuals with high levels of Compliance dislike pressure, and will tend to adopt an evasive style when confronted with difficult circumstances.

Additional information can be gleaned by an examination of the relationships between these factors, giving a total of twelve additional aspects of the personality termed 'sub-traits'. These are Accuracy, Co-operativeness, Efficiency, Enthusiasm, Friendliness, Independence, Patience, Persistence, Self-motivation, Self-confidence, Sensitivity and Thoughtfulness.

II.4 The DISC Profile Series

It is unusual for DISC system to produce only a single DISC profile. Typically, analysis of a DISC questionnaire will provide three or even four different profiles, relating to different aspects of the personality. The names of these profile types vary from system to system, but the information they provide is similar regardless of their title.

The *Internal* profile describes a person's 'inner' personality style, the type of behaviour that can be expected when they feel completely at ease. Conversely, this style can also sometimes be seen when certain people are placed under severe pressure, because such pressure limits their capacity to adapt their personality style. The Internal Profile tends to remain more constant over time than the other profile types.

Very few people maintain the same personality regardless of circumstance; instead, they adapt to situations and others' requirements. The purpose of the *External* profile is to describe the style of personality that an individual feels is appropriate to their current circumstances. This can change considerably over time, as a person's situation and environment changes - such modifications often accompany major life events, such as starting a new job or moving house.

The Internal and External profiles provide valuable information about a person's attitudes and perceptions. In reality, however, a person's behaviour is rarely based completely on one or the other of these styles. The *Summary* profile combines information from the other two to present a view of a person's actual behaviour.

Finally, a *Shift* profile summarises the differences between the Internal and External profiles, highlighting the adaptations an individual is making to meet the perceived needs of their environment. This can be of particular interest in assessing an individual's perception of their role.

This introduction to DISC is necessarily brief. For more detailed information, including explanations of the underlying theory and practical applications of the system, contact Axiom Software Ltd for a copy of *Understanding DISC*.