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THE CONSTRUCTION OF A NORMATIVE SCALE OF LOCUS OF CONTROL

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ABSTRACT

The primary objective of the study was to construct a **normative** scale of locus of control for use with students and adults. A corollary of the study was to establish the personality, interest and cognitive correlates of locus of control. Conceptually the instrument is based on attribution theory and on social learning theory. The first edition of the Locus of Control Inventory (LCI) was applied to 356 first-year university students during 1994. A factor analysis of the 65 items of the inventory yielded **three** factors. The factors were interpreted as Autonomy, Internal Control and External Control. Three scales, corresponding to the three factors, were constructed, and yielded reliability coefficients of 0,80; 0,77 and 0,81 respectively. Following this the cognitive, interest and personality **correlates** of the LCI were determined. The implications of the findings are discussed.

OPSOMMING

Die hoofdoel van die studie was die konstruksie van 'n **normatiewe** skaal van lokus van beheer vir gebruik met studente en volwassenes. 'n Newe-doelwit van die studie was om die persoonlikheids-, belangstellings- en kognitiewe korrelate van lokus van beheer te bepaal. Konseptueel is die instrument op attribusieteorie en sosiale-leerteorie gebaseer. Die eerste-uitgawe van die Lokus van Beheervraelys (LvB) is op 356 eerstejaaruniversiteitstudente toegepas gedurende 1994. 'n Faktorontleding van die 65 items van die vraelys is gedoen en het **drie** faktore opgelewer. Die faktore is as Outonomie, Interne Beheer en Eksterne Beheer geïnterpreteer. Voorts is drie skale wat ooreenstem met die drie faktore, gekonstrueer en het betroubaarhede van 0,80; 0,77 en 0,81, onderskeidelik, opgelewer. Vervolgens is die kognitiewe, belangstellings- en persoonlikheidskorrelate van die LvB bepaal. Die implikasies van die bevindinge word bespreek.

Since the appearance of Rotter's locus of control questionnaire (1966), called the Internal-External Locus of Control Scale (I-E Scale), numerous other instruments have been published. These instruments vary from general to highly specific. Some of these instruments are intended for children and others for adults. However, they are all concerned with the construct of "locus of control". This construct was created by Rotter and pertains to a person's expectation of reinforcement of his/her behaviour, arising from the social environment. It is therefore theoretically based on social learning theory (Mischel, 1986). Rotter (1966) distinguished between two different orientations in people, namely an internal control orientation and an external control orientation. People with an internal control orientation are convinced that the reinforcement of their behaviour depends on their own achievements, abilities and dedication, whereas people with an external control orientation believe that random or fortuitous events, fate, Lady Luck and certain influential people are responsible for their behaviour.

The most well-known scales in this regard are Rotter's Internal-External Locus of Control Scale, Wallston's Health Locus of Control Scale (Wallston, Wallston, Kaplin & Maides, 1976), Wallston's Multidimensional Health Locus of Control Scale (Wallston, Wallston & De Vellis, 1978), the Nowicki-Strickland Locus of Control Scale (1973), Levenson's Multiple Dimension Locus of Control Scale (1974), the Economic Locus of Control Scale of Furnham (1986) and the Internal Control Index of Duttweiler (1984).

Of the said scales, Rotter's I-E Scale is used most frequently in the USA (69%), whereas the Nowicki-Strickland Scale as well as the Multiple Dimension Locus of Control Scale of Levenson are used the least – 7% and 4% respectively (Procuik & Lussier, 1975).

The Health Locus of Control Scale, the Multidimensional Health Locus of Control Scale and the Economic Locus of Control Scale are well-developed scales with acceptable reliabilities, but they are too specific for general use.

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The scales of Rotter and Duttweiler are promising scales from a **content** point of view, but they are both poorly developed from a **psychometric** point of view. These scales will now be briefly discussed.

The single most important problem regarding Rotter's I-E Scale is the fact that the forced choice item-format leads to **ipsative** measurement, while the user of the instrument wants to use it in a **normative** way. In essence, there is nothing wrong with ipsative measures, but the users of such instruments must be fully aware of the limitations thereof.

Ipsative measures can be used successfully to determine the relative strength of drives intra-individually, but not to determine inter-individual differences, for which **normative** measures are required. Clemans (1966, p. 52) states this as follows: "Ipsative scores are relative scores. It is quite possible that a person obtaining a low ipsative score on a particular trait actually possesses more of the characteristics in question than a person obtaining a much higher ipsative score. It is imperative that users of ipsative variables interpret them in the relative sense only."

Paired comparisons, multiple ranks, forced-choice formats and certain electro-physiological measures, where the instruments are calibrated for each person separately, usually lead to ipsative measurement.

Ipsative measures cannot automatically be subjected to item analysis and factor analysis. If ipsative measures are intercorrelated, more than half of the correlations will be **negative** and many values will be close to zero (Clemans, 1966, pp. 3, 38 and 51). This will result in a distortion of the factor structure. Tucker (1956, p. 1) explained the problem as follows:

> The direct factor analysis approach (termed the R-technique by Stephenson and Cattell) has been properly applied to those measures for which the scale of measurement is **consistent for each variable** over the population of people. Such measures are termed "normative", and may be illustrated by test scores. The obverse, or Q-technique, factor analysis approach has

> been properly applied to "ipsative" type measures for which the scale of measurement is **consistent for each person** over the population of observations .... Intercorrelating **variables** involving ipsative measurement implies the use of a double centered score matrix. Similarly, intercorrelating **individuals** over observations made by normative measurement implies use of a double centered score matrix. Use of the traditional factor analysis technique involving communalities, however, is not appropriate.

Tucker (1956) developed a special factor analytical technique for this purpose. It is, however, less well known than the standard techniques and not available in packages such as SAS, SPSS and BMDP.

Various attempts to factor analyse Rotter's I-E Scale were doomed to failure because **inappropriate factor analytical techniques** were used: these include the studies of Rotter (1966), Franklin (1963), Mirels (1970), Abramowitz (1973) and Erwee (1986). However, Collins (1974) was more successful. First, he converted the 23 pairs of the I-E Scale into 46 items with a Likert-format. Then he added 42 items with the connotation that "it depends on the situation". This scale, comprising 88 items, was then applied to 300 undergraduate students. The 46 Likert-format items were then subjected to a principal factor analysis. There were **six** eigenvalues greater than unity, but only **four** factors were rotated. The four-factor solution, with a Varimax rotation, produced a fairly neat simple structure. In the light of his four-factor-solution, Collins reached the following conclusion: "A respondent may score external on the Rotter Internal-External Scale because he believes (a) the world is difficult, (b) the world is unjust, (c) the world is governed by luck, or (d) the world is politically unresponsive". However, it cannot be said with certainty that Collins' four-factor-solution represents four factors. It can also be four **clusters** loading on a single factor.

Duttweiler's Scale (1984) has a good theoretical basis, but its statistical analysis is questionable: she used an intensity scale, but the scale units are not equal. In fact, it is an **ordinal scale**. She gave no indication of the number of items with which she began, but indicated that she ended with 28 items after item analysis and factor analysis. It seems that she conducted an item analysis with all the items without first establishing **the dimensionality of the vector space of the test items**. This is emphasised by the fact that she reported only one reliability coefficient (coefficient alpha) for the scale.

In order to establish the dimensionality of her scale, she used principal factor analysis. There were **eight** eigenvalues greater than unity, but she rotated only **two** factors – an entirely arbitrary decision. The two factors that were rotated were interpreted as **self-confidence** and **autonomy**. There is, however, a strong possibility that these two "factors" are actually two **clusters** of items loading on the same factor.

There are numerous problems associated with factor analysis of items: a single scale can yield as many as twenty factors, most of which are **artefactors**. The basic problem here is **differential skewness** of items. Items with the same degree of skewness or with common content can load on the same factor (cf. Schepers, 1992, pp. 108-143). Therefore, a way must be found to determine the **true structure** of an intercorrelation matrix of items. This matter will be dealt with in the method section.

In view of the above, it ought to be evident that there is currently not a single locus of control scale that is not contestable. Thus, there is scope for the construction of a new measuring instrument to measure this important construct. The limitations of the said measuring instruments should, however, be overcome[1]).

Statement of problem

The principal objective of the present study was to construct a normative measuring instrument of the construct(s) of locus of control, that can be used with students and adults.

A corollary of the study was to establish the personality, interest and cognitive correlates of locus of control. If important personality, interest and cognitive correlates are found, a single instrument could be used to create a fairly comprehensive personality profile of an individual. Conceptually, the measuring instrument is based on **attribution theory** and **social learning theory**.

People are constantly seeking **causes** for their behaviour and those of others. The **ascribed** causes of specific behaviour are called **attributions**. The **causative attributions** that people make, and their interpretation thereof, determine to a large extent their perceptions of the social world. Is it a friendly or a threatening world? Is it a just or unjust world? Is it a predictable or an unpredictable world? Can we exercise control over particular events through our own abilities or are our lives controlled by certain influential people?

The causes of human behaviour can be divided into two broad categories, namely **dispositional** causes and situational causes. Dispositional causes pertain to one's natural disposition and include one's organismic attributes. Situational causes pertain to the external world and include all environmental factors (Roediger III, Capaldi, Paris & Polivy, 1991).

Social learning theory is closely linked to attribution theory: Whilst social learning theory deals with the nature of reinforcements arising from the social environment and how it affects the social behaviour of the learner, attribution theory pertains to the way in which a person gathers information about the stable or invariant characteristics of others – their motives, intentions and traits – as well as of the external world (Baron, Byrne & Kantowitz, 1980). Rotter's (1966) definition of internal and external control is used throughout this paper.

A construct closely related to internal control is autonomy. Autonomy can be defined as "the tendency to attempt to master or be effective in the environment, to impose one's wishes and designs on it" (Wolman, 1973, p.37). It is expected that persons high on autonomy would seek control of situations that offer possibilities of change, would readily accept the challenge of solving complex problems, would take the initiative in situations requiring leadership, would prefer to work on their own and to structure their own work programme.

With attribution theory and social learning theory as frames of reference, the **first edition** (1994) of the Locus of Control Inventory (LCI) was constructed. To ensure **content validity** the domain of locus of control was extensively sampled. Altogether 65 items were written, representing the constructs of Internal Control, External Control and Autonomy.

The items of the LCI are all in the form of **questions** and the responses are endorsed on a seven-point scale. Only the end-points of the scales are verbally anchored, and the respondent has to indicate his/her response by drawing a cross in the appropriate box of the rating scale. For large scale testing separate answer sheets, that can be read by an **optical page reader**, are used.

In the light of the major objective of the study the following **postulates** and **hypothesis** were formulated:

Postulate 1

As far as the **structure** of the LCI is concerned **three** factors are postulated, viz. Internal Control, External Control and Autonomy.

1 The present study is the first of a series of four. The LCI was revised in 1995, 1999 and 2003.

Postulate 2
It is postulated that **three homogeneous** scales, with acceptable reliabilities, can be formed.

Postulate 3
It is postulated that **two** or **more contrasting groups** can be formed with reference to the measures of the LCI.

Hypothesis 1
It is hypothesised that the vectors of means of the **contrasting groups** differ in respect of certain selected measures of cognitive ability, interest and personality.

METHOD

Participants
The LCI was applied to a sample of 356 first-year students in industrial psychology at a large South African university where the main language used was Afrikaans. Almost all of the participants were White. The sample was representative of the Faculty of Economic and Business Sciences, as industrial psychology is one of the core subjects in the faculty.

Measuring instruments
In order to determine the correlates of locus of control the following measuring instruments were applied jointly with the LCI: The General Scholastic Aptitude Test (GSAT), the Senior Aptitude Tests (SAT), the Sixteen Personality Factor Questionnaire (16PF), the Personal, Home, Social and Formal Relations Questionnaire (PHSF), the Survey of Study Habits and Attitudes (SSHA), the 19 Field Interest Inventory (19FII) and the Career Development Questionnaire (CDQ). All the instruments are well known in South Africa and do not need any further description here. Appropriate manuals are available for all the instruments (Cattell, 1989; Claassen, de Beer, Hugo & Meyer, 1998; Fouché & Verwey, 1991; Langley, du Toit & Herbst, 1996). The metrical properties of all the instruments are acceptable for research purposes.

Statistical analysis
If the presumption exists that the **vector space** of test items is **multidimensional**, it will be necessary to first classify the items in terms of the **construct** measured, before an item analysis is done. The **categorisation** of the test items can be done with the aid of **factor analysis**, but the procedure is not free from problems.

The core of the problem centres in the differential skewness of test items. If items that are differentially skew are subjected to factor analysis, a **multiplicity** of factors is obtained with the result that the true structure of the intercorrelations is obscured (cf. Ferguson, 1941).

To overcome the above-mentioned problem, the following procedure (cf. Schepers, 1992, pp.140-143) was followed in the analysis of the LCI:

1. The 65 items were intercorrelated.
2. The eigenvalues of the unreduced intercorrelation matrix were calculated.
3. As many factors as there were eigenvalues greater than unity were postulated.
4. An iterative principal factor analysis was done.
5. Iteration was done on the number of factors as determined at step 3.
6. The obtained factor matrix was rotated to **simple structure** by means of a Varimax rotation.
7. All the items with high negative loadings were reflected.
8. All the items with high loadings on a specific factor were added together and a subscore for each factor was computed. Every item was used only once.
9. The obtained subscores were intercorrelated and steps 2 to 4 were repeated.
10. The obtained factor matrix was rotated to **simple structure** by means of a Direct Oblimin rotation.
11. All subscores with negative loadings on the **first principal axis** were reflected.
12. Separate **scales** were formed, corresponding to each of the factors, by grouping all the items together that have substantial loadings on a factor (cf. step 8).
13. Separate item analyses were done for each of the scales formed*.
14. Iteration was done in terms of the **indices of reliability** of the test items.
15. The **reliabilities** of the scales were determined by means of Cronbach's coefficient alpha.

To determine the **correlates** of locus of control **contrasting groups** were used. These groups were formed by using the **scores** of the LCI. To ensure that the groups that are formed are **natural groups**, use was made of cluster analysis:

According to Sokal (1974) clusters can be considered as **homogeneous classes**. Cluster analysis **minimises** the variance within clusters and **maximises** the variance between clusters.

The cluster analysis program that was used in the present study is based on a method described by Friedman and Rubin (1967). It comprises an **iterative reclassification** of objects with the view to **minimise** the variance within clusters and to **maximise** the variance between clusters. The largest number of clusters expected (essentially a subjective decision) must be specified ahead of time. The program then forms fewer and fewer clusters until only two are left (Muller, 1975).

Next, the clusters obtained are compared with one another in terms of the reference tests already described. Depending on the number of clusters obtained, MANOVA or Hotelling T^2 is used to determine whether the vectors of means of the various clusters differ from one another or not. If the vectors of means of the various clusters differ from one another the **group means** of the different clusters are compared with one another. For this purpose Tukey's studentised range test or t-tests are used. If there are only two clusters t-tests are used.

RESULTS

Factor analysis of the LCI
As the procedure that was followed in the analysis of the LCI has been fully described in the method section, only the essential results are given here.

The items of the LCI were intercorrelated, and the **eigenvalues** of the intercorrelation matrix were calculated. Twenty of the eigenvalues were greater than unity, accordingly 20 factors were extracted and rotated to simple structure by means of a Varimax rotation. These tables, however, are too large for reproduction here.[1])

Next, subscores were calculated in respect of each of the factors. The subscores were then intercorrelated and the intercorrelation matrix is given in Table 1. From Table 1 it is clear that the various subscores are mutually correlated despite the fact that the initial factors were orthogonal to one another.

The eigenvalues of the intercorrelation matrix of subscores are given in Table 2. Table 2 shows that **six** of the eigenvalues are greater than unity. Accordingly six factors were extracted and rotated to **simple structure** by means of a Direct Oblimin rotation. The rotated factor matrix is given in Table 3.

From Table 3 it is evident that Factors IV, V and VI **are poorly determined** with four, one and five **items** respectively. There are thus only **three well determined** factors. Separate **scales** were formed in respect of the three factors.

*NP50 – an item analysis program developed by the National Institute for Personnel Research, previously a division of the Council for Scientific and Industrial Research, was used for this purpose.
1 Can be obtained through the author.

Table 1

Matrix of intercorrelations of the subtests of the locus of control inventory (1994)

Variable	Subtest 1	Subtest 2	Subtest 3	Subtest 4	Subtest 5	Subtest 6	Subtest 7	Subtest 8	Subtest 9	Subtest 10	Subtest 11	Subtest 12	Subtest 13	Subtest 14	Subtest 15	Subtest 16	Subtest 17	Subtest 18	Subtest 19	Subtest 20
Subtest 1	1,0000																			
Subtest 2	0,3926	1,0000																		
Subtest 3	-0,1092	-0,0682	1,0000																	
Subtest 4	-0,0819	-0,0992	0,4227	1,0000																
Subtest 5	-0,0157	-0,0845	0,3515	0,4376	1,0000															
Subtest 6	0,5339	0,4607	-0,1156	-0,1343	-0,1305	1,0000														
Subtest 7	0,2963	0,5332	-0,0670	-0,2175	-0,1847	0,3101	1,0000													
Subtest 8	0,2512	0,2612	-0,0124	-0,1512	-0,0933	0,3287	0,3055	1,0000												
Subtest 9	-0,2305	-0,3677	0,1869	0,2377	0,2073	-0,2259	-0,4142	-0,3604	1,0000											
Subtest 10	-0,1449	-0,0783	0,0787	0,0979	0,2166	-0,1876	-0,0127	-0,0018	0,0345	1,0000										
Subtest 11	0,3674	0,3409	-0,1366	-0,1766	-0,0731	0,4013	0,2846	0,3212	-0,2651	-0,0395	1,0000									
Subtest 12	0,0280	0,0400	0,1704	0,1191	0,2731	-0,0360	0,0184	0,0498	0,0744	0,0663	-0,0125	1,0000								
Subtest 13	0,3652	0,3359	-0,1394	-0,0771	-0,0557	0,3708	0,0925	0,1476	-0,1664	-0,0318	0,3402	-0,0604	1,0000							
Subtest 14	0,1650	0,1358	0,0490	0,0465	0,0899	0,0726	0,0560	0,0807	-0,0237	0,0907	0,1356	-0,0185	0,1247	1,0000						
Subtest 15	0,0376	-0,1172	0,2293	0,3555	0,2603	0,0179	-0,2353	-0,1803	0,2567	-0,0060	-0,0657	0,0021	0,1526	0,0137	1,0000					
Subtest 16	0,0764	0,0143	0,0439	-0,0365	-0,0382	0,0043	-0,0096	0,0389	0,0220	-0,0219	0,1353	0,0401	0,0533	0,0479	-0,0649	1,0000				
Subtest 17	0,3290	0,2669	-0,0326	0,1328	0,0445	0,1839	0,0793	-0,0547	-0,0458	-0,1864	0,0871	0,0686	0,1448	0,0713	0,0902	-0,0458	1,0000			
Subtest 18	0,1923	0,1367	-0,0182	-0,0823	-0,1125	0,1269	0,0800	0,1015	-0,1447	-0,0422	0,1441	-0,1309	0,1732	0,0404	0,0427	0,0835	0,0470	1,0000		
Subtest 19	-0,0721	-0,3188	0,0578	0,1080	0,2381	-0,1815	-0,2920	-0,1240	0,2785	0,1251	-0,0710	0,0744	-0,1071	0,0012	0,1288	0,0022	-0,0132	-0,0506	1,0000	
Subtest 20	0,2853	0,1994	-0,1159	-0,0008	0,0228	0,2039	0,0727	0,1427	-0,0878	-0,0387	0,2312	-0,1792	0,2590	0,0468	0,0414	-0,0164	0,0539	0,0598	-0,0100	1,0000

Note: N = 356; K = 65

Table 2
Eigenvalues of unreduced intercorrelation matrix (20 × 20)

ROOT	EIGENVALUE
1	3,9310
2	2,1736
3	1,5205
4	1,2994
5	1,1168
6	1,0913
7	0,9841
8	0,9044
9	0,8534
10	0,8260
11	0,6885
12	0,6642
13	0,6073
14	0,5689
15	0,5547
16	0,5340
17	0,4816
18	0,4594
19	0,4130
20	0,3277
Trace	20,000

Next, separate item analyses were done in respect of the three scales. The item statistics in respect of Scale I are given in Table 4. From an inspection of Table 4 it is clear that all the items have acceptable **indices of reliability**. The item-test correlations vary from 0,389 to 0,638 and the standard deviations from 0,975 to 1,767. All the items were retained and yielded a Cronbach alpha coefficient of 0,802. As far as the **content** of the items are concerned they all deal with **autonomous behaviour**. The scale was accordingly identified as a scale of **Autonomy**.

Table 4
Item statistics in respect of scale I (Autonomy) of the LCI

Item	N	Mean of item ($\bar{X}_g$)	Standard deviation of item (s_g)	Item-test Correlation (r_{gx})	Index of reliability of item ($r_{gx}s_g$)
*Q1	356	4,669	1,387	0,439	0,609
Q2	356	5,138	1,332	0,403	0,537
Q3	356	4,747	1,319	0,467	0,616
Q5	356	5,621	0,981	0,541	0,531
*Q11	356	5,371	1,354	0,523	0,708
Q13	356	5,789	0,975	0,638	0,622
Q14	356	5,171	1,180	0,581	0,686
*Q15	356	4,806	1,443	0,553	0,798
Q17	356	5,360	1,285	0,502	0,645
Q22	356	5,944	1,044	0,627	0,655
Q24	356	5,424	1,255	0,536	0,672
Q28	356	5,514	1,281	0,611	0,783
Q29	356	5,388	1,166	0,514	0,600
Q30	356	5,096	1,399	0,594	0,832
*Q65	356	4,295	1,767	0,389	0,687

Cronbach alpha = 0,802
Number of items = 15
*Reflected items

The item statistics in respect of Scale II are given in Table 5. Table 5 shows that with the exception of item 21 all the items have **acceptable indices of reliability**. The item-test correlations vary from 0,329 to 0,613 and the standard deviations of the items from 0,834 to 1,843. Only one item was rejected, namely item 21. The remaining items yielded a Cronbach alpha coefficient of 0,774. As far as the **content** of the items are concerned, it is clear that they deal with the **extent of control** that the **respondent** can exert over matters or happenings. The scale was accordingly identified as a scale of **Internal Control**.

Table 3
Factor matrix of LCI (Direct oblimin rotation)

Variables	K	FACTOR I	FACTOR II	FACTOR III	FACTOR IV	FACTOR V	FACTOR VI
Subtest 1: Items 6, 7, 18, 19, 26, 31 en 37	7	0,091	0,528	-0,064	0,322	0,205	0,145
Subtest 2: Items 2, 5, 14, 22, 24, 29 en 30	7	0,646	0,311	0,038	0,123	0,139	-0,145
Subtest 3: Items 12, 32, 33, 35, 36 en 41	6	0,124	-0,198	0,747	-0,055	0,045	0,188
Subtest 4: Items 20, 43, 56, 59 en 64	5	-0,079	0,052	0,603	-0,013	0,077	-0,185
Subtest 5: Items 9, 47, 50, 51, 57 en 58	6	-0,192	0,198	0,379	-0,238	0,378	-0,106
Subtest 6: Items 27, 54 en 55	3	0,227	0,408	-0,017	0,295	0,038	0,197
Subtest 7: Items 13, 15 en 28	3	0,684	0,039	-0,060	-0,023	0,124	0,006
Subtest 8: Items 42, 45, 46 en 49	4	0,326	0,165	-0,024	-0,127	0,057	0,358
Subtest 9: Items 1, 11 en 17	3	-0,515	-0,104	0,164	0,081	0,027	-0,041
Subtest 10: Items 8, 52 en 53	3	-0,009	0,103	0,032	-0,507	0,074	-0,082
Subtest 11: Items 44, 61, 62 en 63	4	0,130	0,454	-0,133	-0,008	0,064	0,272
Subtest 12: Item 4	1	0,007	-0,137	0,090	0,025	0,515	0,106
Subtest 13: Items 10 en 48	2	0,023	0,570	-0,024	0,089	-0,108	0,025
Subtest 14: Item 34	1	0,040	0,226	0,058	-0,082	0,064	0,011
Subtest 15: Items 38, 39 en 40	3	-0,282	0,251	0,420	0,132	-0,127	-0,090
Subtest 16: Item 23	1	-0,052	0,015	0,005	0,020	0,017	0,235
Subtest 17: Item 25	1	0,044	0,185	0,023	0,443	0,266	-0,232
Subtest 18: Items 16 en 21	2	0,068	0,179	0,036	0,064	-0,170	0,116
Subtest 19: Items 3 en 65	2	-0,515	0,098	-0,061	-0,096	0,176	0,070
Subtest 20: Item 60	1	-0,015	0,462	-0,046	-0,036	-0,121	-0,037
Number of items per factor		15	20	20	4	1	5

Table 5
Item statistics in respect of scale II (Internal control) of the LCI

Item	N	Mean of item ($\bar{X}_g$)	Standard deviation of item (s_g)	Item-test Correlation (r_{gx})	Index of reliability of item ($r_{gx}s_g$)
Q6	356	5,778	1,155	0,517	0,597
Q7	356	5,542	1,116	0,424	0,473
Q10	356	6,118	0,834	0,502	0,419
Q16	356	4,997	1,717	0,336	0,577
Q18	356	6,132	0,870	0,530	0,461
Q19	356	6,287	0,799	0,470	0,376
Q21	356	5,025	1,096	***	***
Q26	356	5,121	1,418	0,344	0,488
Q27	356	5,691	1,048	0,568	0,595
Q31	356	6,101	0,956	0,555	0,531
Q34	356	5,315	1,764	0,329	0,580
Q37	356	5,871	0,993	0,613	0,609
Q44	356	5,149	1,025	0,497	0,510
Q48	356	4,885	1,252	0,472	0,590
Q54	356	5,567	1,076	0,500	0,539
Q55	356	5,612	0,926	0,561	0,520
Q60	356	5,739	1,339	0,425	0,569
Q61	356	4,947	1,843	0,449	0,828
Q62	356	5,008	1,255	0,408	0,513
Q63	356	6,081	0,950	0,510	0,485

Cronbach alpha = 0,774
No items were reflected
Number of items = 19

Table 6
Item statistics in respect of scale III (External control) of the LCI

Item	N	Mean of item ($\bar{X}_g$)	Standard deviation of item (s_g)	Item-test Correlation (r_{gx})	Index of reliability of item ($r_{gx}s_g$)
*Q9	356	5,149	1,237	0,469	0,580
*Q12	356	2,972	1,465	0,621	0,910
*Q20	356	3,604	1,342	0,535	0,718
*Q32	356	3,500	1,543	0,323	0,499
*Q33	356	2,882	1,517	0,381	0,577
*Q35	356	3,632	1,570	0,507	0,796
*Q36	356	3,868	1,511	0,508	0,767
*Q38	356	3,671	1,397	0,376	0,525
*Q39	356	3,506	1,403	0,500	0,702
Q40	356	5,472	1,234	***	***
*Q41	356	2,924	1,470	0,633	0,930
*Q43	356	3,826	1,681	0,462	0,776
*Q47	356	4,649	1,435	0,378	0,543
*Q50	356	4,202	1,416	0,338	0,479
*Q51	356	3,803	1,341	0,487	0,653
*Q56	356	3,444	1,510	0,576	0,870
*Q57	356	3,848	1,408	0,601	0,846
*Q58	356	2,329	1,513	0,413	0,624
*Q59	356	2,677	1,523	0,445	0,678
*Q64	356	4,590	1,665	0,472	0,785

Cronbach alpha = 0,807
Number of items = 19
*Reflected items

Table 7
Means and standard deviations of the various clusters in respect of autonomy, internal control and external control

Clusters		N	Means of clusters			Standard deviations of clusters		
			Autonomy	Internal control	External control	Autonomy	Internal control	External control
CLUSTER 1:	LLA$^+$	171	42,7705	43,4269	53,2342	7,6025	8,3837	8,8477
CLUSTER 2:	HHA$^-$	185	56,6824	56,0757	47,0106	6,7872	7,1224	10,0947

Table 8
Significance of differences in means between the two clusters in respect of the GSAT, SAT and M-score

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\bar{X}_1$	S^2_1	N_1	$\bar{X}_1$	S^2_2	N_2						
GSAT: VERBAL IQ	108,9250	10,5050	120	110,7482	11,9916	139	1,93	1; 257	0,1655	-1,29	257	0,1976
GSAT: NON-VERBAL IQ	108,3833	11,8451	120	112,0504	12,1883	139	0,00	1; 257	0,9634	-2,45	257	0,0151*
SAT 1: VERBAL COMPREHENSION	17,8417	3,8018	120	19,1583	3,6836	139	0,30	1; 257	0,5836	-2,83	257	0,0051*
SAT 2: CALCULATIONS	17,8833	5,9736	120	19,0575	5,6296	139	0,48	1; 257	0,4877	-1,63	257	0,1049
SAT 3: DIGUISED WORDS	19,7833	5,4529	120	19,7482	5,4866	139	0,03	1; 257	0,8670	0,05	257	0,9589
SAT 4: COMPARISON	21,7333	3,4731	120	21,4748	3,5982	139	0,20	1; 257	0,6542	0,59	257	0,5584
SAT 5: PATTERN COMPLETION	19,0417	5,1782	120	20,5396	5,3274	139	0,38	1; 257	0,5382	-2,29	257	0,0231*
SAT 6: FIGURE SERIES	19,4500	4,8764	120	20,6331	4,9346	139	0,00	1; 257	0,9526	-1,93	257	0,0541
SAT 7: SPATIAL 2D	17,3167	5,2724	120	20,0719	5,3238	139	0,02	1; 257	0,9019	-4,17	257	<0,0001*
SAT 8: SPATIAL 3D	18,3833	4,9742	120	19,8489	4,6077	139	1,58	1; 257	0,2103	-2,46	257	0,0145*
SAT 9: MEMORY-PARAGRAPH	13,4333	3,6731	120	13,4604	3,7460	139	0,00	1; 257	0,9458	-0,06	257	0,9533
SAT 10: MEMORY-SYMBOLS	25,6250	3,9451	120	26,1007	4,3176	139	0,01	1; 257	0,9151	-0,92	257	0,3584
M-SCORE	15,2000	3,9696	120	15,9353	4,7856	139	1,47	1; 257	0,2265	-1,33	257	0,1837

Hotelling T^2 = 34,1781
F-ratio = 2,5063
df = 13 & 245
p = 0,0031

The item statistics in respect of Scale III are given in Table 6. From Table 6 it is clear that with the exception of item 40 all the items have acceptable **indices of reliability**. The item-test correlations range from 0,323 to 0,633 and the standard deviations of the items from 1,234 to 1,681. Only one item was rejected, namely item 40. The remaining items yielded a Cronbach alpha coefficient of 0,807. As far as the **content** of the items are concerned they all deal with the degree of control that the **external world** exerts on the behaviour of the respondent. The scale was accordingly identified as a scale of **External Control**.

Next, the intercorrelations between the three scales were computed:
The Scale of Autonomy correlates 0,492 with the Scale of Internal Control and both correlate **negatively** with the Scale of External Control. The Scale of Autonomy correlates -0,262 with the Scale of External Control, and the Scale of Internal Control correlates -0,172 with External Control. It is therefore evident that Internal Control and External Control are not bipolar opposites, but **independent constructs**. Although the Scales of Autonomy and Internal Control are moderately correlated, the percentage of common variance is only 24%. Therefore both make a **unique contribution** in their own right.

Cluster analysis
With the view to doing a **cluster analysis** of **cases** (persons) a score was calculated for each participant in respect of each of the **three** scales of the LCI. To facilitate the interpretation of the scores, the respective scales were **linearly transformed** to a mean of 50 and a standard deviation of 10. These transformed scores were then used as **iput-variables** in the cluster analysis.

There is not an **objective criterion** for deciding on the **number** of clusters to take. The choice depends largely on the **meaningfulness** of the obtained clusters. In the present case two, three and four clusters were considered. Ultimately **two** clusters were taken. However, four clusters would also have been meaningful.

The means and standard deviations of the two clusters in respect of Autonomy, Internal Control and External Control are given in Table 7. From Table 7 it is clear that Cluster 1 is **low** in respect of Autonomy and Internal Control and average to **high** on External Control. By contrast Cluster 2 is **high** on Autonomy and Internal Control, but average to **low** on External Control.

Differences between clusters in respect of the cognitive measures
The vectors of means of the two clusters were compared with one another in respect of Verbal and Non-verbal IQ (GSAT), the various measures of the Senior Aptitude Tests (SAT) and the M-score (matric mark). The significance of the differences in means between the various measures are shown in Table 8.

Table 8 indicates that the Hotelling T^2-value is equal to 34,178 with an associated F-ratio of 2,506. This F-value, with 13 and 245 degrees of freedom, is statistically highly significant ($p = 0,0031$). Therefore, the t-tests can be interpreted with confidence.

From Table 8 it is clear that the means of Cluster 2 (HHA^-) are statistically significantly higher than those of Cluster 1 (LLA^+) in respect of the following variables:
- Non-verbal IQ
- Verbal Comprehension
- Pattern Completion
- Spatial 2D
- Spatial 3D

It is therefore clear that persons with **high scores** on Autonomy and Internal Control and **low scores** on External Control achieve **higher** scores on the cognitive measures than those who are **low** on Autonomy and Internal Control, but **high** on External Control.

Differences between clusters in respect of the various primary factors of the 16PF
The vectors of means of the two clusters were also compared in terms of the various primary factors of the 16PF. The significance of the differences in means of the two clusters, in respect of the measures mentioned, are given in Table 9.

Table 9 shows that the Hotelling T^2-value is equal to 59,902 with an associated F-value of 3,525. This F-value, with 16 and 242 degrees of freedom, is statistically highly significant ($p < 0,0001$). Thus, the t-tests can be interpreted with confidence.

TABLE 9
SIGNIFICANCE OF DIFFERENCES IN MEANS BETWEEN THE TWO CLUSTERS IN RESPECT OF THE 16PF

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\bar{X}_1$	S^2_1	N_1	$\bar{X}_1$	S^2_2	N_2						
Factor A: Sociability	12,8667	3,3430	120	13,1727	3,2813	139	0,00	1 and 257	0,9676	-0,74	257	0,4588
Factor B: Intelligence	7,7833	1,6712	120	7,7842	1,7887	139	0,01	1 and 257	0,9355	0,00	257	0,9969
Factor C: Emotional Maturity	**14,7833**	3,4911	120	**16,0647**	3,8565	139	2,02	1 and 257	0,1564	-2,79	257	0,0057*
Factor E: Dominance	**14,1250**	4,2338	120	**16,0576**	4,8838	139	2,30	1 and 257	0,1307	-3,38	257	0,0009*
Factor F: Happy-go-lucky	17,5167	4,4983	120	18,4532	5,4324	139	2,24	1 and 257	0,1357	-1,50	257	0,1357
Factor G: Conscientiousness	12,3333	3,2496	120	13,0576	3,8669	139	1,46	1 and 257	0,2281	-1,62	257	0,1071
Factor H: Venturesomeness	**12,8667**	5,1855	120	**16,0216**	4,5292	139	5,08	1 and 257	0,0250*	-5,18	257	<0,0001*
Factor I: Emotional Sensitivity	**9,8167**	3,5716	120	**8,8129**	3,8175	139	0,60	1 and 257	0,4398	2,17	257	0,0306*
Factor L: Suspiciousness	9,5917	2,4236	120	9,3237	2,9023	139	4,67	1 and 257	0,0316*	0,81	257	0,4190
Factor M: Imaginativeness	13,5000	3,1940	120	12,7698	3,3886	139	0,46	1 and 257	0,4984	1,78	257	0,0769
Factor N: Astuteness	**10,0250**	2,3424	120	**10,6331**	2,4968	139	1,85	1 and 257	0,1748	-2,01	257	0,0454*
Factor O: Apprehensiveness	**12,2583**	3,4287	120	**10,2230**	3,9874	139	3,64	1 and 257	0,0575	4,37	257	<0,0001*
Factor Q1: Radicalism	**10,0500**	2,4898	120	**10,9137**	2,8424	139	1,71	1 and 257	0,1924	-2,58	257	0,0104*
Factor Q2: Self-sufficiency	**9,7583**	3,3532	120	8,8849	3,5223	139	0,02	1 and 257	0,8925	2,03	257	0,0429*
Factor Q3: Self-control	9,9250	2,7960	120	9,9784	3,0443	139	0,13	1 and 257	0,7154	-0,15	257	0,8839
Factor Q4: Tenseness	**12,8667**	4,0707	120	**11,1799**	5,1923	139	9,58	1 and 257	0,0022*	2,93	254,7	0,0037*

Hotelling T^2 = 59,9021
F-ratio = 3,5254
df = 16 & 242
p = <0,0001

From Table 9 it is evident that the two clusters differ statistically significantly from one another in respect of the following primary factors:

- Factor C: Emotional maturity
- Factor E: Dominance
- Factor H: Venturesomeness
- Factor I: Emotional Sensitivity
- Factor N: Astuteness
- Factor O: Apprehensiveness
- Factor Q1: Radicalism
- Factor Q2: Self-sufficiency
- Factor Q4: Tenseness

From Table 9 it is apparent that Cluster 2 (HHA^-) has **higher** scores than Cluster 1 (LLA^+) in respect of the following variables: Emotional maturity, dominance, venturesomeness, astuteness and radicalism. Furthermore, Cluster 2 has **lower** scores than Cluster 1 in respect of the following variables: Emotional Sensitivity, apprehensiveness and tenseness.

Persons with **high** scores on Autonomy and Internal Control and **low** scores on External Control can therefore be described as follows:
They are emotionally stable, mature, calm, self-assertive, independent, unconventional, venturesome, socially uninhibited, firm, responsible, clever, self-assured, analytical, free-thinking, relaxed and composed.

Persons with **low** scores on Autonomy and Internal Control, and **high** scores on External Control fall essentially at the **opposite pole** of all the above-mentioned personality attributes.

Differences between the clusters in respect of the various dimensions of the PHSF Relations Questionnaire
The vectors of means of the two clusters were compared with one another in respect of the various dimensions of the PHSF Relations Questionnaire. The significance of the differences in means between the two clusters are given in Table 10.

Table 10 shows that the Hotelling T^2-value is equal to 101,902 with an associated F-value (11 & 247) = 8,903; $p < 0,0001$). Therefore the t-tests can be interpreted with confidence.

From Table 10 it is clear that the means of the two clusters differ statistically significantly from one another in respect of the following dimensions of the PHSF:

- Self-confidence
- Self-esteem
- Nervousness
- Health
- Personal Freedom
- Sociability – G
- Sociability – S
- Moral Sense
- Formal Relations

With the exception of Self-control and Family Influences the means of Cluster 2 are statistically significantly **higher** than those of Cluster 1. Persons with **high scores** on Autonomy and Internal Control, and **low scores** on External Control are therefore better adjusted persons than those with **low scores** on Autonomy and Internal Control, and **high scores** on External Control. This applies to their Personal, Home, Social and Formal relations.

TABLE 10
SIGNIFICANCE OF DIFFERENCES IN MEANS BETWEEN THE TWO CLUSTERS IN RESPECT OF THE PHSF

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\bar{X}_1$	S^2_1	N_1	$\bar{X}_1$	S^2_2	N_2						
PHSF 1: SELF-CONFIDENCE	**28,3417**	5,2700	120	**33,6691**	4,7463	139	0,00	1 and 257	0,9702	-8,56	257	<0,0001*
PHSF 2: SELF-ESTEEM	**24,6417**	5,2785	120	**29,4964**	5,5317	139	0,83	1 and 257	0,3641	-7,19	257	<0,0001*
PHSF 3: SELF-CONTROL	26,7417	5,0117	120	28,0216	5,5995	139	1,33	1 and 257	0,2499	-1,93	257	0,0553
PHSF 4: NERVOUSNESS	**26,2000**	5,6770	120	**28,9784**	5,1096	139	4,71	1 and 257	0,0309*	-4,11	257	0,0001*
PHSF 5: HEALTH	**32,3750**	5,4435	120	**34,5899**	5,8704	139	0,85	1 and 257	0,3574	-3,13	257	0,0019*
PHSF 6: FAMILY INFLUENCES	29,1167	7,8507	120	30,9065	7,6754	139	0,26	1 and 257	0,6093	-1,85	257	0,0652
PHSF 7: PERSONAL FREEDOM	**33,7417**	7,7095	120	**36,3309**	7,2145	139	0,42	1 and 257	0,5181	-2,79	257	0,0057*
PHSF 8: SOCIABILITY-G	**27,4917**	6,9814	120	**30,6403**	6,7791	139	0,25	1 and 257	0,6191	-3,68	257	0,0003*
PHSF 9: SOCIABILITY-S	**29,7250**	7,0006	120	**32,5180**	7,4856	139	0,34	1 and 257	0,5619	-3,09	257	0,0023*
PHSF 10: MORAL SENSE	**31,3083**	5,8307	120	**33,4964**	6,1082	139	0,04	1 and 257	0,8347	-2,94	257	0,0036*
PHSF 11: FORMAL RELATIONS	**28,1917**	4,5638	120	**31,8993**	5,0466	139	1,46	1 and 257	0,2277	-6,16	257	<0,0001*

Hotelling T^2 = 101,9016
F-ratio = 8,9033
df = 11 & 247
p = <0,0001

TABLE 11
SIGNIFICANCE OF DIFFERENCES IN MEANS BETWEEN THE TWO CLUSTERS IN RESPECT OF THE SSHA

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\bar{X}_1$	S^2_1	N_1	$\bar{X}_1$	S^2_2	N_2						
SSHA 1: DELAY AVOIDANCE	**21,2583**	9,0084	120	**25,4317**	9,3064	139	0,47	1 and 257	0,4940	-3,65	257	0,0003*
SSHA 2: WORK METHODS	**24,4833**	7,6191	120	**29,0935**	8,7534	139	2,47	1 and 257	0,1169	-4,49	257	<0,0001*
SSSHA 4: EDUCATIONAL APPROVAL	**25,0500**	8,4822	120	**27,2518**	8,4176	139	0,02	1 and 257	0,8750	-2,09	257	0,0374*
SSHA 5: ACCEPTANCE OF EDUCATION	**24,7833**	7,2728	120	**27,4892**	7,3241	139	0,15	1 and 257	0,6998	-2,97	257	0,0032*

Hotelling T^2 = 22,2624
F-ratio = 5,5006
df = 4 & 254
p = 0,0003

Differences between the clusters in respect of the factors of the SSHA

The vectors of means of the two clusters were also compared with one another in respect of the different factors of the SSHA. The significance of the differences between the two clusters are given in Table 11.

Table 11 shows that the Hotelling T^2-value is equal to 22,262 with an associated F-value (4 & 254) equal to 5,501; (p = 0,0003). The t-tests can therefore be interpreted with confidence.

From Table 11 it is clear that the means of the two clusters differ statistically significantly from one another in respect of the following factors of the SSHA:

- Delay avoidance
- Work methods
- Approval of education
- Acceptance of education

Cluster 2 has **higher scores** than Cluster 1 on **all** the factors of the SSHA. Persons with **high scores** on Autonomy and Internal Control, and **low scores** on External Control, show good adjustment in the educational context: They have good study-habits and work-methods, they avoid postponement, and have a **positive** attitude toward education.

Differences between the clusters in respect of the factors of the CDQ

The vectors of means of the two clusters were also compared in respect of the different factors of the CDQ. The significance of the differences in means between the two clusters are given in Table 12.

Table 12 shows that the Hotelling T^2-value is equal to 30,305 with an associated F-value (5 & 253) equal to 5,967; (p < 0,0001). The t-tests can therefore be interpreted with confidence.

TABLE 12
SIGNIFICANCE OF DIFFERENCES IN MEANS BETWEEN THE TWO CLUSTERS IN RESPECT OF THE CDQ

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\overline{X}_1$	S^2_1	N_1	$\overline{X}_1$	S^2_2	N_2						
CDQ 1: SELF-KNOWLEDGE	**16,3417**	2,4546	120	**17,1223**	2,1246	139	3,34	1 and 257	0,0686	-2,74	257	0,0065*
CDQ 2: DECISION-MAKING	**15,9083**	3,0348	120	**17,3741**	2,3196	139	9,09	1 and 257	0,0028*	-4,31	220,9	<0,0001*
CDQ 3: CAREER INFORMATION	**13,6000**	3,7938	120	**15,1295**	3,4825	139	1,90	1 and 257	0,1688	-3,38	257	0,0008*
CDQ 4: INTEGRATION OF SELF-KNOWLEDGE AND CAREER INFORMATION	**16,2583**	2,4062	120	**17,5827**	1,9778	139	10,33	1 and 257	0,0015*	-4,79	230,6	<0,0001*
CDQ 5: CAREER PLANNING	**14,1667**	3,1445	120	**15,3957**	2,9748	139	0,94	1 and 257	0,3340	-3,23	257	0,0014*

Hotelling T^2 = 30,3053
F-ratio = 5,9667
df = 5 & 253
p = <0,0001

TABLE 13
SIGNIFICANCE OF DIFFERENCES IN MEANS BETWEEN THE TWO CLUSTERS IN RESPECT OF THE 19FII

Variables	Cluster 1			Cluster 2			Levene F	DF	p(F)	t-Value	DF	p(t)
	$\overline{X}_1$	S^2_1	N_1	$\overline{X}_1$	S^2_2	N_2						
FII 1: FINE ARTS	21,6750	10,9323	120	23,1295	12,6931	139	4,94	1; 257	0,0271*	-0,99	257	0,3227
FII 2: CLERICAL	13,9500	9,6344	120	14,0576	8,9651	139	1,52	1; 257	0,2194	-0,09	257	0,9260
FII 3: SOCIAL WORK	**23,0083**	11,9765	120	**19,4892**	12,3196	139	0,26	1; 257	0,6092	2,32	257	0,0210*
FII 4: NATURE	11,0500	10,4655	120	11,6906	11,2880	139	2,21	1; 257	0,1387	-0,47	257	0,6380
FII 5: PERFORMING ARTS	14,3500	11,6472	120	16,1727	12,9838	139	2,27	1; 257	0,1335	-1,18	257	0,2386
FII 6: SCIENCE	13,1417	10,3211	120	15,3309	10,8183	139	0,66	1; 257	0,4174	-1,66	257	0,0984
FII 7: HISTORICAL	15,9000	10,2984	120	15,4101	10,7244	139	0,04	1; 257	0,8477	0,37	257	0,7092
FII 8: PUBLIC SPEAKING	**15,9750**	10,7144	120	**21,3093**	11,8333	139	0,38	1; 257	0,5379	-3,78	257	0,0002*
FII 9: NUMERICAL	17,4250	10,4017	120	19,9712	11,4607	139	1,75	1; 257	0,1871	-1,86	257	0,0640
FII 10: SOCIABILITY	34,3083	8,1877	120	35,3525	9,3327	139	1,62	1; 257	0,2044	-0,95	257	0,3430
FII 11: CREATIVE THOUGHT	**27,8333**	8,8492	120	**32,5755**	8,5930	139	0,05	1; 257	0,8294	-4,37	257	<0,0001*
FII 12: TRAVEL	31,5083	8,9902	120	32,7050	9,2544	139	0,00	1; 257	0,9852	-1,05	257	0,2940
FII 13: PRACTICAL-FEMALE	17,2500	9,9573	120	15,4532	10,9506	139	0,76	1; 257	0,3851	1,37	257	0,1710
FII 14: LAW	**18,6750**	12,2166	120	**23,0288**	13,6859	139	3,03	1; 257	0,0829	-2,68	257	0,0078*
FII 15: SPORT	23,6500	12,5749	120	26,5827	12,9609	139	0,13	1; 257	0,7174	-1,84	257	0,0668
FII 16: LANGUAGE	16,2333	10,5899	120	17,7986	12,5682	139	4,88	1; 257	0,0280*	-1,09	256,9	0,2778
FII 17: SERVICE	17,9417	9,2102	120	17,1007	8,0084	139	2,90	1; 257	0,0897	0,79	257	0,4326
FII 18: PRACTICAL-MALE	**15,1667**	11,4989	120	**18,2086**	12,7100	139	0,81	1; 257	0,3679	-2,01	257	0,0458*
FII 19: BUSINESS	27,3917	11,2170	120	29,6547	11,8790	139	1,40	1; 257	0,2376	-1,57	257	0,1180
FII 20: WORK-HOBBY	14,6750	2,5771	120	14,1439	3,0158	139	0,38	1; 257	0,5402	1,51	257	0,1321
FII 21: ACTIVE-PASSIVE	10,5500	3,1962	120	9,8993	3,3195	139	0,21	1; 257	0,6442	1,60	257	0,1107

Hotelling T^2 = 48,605
F-ratio = 2,1344
df = 21 & 237
p = 0,0035

From Table 12 it is evident that the means of the two clusters differ statistically significantly in respect of the following factors of the CDQ:

- Self-knowledge
- Decision-making
- Career information
- Integration of self-knowledge and career information
- Career planning

Cluster 2 has **higher scores** than Cluster 1 in respect of **all** the factors. Persons with **high scores** on Autonomy and Internal Control, and **low scores** on External Control are generally more **career mature** than persons with **low scores** on Autonomy and Internal Control, and **high scores** on External Control.

Differences between the clusters in respect of the various fields of interest of the 19FII

The vectors of means of the two clusters were also compared in respect of the various **fields of interest** of the 19FII. The significance of the differences in means between the two clusters are given in Table 13.

Table 13 shows that the Hotelling T^2-value is equal to 48,606 with an associated F-value (21 & 237) equal to 2,134; ($p = 0{,}0035$). The t-tests can therefore be interpreted with confidence.

From Table 13 it is clear that the means of the two clusters differ statistically significantly in respect of the following fields of the 19FII:

- Social Work
- Public Speaking
- Creative Thought
- Law
- Practical-male

Cluster 2 has higher scores than Cluster 1 in respect of all the above-mentioned fields except Social Work. Persons with high scores on Autonomy and Internal Control, and low scores on External Control have a very strong interest in Creative Thought.

DISCUSSION

1. **Primary objective of study**. As far as the primary objective of the study is concerned, namely to construct a **normative** scale of locus of control for use with students and adults, the outcome was very positive. The LCI yielded **three factors** which were interpreted as Autonomy, Internal Control and External Control. Despite the fact that the three scales were quite **short** they nevertheless yielded acceptable reliabilities. Two contrasting groups (clusters) were formed by using the three scores of the LCI in a cluster analysis. The first cluster was low on Autonomy and Internal Control and average-plus on External Control, and the second cluster was high on Autonomy and Internal Control and average-minus on External Control.

2. **The cognitive, interest and personality correlates of locus of control**. In comparing the **means** of the two clusters, statistically significant differences were found in respect of a number of cognitive, interest and personality variables. Cluster 2 was consistently **superior** to Cluster 1 in respect of Non-Verbal IQ, Verbal Comprehension, Pattern Completion, Spatial 2D and Spatial 3D. As far as personality make-up is concerned, Cluster 2 is emotionally mature, dominant, venturesome, astute and radical. Cluster 1, by contrast, is emotionally sensitive, apprehensive, self-sufficient and tense. As far as Personal, Home, Social and Formal relations are concerned Cluster 2 achieved consistently better scores than Cluster 1. Persons high on Autonomy and Internal Control are therefore better adjusted individuals than those high on External Control.

   Cluster 2 also achieved consistently higher scores than Cluster 1 on all the subtests of the SSHA. All the differences were statistically highly significant. Persons high on Autonomy and Internal Control and low on External Control therefore have a **very positive** attitude towards education.

As far as **career development** is concerned, Cluster 2 achieved consistently higher scores than Cluster 1. They have better self-knowledge, are better at decision-making, have better career information and are better at integrating their self-knowledge and career Information. They are also better at career planning. All the differences in favour of Cluster 2 are statistically highly significant.

As far as fields of interest are concerned, Cluster 2 obtained statistically significantly higher mean scores than Cluster 1 in respect of Public Speaking, Creative Thought, Law and Practical-male pursuits. Cluster 1 obtained a higher score than Cluster 2 on Social Work. However, it should be borne in mind that the sample is only representative of the Faculty of Economic and Business Sciences. The **correlates of interest** should therefore be examined on a much wider sample.

From the foregoing it is clear that the LCI shows great promise, but needs to be extended in scope, and should be applied to a much larger and more representative sample. In particular it should also be applied to a sample of adults and multicultural groups. The second edition (1995) of the LCI has been **revised** and **extended in scope**. It is described in the next article in this publication.

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