



*16PF<sup>®</sup> Questionnaire  
French version of the 16PF Fifth Edition*

# French Data Supplement 2011

*December 2011*

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## Table of contents

Introduction .....	2
Sample.....	2
Descriptive statistics.....	2
Norms .....	3
Reliability.....	6
Primary scale factor analysis.....	9
Primary Factor intercorrelations .....	11
Summary.....	12
References.....	12
Appendix 1: Sample description .....	13

## Introduction

This 16PF data supplement for the French version of the 16PF questionnaire complements the current *Manuel 16PF* and the *2010 Data Supplement*. The results reported in the data supplement are based on data gathered from a nationally representative sample of people of working age in France. Where appropriate, the results obtained from this sample are compared with the findings on the French standardisation sample (N=1,000) published in the French *Manuel 16PF* by M.T. Russell and D.L. Karol (1995). This data supplement provides further evidence of the psychometric soundness and good validity of the instrument.

## Sample

The sample consisted of 1,140 respondents (570 female and 570 male) who completed the French version of the 16PF 5th Edition questionnaire between February and March 2011 via an online data collection platform. The sample was representative of the French working age population. Full sample details are shown in Appendix 1.

## Descriptive statistics

Statistical information (mean and standard deviation) for the raw scales for the nationally representative working age sample (N=1,140) can be found in Table 1. The table also provides the same information for the French standardisation sample (N=1,000). The "Raw score mean difference" column shows the scale mean difference between both samples.

Independent t-tests were conducted to determine if the differences in means between both samples were significant. A significant difference ( $p < 0.05$ ) was found for all Primary Factors except Rule-Consciousness (G) and Apprehension (O). However, when sample sizes are large, as is the case here, even a small difference in means is statistically significant. Statistical significance merely indicates that one can be confident that there is a difference between two samples. This does not necessarily imply that the difference is practically meaningful.

In order to determine if an observed difference is not only statistically significant but also important or meaningful, effect sizes are used. The effect size ( $d$ ) was calculated by subtracting the mean for the standardisation sample (N=1,000) from the mean for the nationally representative working age sample (N=1,140) and dividing this by the pooled standard deviation. The effect size is a standardised value, ie all effect sizes are calculated on a common scale.

The effect size results in Table 1 show that there is a moderate effect size (in excess of the traditional 0.50 cut-off) on the Primary Factors Vigilance (0.54), Openness to Change (-0.55) and Self Reliance (0.66). The nationally representative working age sample is on average more vigilant (L) and self-reliant (Q2), and less open to change (Q1) than the respondents in the French standardisation sample.

In order to gauge how substantial the differences between both samples are, let us consider how large an effect size is required in order to affect profile interpretation. An effect size of approximately +/- 0.50 corresponds to a sten difference of approximately 1 sten. In other words, for all factors except the Primary Factors Vigilance (L), Openness to Change (Q1), and Self-Reliance (Q2) the difference between both samples is within the standard error of measurement, which is approximately 1 sten.

The Primary Factor descriptive statistics reported for the nationally representative working age sample have been used to create new and updated French norms for the 16PF questionnaire.

## Norms

Table 2 presents norms for the 16PF, based on the data gathered for the nationally representative working age sample (N=1,140). They are generally similar, but not identical, to the norms previously generated from the French standardisation sample data.

**Table 1. Means, standard deviations, raw score mean differences and effect sizes for 16PF Primary Factors**

Primary Factor		French working age sample (N = 1,140)		French standardisation sample (N=1,000)*		Raw score mean difference	Effect size (d)
		Mean	Standard deviation	Mean	Standard deviation		
A	Warmth	13.15	3.74	14.46	4.08	-1.31	-0.34
B	Reasoning	7.86	2.42	8.81	2.70	-0.95	-0.37
C	Emotional Stability	12.93	4.45	14.78	4.23	-1.85	-0.43
E	Dominance	11.87	4.20	13.36	4.24	-1.49	-0.35
F	Liveliness	11.07	4.08	12.47	4.45	-1.40	-0.33
G	Rule-Consciousness	11.78	4.52	11.99	5.02	-0.21	-0.04
H	Social Boldness	8.89	5.63	10.93	5.76	-2.04	-0.36
I	Sensitivity	11.36	4.66	10.95	5.56	0.41	0.08
L	Vigilance	12.26	3.91	9.92	4.75	2.34	0.54
M	Abstractedness	8.71	4.83	7.21	5.3	1.50	0.30
N	Privateness	11.75	4.67	10.50	5.06	1.25	0.26
O	Apprehension	11.30	4.86	11.44	5.04	-0.14	-0.03
Q1	Openness to Change	17.91	5.04	20.62	4.80	-2.71	-0.55
Q2	Self-Reliance	10.81	4.79	7.57	5.07	3.24	0.66
Q3	Perfectionism	13.16	4.39	13.58	4.96	-0.42	-0.09
Q4	Tension	10.11	4.60	9.18	5.06	0.93	0.19

\* From the French *Manuel 16PF* by M.T. Russell and D.L. Karol (1995)

## French 16PF Data Supplement 2011

**Table 2. French working age sample norms (n=1,140)**

Primary Factor		Sten											Mean	SD
		1	2	3	4	5	6	7	8	9	10			
A	Warmth	0-5	6-7	8-9	10-11	12-13	14-15	16-17	18	19-20	21-22	13.15	3.74	
B	Reasoning	0-3	4	5	6	7	8-9	10	11	12	13-15	7.86	2.42	
C	Emotional Stability	0-2	3-5	6-8	9-10	11-13	14-15	16-17	18	19	20	12.93	4.45	
E	Dominance	0-3	4-5	6-7	8-9	10-12	13-14	15-16	17-18	19	20	11.87	4.20	
F	Liveliness	0-3	4	5-6	7-8	9-11	12-13	14-15	16-17	18	19-20	11.07	4.08	
G	Rule-Consciousness	0-2	3-4	5-6	7-9	10-11	12-14	15-16	17-18	19-20	21-22	11.78	4.52	
H	Social Boldness	-	0	1-2	3-5	6-8	9-12	13-15	16-17	18-19	20	8.89	5.63	
I	Sensitivity	0-2	3-4	5-6	7-8	9-11	12-14	15-16	17-18	19-20	21-22	11.36	4.66	
L	Vigilance	0-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18	19	20	12.26	3.91	
M	Abstractedness	0	1	2-3	4-5	6-8	9-11	12-13	14-16	17-18	19-22	8.71	4.83	
N	Privateness	0-1	2-4	5-6	7-9	10-12	13-14	15-16	17-18	19	20	11.75	4.67	
O	Apprehension	0-1	2-3	4-5	6-8	9-11	12-14	15-16	17-18	19	20	11.30	4.86	
Q1	Openness to Change	0-7	8-10	11-12	13-15	16-18	19-21	22-23	24-25	26	27-28	17.91	5.04	
Q2	Self-Reliance	0-1	2-3	4-5	6-7	8-10	11-13	14-16	17-18	19	20	10.81	4.79	
Q3	Perfectionism	0-3	4-5	6-8	9-10	11-13	14-15	16-17	18-19	20	-	13.16	4.39	
Q4	Tension	0-1	2-3	4-5	6-7	8-10	11-12	13-15	16-17	18-19	20	10.11	4.60	

## Reliability

Reliability gauges the consistency of test results. As a generic term, it relates to a number of different aspects of consistency. Essentially, a reliable test yields the same approximate results when administered repeatedly under similar conditions. Reliability is relevant as it describes how accurately an instrument measures the construct. It is closely related to measurement error. The higher the reliability, the smaller the band width around the observed score. It is within this band width that a person's true score is most likely to be.

The aspect of reliability addressed here is that of internal consistency, or homogeneity, of the test items, as measured by Cronbach's coefficient alpha (Cronbach, 1951). Internal consistency of the 16 factors measured by the 16PF questionnaire reflects the degree to which that set of scale items is sampling the same personality domain. In statistical terms, internal consistency reliability displays how large the intercorrelation is between the items that make up each of the 16 personality scales. Cronbach's coefficient alpha essentially calculates the average value of all possible split-half reliabilities. Internal consistency can be viewed as reliability estimated from a single test administration. As the intercorrelations among items within a scale increase, reliability of the scale itself increases. Internal consistency is lowered to the degree that items on the same scale measure different traits, or to the extent that scale items are not intercorrelated. However, it needs to be noted that – even though a high reliability coefficient is desirable – it can also lead to a scale that is too narrow in measuring a construct.

Cronbach alpha coefficients for the 16PF questionnaire were calculated based on the sample of French respondents described above. Table 3 presents a comparison with the French standardisation data of the coefficients for each primary scale.

Two aspects need to be taken into consideration when judging the obtained reliability coefficients.

Firstly, as mentioned earlier, reliability is dependent on the breadth of the measured construct. The 16PF Primary Factors measure distinct constructs as confirmed by factor analysis (for details see the Factor Analysis section of this data supplement). Nevertheless, when measuring the factors of personality, several behavioural preferences related to the construct are covered in the items constituting one factor. For example, the items of the factor Warmth (A) do not only cover the extent to which a person cares about others, but also how much a person is interested in spending time with others and, additionally, talking about other people's personal concerns. Making the scale more reliable by removing aspects of the constructs (ie including items about only a restricted number of behavioural preferences per scale) would mean that the construct is not accounted for in its whole range. In other words, one would increase reliability at the expense of measuring the construct adequately.

Secondly, the 16PF instrument is a personality questionnaire. Personality questionnaires are usually based on self-reports and thus measure typical behaviour. Reporting on typical behaviour rather than displayed behaviour, as is the case with ability tests, introduces more variance in the responses provided by an individual (Chernyshenko, Stark, Chan, Drasgow, & Williams, 2001), thus lowering the reliability. In addition, when judging the reliability coefficients, the

application of the 16PF questionnaire needs to be considered. The results obtained when administering the 16PF instrument are validated in a feedback process where a practitioner discusses the profile with the respondent. Due to this process, it is possible to explore a person's true score by reflecting on the person's preferences, events that may have impacted on the responses given and by finding practical evidence. Taking this into consideration, the obtained coefficients are highly satisfactory.

The reliability coefficients can also be assessed based on the criteria for rating the technical qualities of an instrument defined by the European Federation of Psychologists' Associations (EFPA). Using EFPA's rating system, seven Primary Factors achieve adequate reliability (ie coefficients between 0.60 and 0.70), six factors show good reliability (ie coefficients between 0.70 and 0.80) and one displays excellent reliability (ie coefficient larger than 0.80). Only two factors (Factor A and Factor B) yielded values below 0.60. A comparison with the reliability coefficients based on the French standardisation sample shows that the differences between both samples with regard to reliability are small, thus confirming that the psychometric properties of the French 16PF questionnaire are stable over time.

**Table 3. Internal consistency for 16PF Primary Factors**

		French working age sample (N = 1,140)		French standardisation sample (N=1,000) *
	Primary Factor	Number of items	Cronbach's alpha	Cronbach's alpha
A	Warmth	11	0.51	0.57
B	Reasoning	15	0.44	0.59
C	Emotional Stability	10	0.72	0.70
E	Dominance	10	0.65	0.65
F	Liveliness	10	0.63	0.68
G	Rule-Consciousness	11	0.67	0.68
H	Social Boldness	10	0.84	0.81
I	Sensitivity	11	0.66	0.75
L	Vigilance	10	0.65	0.74
M	Abstractedness	11	0.72	0.76
N	Privateness	10	0.74	0.76
O	Apprehension	10	0.75	0.72
Q1	Openness to Change	14	0.66	0.62
Q2	Self-Reliance	10	0.75	0.76
Q3	Perfectionism	10	0.70	0.76
Q4	Tension	10	0.68	0.72

\* From the French *Manuel 16PF* by M.T. Russell and D.L. Karol (1995)

## Primary scale factor analysis

Exploratory factor analysis is a statistical technique for discovering, within a large set of variables, a smaller set of variables that can explain much of the larger domain. Raymond Cattell's original development of the 16PF questionnaire used factor analysis to identify 16 Primary Factors. Based on the sample described above (N=1,140), an analysis was conducted to examine if the same 16 Primary Factors could be replicated from the French 16PF questionnaire.

The factor structure of the final set of items was examined for the sample using the procedure discussed by Conn and Rieke (1994). Items within each factor were grouped into 'parcels' based upon the strength of their correlations with items within the same scale. Hence the term 'parcels' refers to small groupings of items within a scale. For each Primary Factor, three or four items were summed within each parcel in order to achieve a parcel score. Each scale was partitioned into three to four parcels, resulting in a total of 49 parcels.

These parcels, rather than separate items, were factor analysed, because it has been shown that parcels are more reliable (Berstein & Teng, 1989; Cattell & Burdsal, 1975; Gorsuch, 1983). In addition, item responses on the 16PF instrument tend to follow a bimodal rather than normal distribution, which violates one of the statistical assumptions of normal theory factor analysis. By grouping three or four items together, the distribution better approximates a normal distribution, thus providing a better estimate of the factor structure.

In accordance with Cattell's theoretical basis for the original development of the 16PF questionnaire, an oblique rather than an orthogonal factor analysis was conducted of the parcels. Principal Axis Factoring was conducted using the statistical package SPSS. This was followed by an oblique rotational method (Promax) with the Kappa value set at 3. The Primary Factor correlation structure is reported in Table 4 with absolute loadings <0.20 excluded.

Overall, the pattern shows a very good, simple structure for the 16PF Primary Factors. All except one of the 49 parcels exhibit the highest loading onto the factor to which they were assigned. The factor loadings of the parcels onto their respective factor range from 0.23 to 0.81 (median of 0.66 and mean of 0.60); and 41 of the 49 parcels (84%) showed a loading of 0.50 or higher, thus suggesting strong links between the parcels and their assigned factor. In addition, as can be seen in Table 4, there are only six cross-loadings equal to or larger than +/-0.20. All other parcels display close-to-zero loadings onto other factors, demonstrating that these parcels represent distinct constructs that are only represented in their assigned factor, and not in the remaining factors that measure other traits.

The parcels displaying cross-loadings equal to or larger than +/-0.20 all showed higher or equal loadings onto their respective factors, with only one exception (parcel A3 loading at -0.38 on Privatness (N)). The results as a whole confirming empirically the strong conceptual links between the item parcels and their assigned factors.

In summary, 16 factors are clearly defined, corresponding to Cattell's 16 Primary Factors in the US 16PF questionnaire and many other language versions of the instrument. Such a clear Primary Factor structure of the French 16PF questionnaire provides excellent evidence for its construct validity.

**Table 4. Rotated factor pattern loadings of 16PF Primary Factors (N=1,140; 570 females, 570 males)**

Parcel	Factor															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	N	O	Q4	Q2	I	Q3	Q1	M	E	G	F	L	H	A	B	C
A1														64		
A2														55		
A3	-38													30		
B1															44	
B2															49	
B3															50	
C1		-23														23
C2		-21														48
C3																68
E1									50							
E2									58							
E3									50							
F1											67					
F2											62					
F3											56					
G1										63						
G2										63						
G3										66						
H1													73			
H2									20				45			
H3													69			
I1					73											
I2					63											
I3					62											
L1													70			
L2													63			
L3													45			
M1									64							
M2									75							
M3									53							
N1	63															
N2	77															
N3	79															
O1		73														
O2		61														
O3		70														
Q1_1									50							
Q1_2									34	23						
Q1_3									53							
Q1_4									56							
Q2_1				81												
Q2_2				60												
Q2_3				55												
Q3_1									65							
Q3_2									72							
Q3_3									61							
Q4_1			55							21						
Q4_2			63													
Q4_3			67													

**Note.** Decimals omitted. Factor loading less than absolute value 0.2 deleted.

## Primary Factor intercorrelations

Although the factor pattern shows that the 16PF items tend to associate with their own scale and not with others, the Primary Factor scales do clearly show a predictable pattern of intercorrelations, because the factors are oblique. Table 5 presents intercorrelations of the Primary Factor scales for the sample of French respondents (N=1,140) described above.

A comparison with the results obtained for the French standardisation sample as reported in the French *Manuel 16PF* shows that the differences are relatively minor (absolute difference: mean 0.05, median 0.04). This suggests that the relationships between the factors of the 16PF questionnaire are stable across different samples and over time.

**Table 4. 16PF Primary Factor intercorrelations (N=1,140; 570 females, 570 males)**

	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3
<b>A</b>															
<b>B</b>	-08														
<b>C</b>	11	06													
<b>E</b>	12	05	26												
<b>F</b>	29	01	21	25											
<b>G</b>	00	03	02	-06	-18										
<b>H</b>	26	-01	35	44	42	-07									
<b>I</b>	19	-08	-28	-20	01	-02	-18								
<b>L</b>	-05	-09	-24	04	-23	00	-22	-01							
<b>M</b>	-13	-09	-34	-09	-00	-30	-11	08	15						
<b>N</b>	-33	01	-10	-13	-29	03	-45	03	27	01					
<b>O</b>	05	03	-48	-22	-15	13	-38	30	23	16	10				
<b>Q1</b>	13	18	24	34	31	-28	31	-02	-07	14	-10	-08			
<b>Q2</b>	-27	02	-17	-02	-42	-05	-26	07	31	14	28	11	-13		
<b>Q3</b>	04	-02	14	16	-10	34	06	-07	18	-29	07	08	-00	08	
<b>Q4</b>	-06	-03	-42	13	-07	-02	-18	19	22	10	06	26	-11	22	-02

**Note.** Decimals omitted.

## Summary

The results reported in this 16PF data supplement provide excellent evidence of the instrument's psychometric qualities. They demonstrate that the French version of the 16PF questionnaire is a reliable and valid tool for the assessment of personality. A comparison of our current findings with the results obtained from the French standardisation in 1995 shows compelling similarity in the psychometric properties between the data from the two different points in time. This means that what we knew then about the French version of the 16PF questionnaire is concurrent with what we found in our more recent data. We can therefore conclude that the 16PF instrument is just as current now as it was when the data for the standardisation was gathered in 1995. Users of the French version of the 16PF questionnaire can be confident that the instrument remains a reliable and valid tool for the objective assessment of personality.

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## Appendix 1: Sample description

The sample consists of 1,140 individuals, specifically sampled to be representative of the French working age population. Respondents completed the French version of the 16PF 5th Edition questionnaire between February and March 2011 via an online data collection platform.

570 of the respondents (50%) were female and 570 (50%) were male.

The mean age was 39 years, and the range was as follows:

Age (years)	Number	Percentage
18–24	143	12.5%
25-29	145	12.7%
30-34	160	14.0%
35-39	144	12.6%
40-44	149	13.1%
45-49	127	11.1%
50-54	110	9.6%
55-59	85	7.5%
60-64	77	6.8%

A broad range of educational levels was represented, with the largest single group being BEP-CAP (24%), as shown below:

Educational level	Number	Percentage
Aucun diplôme, CEP	24	2.1%
Brevet des collèges	54	4.7%
BEP- CAP	269	23.6%
Baccalauréat	233	20.4%
Bac+2/DEUG	190	16.7%
Bac+3/Licence	141	12.4%
Bac+4 /Maîtrise	84	7.4%
Bac+5/ Masters/DESS/DEA	121	10.6%
Doctorat	24	2.1%

All the respondents lived in France, with 1,093 (96%) having been born in France. Respondents lived in different regions of France, as follows:

Region	Number	Percentage
Nord et Picardie	120	10.5%
Bretagne	70	6.1%
Normandie	70	6.1%
Alsace-Lorraine	84	7.4%
Champagne -Ardennes	32	2.8%
Ile de France	238	20.9%
Centre	60	5.3%
Pays de Loire	66	5.8%
Bourgogne et Franche-comté	53	4.6%
Poitou-Charente	34	3.0%
Limousin- Auvergne	30	2.6%
Rhône –Alpes	119	10.4%
Aquitaine	62	5.4%

Midi-Pyrénées	55	4.8%
Languedoc-Roussillon	41	3.6%
PACA-Corse	6	0.5%

The majority of the group were in full-time employment:

Employment status	Number	Percentage
Travail à plein temps (pour un employeur)	759	66.6%
Travail à plein temps (à votre compte)	49	4.3%
Travail à mi-temps (pour un employeur)	148	13.0%
Travail à mi-temps (à votre compte)	19	1.7%
Sans emploi	40	3.5%
Travail non rémunéré	4	0.4%
Etudiant	37	3.2%
Personne au foyer	30	2.6%
Retraité	54	4.7%

Amongst the 975 people in paid employment, the occupational levels were as follows:

Occupational level	Number	Percentage
Management exécutif / Chef d'entreprise	32	3.3%
Management supérieur/Cadre supérieur	54	5.5%
Management intermédiaire/Cadre	184	18.9%
Superviseur/Premier niveau de management/Agent de maîtrise	123	12.6%
Employé	534	54.8%
Autre	48	4.9%

And a range of work areas were represented:

Work area	Number	Percentage
Agriculture, forêt et pêche	15	1.5%
Exploitation minière	4	0.3%
Industrie de transformation	64	6.8%
Fourniture d'électricité, gaz et air conditionné	10	1.0%
Approvisionnement en eau, traitement des déchets et eaux usées	2	0.2%
Construction	53	5.4%
Commerce de gros et de détail, réparation de véhicules à moteur	81	8.1%
Hébergement et restauration	33	3.4%
Transport et stockage	46	4.4%
Information et communication	44	4.5%
Services financiers et assurances	34	3.2%
Immobilier	14	1.8%
Activités professionnelles, scientifiques et techniques	56	5.6%
Activités administratives et services d'assistance technique	30	3.8%
Administration publique et défense; sécurité sociale	98	9.1%
Education	86	9.7%
Santé publique et services sociaux	110	10.5%

Arts et loisirs	19	2.8%
Autres activités de service	158	16.2%
Activités ménagères en tant qu'employeurs; biens et services divers produisant des activités ménagères à usage personnel	15	1.7%
Organisations extra-territoriales	3	0.3%