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A substantial psychometric analysis of the scales of the Minnesota Multiphasic Personality Inventory: F. B. Berezin's version, the MMIL

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In our research we made a substantial psychometric analysis of the scales of F. B. Berezin's version of the Minnesota Multiphasic Personality Inventory (MMPI), the MMIL, which is widely used in various spheres of psychological practice. Since the mid-1990s in Russia there have been many essential transformations in thinking and values that have been caused by changes in social and economic reality. For this reason, we need to continue our work on specifying the meaning of the MMIL tasks and, then, on updating the test norms and keys. Such psychometric updating is necessary for maintaining the efficiency of the method. For our update, we constructed linear norms for the test; we tested the questionnaire for the normality of the distribution of points; and we checked the validity (including external validity), the reliability coherence of the scales, and the variability of the points. The necessity of readapting the MMIL was thus demonstrated. Questions that display low variability and that are not significantly correlated with the scale they belong to, which reduces their differentiating potential, may be excluded from the test or reformulated.

Keywords: psychometric analysis, test norms, validity, reliability coherence, representativeness, the Minnesota Multiphasic Personality Questionnaire (MMPI), the MMIL, factor analysis

The MMPI is a test questionnaire that is extremely popular among not only domestic but also foreign experts. The classic version of the MMPI questionnaire was offered by S. Hathaway and J. McKinley in 1940. Since then reworked and reduced versions of the questionnaire have been repeatedly offered. In 1989 the questionnaire was considerably redesigned (the restandardization project began in 1982) and was published under the name MMPI-2 (J. Butcher et al., 1989).

Adaptation of the questionnaire in our country began in the 1960s. The first MMIL version consisted of 384 statements by Berezin & Miroshnikov in 1967**.** Berezin and his colleagues developed an original interpretation of the MMPI scales

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and carried out a careful standardization and adaptation, taking into account the specifics of sociocultural conditions, the possibilities of applying the test to mentally healthy people, and also the use of the reduced version of the test. As a result, the MMIL was created (Berezin, Miroshnikov, & Rozhanec, 1976, 1994). The MMIL was used in this research.

Today there is wide circulation of other domestic versions of the questionnaire: the Standardized Method for the Multivariate Study of Personality (SMIL) (Sobchik, 2007), the Standardized Clinical Personal Questionnaire (SKLO) (M. Bekhterev Psychoneurological Institute in St. Petersburg), and Mini-Mult, which consists of 71 statements selected on the basis of factorial analysis, created by Zaytsev and his colleagues (Zaytsev,1981).

Since the standardization and adaptation of the MMIL there have been significant changes in the political, economic, and spiritual spheres of the Russian-speaking culture; these alterations have caused extensive changes in the personal, axiological, semantic, motivational, and behavioral spheres of the Russian people. Therefore, the relevance of the present research is explained by the necessity of reassessing the psychometric indicators of the MMPI to reflect precisely the actual semantic structures of people surveyed in specific sociocultural conditions. The question of how test points are structured is also important as features of this structure reflect the psychological reality that the test is expected to measure. Attempts to apply factor and cluster analyses of MMIL points have been undertaken previously. From our point of view, these methods look most suitable for modeling the psychological reality measured by the MMPI. In particular, one of the most convincing studies was carried out by Shmelev in 2000 (Shmelev, 2002) on a sample of 766 people (students of Moscow colleges and universities). So we were curious to find out what our results in 2009 would be. One of our objectives was to compare the results of the above-mentioned study with those obtained almost 10 years later.

Experiment 1. Psychometric analysis of the MMPI

It was necessary to carry out a psychometric analysis of the questionnaire in order to check the reliability, coherence, and internal and external validity of the technique. For that reason we examined the following psychometric indicators of the MMPI test: medians of root-mean-square deviations on each of the test scales and on female and male samples separately, indicators on the one-sample Kolmogorov-Smirnov criterion, correlations between answers to questions and the total points on a scale, and Cronbach's alpha coefficient values.

Methodology

1. **Creation of linear norms for the test.** Medians and root-mean-square deviations were calculated for each of the test scales, for female and male samples separately. Medians and root-mean-square deviations obtained in 1977 for each of the test scales for female and male samples by Berezin, were compared with our 2009 results.

2. **Check on normality and the assessment of the distribution of points.** A check of the sample and the distribution of test points were estimated visually according to the charts of distribution and analytically considering the results of the one-sample Kolmogorov-Smirnov criterion.
3. **Validity check.** A check of validity was carried out in the traditional way—by calculating correlations between answers to questions and the total points on a scale (the bivariate coefficient of correlation).
4. **Reliability coherence check.** Assessment of the internal coherence of the test was made by calculating Cronbach's alpha coefficient. This coefficient represents the assessment of reliability based on the homogeneity of a scale or the sum of correlations between answers of examinees on the same test form.
5. **Analysis of variability of points.** This analysis reveals the questions for which the diagnostic potential is limited, not least because the majority of examinees give the same answers to them. The variability of points was defined by calculating a portion of affirmative and negative answers on the basis of the binary system of answers (true or false).
6. **Check of the external validity of the MMIL.** To this end, a measurement of the convergent validity of MMIL scales and of 16-PF questionnaire scales, which are defined to measure similar psychological reality, was carried out.

Sample

The sample consisted of 548 people aged 19 to 40 (210 men and 338 women).

Time of the experiment

The experiment was carried out in 2009.

Procedure

All examinees filled out the MMIL test questionnaire; their sex, age, and educational background were taken into consideration. The research was carried out during a course of psychodiagnostic methods of university undergraduates. Because participation was voluntary and anonymous, examinees were interested in receiving the most complete feedback on the results of the diagnostics. Therefore, it was necessary to ensure that the testing procedure minimized the influence of the social-desirability factor.

Analysis of the data

The statistical analysis was carried out using Microsoft Excel 2007 and SPSS 15 software.

1. Creation of linear norms for the test-

In order to identify possible changes we counted up the linear norms of the MMPI test by calculating the medians and root-mean-square deviations for each of the

test scales for female and male samples separately. We compared these 2009 results with the results obtained in 1977 (see Berezin et al., 1994) (Table 1).

Table 1. Linear standards of the MMPI test

No.	Scales	Men, 2009		Men, 1977		Women, 2009		Women, 1977	
		N=210		N=250		N=338		N=250	
		m	σ	m	σ	m	σ	m	σ
1	L	2	1.7	4	2.23	3	2.19	4	2.43
2	F	8	4.42	5	2.91	9	4.3	7	3.18
3	K	16	3.96	15	3.88	15	4.1	15	4.14
4	Hs	12	3.31	12	3.28	14	4.1	14	4.37
5	D	19	5.27	20	4.14	20	5.47	20	5.03
6	Hy	20	4.37	18	4.43	22	4.76	20	5.17
7	Pd	23	3.58	21	4.17	22	4.45	22	4.11
8	Mf	23	3.81	22	3.91	30	4.47	32	3.82
9	Pa	10	3.46	9	2.77	12	3.7	10	3.29
10	Pt	33	5.23	27	4.79	33	4.8	32	4.77
11	Sc	31	5.66	27	2.46	31	5.73	29	5.25
12	Ma	23	4.04	19	4	24	3.78	19	3.81
13	Si	21	8.11	27	7.03	22	7.54	30	7.74

Note. m: median, the average norm; σ: root-mean-square deviation

Let's consider separately for the samples those scales that underwent the most essential changes.

For the female sample, the most significant changes (shifts of about 10 to 13 T-points) were on scale 0 "social contacts" and scale 9 "anxiety denial, hypomania tendencies." Such an essential shift toward an increase in the average value on the scale of hypomania tendencies allows us to conclude that the former top border of the mental norm (70 T-points) cannot be considered as a symptom of the corresponding mental disorder but rather reflects an expansion of the range of acceptability corresponding to this scale of behavior. In other words, young females became on average more active and spontaneous. The norm on the scale of social introversion (scale 0) essentially went down. This change indicates a more courageous and open attitude to society and the social mobility of modern youth.

Less considerable changes occurred on the "female and male character traits" scale (scale 5): the norm moved 6 T-points up, a change that indicates an increase in masculinization in modern young women. This finding testifies to the fact that women increasingly prefer men's occupations (in particular, they prefer office work

to housework), and it shows a strengthening of the tendency toward domination and independence.

We also found a median increase of 6 T-points on the frustration scale (F scale); this escalation signifies an increase in unusual thoughts, desires, and feelings that, in turn, testifies to an expansion of the admissibility framework for those mental manifestations that were perceived earlier as disadaptation signs. Minor changes of the median toward an increase (of 4 to 6 T-points) also were found on scales 6 and 8 ("rigidity of affect" and "autization"); these changes can be interpreted as an increase in emotional coldness and affect emasculation, combined with affective rigidity, egocentrism, ambition, a tendency to self-affirmation, suspiciousness, and an increase in rancor.

For the men**,** as well as for the women, we discovered an increase in the norm on the hypomania scale (scale 9) of 11 T-points, a decrease on the social introversion-extroversion scale (scale 0) of 9 T-points, and an increase on the frustration scale (F scale) of 9 T-points.

Unlike women, men demonstrated a decrease in the L scale "lie" of 10 T-points; this decrease indicates an expansion of their outlook and more spontaneity in their behavior.

Also, the men's sample differs from the female sample in having a 12 T-point increase on the scale of "anxiety fixing" (scale 7) and a 9 T-point increase in the "autization" scale (scale 8). This result says to us that the modern young man has become more distanced; his behavior is emotionally cold, and he is more uncertain because of his feeling of exclusiveness, of the originality of his personality, and his feeling of insufficient recognition of his personality by the people around him. These changes are probably connected with growing uncertainty and a blurring of traditional men's roles in modern society and with the strengthening of modern man's anxiety about the choice of adequate means of socialization.-

So, looking at the medians and the root-mean-square deviations used in the linear standardization of crude points, we can consider the medians out-of-date and not operating in current sociocultural conditions. Carrying out linear standardization using the factors calculated in our research essentially corrects the profile of a respondent on separate clinical scales.

As a whole, it is obvious that it is necessary to readapt the technique so that the MMPI fulfills the requirements of the times. This task demands creation of a sample population and a check on the representativeness of the technique.

2. Check on normality and assessment of the distribution of points

A check of the sample and the distribution of test points was estimated visually according to distribution charts and also analytically by the results of the one-sample Kolmogorov-Smirnov criterion. See Table 2.

We found that none of the MMPI scales is normal. See distribution charts.

Analysis of the distribution of test points on the MMPI scales allowed us to make the following assumptions concerning the determinants of similar configurations of schedules of distribution.

Scales L, F, and 1 («lie,» «reliability,» and "somatization of anxiety") are characterized by a right-hand asymmetry; thus, we can say that in these scales there are questions with which the majority of respondents are inclined to disagree. Therefore, these scales are not capable of differentiating examinees.

Table 2. One-sample Kolmogorov-Smirnov criterion

	Kolmogorov-Smirnov Z	**Asymp. sig. (2-tailed)**
Age	3.09	0.00
L Scale	3.32	0.00
F Scale	1.84	0.00
K Scale	1.69	0.01
Scale 1	3.00	0.00
Scale 2	1.82	0.00
Scale 3	1.69	0.01
Scale 4	1.86	0.00
Scale 5	1.59	0.01
Scale 6	1.76	0.00
Scale 7	1.89	0.00
Scale 8	1.63	0.01
Scale 9	1.60	0.01
Scale 0	1.98	0.00

Scale 4 "realization of emotional intensity in direct behavior" and scale 7 "fixing of anxiety and restrictive behavior" have a bimodal distribution of points that allows us to assume that there is some factor or sign that influences the answers of the examinees: if it is present, the examinees agree with the statement; if it is not present, they disagree.

The distribution of scale 9 "anxiety denial, hypomaniacal tendencies" has a negative excess that allows to assume a significant connection between the points of the questionnaire belonging to this scale.

For all scales of the MMPI in which the distribution of points is not normal, it is necessary to estimate separately the validity and diagnostic ability of each point constituting a scale.

3. Validity check

A check of validity was carried out in the traditional way—by calculating correlations (the bivariate coefficient of correlation) between answers to questions and the total points on a scale.

The received correlation parameters calculated to check test validity make it possible to draw a conclusion about the average level of communication. Aver-

age factors of correlations were obtained on the following scales: 3 "repression of the factors causing anxiety" (0.28), 5 "female and male character traits" (0.24 for men and 0.22 for women), and 9 "anxiety denial, hypomania tendencies" (0.27), at $p<0.05$. These results demand a further substantial analysis of points of the questionnaire in order to withdraw points that do not correlate significantly with the scales they belong to.

4. Assessment of the internal coherence of the test

The internal coherence of the test was assessed by calculating Cronbach's alpha coefficient. This coefficient represents the assessment of reliability, which is based on the homogeneity of a scale or the sum of correlations between answers of examinees to questions in the same test form. See Table 3.

Table 3. Cronbach's alpha coefficients

Scale	Cronbach's alpha coefficients
L	0.49
F	0.62
K	0.65
Scale 1	0.78
Scale 2	0.63
Scale 3	0.53
Scale 4	0.53
Scale 5	0.45 for men, 0.38 for women
Scale 6	0.47
Scale 7	0.82
Scale 8	0.82
Scale 9	0.49
Scale 0	0.80

The assessment of the internal coherence of the scales of the MMPI shows that these scales are coordinated: F "reliability," K "correction," 1 "somatization of anxiety," 2 "anxiety and depressive tendencies," 7 "psychasthenia, or the fixing of anxiety and restrictive behavior," 8 "autization," and 0 "social contacts."

The following scales are not internally coordinated: L "lie," 3 "hysteria or repression of the factors causing anxiety," 4 "psychopathic deviation or realization of emotional tension in direct behavior," 5 "male and female character traits," 6 "paranoia or rigidity of affect," 9 "hypomania or anxiety denial." It can be determined by the substantial dimensions of the scales of the questionnaire that each scale consists of more than 40 versatile questions that allow the expansion of the area of coverage of the studied factors but, at the same time, reduce the level of internal coherence. Theoretically and methodologically the questionnaire points do not assume ho-

mogeneity; they reflect an extensive area of possible somatic, behavioral, and other features of the people belonging to a certain disadaptation group.

5. Analysis of the variability of points

We found 12 points that have less than 10% of negative answers in the sample. We also found 45 points that have less than 10% of positive answers.

So, 57 out of 377 points of the MMIL possess low variability and thus have reduced differentiating potential. It's expedient to exclude them from the test to decrease the number of points or to reformulate the statements on the questionnaire.

6. Check of the external validity of the MMIL

In order to check the external validity of the MMIL, a correlation analysis was carried out on the data files of the standardized points of the MMPI test, Cattell's 16PF test, and also coded biographical data of the respondents (sex, age, education level, occupation, having a family and children). Results of the correlation analysis (the Spearman coefficient of correlation at a significance level of $p<0.01$) reflect a connection between points of the MMPI questionnaire and points of the 16-factorial personality questionnaire that are designed to diagnose the same psychological reality.

Results are presented in Table 4.

Table 4. Results of the correlation analysis of the standardized points of the MMPI and the 16-PF

MMPI	16 PF	Correlation coefficients
Scale 0 "social contacts"	H-factor: "courage — shyness"	–0.71
Scale 5 "female and male character traits"	I-factor: "rigidity –sensitivity"	0.57
K scale "correction"	Q4-factor: «tension — slackness"	–0.53

On a number of indicators the MMPI and the 16-PF questionnaires have significant correlation coefficients, which are easily explainable.

The highest correlation score (–0.71 at a significance level of $p<0.01$) was for the H-factor "courage — shyness" of Cattell's test and scale 0 "social contacts" of the MMPI test.

The contents of these indicators are the following. High scores on the H-factor indicate immunity to threat, courage, determination, craving for risks and thrills. People with high scores on this factor freely makes interpersonal contacts, do not experience difficulty in communication, speak willingly and a lot, are not at a loss when facing unexpected circumstances, quickly forget about failures, do not make appropriate conclusions after being punished. A decrease in the level of a profile on the 0 scale of the MMPI test also reflects a desire to make interpersonal contacts and an interest in people. Examinees with such a profile are sociable, emotionally sympathetic; they have well-developed communication

skills. Persons of this type willingly take up public duties, have a large number of interpersonal contacts in various spheres, and get great pleasure from making use of these contacts.

The I-factor "rigidity — sensitivity" on Cattell's 16-PF test correlates with scale 5 of the MMPI "female and male character traits" (correlation coefficient 0.57 at a significance level of $p<0.01$). High scores on the I-factor indicate softness, refinement, and a figurative, artistic perception of the world. Persons with high indicators on this factor possess rich imaginations and esthetic taste; works of art influence their life more than real events. They are inclined toward artistic activity. Low scores are characteristic of courageous, severe, practical, and realistic persons. They approach life from a logical perspective, trust their minds more than their feelings, substitute calculation for intuition, and get rid of psychological traumas at the expense of rationalization. In the MMPI test the substantial rise of a profile on scale 5 reflects the decrease or absence of identification with the traditional cultural and social roles of men and women, while an obvious decrease in a profile on this scale testifies to a high level of identification with traditional gender roles. A profile decrease on this scale for men means higher selectivity and a limited scope of interests, resourcefulness, an expressed desire to overcome obstacles, lower sensitivity to esthetic subtleties and shades of human relations. The higher the score on scale 5 for men, the more they pay attention to emotional nuances and shades of relationships, possess sentimentality, and have a broad range of interests, and they are less gauche and have less of a tendency to dominate. An increase on scale 5 for women reflects an increase of those tendencies that are for men accompanied by a decrease on this scale. The higher the score on scale 5 for women, the more they express confidence, initiative, consistency of behavior, dominance, and heteroaggressive trends.

The "validity" scale, K, has a significant factor of correlation (-0.53 at a significance level of $p<0.01$) with the Q4-factor "tension — slackness."

Persons with high scores on scale K generally behave according to socially accepted norms, are anxious about their social status, and abstain from criticism of the people around them as long as the behavior of those people is within accepted norms. Thus people with high K scores are inclined to deny any difficulties in interpersonal relationships or in the control of their own behavior. Low marks on the Q4-factor indicate approximately the same characteristics—denial of internal tension and also of unfilled aspirations.

Table 5. Results of the internal correlation analysis of the standardized points of the MMPI scales

MMPI scales	MMPI scales	Correlation coefficients
Scale 7 "fixing of anxiety and restrictive behavior"	Scale 8 "autization»	0.69
Scale 3 "hysteria or repression of the factors causing anxiety"	Scale 1 "hypochondriasis or somatization of anxiety"	0.63
Scale 2 "anxiety and depressive tendencies"	Scale 7 "fixing of anxiety and restrictive behavior"	0.62

Scale 2 "anxiety and depressive tendencies"	Scale 0 "social contacts»	0.6
F scale "reliability"	Scale 8 "autization»	0.56
Scale 6 "paranoia or rigidity of affect"	Scale 8 "autization»	0.53

Besides correlations with the 16PF questionnaire, there are internal correlations of scales of the MMPI that show the most frequent combinations of the scales. See Table 5.

Analysis of these correlations, which reveal steady personal and behavioral patterns (or well-known options for disadaptation if it is a question of the clinical expressiveness of these patterns), indirectly testifies to the internal validity of the questionnaire.

In this way correlations scale 1 "hypochondriasis or somatization of anxiety" and scale 3 "hysteria or repression of the factors causing anxiety" with factor 0.63 at a significance level of $p<0.01$ have been found. It reveals a tendency toward repression, which is shown in an inclination to deny problems and difficulties, combined with a desire to emphasize somatic trouble and/or the declaration of hypersocial installations masking egocentricity. Such a constellation of scales characterizes persons with more or less expressed hysterical phenomena.

Another steady combination is reflected by correlations between the scales of hyposthenia* (scale 2 "anxiety and depressive tendencies," scale 7 "psychasthenia, or fixing of anxiety and restrictive behavior," and scale 0 "social contacts") with factors from 0.6 to 0.63 at a significance level of $p<0.01$. This combination indicates the prevalence of inhibitive features, which testify to an individual's uneasiness, internal tension, conformity, social pliability, and refusal of self-realization.

There is also a correlation between the F scale and scale 8 "autization" (0.56 at a significance level of $p<0.01$) that can be determined by a general tendency of respondents to attribute to themselves abnormal behavioral manifestations, which is a strategy for moving away from testing.

Scale 8 "autization" of the MMPI correlates significantly with scale 6 "paranoia or rigidity of affect" (0.53 at a significance level of $p<0.01$). This correlation also reflects a certain personal pattern: a combination of autization and distancing with rigidity and a desire to lay the blame for violations of interpersonal relations and life difficulties on others. When these scales are clinically apparent, the growing autization is accompanied by the formation of affectively charged and hard-to-correct concepts connected with the idea of the hostility of other people.

* Scales 2,7, and 0 reflect properties of a hyposthenic type of reaction and testify to the prevalence of inhibitive characteristics. A profile with leading scales of the hyposthenic register reveals the neurotic option of disadaptation or a personality decompensation toward the strengthening of inhibitive reactions.

The correlation of MMPI scales 8 "autization" and 7 ("psychasthenia, or fixing of anxiety and restrictive behavior") (0.69 at a significance level of $p<0.01$) reveals one more steady personal pattern: a combination of autization and difficulties in interpersonal communication with the uneasiness caused by these difficulties. When the specified tendencies are expressed, this pattern is revealed in internal tension, a tendency toward fruitless introspection, and a chronic feeling of embarrassment.

Experiment 2. Comparison of two independent samples

Within this research we also wanted to uncover the differences in the average total points on the MMPI scales obtained in our own studies in different time periods—in particular, changes that occurred over 10 years in the use of the MMIL on a youth sample and how those changes are reflected in the perception of the statements on the test questionnaire.

Sample

In the research of 2009 the sample contained 548 people aged 19–40 (210 men and 338 women). The sample in 1999 contained 220 people (110 men and 110 women).

Time of the experiments

The experiments took place in 1999 and in 2009.

Procedure

All examinees filled out the MMIL test questionnaire; their sex, age, and educational background were taken into consideration. The research was carried out during a course of psychodiagnostic methods. Participation was voluntary and anonymous, and the examinees were interested in receiving the most complete feedback about the results of the diagnostics. So the way the testing was carried out had to contribute to minimizing the influence of the social-desirability factor.

The statistical analysis was carried out using Microsoft Excel 2007 and SPSS 15 software.

For verification of the assumption that there were different average total points on the MMPI scales investigated during the different time periods, a comparison was made of the results for two independent samples; the results consisted of the standardized points on 13 scales of the MMIL test. Because none of the test scales in 2009 were distributed under the normal law (as we found in the previous experiment), we used the Mann-Whitney nonparametric criterion to compare the samples. The comparison was made for female and male samples separately.

Thus, considerable changes were found in the responses of the examinees to the points of the K scale "correction," scale 7 "fixing of anxiety and restrictive behavior," and scale 8 "autization" for men, and the L scale "lie," scale 2 "anxiety and depressive tendencies," and scale 5 "female and male character traits" for women.

Comparison of average values allows us to track which particular tendency is being observed. See Table 6.

Table 6. Comparison of average values in T-points

	Men			Women		
	K scale	**Scale 7**	**Scale 8**	**Scale L**	**Scale 2**	**Scale 5**
1999	47.28	55.86	56.52	41.96	45.69	55.6
2009	52.27	61.51	68.93	47.49	52.14	43.77

Analysis of the data

In comparison with the 1999 sample, in the 2009 sample there was a tendency toward an increase of average values on the K scale and scale 7 for men and on the L scale and scale 2 for women, whereas values on scale 5 for women demonstrated a tendency to fall.

Thus, men's anxiety level, readiness for the emergence of uneasy reactions, autization, and also conformism rose. As for women, we can see the growth of depressive tendencies, a desire to put themselves in a favorable light, and strict adherence to social norms. The most surprising dynamic was the fall in 2009 indicators on scale 5; this decline can be interpreted as follows: women in 1999 on average showed greater ease and self-confidence, initiative, internally motivated consistent behavior, domination, and heteroaggression. Possibly, similar shifts can reflect real changes in the gender stereotypes of the population—namely, the feminization of women in 2009 in comparison with former sociohistorical realities. However, if we recall the results obtained in 1977, scale 5 for women on average had values lower than in 2009. Also in 2009 the average values for activity, extroversion, unusual thoughts, autization, and affect rigidity increased.

Experiment 3. Analysis of the factor structure of the MMPI

In the present research we did not receive enough satisfactory data (at least on some scales) for checking the calculation of correlations between answers and the total score of a scale. For this reason we thought that a factor analysis of points would allow us to discover how MMIL points are grouped in factors and which of the factors really work.

Sample

The experiment was carried out on the same sample as in 2009.

Procedure

All examinees filled out the MMIL questionnaire; their sex, age, and educational background were taken into consideration.

The statistical analysis was carried out using Microsoft Excel 2007 and SPSS 15 software.

The factor analysis was carried out on the basis of a matrix of intercorrelation 377*377 with measure application "4 dot μ-correlation," with subsequent varimax rotation. The results are presented in Tables 7 and 8.

Table 7. Results of the factor analysis of MMPI points

Component	Initial eigenvalues			Rotation sum-squared loadings		
	Total	% of variance	% cumulative	Total	% of variance	% cumulative
1	90.947	24.124	24.124	70.491	18.698	18.698
2	25.679	6.811	30.935	30.555	8.105	26.803
3	24.789	6.575	37.510	24.262	6.435	33.238
4	9.899	2.626	40.136	21.265	5.640	38.879
5	9.053	2.401	42.538	12.652	3.356	42.235

Table 8. Five leading varimax factors, explaining 42.2% of the general dispersion (points that received the highest loadings on each factor are given)

Factor 1. 18.69% of the variance explained. Neurotism (distress) includes 122 points with significant loadings.		
21	0.84	You are very excited approximately once a week or more often.
257	0.83	You consider yourself a nervous person.
106	0.82	You have periods of such anxiety that you find it hard to sit still.
51	0.76	From time to time you have attacks of uncontrollable laughter or crying.
141	0.76	Sometimes you are afraid of some objects or people, although you know that they do not threaten you.
16	– 0.76	You rarely have any pain (or nothing hurts you at all).
259	0.76	You can easily begin to cry.
290	0.76	Sometimes all of a sudden some bad words, often swear words, come to your mind, and you cannot get rid of them.
314	0.75	You very easily get tired.
154	0.74	You often worry about something.
80	0.73	Almost always you are anxious about something.
251	0.73	You often have a feeling that you made something incorrectly or did something bad.
129	0.71	You get irritated easily while communicating with people.
191	0.71	The most difficult problem for you is to cope with yourself.
19	0.70	Usually at night you can't get to sleep because thoughts fill your mind.
Factor 2. 8.10% of the variance explained. "Introversion — extroversion" includes 33 points with significant loadings.		
96	– 0.88	You like public entertainment because you love to be in society.

363	– 0.87	You like to visit somebody or visit places that are noisy and cheerful.
185	– 0.85	You willingly get acquainted with people.
246	– 0.87	You like to take part in parties and meetings.
6	0.83	At parties you sit alone most often or talk to one of the guests instead of joining a group.
156	– 0.78	You feel good in a crowd of people having fun.
368	– 0.74	You easily meet people and feel good in society.
198	– 0.75	You love different games and entertainments.
273	– 0.73	You would like to perform on stage.
38	– 0.64	It is difficult for you to keep up the conversation with a person with whom you just got acquainted.
309	0.70	It is more difficult for you than for others to get acquainted with people.
172	0.76	You do not like to be among people.
299	– 0.74	When a situation is boring for you, you try to arrange something cheerful.
36	– 0.79	You like to dance.
217	0.65	In cheerful company you find it difficult to fool around with the others.
248	0.63	You prefer not to talk to people when they do not address you.
8	0.66	When you are in society, it is difficult for you to find a suitable subject for conversation.
216	– 0.63	When you find yourself in the company of cheerful friends, your worries disappear.
171	0.63	Even being in society, you usually feel alone.

Factor 3. 6.43% of the variance explained. "Self-control — impulsiveness» (estheticism, sensitivity — roughness, impulsiveness) includes 23 points with significant loadings.

78	0.79	Sometimes you would like to start a fight.
302	– 0.66	You often would like to be a woman, and if you are a woman, you are never sorry about it.
332	– 0.64	If you were an artist, you would willingly draw flowers.
331	– 0.61	If you were a journalist, you would willingly write about the theater.
127	– 0.69	You are embarrassed when somebody tells indecent jokes in your presence.
87	– 0.54	You believe that observance of laws is obligatory for all.
181	– 0.70	You like to collect flowers or to grow them at home.
192	0.63	You have had trouble because of a violation of the law.
213	– 0.70	You would like to work as a flower grower.
244	0.56	Sometimes you tease animals.
72	0.61	You have abused alcohol.

91	0.62	If you are treated unfairly, you feel you must pay back for it.
212	0.53	If you argue, you argue for anything.
70	0.63	Sometimes you were called to the principal's office for bad behavior at school.
50	0.63	Sometimes you listen to indecent jokes with pleasure.
319	– 0.59	Sometimes you do not give in to people, not because it is really important but just out of principle.
59	– 0.56	At times you have liked the quick thinking of a criminal so much that you hoped he would not be caught.
339	0.54	Sometimes you have subjected yourself to danger because of a love of taking risks.

Factor 4. 5.64% of the variance explained. Depression (disadaptation) — adaptation includes 15 points with significant loadings.

42	0.75	You definitely are not lucky in life.
101	– 0.68	You believe that your family life is not worse than that of the majority of your acquaintances.
369	0.68	You are dissatisfied with how your life is going.
370	– 0.63	Usually you are satisfied with your destiny.
41	– 0.63	There is a lot that is interesting in your everyday life.
145	0.61	Your destiny is not of special interest to anybody.
132	0.61	Your parents and other members of the family often pick up for you.
367	0.61	The majority of people are happier with their life than you are.
40	0.60	Now you do not hope any more to achieve desirable circumstances in your life.
138	– 0.56	Usually you believe that living is not in vain.
215	0.40	If conditions allowed, you could bring big benefits to people.

Factor 5. 3.35% of the variance explained. Paranoia (negativity, suspiciousness, malevolence) includes only 8 points with significant loadings.

186	0.606	You often meet people who envy you for your successful ideas because they could not come up with them themselves.
208	0.571	You have ill-wishers who try to cause trouble for you.
295	0.550	There are people who try to steal your ideas and thoughts.
312	0.550	You often meet people who are considered experts, but actually they know no more than you.
218	0.548	Most people are capable of gaining a benefit in a not absolutely honest way.
162	0.531	You are sure that somebody talks about you behind your back.

252	0.527	Someone bore malice toward you.
226	0.514	You think that the majority of people can´t help lying when it is to their advantage.
164	0.498	It is safer to trust no one.
12	0.496	You would have attained much more in life if people were not biased against you.
239	0.485	You planned a life program for yourself based on a sense of duty, and you try to adhere to that plan.
343	0.479	If somebody acts pleasantly toward you, you usually are interested in what the motivation is behind it.

Analysis of the data

As can be seen, the specified factors bear a strong resemblance to "The Big Five". But the MMIL material adds some specific features.

It is interesting that in research by Shmelev (2002) the five-factorial space was also obtained as a result of factorization of the intercorrelation matrix of 377 MMIL points. However, the structure of factors differed a little. So in Shmelev's research the first factor was "general adaptation" (social desirability); the second factor, as in our research, was "introversion-extroversion"; the third factor was "emotional stability"; the fourth was "self-control — impulsiveness," which in our research was the third factor. The fifth factor was "friendliness — negativism," which resembles the fifth factor in our research "paranoia (negativism, suspiciousness, malevolence)." These results convince us that the multidimensionality of the MMIL is exaggerated, at least in this edition of the test. Marked differences in the factor structure of the questionnaire can be explained by the peculiarities of semantic links that reflect a specific-to-each-sample image of the world. However, such a result also testifies to the insufficient reliability of the MMIL.

Conclusions

First, the creation of linear norms of the test demonstrates that it is necessary to readapt the technique so that the MMPI meets the requirements of the times. This task demands the creation of a sample population and a check on the representativeness of the technique.

Second, for all scales of the MMPI in which the distribution of points is not normal, it is necessary to estimate separately the validity and diagnostic ability of each point of a scale.

Third, the check of validity, the assessment of the internal coherence of the test, and the analysis of the variability of points demonstrate that many points have reduced differentiating potential. It's expedient to exclude them from the test to decrease the number of points or to reformulate the statements of the questionnaire.

Fourth, the differences in average total points on the MMPI scales reveal the changes that occurred over 10 years of use of the MMIL (1999–2009). Considerable changes occurred in the responses of the examinees to the points of the K scale "correction," scale 7 "fixing of anxiety and restrictive behavior," and scale 8 "autiza-

tion" for men, and the L scale "lie," scale 2 "anxiety and depressive tendencies," and scale 5 "female and male character traits" for women.

Fifth, in general, our study shows that the present version of the questionnaire does not meet all psychometric requirements and needs a substantial revision, which we plan in the near future.

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