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New Construction of the POA Personality Questionnaire Based on the Rasch Model[1]

Abstract

This paper discusses the usefulness of methodological seizing based on the logistic Rasch model in constructing of a new diagnostic tool: POA questionnaire (Pomiar Osobowości Autorskiej) is designed to examine the author's personality based on Kazimierz Obuchowski's personality theory. Basic foundations of the Rasch model will be presented, the information of theoretical and empirical bases of the new tool and example- results obtained using this model with reference to the created personality questionnaire. A theoretical basis of the psychological measurement was *item response theory* (IRT) – one of the *theories of latent classes*. The Rasch model comes from this theory. The psychometric properties of the data based on 2316 people investigated were analyzed using the computer programmes WINMIRA (supported by SPSS) and Mixed Rasch Model (MIRA). Both programmes were then used for scale development and validation. WINMIRA was used to examine the degree of fitting of the model to the POA questionnaire. Then it was possible to make the practical valuation of suitable parameters of the Rasch model by maximum likelihood methods using a series of iterative procedures.

Key words: *psychometrics theories, Rasch model, author's personality theory, personality questionnaire, educational psychology.*

[1] Some of the theses presented in this article were published in: W. Ożarowski (2006). Zastosowanie modelu Rascha w konstrukcji narzędzia do badania zdrowej osobowości. *Polskie Forum Psychologiczne*, Vol. 11, No. 2, s. 242-255.

Introduction

The aim of this paper is the presentation of the usefulness of methodological seizing based on the logistic Rasch model constructing a new diagnostic tool. This is a questionnaire to examine the author's personality. There will be presented the basic foundations of the Rasch model, information concerning the theoretical and empirical bases of a new tool and sample results obtained using this model with reference to the created questionnaire of personality. In the sphere of psychology of personality that we are interested in, it depends on the measurement of the value of psychological traits. However, these traits (-they are theoretical constructs) are not directly observed and to recognize them is necessary to use the binding theory that effects the research by means of measuring tools with the psychological feature which those effects reflect. Two basic psychometric theories realize these demands: the Random Sampling Theory (RST) and the Item Response Theory (IRT). Each of them binds the result of the test measurement with the true result of the given person in a different manner (cf.: Hornowska, 2001, pp. 18–21). Within the framework of the second form of the theories mentioned, the Rasch model has the more and more widespread recognition.

Because the theory of personality which is the basis of a new investigative tool transcends the frames appointed by psychology having strong references to sociology, anthropology and philosophy, there appeared the requirement of other empirical working out than this which the methodology based on the classical theory of tests carries with itself. The author paid attention to models connected with IRT and especially with the Rasch model. The class of models is named after Georg Rasch, a Danish mathematician and statistician who developed the epistemological case for the models based on their congruence with a core requirement of measurement in physics; namely, the requirement of *invariant comparison*. The most widely known and used is the Rasch model for dichotomous data – i. e. where responses are classifiable into two categories. The brief outline above highlights certain distinctive and interrelated features of Rasch's perspective on social measurement, which are as follows:

1. He was concerned principally with the measurement of *individuals*, rather than with distributions among populations.
2. He was concerned with establishing a basis for meeting a priori *requirements* for measurement deduced from physics and, consequently, did not invoke any *assumptions* about the distribution of levels of a trait in a population.
3. Rasch's approach explicitly recognizes that it is a scientific hypothesis that a given trait is both quantitative and measurable, as operationalized in a particular experimental context.

The Rasch model for dichotomous data has a close conceptual relationship to the law of comparative judgment (LCJ), a model formulated and used extensively by L. L. Thurstone (cf.: Andrich, 1978), and therefore also to the Thurstone scale. This model can be applied in contexts in which successive integer scores represent categories of increasing level or magnitude of a latent trait, such as increasing ability, motor function, endorsement of a statement, and so forth. For example, the Rasch model in the case of an assessment item used commonly in the context of educational psychology.

Methodological orientation

Every statistical analysis given relates to the use of statistical models. In models of the classical theory of tests one goes out from a stable value of the measurement (or measure values) and one fashions variable properties of the error. However, the probabilistic theory of tests (for example IRT and also models of latent classes) refers to single answers on positions in the class (*items)* or in the test task. These are alternative models. One goes out from test-answers from the value of the measurement, the second begins from the value of the measurement to correlations of dependences of other variables taking into account the error of the measurement (cf.: Rost, 1990).

The sense of the model of the test is that it founds relationships between measured properties and answers in the test. The relationship of such a formal model and data comes true at an angle of this whether the given model and data fit to each other. The step of principle in the analysis of tests consists in this, to legitimize the interpretation of measured values.

In the realized research project for the theoretical base of the psychological measurement, one accepted the theory of the answer on positions of the test (IRT) which is the gathering of statements describing the manner that the person examined answers on positions of the test. IRT depends on the qualification of the relationship between answers given by the person examined with not observable founding feature lying at grassroots of test maintenances. Models formulated within the framework of IRT have a form of mathematical functions, binding a probability of given correct answers on the given test-position with the general level of measured traits in the person examined (Rost, 1996, Hornowska, 2001). These hypothetical traits treated as psychological indispensable measurements to the description of the individual, are qualified as latent (hidden) and marked by a symbol Θ (theta)[2]. This kind of

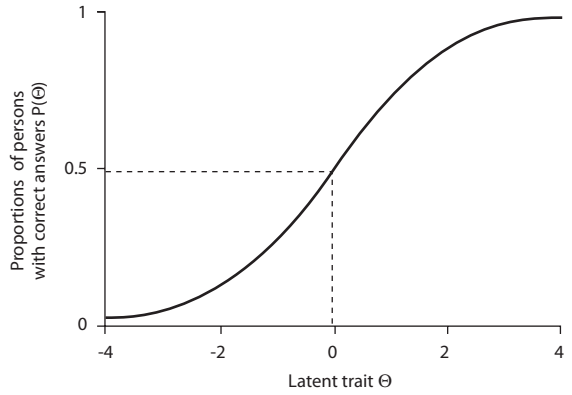
[2] Latent trait Θ (*theta*) has a normal standard scale with Mean = 0 and Standard deviation=1, from +∞ to -∞ (cf.:R. Konarski, 2004, p. 5) In the event of personality test the probability of

functional dependence between the probability of the impartment of the good answer in the test with the differentiation of the propriety one can represent in the form of the mathematical item function (see below: [1]) and by means of the characteristic curve of the test-position (*Figure 1*).

$$[1] \quad Pi(\Theta) = \exp(\Theta - \alpha\, i) / (1+\exp(\Theta - \alpha\, i)$$

where: Pi(Θ) = probability of the answer
i = 1, 2, …n
n = number of items in the test
Θ = person's assignments level

Fig. 1: Item characteristic curve (ICC)with difficulty degree α i = 0



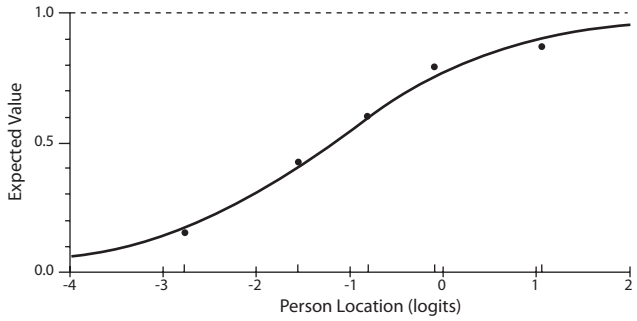
The Rasch model comes from the theory of latent traits, where the basic foundation concerns the conditions if independence[3]. It concentrates on defining and identifying traits in the terms of observed variables, so one can say which of them (traits) has the biggest influence on an individual's behaviour in that particular situation (cf.: Hornowska, 1980, pp. 121–122; Cavanagh, 2003, p. 5). The basic goal of the latent trait theory is to establish the rules of deduction about not observable parameters (traits) on the grounds of data obtained after using the measurement tool. The point is to determine traits, so their values are connected with particular layouts of probabilities of observable results. In this model, as opposed to classical

correct response on the dichotomous test- item is monotonically a growing and non-linear function of latent trait.

[3] Rasch introduced the notion of the socalled specific objectivity of statistical inferring. It depends on the fact that the incidental parameter does not have the influence on probabilities of the second parameter and this is possible only in the case when considered probabilities are treated as conditional probabilities (cf: E. Hornowska, 1980, p. 126)

tests theory, the relationship between the real and received result is not the linear relationship; the divisions of trust are not the same for all results and the standard error of measurement is not connected with a particular population, nor are they connected with the parameters describing the tests positions. The estimation of the level of the examined trait occurs separately for each answer given, controlling parameters of the position of the given test. The analysis of the test positions in the Rasch model, consists in the estimation of the ICC curves of the analyzed test positions[4].

Fig. 2: ICC for the Rasch model showing the comparison between observed and expected proportions correct for five Class Intervals of persons

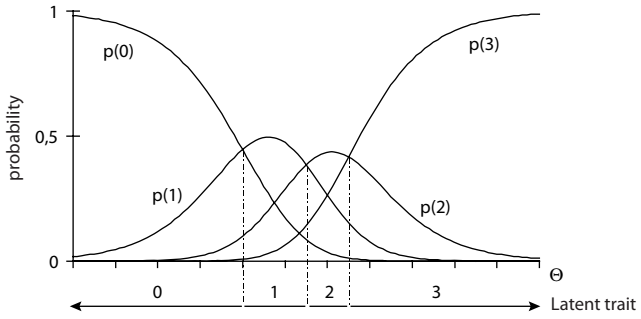


The form of the Rasch model for dichotomous data can be seen in Figure 2. The grey line maps a person's location on the latent continuum to the probability of the discrete outcome $X_{ni} = 1$ for an item with a location of approximately 0. 2 on the latent continuum. The location of an item is, by definition, that location at which the probability $X_{ni} = 1$ is equal to 0. 5. The black circles represent the actual or observed proportions of persons within Class Intervals for which the outcome was observed. For example, in the case of an educational assessment item, these could represent the proportions of persons who answered the item correctly. Persons are ordered by the estimates of their locations on the latent continuum and classified into Class Intervals on this basis in order to graphically inspect the accordance of observations with the model. In Figure 2, there is a close conformity of the data with the model. In addition to the graphical inspection of data, a range of statistical tests of fit are used to evaluate whether departures of observations from the model can be attributed to random effects alone, as required, or whether there are systematic departures from the model.[5]

[4] Cf.: F. M. Lord, M. R. Novick, 1968; E. Hornowska, 2001.
[5] Cf.: D. Andrich, 1988, pp. 46–47; J. Rost, 1988, p. 149.

The majority of ICC's curves over the classic index of goodness consist in that one can determine the relation between the probability of a correct answer on particular position of test and various values of a latent trait.[6] Their shape depends on the number of categories of answers given on particular item in the test. Constructing the POA questionnaire we had to deal with the type of the trait estimation based on a 4-categorial answers system (*Figure 3*).

Fig. 3: The category response functioning of an item with 4 ordered response categories (cf.: Rost, 2002, p. 110)



The Rasch model ensures that the answer of every investigated person examined on one test-position is not relative to their answer on no matter which other position of this test. It means that the schedule of results of each test-position depends only on the parameter and results of the test-position are statistically independent (Hornowska, 2001, p. l95). The inference about the main parameter aside from incidental parameters is possible.[7]

The usage of Rasch model makes the procuration of the objectivity of the measurement possible, which results from two basic properties of this model: (1) the calculation of the value of the difficulty parameter of giving test- is independent of a sample drawn from the population, (2) the measurement of a latent trait is not relative to using test-assignments. The next advantage is that one can execute estimations and comparisons of test assignments for their difficulty without the reference to the schedule of the latent trait in the population. Further properties of the model are connected with: (3) the estimation of the difficulty of a given test will not surrender to the change impromptu essential in different samples investi-

[6] Cf.: E. Hornowska, 1980, p. 199 Smit, 2003, p. 2.

[7] Cf.: E. Hornowska, 1980, p. 127. This model is based on the foundation that all test items have the same discriminatory power. So the sum of correct answers of the given person in the test is simultaneously their statistical true result.

gated: (4) the estimation of an investigated trait on the ground of the raw result is immutable in different samples of persons; (5) trait estimations made on the ground of no matter which subset of standard-assignments are statistically equivalent; this makes free manipulation with the number of test-assignments within the framework of the given method possible.[8]

In her own work from 1980, Hornowska puts the accent on the Rasch model. She notices that till now its influence on the creation of test-methods and practices of their using has not been large (in spite of that the model assured the obtainment of such a degree of measurement objectivity which was up to here unattainable). In her view this was mostly caused by difficulties connected with a specification of component assignments of the given method. Over the recent years the problem of the very labour-consuming procedure has been solved by creating computer programmes. One of these programmes is WINMIRA – it makes the practical valuation of suitable parameters of the Rasch model easy, by the method of the greatest reliability (maximum likelihood) with the help of the series of iterative procedures.[9] It was used to examine the degree of fitting of the model to the POA questionnaire.

Theoretical model

POA has its own theoretical support in Kazimierz Obuchowski's approach. This theory is: (1) the idea intended for presenting the civilization, cultures and individualities by means of the same set of notions; (2) the idea which transcends the traditional range of personality psychology (that is why the Author calls it psychology of human individual); (3) the idea that concerns psychological properties of the man, which are the derivative of the genotype, personal experiences and experiences created individually as a result of the reflection over the world; (4) the idea of the human individual adapted to requirements connected with the revolution of subjects[10].

[8] Cf.: E. B Andersen, 1973; D. Andrich, 1988; E. Hornowska, 1980.

[9] WINMIRA 2001 is the programme by J. Rost and M. von Davier which works in the environment Windows and is supported by the statistical pack SPPS. It makes possible the execution of statistical analyses of given 2-categorial, as also multi-categorial basing on the Rasch model (with founding that the same parameters bear upon all population), mixed Rasch model and models hybrid (with the connection of definite models IRT and analyses of latent classes)

[10] Cf.: K. Obuchowski, Subject's revolution, 2006,

Empirical analyses placed in further part limit themselves to the last of them. The accent is situated on the author's personality and the model of the personality qualified as the author himself. Obuchowski emphasizes one's own creative development of the individual which is peaceable with their potentials and embraces two systems of personality: (A) Base system: formal properties of personality, they determine the definite manner and the level of the above-mentioned programming and interpretation, (B) Programming system: informal properties of personality. By means of their help the individual programmes their own life and interprets their own experiences (cf. Obuchowski, 1996, pp. 47–59).

Tab. 1. Obuchowski's model of personality based on two systems

TWO SYSTEMS OF PERSONALITY		
BASE SYSTEM		**PROGRAMMING SYSTEM**
formal (internal) properties of personality		informal (external) properties of personality
• intelligence, • temperament, • special talents, • not functionally defined indicators of definite states of the psychical regulation		• bears upon inquiry concerning proprieties of the internal world, • the manner of the interpretation of reality • valuing, • the idea of oneself, • the sense of life, • personal tasks.

The second system has a transitive, relational or else interactive character. Because he in his own specific way mediates in accounts of the individual with their world. For example, it decides about the choice of assignments: close or distant, "social" or personal. So understood Obuchowski's theory can be also seized from quite a new point of view as the autopoietic system.[11] The authors of this approach, Maturana and Varela, used connections of two time-limits "of the autonomy" and "*poiesis*" (this means creation/production), qualifying this system as surrendering to favour a complex of forming processes components and components produced in this way, related as the autonomous unity with their own environment. Such a unity is characterized with specific accounts among its components and it elaborates those components with processes. Namely, components cooperating, recursively produce, hold and reproduce the same complex of processes which they produced. The mind appears in concrete, incarnate acting. While human knowledge is not positive about the discourse or with kind of the recording,

[11] Cf.: J. Rost; W. Zeidler (2006): "Osobowość autorska jako rodzaj autopoiesis." *Polskie Forum Psychologiczne*, vol. 11, No. 1

but rather the manner of the concrete individual, this is the dimension of the sense of their activities.[12]

In realization of the project, targeting constructing the tool examining the author's personality, programming the system of individuality and measurements characterizing the subjective valuation standard of activities of the individual, were taken into account. In compliance with Obuchowski's theory there are 14 accepted proprieties[13] which constitute the man being the author himself, creating three areas of principle:

Tab. 2. Three areas of author's personality

AUTHOR'S PERSONALITY
↓
(A) Subjectivity
(1) having the knowledge about himself, (2) tracing new assignments, (3) choosing the method to assignments, (4) intelligent realization of assignments, (5) intentional autonomy "to", (6) creative interpretation of needs, (7) personal model of the world, (8) projection of himself
↓
(B) Being the person
(9) having the psychical distance, (10) development of personality, (11) having the sense of life
↓
(C) Assuming an attitude
(12) the relation to himself (13) the relation to his own assignments (14) the relation to the world.

[12] Cf.: H. Maturana, F. Varela, 1980.

[13] Contents of 14 proprieties can be found in: W. Ożarowski, *Pomiar Osobowości Autorskiej*, 2006.

Results and findings

In the first phase of the realization of the investigative project, for the aim one accepted faithful operationalization of the theoretical model in which one took into account all higher measurement given constituting the author himself. Making for the frontal rightness, one arranged 485 ascertainments which were grouped similarly to fourteen properties. Statements which were bearing upon the scale of the lie (as a controlling subscale), were added. All turnings over had to differentiate persons about the high and low intensity of the trait of the authorship of themselves. By means of techniques of component judges, one executed estimations of the degree of agreement of each positions with the enclosed descriptive characterization of 14 properties formulated on the basis of Obuchowski's theory. In result one chose positions about the greatest degree of agreement which then one subjected to experimental investigation on the sample of 557 persons. Governed by indicators of honesty and the power of the discriminatory position in the final version one left 100 positions (5 of them determine the control subscale). In the following stage of the process of constructing tools one passed the measurement with the POA questionnaire (The Measurement of the Author's Personality) on the sample of 1139 persons. It was constituted of bands of representing students, young adults, old adults. In the effect one obtained the following statistics.

Tab. 3. The comparison of the POA statistics

Number of items in the scale	95	Number of cases	1339
Mean	202.1296	Sum	270651.716
Standard deviation	24.8099	Variance	615.5318
Minimum	122.00	Maximum	276.00
Cronbach Alfa	0.9230		

Tab. 4. Half reliability parameters

	First half	Second half
Number of items	48	47
Mean of items	98.9861	98.8996
Sum	132542.450	132426.585
Standard deviation	12.2999	14.4213
Variance	151.2893	207.9796
Cronbach Alfa	0.85247	.88909
Correlation between 1&2 half	0.681859	
Half reliability	0.810839	
Guttman half reliability	0.832661	
Spearman-Brown correlation	rit = 0.81	

One also counted the coefficient of correlation (rbi), and then one counted on with Fisher-Z. The discriminatory power of particular positions is situated in section from 0.06 to 0.69. Positions about the lowest power were crossed out.

The next stage consisted in the extension of the sample of persons examined and subjecting the collected data to further analyses. The size of the sample (2316 persons investigated) and its heterogeneity showed the necessity of using the model which would make the most certain inference from the obtained observations about the real values of traits possible. One used the Rasch model and its modified version: mixed Rasch model which makes the procurance of the specific objectivity of statistical inferring possible.[14]

One passed the analysis withthe use of WINMIRA programme. First, one executed a replication of fourteen theoretical measurements (subscales) pursuant to 95 positions determining the POA scales. Its aim was the verification of the position at an angle of the theoretical rightness.

The results obtained in relation to an example chosen subscale picture the course of statistical procedure used.

Tab. 5. Elementary data of subscale No. 5

Subscale number	Name of the subscale	Subscale's characteristic
5	Intentional autonomy 'to'	Is able to be responsible; to concentrate himself on what he considers essential, because this results from his idea of life; resistant to hindrances; does not hesitate before the acceptance of the responsibility for adversities; knows that attaining of the distant aim always demands some resignations and sacrifices

Every subscale was rated at an angle of the internal cohesion of forming its positions. Their adjustment was marked by basing on the value of the index Q and the coefficient Z. Besides one valued the degree in which the position differentiates respondents basing on the frequency of given answers (sample frequencies) and the order of liminal (threshold parameters) values. One obtained indicators for subscale No. 5 about the following values:

[14] Along with the development of the so-called mixed models, there came into being the more easy manner of checking or valuation of the item parameters in both parts of the test. The mixed Rasch model (cf. Rost, 1990) shows such partition of the population examined, wherein items differ apart to a maximum. If it appears that parts of the test sampling the value of the items only by chance, then this is the strong evidence of real fitting of the model to empirical data. As the evidence about fitting of the model for scientific reasons does not exist (cf.: K. R. Popper, 1986)

Tab. 6. Contents of subscale No. 5

Item number	Item contents	Item label
25	I am fully responsible for my own doings	28
62	I am well-informed in running problems of the environment wherein I live	65
74	I am ready to throw up my own idea of the life for sometime to avoid critiques on the part of the community to which I belong	74
89	I experience feelings of uncertainty, when I must make something on my own responsibility	87
95	Other people concern me inasmuch as are useful	93

Tab. 7. Item labels and sample frequencies

Serial Number	Item label	Numbers of categories	Response categories				
			0	1	2	3	N
1	28	4	10	67	696	1543	2316
2	65	4	24	245	1432	615	2316
3	74	4	227	649	949	491	2316
4	7	4	223	780	945	386	2316
5	93	4	322	436	666	892	2316

WLE = Warm´s modified likelihood estimates:
Mean = 0. 859; Variance = 0. 910; Standard deviation = 0. 954;
Marginal error variance = 0. 459; Standard deviation = 0. 677;
Anova reliability = 0. 665;
MLE = Standard maximum likelihood estimates
Raw score: Mean = 10. 052; Standard deviation = 2. 389

Tab. 8. Treshold parameters in subscale No. 5 in simple Rasch model

Item Label	Item location	Treshold parameters		
		1	2	3
28	-1. 12044	-1. 498	-1. 844	-0. 019
65	-0. 40233	-1. 889	-1. 162	1. 844
74	0. 51691	-0. 578	0. 324	1. 805
87	0. 65261	-0. 759	0. 552	2. 165
93	0. 35326	0. 128	0. 214	0. 718

In the quoted subscale No. 5 indicators of the item label 74 are unsatisfactory, that is why it was crushed up in further analyses. The use of this procedure to all POA scale caused the diminution of the number of the items to 75. At the same time one made for not only the statistical indicator, but also with the material convergence of the position to theoretical foundations of the model. This approach

bore fruit in formulating subscale No. 8: *the projection of himself* in which one decided to hold positions about weaker statistics, but outweighing material.

The second stage of passed analyses moved to the reduction of 14 subscales determining operationalization of theoretical properties of the author himself basing on the row of executed factor analyses. The most distinct image of the dependence one obtained in the aftermentioned analysis which succeeded in dealing out 8 independent factors.

Tab. 9. Item fit assessed by the Q-index in subscale No. 5

Item label	Q-index	Zq	p(X >Zq)	
28	0. 2386	0. 9430	0. 17284	-Q … ! …+
65	0. 2786	2. 2966	0. 01082-?	Q… ! … +
74	0. 1020	-1. 9360	0. 97357+?	- … ! … Q+
87	0. 1344	-0. 9233	0. 82206	-… ! … Q. +
93	0. 0941	-0. 6453	0. 74062	-… ! … Q. +

-?:p<0. 05, +?:p>0. 95
-!:p<0. 01, +!:p>0. 99

Tab. 10. Parameters for all subscales and the number of items before and after mixed Rasch analysis

Subscale number	Primary number of items	Number of items after analysis	Reliability	Mean	Standard deviation
1	9	6	0. 712	13. 438	2. 345
2	8	6	0. 671	12. 080	2. 440
3	7	7	0. 675	13. 867	2. 667
4	6	5	0. 640	10. 104	2. 183
5	5	3	0. 665	10. 052	2. 389
6	6	6	0. 651	11. 678	2. 502
7	5	5	0. 621	11. 174	2. 063
8	8	4	0. 747	7. 021	2. 612
9	10	7	0. 721	15. 660	3. 462
10	7	3	0. 806	7. 274	3. 312
11	7	6	0. 658	12. 611	2. 639
12	5	5	0. 568	10. 209	2. 050
13	7	4	0. 673	10. 660	2. 214
14	5	4	0. 724	7. 057	2. 809

Tab. 11. Results of the Factor analysis for 14 subscales

	Factors components						
	1	**2**	**3**	**4**	**5**	**6**	**7**
SCALE 10	.896	-8.531E-03	4.486E-02	3.402E-02	7.579E-02	.135	7.350E-02
SCALE 8	.871	8.446E-04	2.046E-02	-6.348E-03	.103	6.463E-02	8.319E-02
SCALE 5	.857	1.198E-02	9.411E-03	4.714E-02	9.879E-02	.137	-1.748E-02
SCALE 9	.805	.235	.155	9.241E-02	.158	5.660E-02	2.211E-02
SCALE 14	.785	-2.365E-02	5.189E-02	1.126E-03	3.447E-02	.112	.241
SCALE 1	6.376E-02	.846	1.926E-02	.262	7.852E-02	.130	-9.063E-02
SCALE 13	2.328E-02	.803	.233	-1.198E-02	7.236E-02	-9.537E-03	.188
SCALE 2	4.087E-03	.627	.334	-7.332E-04	.307	8.491E-02	.373
SCALE 6	6.826E-02	.106	.860	9.739E-02	8.219E-02	.141	.210
SCALE 4	.118	.360	.726	.296	7.282E-02	-4.887E-02	-.132
SCALE 7	5.310E-02	.173	.272	.894	8.908E-02	9.785E-02	.133
SCALE 3	.367	.260	.142	.114	.850	9.296E-02	7.058E-02
SCALE 12	.377	.133	.111	.106	8.762E-02	.885	7.317E-02
SCALE 11	.459	.259	.136	.219	7.333E-02	8.991E-02	.711

Method of exploration: Factor analysis. Method of rotation: Varimax with Kaiser's normalization

Tab. 12. New model of the author's personality

Factors	Number of the subscale	New name of the subscale
I	5, 8, 10, 14	Intentional autonomy to projection of himself
II	9	Psychical distance
III	1, 2, 13	Knowledge about himself & auto-controllable
IV	4, 6	Creativity & intelligent realization of assignments
V	7	Personal model of the world
VI	3	Choosing the method to assignments
VII	12	Relation to himself
VIII	11	Having the sense of life

At this stage of analyses it appeared that, in compliance with theoretical foundations, four subscales are of separate quality, but remained joined in the following factors. They show other than primary (at the start) arrangement of proprieties characterizing the person with the author's personality. That is why the introduction of changes in the theoretical model of the author's personality becomes necessary.

Within the framework of further works over psychometric aspects of the POA questionnaire one obtained results that are giving a new insight into the problems of the author's personality. The obtained results do not reject the theoretical model.

Work undertaken at present is aimed at the creation of new typology. The analysis of the mixed Rasch model will serve this; by means of each profile of the personal property it will be identified. These results determine the promising announcement of further explorations of the analyzed model.

Bibliography

Andersen, E. B. (1973): "A goodness of fit test for the Rasch model." *Psychometrika*, No. 38, pp. 123-140.

Andrich, D. (1978): "A rating formulation for ordered response categories." *Psychometrika*, 43, pp. 357–374.

Andrich, D. (1988): *Rasch models for measurement*. Newbury Park, CA: Sage.

Hornowska, E. (1980): "Klasyczna teoria testów a model Rascha." In: J. Brzeziński (eds.), *Poznańskie Studia z Filozofii Nauki*. Vol. 5: *Z zagadnień psychologii ilościowej*, pp. 117–130. W-wa: PWN.

Hornowska, E. (2001): *Testy psychologiczne. Teoria i praktyka.* W-wa: Wydawnictwo Naukowe SCHOLAR

Konarski, R. (2004): "Model cechy latentnej w analizie psychometrycznej testów i pozycji testowych." In: B. Niemierko, H. Szaleniec (eds.) *Diagnostyka edukacyjna. Standardy wymagań i normy testowe w diagnostyce edukacyjnej*. Kraków: PTDE.

Lord, F. M.; Novick, M. R. (1968): *Statistical theories of mental test scores*. New York: Addison Wesley.

Maturana, H.; Varela, F. (1980): "Autopoiesis and cognition." *Boston Studies in the Philosophy of Science*, vol. 42, Boston. In: A. Skibiński. *Umysł jako system autoreferencyjny*. Referat na seminarium pt. "Czym jest umysł?" w Instytucie Filozofii i Socjologii PAN (17 I 2003).

Obuchowski, K. (1996): "Jednostka ludzka." *Czasopismo Psychologiczne*, vol. 2, No. 1, pp. 47–59.

Obuchowski, K. (2005): *Subject's revolution*. Łódź: Wydawnictwo WSHE.

Ożarowski, W. ((2005): "Zastosowanie modelu Rascha w konstrukcji narzędzia do badania osobowości zdrowej." *Polskie Forum Psychologiczne*, vol XI, nr 2, pp. 242–255.

Ożarowski, W. (2006): POA – Pomiar Osobowości Autorskiej. Bydgoszcz: Wydawnictwo UKW (in press)

Popper, K. (1986): *Logika poznania naukowego*. W-wa: PWN.

Rost, J. (1988): "Test theories with qualitative and quantitative latent variables." In: R. Langeheine, J. Rost, (eds.) *Latent trait and latent class models*. New York: Plenum Press.

Rost, J. (1996): *Testteorie – Testkonstruktion*. Bern.

Rost, J. (1990): "Rasch models in latent classes: An integration of two approaches to item analysis." *Applied Psychological Measurement*, No. 14, pp. 271–282.

Rost, J. (2002): "When personalisty questionnaire fail to be unidimensional." *Psychologische Beitrage,* vol. 44, No. 1, pp. 108–125.

Rost, J.; Zeidler, W. (2006): "Osobowość autorska jako rodzaj autopoiesis." *Polskie Forum Psychologiczne.* Vo. 11, No. 2

Smit, A., Kelderman, H., van der Flier, H. (2003) "Latent Trait Latent Class Analysis of an Eysenck Personality Questionnaire." *Methods of Psychological Research Online*, Vol. 8, No. 3, pp. 23–50.