OPEN PSYCHODIAGNOSTIC SYSTEM

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The linearity of the sequences of questions, rigidity and artificiality of answers as well as the quantification based on the mean values are the main handicaps of the classic questionnaires. The suggested hypertext psychodiagnostic system could overcome these disadvantages. The conditions for developing such a system and its benefits are discussed. The experimental hypertext version of Eysenck Personality Inventory is shown as an example of the simple form of such a system.

Psychologists who use tests and questionnaires are permanently prompted by their self-reflection to posing questions about their adequacy, theoretical preparedness and practical applicability. R.J. Sternberg (1991) analysed the situation in the area of the theory of intelligence and intelligence tests. His conclusions are instructive and inspiring also for people working in other fields of psychology. According to him, intelligence tests should be based upon cognitive theory which should be broadened and the tests should evolve as this theory evolves; the tests should be more closely linked to intellectual training; they should provide diagnostic information on information-processing skills; they ought to reflect qualitative as well as quantitative aspects of information processing and test scores should reflect several dependent variables, not just numbers correct. Let us consider whether there are favourable prerequisites for expansion and generalization of the new demands on psychodiagnostic methods and psychodiagnostics at large.

It is certainly not necessary to describe a psychological test, although it is not completely trivial. It consists of a set of questions following one after the other with a place for replies. Their sequence is definitely predetermined and each question is administered to every examinee in the same sequence. The sequence of questions is linear. Classical test theory has changed this simple scheme into a standard psychological method by assigning a uniform scheme of answers to each question and an unequivocal number to each response. The psychological interpretation of the results is also based on one number. The test can naturally contain a subscore which, however, does not change the fact that every psychic entity (property) in the test is linked to one number. This number is obtained through simple arithmetic operations, most often by the summation of responses. Of

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course, it requires a lot of standardization work but the whole measurement model is based on relatively primitive assumptions which, if applied to a vulgar level, imply a comparison of an individual with an "average man" in testing.

Current test theory has slightly advanced in "individuation" of testing as a result of two strong assumptions. The first is the development of psychometric Item Response Theory – IRT. In the United States numerous achievement and aptitude tests have been devised using IRT theory, just to mention Scholastic Aptitude Test, California Achievement Tests, Stanford Achievement Tests, etc. The second assumption has been the development of computer-based psychodiagnostics. Interconnection of these two strong weapons has led to the construction of the so-called adaptive or tailored tests. Six problems have to be resolved to be able to build an adaptive test (see e.g. R.K. Hambleton, J.N. Zaal, J.P.M. Pieters: Computerized adaptive testing: Theory, application, and standards, p. 341), namely:

1. The choice of IRT model. The most important phase – the choice of a well-fitting mathematical model describing the relationship between the prediction of correct response and a latent trait/ability – is usually solved by selecting a model with the greatest number of parameters. Presently, the most widely used model is the three-parameter logistic model.

2. The item bank. Adaptive testing requires the presence of a large item bank where their empirical item response function is also stored. This is expensive and time consuming.

3. Choice of starting point. This implies the choice of an item that is matched to the individual's ability level. This choice can substantially influence the effectiveness of further testing.

4. Selection of test items – this is de facto algorithm of item selection involving the minimum number of items so as to achieve the most precise result.

5. Scoring/ability estimation. A computer facilitates quick feedback which allows for the use of sophisticated methods of ability estimation, maximum likelihood and Bayesian.

6. Choice of stopping rule. This has to do with finding an analytical criterion that would confirm that our information about the individual's ability obtained from the responses to questions posed so far is sufficient.

The test constructed in this way has interesting features. Each examinee is administered only questions which would match to his/her ability level. The test is in these terms "individualized" and made more effective. The argument concerning the comparison with an average man is no longer appropriate in this case. In spite of this, any primary disadvantages of tests and questionnaires are preserved even in adaptive testing. They are: the linearity of the sequence of questions and the "artificiality" of the shaping of replies. The question is whether these limitations can be overcome. We believe that it is possible and that some theoretical and technological prerequisites are prepared.

The starting point for such considerations is the concept of hypertext system. Although the idea of hypertext systems was based on efforts to mechanize excerpt work in information science, its use is today much wider. The hypertext system can briefly be characterized as a nonlinear representation of texts in natural language organized as a network. Technically, the network is built by means of the hypertext computer program which is responsible for the mechanism of the linkages between nodes and enables creation of new nodes and links between them as well as orientation in such a network. The essential idea of hypertext consists de facto in a computer-supported linking of the texts. An important universal characteristic of hypertext is that it enables a modularization of ideas into units so that a reference to the idea in question may be created at any time, and the user may be provided with consequent alternatives of the particular node. The mode of information processing by means of hypertext is akin to the natural process of human thinking which sometimes produces rather exotic association "digressions". The application of this principle enables:

1. Delinearization at the level of responses, i.e at the level of measurement. This is the level where the hypertext characteristics can also be applicable to common types of questionnaires and tests;

2. Construction of original hypertext-oriented tests enabling individuation of test administration on the basis of a universal joint scheme.

What is the essential starting principle for delinearization at the level of responses? Let us imagine a particular situation: we intend to test an individual's personality traits. Let us choose an item and consider it from the point of view of measurement. For instance, the item determining super ego strength: "Do you feel strongly thet people should pay more attention to good manners and have more respect for law and standards of behaviour?" Admissible responses are a) yes, b) something in between, c) no. What will the respondent do? He or she will assign the exact number to the vague statement (0, 1, or 2) although it seems to that his/her response might be hazy – something in between. Let us have a look at how vague the expression is: *Do you feel strongly...*, *should pay more attention...*, *good manners...*, *more respect*. All these words express a measure of something. On the whole, they not only enhance uncertainty concerning the fact to which the respondent will react but they also introduce evident generalization and artificiality into the expression. Psychological questionnaires are the only place where man faces such expressions. There is a great danger that the examinee would assign a word response to the expression but, as a matter of fact, he would assign a number. It may function if proper principles of measurement are preserved. Let us call to mind R.N. Shepard's idea (1966) who assumes that qualitative assessments can usually be created not only in a simpler way and with greater certainty but also in more reliable and more valid ways than quantitative judgements. Formulations of such assessments can be directly controlled in the proposed hypertext dialogue psychodiagnostic systems. The respondent will adapt

every item of the questionnaire to the acceptable meaning by simple user-friendly manipulations.

We shall use Eysenck's Questionnaire EPI to show the advantages of hypertext modification (the modification was implemented by this author last March and is now ready for research application). The great advantage primarily is a compact integration of the text with manual and the resulting panel into an easy-to-use system. Fig. 1 shows the computer screen the user sees as first. Three buttons are activated by the mouse and the user can thus readily open the corresponding part. The manual has been written as hypertext which enables quick and easy work with all available information. The essence of the method consists in the test itself. In our modification, the examinee can either use standard responses which are shown on the screen or he/she can write the reply in the response frame. Fig. 2 shows the testing screen with item 3. The operation is easy and practically readily understandable. After completing the whole test, documentation of the results comes into consideration. Fig. 3 presents the resulting panel. We see that the scores of all subtests can be displayed on the screen by clicking the mouse button. In addition, we can see a table containing all the particular responses. The corresponding values are assigned in the place where standard answers have been used. If the examinee's response has been non-standard, the value assigned is 0. In this case a psychologist's interpretation is needed. Moreover, during further application, the same non-standard replies may be so frequent that they can be put on the list of standard responses. The method also enables writing the results into the data base. The data base is dBase compatible and contains four fields: name or code of the respondent and three scores of EPI test. The computer prints the results and the individual's data. His/her code and three subscores are printed on the first page. The second page contains a complete table of responses to individual items. The results can be supplemented with response time to each item and with total response time. The psychologist has thus complete information about the examinee's answers immediately at their disposal permitting thus not only a comparison of the results with a group but also an individualized qualitative analysis. Methodological and program principles used for the construction of this method are general enough to be able to mould additional standard methods into similar shapes. The advantages of such an approach will become more distinct in such methods which will be built with the goal to emphasize individual and qualitative approach. There is also another way of using the hypertext-based computer technique, notably as a research intergrade in the construction of new paper-and-pencil methods aimed at finding a set of adequate responses to test items.

We deem it very useful to build a new psychodiagnostic instrumentarium on the basis of hypertext dialogue systems from the very beginning. Let us imagine an interview with a client. Some areas will be examined only superficially, others will be studied thoroughly and profoundly. This selective and individually accen-
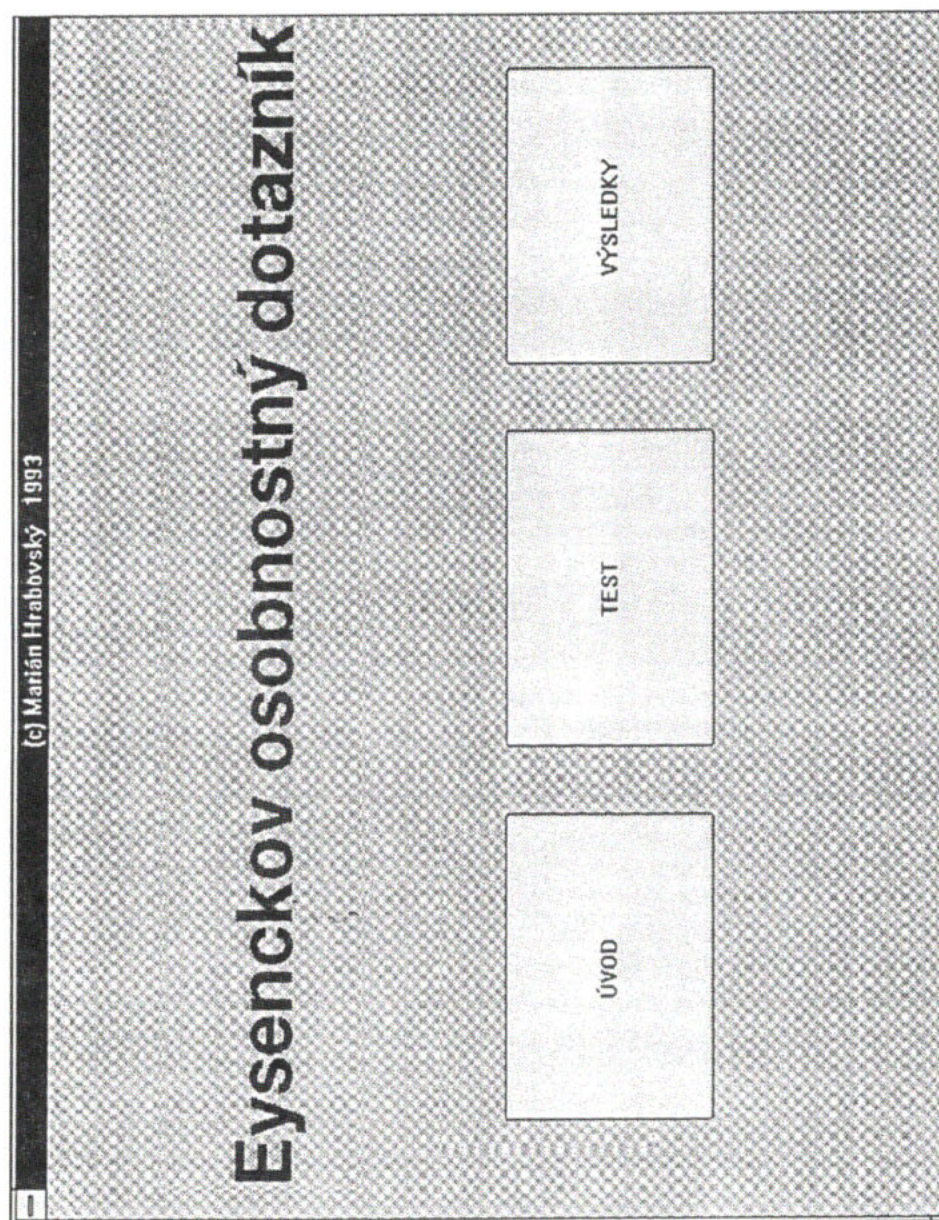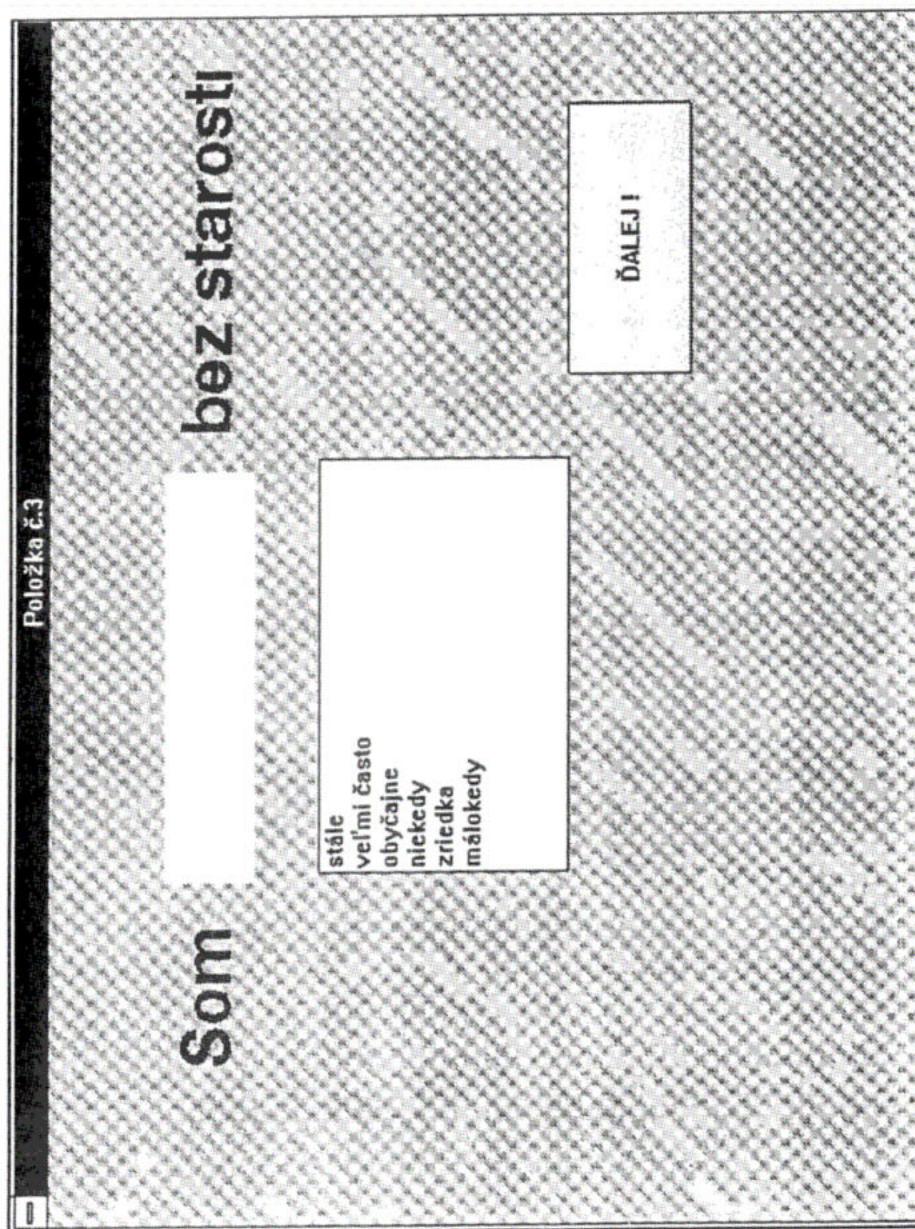
Fig. 1

Fig. 2

Fig. 3

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Výsledky

Extraverzia=9

Neurotic.=2

Lži skóre=0

KONIEC

| Číslo	Premenná	Skóre	Odpoveď
1	1 E	3	často
2	2 N	3	Niekedy
3	3 E	3	obyčajne
4	4 N	0	malé
5	5 E	5	predtým
6	6 L	1	niekedy
7	7 N	4	niekedy
8	8 E	6	málokedy
9	9 N	4	niekedy
10	10 E	1	Neurobil
11	11 N	3	sem - tam
12	12 L	2	občas
13	13 E	4	Niekedy
14	14 N	3	Niekedy
15	15 E	6	Uprednostňujem
16	16 N	6	Ťažko
17	17 E	4	niekedy
18	18 L	1	Mávam niekedy
19	19 N	6	Nie je pre mňa typické
20	20 E	1	Uprednostňujem
21	21 N	3	niekedy

TLAČ

DATABÁZA

tuating feature of interview can in a certain extent be used for constructing novel psychodiagnostic procedures. The basic principle can be graphically represented, see Fig. 4.
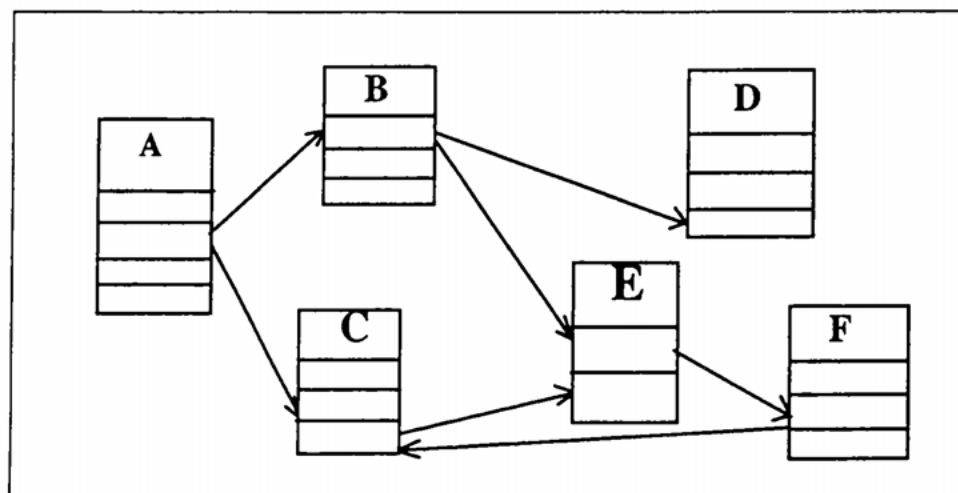
The A, B, C, D, E, F areas represent content constituents of a certain system of a psyche, e.g. of a personality. Several levels are recognizable in each of them. Not every level is naturally accessible to every individual. In concrete psychodiagnostic act it is therefore natural to reach the level characteristic of the individual and then pass to the corresponding level in other area. The structure built in this way carries in our opinion much more important information than common "one-number" information about the intensity of a trait. We are now preparing the first version of hypertext dialogue psychodiagnostic system (HDPS) focused on a study of man's motivation.

The advantages of this approach are not negligible. In the first place it is a more real psychological model in the background of the method, as well as a more realistic language of tool description and processing. The client or respondent produces actual, not pseudoqualitative judgements which are evidently individualized and thus the "antipsychological" comparison with an average man is not appropriate in this case. Active, or, even constructive self-reflection is seen as a great advantage. The individual actively formulates his/her self-report and he/she is not restricted or discriminated by response alternatives offered by classical tests and questionnaires. Unfortunately the disadvantages are not small either. Construction of an appropriate system needs much effort and time. It requires demanding hardware and software as well as educated and trained users. In any case, advantage should be taken of this opportunity, now at least in research. We said at the beginning that at the core of our efforts is the idea of hypertext. It should be emphasized that the concept itself and the computer-based hypertext

media are not sufficient for building hypertext dialogue psychodiagnostic techniques. The technological basis for the construction of such media is without doubt object-oriented programming. It is virtually impossible to construct materialized HDPS without using objects comprising programs and data, without the heredity of the properties of objects and without the possibility of object linking (so-called OLE – Object linking and embedding). Moreover, we have to learn from the principles and media used in the field of artificial intelligence. At last, we have to be able to analyze the information obtained. New contributions to the analysis of quantitative data are here irreplaceable.

We believe that the principles reported support our reasoning about potential "openness" of psychodiagnostic system. Mutual approach of interview on the one hand and paper-and-pencil methods on the other, based on the communication principle creates an inspiring boundary. Hypertext dialogue psychodiagnostic system enables a more natural way of posing questions. On the other hand, it allows for a more precise recording and processing of respondents' answers than in the case of interview. It might be said with certain simplification that interview on the one hand and questionnaire on the other, make up a kind of the continuum of psychological communication methods and HDPS lies somewhere in the middle of this continuum. In interview, the levels of validity and reliability significantly vary and a possibility of quantification is absent or is remarkably reduced. We correctly criticize the superficiality of questionnaires as well as their neglect of the uniqueness of an individual in favour of the comparison of the individual with an average man. We advance the hypertext dialogue system as a method which would be able to suppress these weak points. The future will verify its chances.

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