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The Rorschach test in behavioral toxicology

by Kari Lindström, PhD¹

Nonintellectual personality characteristics have seldom been assessed in field studies on workers with long-term exposure to industrial chemicals, but they are usually included in clinical examinations. The methods used have included standardized interviews, projective methods, and personality inventories (2, 4, 7, 8, 9). In this paper I concentrate on the psychometric use of the Rorschach test in the assessment of personality characteristics of workers with long-term exposure to organic solvents. This test was used in some early studies on behavioral toxicology to assess the prevalence of organic psychosyndromes (4, 3, 10), and it has also been used in recent Finnish studies.

The Rorschach test is projective and has been, and still is, a popular but controversial instrument in clinical psychology. Practical experience with the test is vast, and numerous empirical studies have been done on it. It provides additional useful information when used as part of a clinical examination carried out by an experienced clinician. The statistical analysis of its variables is however connected with many unsolved problems (1).

Rorschach responses can be analyzed in two different ways, namely, with the use of either formal or content categories or with a combination of the two in various sign scores. Content analysis has become especially popular during recent years. The formal scoring system is usually based on the system developed by Klopfer & Davidson (6), but numerous systems of content analysis exist. However, both types of scoring system have been used in studies on behavioral toxicology.

The Rorschach test has been applied in the assessment of personality characteristics of workers exposed to carbon disulfide (4), car painters exposed to mixtures of organic solvents (5), laminators exposed to styrene, and patients with occupational diseases caused by solvents (8).

Applied Rorschach test variables

In the earliest study, which dealt with workers exposed to carbon disulfide, five combined Rorschach variables were used that were based on the factor

analysis of separate formal scoring categories. These were called adaptability, emotionality, spontaneity, rational self-control, and originality of perceptions (4). A detailed description of these variables can be found in the appendix. In the study on car painters exposed to mixtures of organic solvents (5) the three content variables anxiety, hostility, and bodily preoccupation developed by DeVos were also used.

The study of styrene-exposed workers and patients with solvent-related occupational diseases included still more Rorschach variables, mainly various content categories (8). These were Miale/Harrower Ericson neurotic signs, Piotrowski organic signs, Neiger's reality index, pathological thinking, experience actual, Becker's genetic level, average form level, personal distance scale, human-like scale, and primary processes levels 1 and 2. In addition the number of responses and blots without responses were included. All these variables are described in detail in the appendix. After factor analysis the variables were grouped into factors called productivity, ego strength, lack of emotionality, defensive introversion, and aggressiveness. The interscorer reliabilities for the variables are presented in table 1. Those for the composite Klopfer scores are quite high, ranging between 0.92 and 0.98. The

Table 1. Interscorer reliability of the Rorschach variables determined for a nonexposed reference group. See the appendix for an explanation of the variables.

Variable	Interscorer reliability r^a
FL	0.68
GL	0.90
Ada	0.92
Emo	0.96
Spon	0.98
Rat	0.95
MHE	0.90
Org	0.65
RI	0.90
Delta	0.66
EA	0.95
Anx	0.82
Host	0.93
BdPre	0.94
PD	0.84
H-L	0.89
Pripro 1	0.62
Pripro 2	0.91

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^a Pearson's r between scorings of two independent judges (reference group $N = 41$).

low reliabilities for Piotrowski organic signs, pathological thinking, and primary processes level 1 are probably partly dependent on the small number of observations in these categories because a rather "normal" group was tested. At the same time the interscorer reliabilities give some indication of the ease of the use of the score. Although the composite Klopfer scores have high reliabilities, their use is relatively time-consuming and demands much practice in Rorschach test scoring. The DeVos scales, various sign scores, and experience actual are easy to score.

Personality characteristics of various exposed groups

The personality changes associated with various organic brain injuries are often individual and dependent on premorbid personality. Common personality characteristics in brain injuries have been decreased emotionality, disinhibition, decreased anxiety, and lowered social sensitivity. But quite opposite changes have also been possible. The control of behavior has often been somewhat affected. As in brain injuries in general, also after the adverse action of neurotoxic chemicals, personality changes are not easy to detect. They are a product of a complex interaction between the type of injury, premorbid personality, interpersonal relations, and actual reactions to a whole situation.

Carbon disulfide

In a comparison of a group with carbon disulfide poisoning (N = 50), a group with carbon disulfide exposure (N = 50), and a nonexposed group (N = 50), the results of the exposed and nonexposed groups were similar, while the group with carbon disulfide poisoning clearly differed. This group was characterized by low adaptability, rational self-control, and originality of perceptions. In comparison to the nonexposed group they also had a somewhat lowered emotionality. The mean age of these groups varied from 39 to 41 years, and the exposure of the carbon disulfide groups averaged 10 years (4).

Mixtures of organic solvents

In another study car painters (N = 100) exposed to organic solvents showed less emotional reaction in general and less expression of hostility, and they were more prone to control their thinking and behavior than were nonexposed referents (N = 101). The mean age of the car painters was 35 years, and the mean duration of exposure 15 years. The level of solvent exposure was assessed to be about 30 % of the Finnish hygienic standard for solvent mixtures.

The authors mentioned two alternative explanations for their findings: (i) that they were the result of

toxic effects on the brain centers regulating the emotional aspects of behavior or (ii) that they were due to the subjects' emotional or compensatory reactions to the situation created by the impairment of mental functions. The reduced emotionality was interpreted as an immediate toxic effect, and the increase in rational control could be interpreted and understood as a compensatory feature (5).

Styrene

In a group comparison, styrene-exposed laminators (N = 98, mean age 30 years) were characterized by few emotional reactions, low anxiety, and few Miale/Harrower Ericson neurotic signs. The duration of styrene exposure (mean five years) was not related to personality characteristics. The level of exposure, as measured by urinary mandelic acid concentration, was related to an increased number of emotional reactions; this relationship was interpreted to represent an acute reaction to exposure or to the situation. The group differences were interpreted (8) in the same manner as in the study on car painters.

Patients with an occupational disease

Patients (N = 53), mean age 36.5 years, with occupational disease caused by various industrial solvents were characterized by a high number of Piotrowski organic signs and a low Becker's genetic level, both of which indicate psychoorganic deterioration. The duration of this group's exposure (mean 10 years) was related to high productivity on the Rorschach test. This finding was difficult to interpret; it could be that it indicates better adjustment with a longer duration of exposure, owing to the selection occurring among exposed workers and to individual compensatory mechanisms. The level of exposure did not correlate with the personality variables (8).

The results indicated the following: *Lowered emotionality* of actively working groups with long-term exposure to organic solvents, possibly the result of direct effects of solvents on the central nervous system; *strict rational control* of thinking and behavior in the same groups with long-term exposure, an indication of possible compensatory mechanisms; *signs of psychoorganic deterioration* in the group with solvent-related occupational disease.

These results were all obtained in cross-sectional studies, and their validity is therefore weak. However, clinical experience with the Rorschach test partially confirms the findings. The Rorschach test responses vary greatly from person to person, and they differ also according to differences in exposure. The patients in the occupational disease group were tested again with the Rorschach test six years after the diagnosis. These data have not yet been analyzed, but they will

undoubtedly give more information about the usefulness of the Rorschach test.

Use of the Rorschach test in behavioral toxicology

The Rorschach test has many advantages for behavioral toxicology. These advantages include the great amount of data for various clinical groups, the knowledge derived from cross-sectional studies with solvent-exposed groups, and its objectivity in comparison to questionnaires.

It also has many limitations which weaken its applicability, for example, the difficult and time-consuming training needed before a psychologist is competent to administer the test, the difficulty of using the test in statistical analysis, uncertainty about the phenomena it deals with, ie, the extent to which it measures overt behavior and deeper personality dynamics. In spite of these drawbacks the Rorschach test has many advantages over other methods available for personality assessment, especially in clinical behavioral toxicology.

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Appendix

Rorschach variables used in studies of behavioral toxicology

Adaptability (Ada) indicates the general level of the Rorschach test production (good whole answers, human movement answers, form-color and form-shading answers, popular answers).

Emotionality (Emo) measures readiness to react emotionally or affectively (color-form and shading-form answers, pure color and shading answers, nature and plant answers, and, negatively, the percentage of animal and form answers).

Spontaneity versus Inhibition (Spon) includes animal movement answers as positive and reaction time, anatomical answers, and human and animal detail responses as negative.

Rational Self-Control (Rat) is manifest in an accurate and detailed perception of the blots (form answers, the percentage of detailed answers, and space answers).

Total Number of Responses (R) is usually an indication of productive capacity.

Number of Blots Without Response (Rej) includes both "rejections" and "shocks." Differentiation between these two in the actual test protocols is difficult.

Average Form Level of Responses (FL) is based on the accuracy, specification, and organization of the responses. It indicates perceptual accuracy and constitutes the most important basis for estimating intellectual level and functioning in the Rorschach test. The average form level rating used is rather an indication of the general level of efficiency.

Miale/Harrower-Ericson Neurotic Signs (MHE) are an index of neurotic behavior or maladjustment. The reliability and validity of this sign score is poor, just

as are those of all other neurotic sign scores. The capacity of a neurotic sign scale to differentiate between criterion groups has been questioned.

Piotrowski Organic Signs (Org) indicate changes linked to organicity among brain damaged patients and differentiate organic damage from other forms. This index of organicity has proved to have higher validity than other similar indices.

Neiger's Reality Index (RI) is a widely used and well-known Rorschach index based on the four most popular responses in the Rorschach test. 5—7 points reflect good reality control, 0—4 points weak control, and 8 points control that is too strict.

Pathological Thinking, or the Delta Index (Delta) measures loss of ability for abstract thinking — often associated with the schizophrenic process. The index is composed of various kinds of fabulized responses, confabulations, peculiar verbalizations, vagueness and incoherence of responses, and absurd responses in the Rorschach test.

Experience Actual (EA), demonstrated by Beck, is an index of the intensity and width of emotional capacity. It comprises the number of color responses (Sum C) and the number of human movement responses (M). Total emotional resources are described with this index.

Anxiety (Anx) is composed of responses with disgusting content, overt and covert anxiety, dysphoric content, confusion, and rejections. Empirical validity data are scarce for this index, but it nevertheless proves useful.

Hostility (Host) is a scale containing various types of direct or indirect aggressive content and verbalization on the Rorschach test. The scale is similar to the Elizur hostility scale, the correlation being 0.70. Validity studies have indicated a general one-to-one relation-

ship between the Rorschach hostility scale (Elizur) and behavioral and ideational indicators of hostility.

Bodily Preoccupation (BdPre) is composed of different anatomical responses such as bony, muscular, and sexual anatomy. It has been found to indicate affects turned inwards in a narcissistic way.

Becker's Genetic Level (GL) approach is based on Werner's development theories and on some later empirical studies. This index of mental organization consists of scoring each response in a six-level system. Validity studies have indicated that GL measures the level of personality organization. It is also considered an index of ego strength, although its correlation with the ego strength of the Minnesota Multiphasic Personality Inventory is poor. The lack of correlation can however depend on the fact that the two scales measure different levels of functioning.

Personal Distance Scale (PD) reflects the social, spatial, or temporal distance experienced with regard to the environment. The scale has been proved to indicate social introversion.

Human-Like Scale (H-L) measures the extent to which human-like percepts are described in either a positive or negative direction. This scale may be interpreted as measuring empathy and interest in social contacts.

Two variables measuring libidinal and aggressive motives and their control were also included from *Holt's system*. These two content categories are divided into two levels. *Level 1* (Pripro 1) is more primitive in orientation, and *Level 2* (Pripro 2) more controlled and responsive to social factors. They do not directly indicate primary and secondary processes, but rather the "degree of primariness." The scales have been used in the study of creativity and adaptive and maladaptive regression. These scores are also related to pathological thinking, as is the Delta Index.