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AN INVESTIGATION OF THE FACTORIAL
STRUCTURE AND EXTERNAL VALIDITY OF
TESTS OF SOCIAL INTELLIGENCE

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An Investigation of the Factorial Structure and External Validity of Tests of Social Intelligence[1]

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Summary

A set of 13 variables measuring Social Intelligence (SI) together with 6 intelligence, 12 personality and 11 interest scales was administered to a sample of N = 254 subjects (parachutists of the German Army). Each of the subjects (Ss) was rated by acquaintances on 15 questions dealing with several aspects of SI. The same questions were as well answered by the Ss themselves (self-ratings). The factorial structure was not in accordance with the hypotheses from GUILFORD's S-I-Model. Although the SI-variables differentiated well between the Ss and showed a satisfying degree of internal consistency the correlations between SI-scales and self-ratings on the one side and peer-ratings for SI on the other were generally low and often failed to reach the level of statistical significance. Because the agreement between the raters delivering the criterion scores was insufficient (Interrater-Reliability r = .17) two groups of concordantly and discordantly rated Ss were separated. It could be shown that the concordantly rated Ss scored consistently higher on all the SI-scales than the discordantly rated ones, the mean differences being significant in some variables. The external validities, however, differed not systematically between the two groups. An analytically constructed answer key for two scales computed on the basis of the correlation of each distractor of each item with the peer-ratings produced higher validities in comparison to the intuitive-rational key by the test authors, but the results were not stable in cross-validations. It is inferred that the common SI-scales are measuring only factors of social perception. In order to construct scales which are valid against external criteria of behavior some particular principles are to be taken into consideration, some of which are discussed.

An Investigation of the Factorial Structure and External Validity of Social Intelligence

1. The conceptualization of Social Intelligence (SI)

In 1920 THORNDIKE published in an epochal (and thus often quoted) article in Harper's Magazine the idea, that if you can talk of an abstract-theoetical form of intelligence and a mechanical-technical one, there must still be an additional form representing human interaction. This idea has been expressed in similar ways by different authors and at different occasions.

Hendricks, Guilford and Hoepfner (1969), for example, have expressed doubts as to whether the typical „school-learning intelligence" is sufficient to help solve such weighty social problems as racial tensions or criminality. They came to the conclusion, rather, that a special form of intelligence is necessary for these purposes and those of other areas of interpersonal relations. Social intelligence is, according to Cline(1964), especially important in situations calling for adequate understanding and a correct assessment of others in every day life. Summing up the definitions and hypotheses of these and other authors social intelligence includes: Social ability, social maturity, empathy, insight into social relations or the ability to put oneself in the place of others or to anticipate their reactions, or in other words, the way they get along with others or react to them.

It would be very difficult to reject such an appraisal even today (or perhaps today in particular) when analysing, for example, socially deviant behavior or international politics. Insofar social intelligence is very much a „tempting, attractive" construct (Orlik 1974), not only from a common sense and every-day philosophical point of view, but for academic psychology as well. In both realms one believes (or, better, „knows") that there must be something on the order of social intelligence.

Scientific research has considerable and well-known difficulties, however, in evaluating this construct. There is no lack of methods for looking of social intelligence (and in the past the stronger impulses for the development of ideas in differential psychology and psychological diagnostics have customarily come from the test instruments rather than from the abstract definitions), but the present state of research leaves, to put it mildly, a good number of questions unsolved when the

usual standards of scale construction are applied to the aim of measuring social intelligence. The problems range from deciding on „correct" item responses, to questions of consistency and factorial structure of test scales, all the way to the validity against external criteria.

2. Some results of published work on SI and reasons for the study reported here

The most careful investigation to date on social intelligence was done by Probst (1982) at Hamburg University. In order to investigate the question of convergent validity SI constructs were used that could be distinguished according to four different methodological approaches, employing verbal information, pictures, film and real situations as tests. For the examination of discriminant validity, a good number of variables were availabe from the domains of general intelligence (excluding social intelligence), interests and personality characteristics. Altogether there were more than a hundred variables that were examined in 283 male subjects (cadets at a police school, with an average age of 23 years). 24 hours were needed to complete all the tests and this time was distributed over a total of 20 sessions.

Linear and non-linear factor analyses found „no common SI factors that would indicate the use of different test methods for the construct of social intelligence that was not directly connected to the test questions themselves" (Probst 1982, p. 221). In addition it became apparent that no single social intelligence variable had a relation to any other domain of variables, with the exception of some cartoon tests which correlated ar $r = .20$ to .30 with variables of logical thinking. Even a canonical correlation analysis failed to demonstrate stable relations between the measures in the SI-picture tests and any other areas. Interestingly the study did reveal a global SI-factor that was orthogonal to the dimensions of verbal intelligence.

In spite of the heterogeneous range of variables considered in this study, measurements were lacking which came from any source other than the subjects themselves and which could have served as external criteria.

Concerning the external validity, it could not yet be demonstrated in the literature that, after removing components of verbal intelligence, there is any substantial relation between SI-scales and ratings by others (Mehrotra, 1971).

Thus, social intelligence suffers more from lack of agreement between reality and hope, or fact and fiction, than any other dimension in differential psychology. The doubts become all the more serious when one thinks about whether social intelligence is a reasonable trait at all or merely an attractive test concept.

The main approach here emphasizes an orientation towards external criteria for social intelligence in the form of peer ratings. In this way we remain, so to say, behind the conclusions drawn by Orlik (1982) with references to the Guilford tests (which play a considerable role in our study): namely, that they an2im „primarily at processes of differentiation and generalization in dealing with the stimuli of our social environment" (Orlik 1982, p. 347), which could thus not predict any substantial correspondence with concrete behavioral acts.

We did not want to subscribe to this conclusion for three reasons:

1. One is the fact that social intelligence, as mentioned, has such a subjectively high importance in every-day-life and, in addition, a considerable face-(or only faith-?) validity in the appropriate tests.

2. Also important is the fact that the Guilford-school, too, traditionally use SI-tests as predictors for external criteria such as success in university studies or in one's occupation.

3. The conviction that it is still possible to essentially improve the psychometric qualities of criteria, and that in this way establish far better conditions for arriving at positive results.

To put this last point more clearly: Jung (1972) and Zoch (1974) both used in their samples sociometric choices as external criteria, without coming up with satisfactory coefficients for the distribution and reliability of the peer ratings, but this was not really surprising when one considers the special nature of such measurements. In addition, they were using students of 16 and 17 years of age as subjects who where thus perhaps not quite differentiated in the characteristics of interest in the study. Perhaps, too, there were not enough chances for observation. Hoepfner (1974) reported a study with ratings by adults, but their judgements were limited because there was a strong hierarchy in their social network.

A photographic adaption of Wechseler's picture sorting test was used over several years in one of the biggest diagnostic projects ever financed by the Federal Republic of Germany: the development, testing, and first full-scale administration of an admission test for medical school. Several thousand persons were given a test battery including thirteen subscales. The subscales correlated with each other on the average about r = .30. The total score correlated with the grades of

exams after the first two years of medical school r = .38 (Bartussek et al. 1984); the predictive validity of individual subscales was around .20. However, the social intelligence scale showed a zero correlation with the criterion and low correlations with the other subscales (Trost et al., 1984). Of course, the results of these exams reflect rather learning, memory, and motivation, and not so much abilities relevant for social interactions.

Our investigation is based on adults and it required not only that the subjects know each other well, but also that each and every subject be rated by three independent raters when possible.

In this way the requirements were met for:

1. examing the total sample of ratings in terms of the interrater agreement.

2. subdividing the total sample of subjects (according to the degree of agreement of their peer ratings) into groups with relatively high or low interrator agreement.

This kind of segregation among the subjects was advantageous in considering the possibility that a higher degree of similarity in the ratings would indicate that the rated subject exhibits person- specific behavior, whereas a low degree of similarity would indicate an inconsistent behavior which is more dependent on situational characteristics or the ad hoc needs of the situational context.

Thus the recently proposed method for studying personality and temperamental characteristics by differentiating between cross-situationally stable and cross-situationally variable subjects could be applied to the domain of measuring particular achievement dimensions, and higher predictive validities could then be assumed for the cross-situationally subjects („trait-like" vs. „trait-free" people sensu Bem & Allen 1974).

The use of external criteria also allowed for the analysis of the appropriateness of keys for scoring some tests of social intelligence. Generally, the correct solution for Guilford and his co-workers was determined by the consensus of opinion among the experts. O'Sullivan et al. (1965) even went so far as to eliminate those items in which the subjects most frequently had not responded to the „correct" distractors.

In our study the validity of the intuitive-rational key according to the test authors was intended to be compared with that of a „blind-analytical" one, which was determined by the maximum correlation of a score computed for each of the distractors. Concerning this question Pawlik (1974, p. 352) has spoken of „indirectly arriving at the correct evaluation key by systematically trying them all out". For that procedure the principle of cross-validation was absolutely necessary.

Furthermore the availability of criteria made it possible to ask whether or not socially intelligent persons could be identified equally well with the help of well-known ability and personality scales thus making social intelligence understand-able as, perhaps, a special configuration of other traditional dimensions of per-sonality. For this purpose an heterogeneous battery of ability, interest and personality tests was administered and analyzed accordingly.

Finally it was possible to undertake a further test of the assumptions in Guilford's model with the help of the data collected here. As opposed to the questions already mentioned, there is some material available on this topic in other litera-ture. But for this we made use of inferential statistical methods: the confirmatory factorial analysis developed by Jöreskog (1978).

3. Method

3.1. Sample of Subjects

Our sample consisted of 222 soldiers of the German Armed Forced and 32 stu-dents of psychology (N_{tot} = 254). The group of soldiers consisted of all the recruits of a batallion of the First Air Division of the German Army who had duty on the day of the study. They were almost finished with their term of service or had at least completed the better part.

A sample of this kind seemed particularly useful because the soldiers presumably know each other well, especially considering the fact that parachutists depend strongly on reliable teamwork. In addition it would have been very difficult to gain access to another group of non-student adults with the necessary requirements (group size and degree of familiarity) for a 6 hour examination without payment. Because of this fact, the number of non-soldiers was correspondingly small. These students knew each other because they were taking part in the same lec-ture.

The final analysis used the data from all Ss tested.

The mean age was 21.4 years with a standard deviation of s = 2.6.

3.2. Sample of Variables

3.2.1. Predictor scales

The core of our investigation consisted of the Social Creativity Tests that belong to the category of divergent production in Guilford's Structure of Intellect Model. An appropriate „slice" from the SI model is given here to facilitate an understanding of the categorisation (see Table 1).

Insert Table 1 about here

Altogether 13 tests (10 developed by Guilford and 3 by Marlies Horstmeyer, a former research assistant of our team) fall within the row for Divergent Production.

The following scales were used (see table 2).

Insert Table 2 about here

The instructions for the tests as well as an example for each item format are given in the following figures.

Figures 1 - 13

In addition to these divergent methods, there were also two Cognition Scales: the „Stick Figures Opposite" (which according to Guilford & Demille, 1965, belongs to the field of CBR) and the Social Insight Test by Chapin (1967), which measures what Höpfner (1974) describes as the general characteristic of CBI: „The ability to predict what other people will do in given behavioral situations".

Figures 14 + 15

In order to test the independence of social intelligence and semantic creativity, a series of creativity tests was used as well, namely:
- Unusual uses
- Consequences („What would be the result if humans no longer needed sleep?")
- LPS 6 (Word Fluency)
- Fluency of Association (thinking of words that have a similar meaning to a previously given word).

So as to distinguish Social intelligence from some „classical" factors of intelli-
gence, some common PMA-like intelligence scales from the German „Intelligenz-
Struktur-Test" IST (Amthauer, 1970) and „Leistungs-Prüfsystem" LPS (Horn, 1962
were used:

Insert Table 3 about here

Areas of interest were checked on with the shortened form of the „Activities" -
part of the Differential Interest Test by Todt (1967). Finally, the Freiburg Personal-
ity Inventory (Fahrenberg & Selg, 1973) was used for measuring several personal-
ity characteristics as well as the Scales for Extraversion and Neuroticism from the
EPI-Eysenck and the Achievement-Motivation List from Ehlers & Merz (1966).

3.2.2. Criteria Variables

Because our definition of social intelligence sees it as a dimension in which
aspects of understanding can be distinguished from those of behavior, we chose
altogether 15 questions for the peer ratings, which were concerned with the abil-
ity to recognize feelings, thoughts, intentions and attitudes on the one hand and
the ability to have appropriately towards other persons on the other. We distin-
guished between work colleagues, friends and acquaintances of both sexes in
order to cover by this variation the possible situational specifity of social intelli-
gence as well.

Raters' answers were graded on a seven-point scale.

Since Carroll (1952) and Burisch (1978) found that direct self-ratings are more
valid than longer scales when peer-ratings are being used as external criteria, all
these questions were as well answered by the subjects themselves.

3.3. Course of the Testing

The recruits were assigned to three groups of approximately the same size, each
of which was tested all in one day. The first part lasted from 8:15 a.m. to 11.30,
and after a three-our pause the rest of the program was completed.

Each subject was required to name three friends who were not only present but
were also so well acquainted with the individual subject that they could properly
fill out the questions on the peer-ratings.

The test for students took place in much smaller groups.

4. Results

4.1. Statistics of the predictor scales

First, means, standard deviations and (where feasible) split-half reliabilities were calculated for all predictors. Because this study is basically a correlational analysis, variability and stability values in advance were necessary requirements for analyzing the eventual relationships.

The following table contains the appropriate statistics.

Insert Table 4 about here

The mean value for the LPS-3 test may be relatively low because this test, as well as the IST-AN, were administered towards the end. The values all lie within those of the standardization results. Because the LPS 13 was used in a shortened form, a comparison with the published norms makes no sense.

Insert Table 5 about here

In order to facilitate work on the DIT, we did not store the item- specific data on punch cards, and thus odd-even-coefficients were not calculated. The personality variables had a stability similar to those reported in the literature.

Insert Table 6 about here

As to the scales on social intelligence or creativity, the questions of distribution are of particular interest because the means yield little information when the original text, the format or scoring of the items has been changed in any way. However, where comparisons could be made to data published in the literature, our sample demonstrated with one exception broader distributions.

This is also the case for the four tests of creativity, which will not be discussed in detail here.

That our subjects worked as desired can be seen in their self-ratings on social intelligence: these items which in practically the n6me form, served as criteria-scales were answered a second time by the subjects at the start of the second session (the retest interval thus being 6 hours for the recruits).

Insert Table 7 about here

As one can see, a sufficient degree of variability and stability

is undoubtedly ensured. We did not repeat the questions on the peer ratings because their quality could be checked by the interrater reliability.

4.2. Factor analysis of the tests of social intelligence

According to Guilford's Structure-of-Intellect model, 6 factors should be revealed by factoring the divergent production tests: units, classes, relations, systems, transformations and implications. Table 8 shows the results when extracting 6 factors.

Insert Table 8 about here

Without going into a detailed evaluation of these results, it is readily apparent from the matrix that:
a) the loadings on some scales (DBU 3, DBI 1, DBI 4) cover different factors,
b) some factors (e. g. V. and VI) are co-determined by conceptually independent tests,
c) some factor-scales are very specific (e. g. II: DBU 2, III DBI 2).
A confirmatory factor analysis revealed a highly significant deviation between the empirical data and a SI-defined target matrix (Chi-quare = 1.083, 78; df = 106.). It was thus reasonable to extract a smaller number of factors, which was in accordance with the eigen values (clear gap and then linear course for k = 4).

This factor structure can be seen in the following table.

Insert Table 9 here

In spite of some rather strong methodological effects, additional components are apparent, at least for the first factor, which are independent of the specific item-format.

4.3. Analysis of the correlations between Predictors and Criteria

4.3.1. Factoring the criteria and predictors

The peer-ratings that were given for each question for each individual subject were summed across all raters, and averaged. The resulting scores were then defined as the individual criteria, and were correlated with the directly associated self ratings, which were in fact almost identical in their verbal formulation. These correlations are given in Table 10.

Insert Table 10 here

Question SE 1 asked „How strong do you think you are in your ability to recognize feelings, thoughts, intentions and attitudes in your colleagues and to **understand** their behavior?"

Question FE1 a (as the first peer-rating) was concerned with this same dimension.

For the first block of items only the specific kinds of relations („friends" or „acquaintances") were varied as shown in the table. Question 3 concerned the ability to **behave** appropriately, Item 2 dealt with the function of gestures, positions, the voice and facial expressions for communicating feelings and thoughts.

As can be seen only 4 of the 11 coefficients are significant, but even then they are not sufficient to conclude a substantial validity.

An additional cause for the low correlations may be seen in the quality of the peer ratings. In fact, the interrater reliabilities, computed by analysis of variance-design are disillusioning low as shown in the following table.

Insert Table 11 here

Although the majority of the coefficients are siginificant, the fact that the highest interrater-agreement was only .23 reduces the base for sufficient relationships between predictors and the criteria.

Refering to this findings it seemed reasonable to identify those subjects in the sample who, for whatever reasons, were most consistently rated by the others. Performing the final analyses on the resulting sub-sample seemed more promising. The basis sample was one of N = 211 persons, each of whom had at least two peer-raters available. For each individual and rating scale the squared differences between the (two or three) raters' judgments were summed across all items and the resulting distribution was dichotomized into N = 105 relatively „concordant" and N = 106 relatively „discordant" subjects in terms of their peer ratings. The following table demonstrates that generally all scales benefitted from this subsampling procedure in approximately the same way.

Insert Table 12 here

This perocedure was influential for the correlations between self- and peer-ratings: the mean coefficient for concordantly rated subjects was r = 0.15, and for discordant subjects r = .0.04.

However, the retest-reliability, averaged over the 11 scales for self-ratings did not show any change, remaining r = .57 for concordant subjects and r = .58 for discordant ones. This may be understood as an indication that the dichotomy did not result from an effect of differential reliability.

Interestingly the peer-ratings reveal across all the scales a higher level of social intelligence in favor of the concordant subjects. The differences for discordant subjects were in fact significant in 4 scales.

Insert Table 13 here

On the other hand, differences based on self-ratings, were consistently insignificant.

In order to raise the reliability of the data as well as to „condense" the information, factor analyses were performed separately for concordant and discordant subjects using simultaneously the self- and peer-ratings as variables. The results are shown in Table 14.

Insert Table 14 here

For both groups only two factors were extracted because of formal as well as contextual reasons: a greater number of dimensions would have explained only very small portions of the total variance and would have made interpretation impossible. The two factors could be identified as the dimensions of „self-rated" and „peer-rated" social intelligence. Variables of both ratings loaded in one dimension only within the sample of concordant subjects. Interestingly, it was the self-attribution of skill in contact with the other sex which correlated with certain aspects of the peer-ratings.

The orthogonal separation between self-perception and perception of others is disappointing. We wanted to examine whether any internal differentiation might have been „covered over" by the relatively large correlation-differences between the self-ratings on the one side and the peer-ratings on the other compared to those within the self- and peer-ratings, respectively. Thus, we factorized separately for groups of concordant and discordant subjects as well as for the variables of self- and peer-ratings. The results are shown in the following table and are essentially the same as those reported above. A second factor for peer-ratings became apparent only within the group of discordant subjects, a factor which is interpretable as „skill with the other sex".

Insert Table 15 here

For each of these factors individual factor scores were calculated that served as criteria for the original predictor scales. The resulting correlation coefficients are given in Table 16.

Insert Table 16 here

None of these individual coefficients of validity is very high. The finding is important, however, that the dichotomisation into concordant and discordant subjects has consequences especially for the correlations between predictor-scales and the self-ratings.

Multiple correlations yielded the following results.

Insert Table 17 here

The linear combinations of tests for creativity, interests and temperament correlate significantly with self-ratings of social intelligence (which were of minor importance as criteria, however). This is not true for social and verbal intelligence. Only one of the coefficients of validity against the peer-ratings of social intelligence is significant, with the variables EPI-Neuroticsm (r = .34) and FPI-Calmness (.28) accounting for the better part. This coefficient appears, interestingly, within the sample of discordant subjects, which is possibly a hint that predicting specific criterial aspects may be more likely to succeed than those of global aspects.

By adding the factor of self-rated social intelligence as one predictor within the group of social intelligence tests, the multiple validity is raised to R = .44 (ss) but only for the concordant subjects (while there are only insignificant results for the discordant subjects for both peer-rating factors).

Combining the variables of social intelligence and creativity, social intelligence and verbal intelligence, etc. does not lead to better results.

However, multiple correlations of around .40 are possible by selecting specific variables from different areas (for example, combining 4 variables from the areas of intelligence, social intelligence and personality).

4.3.2. Development of an analytical answer key

Although the results in their overview support rather the idea that SI-tests are concerned with testing perception, it would be wise to check the possibility that, for tyhe two convergent scales CHAPIN and Stick Figures Opposite, alternative keys might yield higher validity values compared to the intuitive-rational keys use to date. With an a = .40 and .60 for CHAPIN and CBR respectively, both scales demonstrate a minimum of internal consistency, as far as the scoring key is concerned given by the authors.

Using the results from the subjects who were rated most concordantly, for each distractor of each item the correlation with the peer-rating factor was computed. Afterwards an optimized scoring key was determined according to the size of the resulting coefficients, and then a new individual score was calculated. The consequence of this procedure is shown in Table 18a (row 2). For comparison the coefficients of validity are also given for the original keys published by the test authors (row 1).

Insert Table 18 a here

The question arises whether such a positive finding is stable and generalizable over different samples of subjects. For this question it was necessary to check whether the significant relationships between predictors and criteria in Table 18a remain when the sample of concordant subjects is randomly divided into 2 subgroups. This was not the case.

The last question to be examined concerns whether or not the scoring key, developed for one subsample, can be cross-validated for another one. The results are given in Table 18b.

Insert Table 18b here

As can be seen, the originally signicikant coefficients now became insignificant, as it is often true when using an exclusively external scale construction principle.

5. Discussion

As always, the results presented here are valid only for the sample of subjects and variables.

To start with the subjects: The relative homogeneity of the soldier group may have been an unfavorable condition for any test of the model. Also, female subjects were completely lacking. In addition the predictors were related only to the levels of Divergent Prediction an Cognition in the Structure of Intellect-model. Finally there are some short-comings as far as the criteria are concerned. It would have been interesting to formulate an additional item dealing with global social intelligence in self- and peer-ratings.

Generally it would have been reasonable to ask the peers for judgments concerned with other dimensions in order to arrive at more information on the rating achievement of the peer with regard to the Multitrait-Multi-method approach.

In spite of these short-comings, it becomes clear that there is little agreement among peer raters as to what social intelligence means with respect to concrete individuals. This is probably also an aspect of the interactional specificity of this construct and not just a component of error.

Considering theses unfavorable conditions the attempt at identifying socially intelligent persons with the help of common dimensions of personality or analytical scoring keys turned out to be not very successful: After all the subgrouping

according to concordant and discordant subjects opens several interesting perspectives, especially concerning the predictors.

Moreover, although the results here were negative as far as Guilford's assumption on Structure of Intellect are concerned, the modification of this model on the basis of empirical results should now be started. Essential elements of the Structure of Intellect are apparently not verifiable, which does not after anything for the obious heuristic value of this model.

Further work on this problem should concentrate less on a revision of theoretical assumptions concerning structure and more on changing the quality of the predictors: Tests of general intelligence are valid predictors of school and academic achievement precisely because their individual items represent the criterion behavior by being a sample of just that criterion behavior. In light of the fact that the usual paper and pencil tests are inadequate for predicting concrete situation-dependent behavior, there is very little reason for coming to the conclusion that answering an item on a test of social intelligence is the same as a social behavior in a real-life situation. Just as McClelland (1973) called for a reorientation in the field of the intelligence diagnostics which would no longer be concerned with (merely) inventing new „test games", it seems worthful in the field of social intelligence to record samples of behavior at least partly outside of the laboratory, from socially component persons in defined situations, and to describe the relevant dimensions. Such an approach would enable learning and teaching situations to become more concrete, and individual progress could then be checked on the basis of development and training (Orlik, 1982).

The Act Frequency Approach developed by Buss & Craik (1983) would be a very useful method for the description and validation of these samples of behavior which then could be measured in terms of questionnaires rather than in terms of the items of achievement tests.

Footnotes

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Table 1: The Behavioral "Slice" of GUILFORD's Structure-of-Intellect Model

	Units	Classes	Relations	Systems	Trans- formations	Impli- cations
Cognition	CBU	CBC	CBR	CBS	CBT	CBI
Memory	MBU	MBC	MBR	MBS	MBT	MBI
Divergent Production	DBU	DBC	DBR	DBS	DBT	DBI
Convergent Production	NBU	NBC	NBR	NBS	NBT	NBI
Evaluation	EBU	EBC	EBR	EBS	EBT	EBI

Table 2 : List of Divergent Production Tests used in the study.

Tests of "Divergent Production of Behavioral Units"
     DBU 1 Different Meaning
     DBU 2 Expression of Several Feeling
     DBU 3 Possibilities for the Expression
     DBU 4 Different Meanings in Pictures

Tests of "Divergent Production of Behavioral Systems"
     DBS 1 Representing Siutations"
     DBS 3 Writing Stories

Tests of "Divergent Production of Behavioral Transformations"
     DBT 2 Choosing Faces
     DBT 4 Developing Stories

Test of "Divergent Production of Behavioral Classes"
     DBC 1 Grouping Faces

Test of "Divergent Production of Behavioral Relations"
     DBR 1 Making Pairs of Faces

Tests of "Divergent Production of Behavioral Implications"
     DBI 1 Solving Conflicts
     DBI 3 Social Problems
     DBI 4 Possible Behaviors

Table 3 : German Intelligence Tests used in the study

Test	Label of the dimension by the test-authors	Factor supposed according to the systematic order by FRENCH
LPS 3	Thinking Ability	'R' Reasoning
LPS 7	Motion of Symbols	'S' Spatial Orientation
LPS 10	Identification of the Essential	'CF' Flexibility of Closure
LPS 11	Ability for Guessing	'CS' Speed of Closure
LPS 13	Perceptual Speed	'P' Perceptual Speed
IST AN	Ability for Combining	'V', 'I' Verbal Comprehension, Induction

Table 4 : Split-half-reliabilities, means and Standard-
Deviations for the German Intelligence Scales
used in the study

Test	r_{oe}	M	s	C bzw. z_a
LPS 3	.90	15.77	6.95	3.2
LPS 7	.95	24.64	5.97	6.9
LPS 10	.96	21.65	9.04	5.7
LPS 13	.97	32.97	8.14	
IST AN	.79	8.56	4.07	98

Table 5: Split-half Reliabilities(SPERMAN & BROWN),   Means
and Standard Deviations

(a) Scales administered
    compared with
(b) some reference data
    from the literature *

Test	a			b		
	r_{oe}	M	s	r_{oe}	M	s
EPI N	.82	8.52	4.42	.82	9.78	4.83
EPI E	.68	13.65	3.35	.75	11.40	4.29
LM	.73	17.50	11.72	.75	20.90	4.55
FPI 1	.78	4.94	3.35	.78		
FPI 2	.73	4.82	2.68	.61		
FPI 3	.83	5.71	3.63	.79		
FPI 4	.73	4.53	2.52	.75		
FPI 5	.56	8.41	2.72	.72		
FPI 6	.57	5.23	2.12	.60		
FPI 7	.72	4.84	-2.48	.64		
FPI 8	.65	3.83	2.27	.72		
FPI 9	.75	9.81	2.67	.43		
DIT SE		36.29	8.88	.96	39.6	8.0
DIT UN		43.96	6.52	.82	46.6	6.6
DIT PW		32.66	9.80	.94	38.7	8.1
DIT VW		26.92	9.33	.91	31.3	7.4
DIT BI		33.29	9.50	.93	38.4	8.7
DIT MU		29.67	10.54	.93	32.3	11.8
DIT MA		33.01	10.54	.91	39.0	8.9
DIT SR		39.46	10.40	.91	46.1	8.5
DIT KU		33.17	10.41	.96	40.3	9.1
DIT LS		31.34	9.84	.90	38.2	8.0
DIT TN		32.98	11.01	.94	41.2	8.1

* According to the following literature:

EPI: WESTHOFF und SCREMBE (1979), zufällig ausgewählte Personen,
     Alter (C $_{50}$) 27 Jahre

Table 6: Arithmetic Means and Standard Deviations of scales
measuring Social Intelligence (a) compared to some
data from the literature (b)

Test	a		b		
	M	s	M	s	
CHAPIN	6.75	2.37			
CER	14.78	5.11	17.70	3.60	
DBU 1	23.32	9.51	15.75	4.50	
DBU 2	16.81	10.94	32.98	8.38	
DBU 3	23.13	13.65	19.66	4.85	
DBU 4	23.09	9.71	13.73	4.51	
DBS 1 a	4.44	2.60	3.54	2.10	
DBS 1 b	10.33	6.88			(new score)
DBS 3 a	5.44	2.82			(new scale)
DES 3 b	15.51	8.79			
DBT 2	10.25	5.20	23.26	5.41	
DBT 4 a	5.30	4.17	12.97	3.63	
DBT 4 b	16.04	13.90			(new score)
DBC 1	9.17	3.52			(new scale)
DER 1	27.35	15.79			(new scale)
DBI 1	15.90	9.67	19.99	4.29	
DBI 3	12.0	7.83	12.23	4.37	
DBI 4	21.60	14.60	18.95	4.85	

Table 7: Retest-Reliability for the self-evaluation variables

Variable	r_{tt}	M	s	
SE 1 a	.65	4.25	1.27	colleagues
SE 1 b	.50	5.39	1.27	good friends
SE 1 c	.56	3.17	1.22	slight acquaintances
SE 1 d	.64	4.24	1.37	same sex
SE 1 e	.62	4.33	1.51	other sex
SE 2	.60	4.62	1.28	possible expressions
SE 3 a	.54	4.34	1.19	colleague
SE 3 b	.58	5.32	1.08	good friends
SE 3 c	.41	3.48	1.24	slight acquaintances
SE 3 d	.46	4.29	1.18	same sex
SE 3 e	.66	4.54	1.42	other sex
SE 4	.55	4.71	1.38	empathy for others
SE 5	.62	4.68	1.44	sociable person
SE 6	.51	4.40	1.26	adapting to other persons
SE 7	.52	3.59	1.60	inappropriate reactions
SE 8	.64	4,58	1.35	relaxing a tense situation
SE 9	.64	4.23	1.43	relaxing a very tense situation
SE 10	.75	3.68	0.75	desired contacs during free time
SE 11	.78	3.65	0.77	actual contacts during free tim

Table 8: Factor Structure (Varimax) for Divergent Social Intelligence Tests, extracting 6 factors (only loadings of > .40 are shown)

	I	II	III	IV	V	VI
DBU 1	54					
DBU 2		85				
DBU 3						
DBU 4						
DBS 1 A				74	52	
DBS 1 B					84	
DBS 3 A					86	
DBS B					72	
DBT 2			91		80	
DBT 4 A					78	
DBT B					84	
DBC 1						80
DBR 1						80
DBI 1	65				50	
DBI 3	81					
DBI 4	60				61	

Eigenwerte: 2,2 - 1,6 - 1,1,0 - 0,9 - 0,8
1,0 - 0,63 - 0,56 - 0,51 - 0,42
1,8 - 3,- 3,2 - 3,2

% total: 5,1 ... 1,9

Table 9: Factor Structure (Varimax) for Divergent Social
Intelligence Tests, extracting 4 factors (only
loadings $>$ .40 shown)

	I	II	III	IV
DBU 1		.76		
2		.85		
3	.47			.64
4		.69		
DBS 1 a	.81			—
b	.84			
DBS 3 a	.74			
b	.81			
DBT 2			.61	
4 a	.78			
b	.83			
DBC 1			.80	
DBR			.79	
DBI 1	.49			.64
3				.79
4	.57			.67
	8,5	1,6	1,0	0,9 % total

Table 10: Correlations between self- and peer ratings ($r_{s/f}$)

Variable	$r_{s/f}$	Short label
SE 1 a/ FE 1 a	.08	Colleagues
SE 1 b/ FE 1 b	.07	Good friends
SE 1 c/ FE 1 c	.03	slight acquaintances
SE 1 d/ FE 1 d	.09	same sex
SE 1 e/ FE 1 e	.20**	other sex
SE 2 / FE 2	.08	possible expressions
SE 3 a/ FE 3 a	.16*	good friends
SE 3 b/ FE 3 b	.08	slight acquaintances
SE 3 c/ FE 3 c	.05	same sex
SE 3 d/ FE 3 d	.17*	same sex
SE 3 e/ FE 3 e	.21**	other sex

For this table and all other:
* significance was chosen at the 5 % level
** significance was chosen at the 1 % level

Table 11: Interrater-Agreement for the total sample
a) using three raters per subject (N = 162)
b) using two raters per subject (N % 211)

				a	b
colleagues	FE	1	a	.17 ss	.24 ss
good friends		1	b	.24 ss	.27 ss
slight acquaintances		1	c	.11 s	.10
same sex		1	d	.14 ss	.03
other sex		1	c	.23 ss	.26 ss
possible expressions	FE	2		.01	.11
colleagues		3	a	.20 ss	.18 ss
good friends		3	b	.23 ss	.24 ss
slight acquaintances		3	c	.17 ss	.21 ss
same sex		3	d	.13 s	.11 s
other sex		3	e	.11 s	.10
		$\bar{r}$		.16	.17

Table 12: Interrater-Agreement for two subgroups of "concordantly" and "discordantly" rated subjects

Variable			"concordant" N = 105	"discordant" N = 106	
FE 1	a	colleagues	.43	.14	
	b	good friends	.44	.15	S
	c	slight acquaintances	.37	-.05	
	d	same sex	.40	-.14	
	e	other sex	.44	.16	S
FE 2		possible expressions	.30	.01	
FE 3	a	colleagues	.51	-.02	
	b	good friends	.51	.07	
	c	slight acquaintances	.33	.13	
	d	same sex	.51	-.07	
	e	other sex	.36	-.05	
		$\bar{r}$	.42	.03	

understand / behave

All coefficients here: SS

Table 13: Arithmetic Means and Standard Deviations of the items of the peer ratings, separate for concordant and discordant subjects

	Variable	N = 92 concordant X̄	N = 92 discordant X̄	t	concordant s	discordant s	F
FE 1	a colleagues	4,65	4,32	ss	0,72	0,94	ss
	b good friends	5,00	4,74		0,85	0,99	
	c good acquaintances	3,84	3,76		0,86	0,94	
	d same sex	4,65	4,43		0,80	0,98	s
	e other sex	4,77	4,56		1,1	1,24	
FE 2	possible expressions	4,71	4,59		0,86	0,94	
	a colleagues	4,70	4,36	s	0,85	0,99	
	b good friends	5,02	4,68	s	0,85	1,00	
	c good acquaintances	3,96	3,89		0,87	1,04	s
	d same sex	4,75	4,62		0,79	1,02	ss
	d other sex	4,93	4,58	s	0,99	1,06	

Table 14: Factorial loading matrix (varimax rotation) for concordant and discordant subjects (only including loadings $\geq$ .20

	Variable	Concordant subjects first rotation			discordant subjects second rotation	
		HK	factor		HK	factor
understanding	SE 1 a colleagues	.41		.80	.54	.68
	b good friends	.29		.60	.57	.72
	c good acquaint.	.40		.58	.46	.66
	d same sex	.29		.70	.50	.66
	e other sex	.61	.51	.33	.36	.41
	E 2 possible expression	.54		.72	.49	.62
behavior	SE 3 a colleagues	.47		.82	.60	.67
	b good friends	.25		.48	.56	.63
	c good acquaint.	.53		.72	.50	.65
	d same sex	.45		.79	.63	.71
	e other sex	.63	.47	.43	.50	.88
	SE4 possible expr.	.36		.55	.45	.67
	5	.45	.21	.49	.34	.47
	6	.35		.35	.56	.75
	7				.28	.39
	8	.48	.24	.51	.28	.43
	9	.40		.50		.37
	1o	.23	.27			
	11	.29	.29			
understanding	FE 1 a colleagues	.73	.85		.49	.75
	b good friends	.77	.79		.57	.85
	c good acquaintances	.57	.67		.46	.65
	d same sex	.76	.78		.49	.76
	e other sex	.70	.81		.43	.61
	FE 2 possible express.	.65	.76		.54	.71
	a colleagues	.76	.83		.55	.81
	b good friends	.70	.81		.54	.82
	c good acquaintances	.80	.75		.46	.72
	d same sex	.68	.82		.48	.80
	e other sex	.41	.81		.52	.66
	% common	.30	.16		.22	.19
	% total	7,8	6,0		6,3	6,2

course of eigen values

8,97-4,88-2,67-1,66-1,24-1,15-1,08-0,94

6,68-5,81-2,25-1,88-1,55-1,33-1,15-1,03

Table 15: Factorial loading matrix for the separate factors for self- and peer evaluations (including only loadings .20)

Variable	concordant (N = 92)	discordant Vpn (N = 97)		
SE 1 a colleagues	.75	.69		
b good friends	.57	.70		
c acquaintances	.61	.64		
d same sex	.63	.66		
e other sex	.45	.44		
SE 2 possible expressions	.76	.63		
SE 3 a colleagues	.79	.69		
b good friends	.45	.62		
c acquaintances	.73	.64		
d same sex	.71	.72		
e other sex	.52	.53		
SE 4 possible expression	.60	.67		
5 social person	.53	.45		
6 adapting to different personalities	.47	.70		
7 inappropriate reactions		.35		
8 relaxing tense situations	.57	.45		
9 relaxing very tense situations	.61	.37		
10 desired contacts during free time				
11 actual contacts during free time		-.21		
	32 %	6,1 %		
FE 1 a colleagues	.84	.75		
b good friends	.82	.85		
c acquaintances	.64	.67	-.36	
d same sex	.83	.76		
e other sex	.82	.61		.69
FE 2 possible expressions	.75	.70		
FE 3 a colleagues	.85	.81		
b good friends	.85	.82		
c acquaintances	.76	.72	-.27	
d same sex	.85	.80		
e other sex	.81	.62		.67
	65 %	55 %	11 %	
	7,1 %	6,0 %	1,2 %	

Table 16: Correlation coefficients of the tests compared with factored values for the criteria (only including significant results)

Variable	concordant self-rating	concordant peer-rating	discordant self-rating	discordant peer-rating 1	discordant peer-rating 2
Social intelligence					
CHAPIN					
Stick Figures		-.32 (!)			
DBU 1	.31			.27	
2			.32		
4	.22				
DBC 1	.21			.23	-.25
DBR 1			.21		
DBS 1 a	.19				
1 b	.24				
DBS 3 a	.20				
3 b	.28				
DBT 4 a					
4 b	.21				
DBT 2					
DBI 1					
3					
4					
Creativity					
Association					
Results				.20	
Uses	.27				
LPS 6	.26				
DIT-SE	.29			.25	
-UN					.27
-PW	.32				
-VW					
-BI	.29				
-MU	.38				
-MA					
-KU	.29			.31	
-LS	.43			.34	
-TN					
EPI-E					
-N					-.34
LM					
FPI-NE					
-Ag					
-De					
-Er					
-Gs	.34				
-Gl	.27			-.21	
-Do	-.24				
-Ge	-.30				
-Of					

No significant realtionship between verbal intelligence tests and DBU 3

Table 17: Multiple correlations for the relation between the factored tests as predictors and the factors of self and peer evaluations for Social Intelligence as criteria , separate for concordant and discordant subjects

	Area of variables	number of orthogal predictors	concordant		discordant	
self-evalutation	Social Intelligence	4	.29		.25	
	Creativity	2	.22	s	.24	s
	Interests	3	.45	ss	.31	s
	Intelligence	3	.15		.19	
	Personality	4	.35	ss	.15	
			FE 1	FE 1	FE 2
peer-evaluation	Social Intelligence	4	.28	.20	.16
	Creativity	2	.OO	.OO	.12
	Interests	3	.17	.11	.15
	Intelligence	3	.20	.01	.18
	Personality	4	.13	.20	.36ss

Table 18 a: Validity coefficnets for: total results
(calculated according to optimized answer key from
CHAPIN using   1. intuitive-rational and
2. analytical methods

Predictor		concordant subjects peer evaluation	discordant subjects peer evaluation	
1.	CHAPIN	.07	.11	-.15
	CBR	-.32 ss (!)	.08	-.05
2.	CHAPIN	.32 ss	-.01	.07
	CBR	.32 ss	-.04 .—	.07

Table 18 b: Validity coefficients for an answer key (optimized
on a sub-sample of condordant subjects) and its
cross-validity

	analysis sample (N=52)	cross-valid sample (N=53)
CHAPIN	.46 ss	-.26
CBR	.61 ss	-.22

Figure 1

Different Meanings

Each item in this test describes a way of behavior in
one person. It is your task to write down as many different
thoughts or feelings as possible which this person could
be expressing in this way.

Practise Item:

Waht can somebody thinking or feeling when he blinks his or her
eyes at another person? Write down as many thoughts or
feelings as possible.

1. We'll meet again.

2. I'd like to be nice   to the other person.

3. We know the solution better than

4. Please don't betray anything.

5. I think you are attractive.

Figure 2

Espression of Several Feelings

Each item in this test describes two different emotional
states. What might a person say who is experiencing these
two emotions at the very same time?

Practice Item:

Write down as many things as possible that a person might
say who is experiencing jealousy and disappointment at the
very same moment.

1. You can keep everything! I don't want anything anyway.

2. Sure Hans won - he always wins.

3. Did they give him the job? But they wanted to give it
   to me originally.

4. Take a look at this new car. He just bought it.
   (This would be incorrect)

5. I didn't do it! (This would not be correct.)

Figure 3

Possibilities for the Expression of Emotions

Each item in this test describes an emotional state.
What might a person say who finds himself or herself
in this state. Write down as many answers as possible.

Practice Item:

Write down as many things as possible that somebody might
say who is very angry.

1. You're driving me crazy.
2. I can't stand you.
3. Say one more word and I'll know you down.
4. Rrrr.
5. Get out of here.
6. How often have I told you to ...

Figure 4

Different Meanings in Pictures

A particular expression in a person's face or in his or
her gestures can have different meanings. Each exercise
in this test shows a facial expression or a gesture. Please
observe these pictures with care. It is your task to write
down as many remarks as possible that somebody might say
who is feeling like the person in the picture.

Practice Item:

1. Wait a minute. What was I just doing
   a moment ago?
2. If I had only kept my mouth shut.
3. I'm too tired to work any more.
4. Oh, God, what did I do?
5. Why can't he leave me alone?

Figure 5

Representing Situations

In each Item of this test three persons are described,
indluding their feelings.

Try to describe as many different situations as possible
which could either provoke these feelings or increase them,
remembering to use only the persons in the pictures.

In each situation that you create every one of the three
persons is supposed to have a different role.

Practice Item:

A. a woman who is afraid

B. an angry man

C. an unhappy child

1. C has gotten a bad report card. B, his father is therefore
angry, and the mother A is afraid that the father will hit
the child.

Figure 6

Writing Stories

In this test fotos will be shown to you each of which
portrays a situation involving three participants. You
are are requested to write as many different stories
as possible for each situation. The stories should des-
cribe how the persons feel,what they are thinking and
what their reasons are.

Practice Item:

How do these persons feel?
What are they thinking and why?
Please write as many stories
as possible.

A   B   C
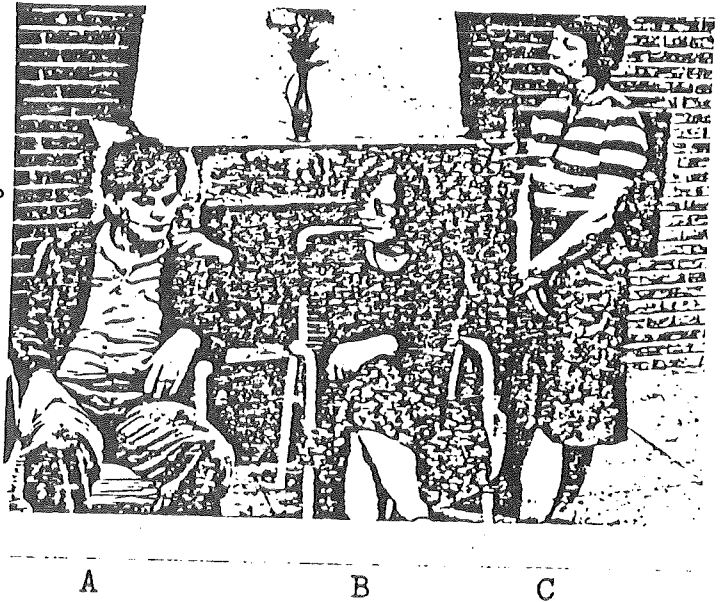
1. The girl, B, feels sorry for the young man (a) because
   she thinks that he doesn't feel well. C realizes that
   he is faking. A likes it when people feel concerned
   about him.

Figure 7

Choosing Faces

In this test you will be given short stories and a series of faces. You are requested to choose a face for each part of the story which best represents the possible feelings of the person.

Practice Item:

A man tries to trip a woman going past by putting out his leg.

The woman trips, the man says he is sorry.

But the woman reacts angry.

From the following series of faces please choose different groups of three faces which could represent the way the man feels at the three parts of the story above. Write the appropriate letters in the spaces at the right. Each group of faces should make up a story with a different emotional background.

| A | B | C | D | E | F | G | H | I |
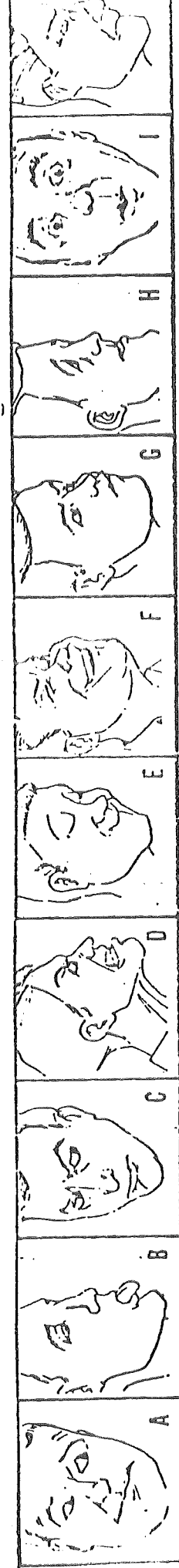
How does the man fell when he trips the woman?

How does he feel when he begs her pardon?

How does he feel when she gets angry?

1	2	3	4
I			
A			
C			

Figure 8

Developing Stories

In each item of this test a situation is given which is
the beginning of a story. Each story includes three persons
every time. You are requested to continue the beginning for
as many stories as possible, without introducing any new
persons. Each new story should include the feelings and
thoughts of all the three characters.

Practice   Item

Develop the following situation into as many new stories
as possible:

Two sisters (A and B) have fallen in love with the same
man. One day he receives an unexpected visit.

1. A and B both try to convince him why they are better
than their sister. C then becomes all the more unsure as
to which of the two pleases him more.

2. A tells C that B doesn't want to see him any more.
Instead of discouraging him, this news rather makes B
all the more interesting for him.

Figure 9

Grouping Faces

In this test a row of fotos will be shown to you. You are
requested to group those faces which could show a similar
thought, feeling or purpose. There are many different ways
to form such a group. You are requested to give as many
as possible. Each group is supposed to consist of three
fotos. Each foto can of course occur in several different
groups.
Practice Item:
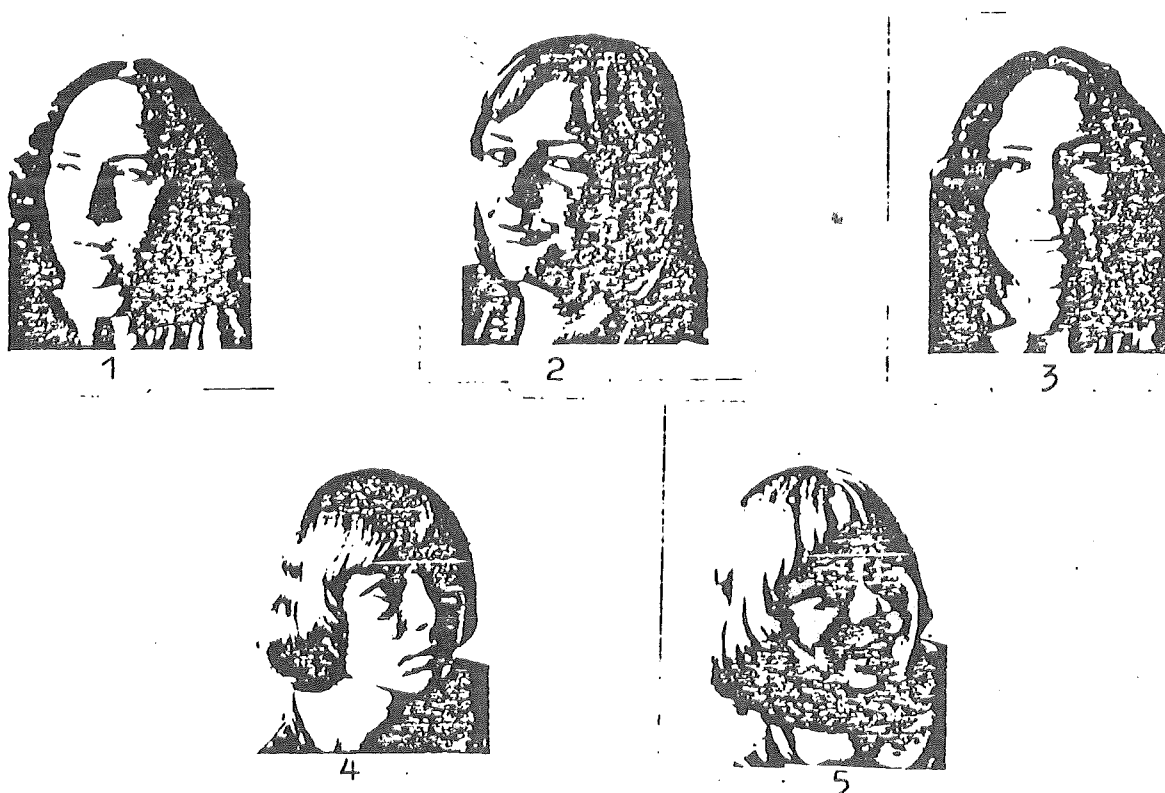
Groups

(Explanations are only necessary for
unusual combinations.)

A. 2 / 3 / 5

B. 1 / 3 / 4

C. 3 / 4 / 5 (not acceptab-
le)

In this practice exercise faces 2, 3 and 5 form a group in that
they all show happy faces. Faces 1 and 4 do not appear happy and
thus do not belong to this group. Faces 1, 3 and 4, on the other
hand, could belong to a group because each face gives the im-
pression that someone is withdrawing from contact to someone else.

Figure 10

Making Pairs of Faces

In this test you will be shown fotos of faces with a comment. You are requested to place different pairs of faces together. The first foto is supposed to represent the facial expression of the person who is giving the comment or remark while the second foto shows the expression of the person receiving the remark.

Practice Item:

Choose two faces which show one person saying "Wait a minute. I didn't mean that!" to a second person.
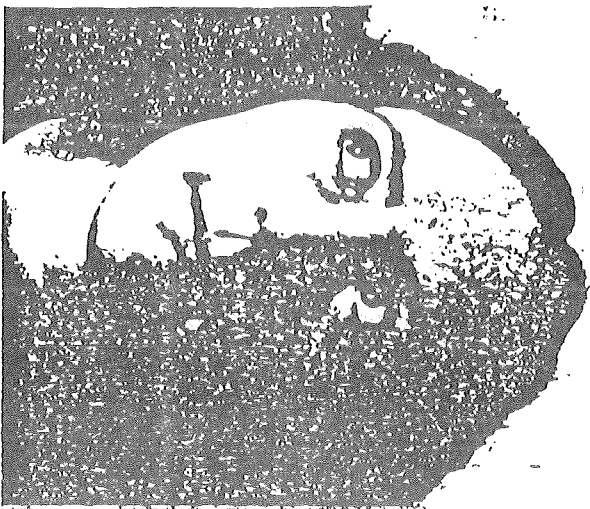
A

B

C

Fotos B and C are an example for such a situation involving two persons. Fotos B and A would not fit such a situation.

Figure 11

Solving Conflicts

In this test conflicts in social situations are briefly des-
cribed. You are requested to go beyond these first situations
and find as many solutions as possible.

Practice Item:
You are on a weekend trip with a group of friends. While
your friends would prefer to play football on Sunday, you
would rather go fishing.

You could:
1. give in and play football
2. suggest that you do different things: you go off fishing
   alone and your friends play their game of football
3. convince your friends that fishing is more fun
4. suggest that flipping a coin could decide the matter.

Figure 12

Social Problems
In this part of the test two persons in a typical family
are described. Please write down as many different problems
of a personal nature which could occur in the relationships
of these two persons to each other.

Practice Item:
Which personal problems could arise between a brother and
a sister?
1. the sister makes fun of her brother's friends
2. both try to bet their mother's favor at the cost of
   the other
3. the brother tries to order his sister around
4. the sister helps in the household, but the brother
   doesn't
5. jealousy

Figure 13

Possible Behaviors

In each part of this test the behavior of person A is des-
cribed. You are requested to decide how another person
might react emotionally or might behave openly.

Practive Item:
How can   person B feelor behave when person A blinks
his or her eyes in the direction of B?
Write down as many different reactions as possible.

1. laugh back shyly
2. look surprised
3. become embarassed or red in the face
4. pretend not to see person A
5. become angry at A

Figure 14

Item 1:
Mr. Smith is married and has four children. Occasionally
he gets drunk. Since starting at his job he has been in
the   same firm, although after all these years he still
has not been able to advance to the middle management level
which he would like. In his original family his younger
brother was the favorite of his mother, and in his present
family the only son is favored by his wife over three
daughters. In order to help Mr. Smith a friend of the family
tries the following:

a. he introduces strict measures to keep him from alcohol
b. he advises him to take the cure
c. he listens to Mr. Smith understandingly when telling of
   his problems, and particularly praises the fact that
   Mrs. Smith has cared for the social well-being of his
   family by being so reliable and consistent at work
d. he secretly urges Mrs. Smith to leave her husband, to
   move to another city in order to establish a new life
   there and to get a divorce.

Figure 15

Each exercise in this test shows a line figure displaying some
kind of feeling,thougt or purpose. You are requested to
choose that one figure in the following series which best
represents the opposite of the first feeling or intention.

Practice Item:

1   2   3
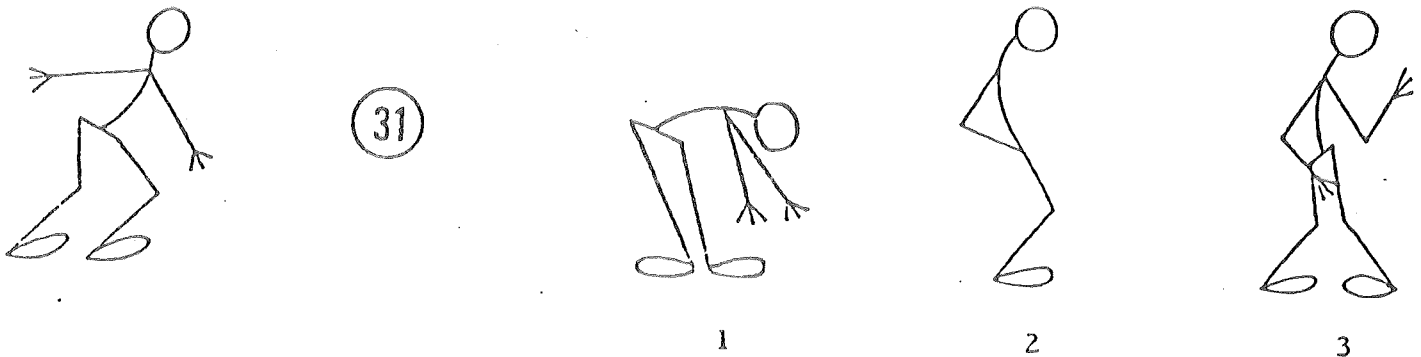
The first figure shows a person attending to something else.
1 and 3 also show attentiveness, but in a somewhat different
way. But here figure number 2 would be correct because it ex-
presses a relaxed or bored person, which is the opposite of
the original figure.
Please cross out the number of the correct figure.