Evaluation of the DNLA SC analysis considering the quality criteria of psychometric measurements

An empirical study

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Author information

Name: Prof. Dr. René Lehmann

Adress: Jahnstraße 3, 39218 Schönebeck, Germany

Contact: rene.lehmann82@t-online.de

About the career of the author

René Lehmann studied business mathematics at the Otto-von-Guericke University of Magdeburg (Germany). As a scientist, he was active in various fields, including as a statistician in the automotive sector and in environmental quality assessment. He received his PhD in applied statistics from the Rheinisch-Westfälisch-Technische Hochschule (RWTH) in Aachen (Germany). In 2016, René Lehmann accepted the appointment as Professor of Business Mathematics and Statistics at the FOM Hochschule für Oekonomie und Management (Essen, Germany). He is a member of the Institute for Empirical Research and Statistics (ifes) and the Institute for Business Psychology (iwp). His research fields include psychological statistics as well as quantitative methods in ecotoxicology and quality management.

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1. Introduction

The "Social Competence" (SC) is used to record the social competence factors most important for professional success by means of a survey. The aim is to evaluate the current state and to derive optimization potentials. The survey measures the characteristics of a wide range of social competencies (so-called constructs), including drive to perform and empathy. An overview is provided in Table **1**.

The psychometric measurement of constructs always raises the question of the extent to which the quality criteria were met in the context of the measurement. The main quality criteria include validity, reliability, and objectivity. Validity deals with the question of whether a measurement procedure is in principle capable of measuring what it purports to measure. Reliability describes both the accuracy of a measurement result and its stability when measured several times (e.g. by repeating measurements). Objectivity exists when the performance of a measurement, its evaluation and the interpretation of the measurement results are independent of the person performing the measurement. On the basis of the preceding explanations, it can be seen that the main quality criteria can be subdivided into various sub-quality criteria. This report presents the results of the systematic examination of the SC procedure with regard to the degree of compliance with the quality criteria.

Table 1: Compilation of the constructs measured by SC

Construct	**Guiding question**	**Example item**
Self responsibility	Do I realise that I am responsible for my own achievements and failures?	I alone am responsible for all my career successes or failures.
Drive and application	Do I take on performance situations and demands and do I have the ambition to master them?	My performance improves when I am not so worried.
Self-confidence	Am I able to adequately assess the difficulty of a task and of my performance?	I am capable of dealing with unusual problems.

Achievement Motivation	Am I committed to the tasks assigned to me and do I identify with the company's goals?	I always achieve what I set out to do.
Sociability	Am I able to open up and address even deeply rooted or difficult issues?	I am often distrustful of other people.
Assertiveness	Am I relaxed and at ease, even if my counterpart is hierarchically or socially higher?	I feel uncomfortable in the presence of people having a higher position.
Empathy	Can I put myself in the shoes of others and understand messages even if they are not explicitly expressed?	The participants are presented with 24 situations and have to decide on an alternative course of action.
Commitment	Do I identify with my work and my tasks and do I show this by performing accordingly?	I am always prepared to accept extra responsibilities.
Status Awareness	How important are prestige and professional image to me?	I would like to achieve a high standard of living and would like to safeguard this into retirement.
Systematic Mentality	Do I approach complex problems in a structured way?	Less organisational effort brings an increase in performance.
Initiative	Do I contribute independently and innovatively without	I hate it when my ideas and initiatives are suppressed by other people.

	direction or pressure from others?	
Resilience	How do I deal with small and big failures?	I find it difficult to get over my failures.
Feedback Reaction	Can I use criticism constructively and give it a positive facet?	Criticism from colleagues who mean a lot to me tends to disturb me for a long time.
Outlook	Does my basic attitude at work tend to be optimistic or pessimistic in outlook?	I tend to overestimate other people only to be disappointed by them afterwards.
Self-esteem	Do I have great doubts and insecurities inside me, or am I active and engaged with others and myself?	I often abandon plans because of a lack of self-confidence.
Flexibility	How well can I adapt to changes, changing situations and demands?	I prefer to avoid work situations where I do not have a clear strategy to follow.

2. Methodical approach

2.1 Validity: Correlations of the constructs

To identify indications of possible (in)consistencies, both simple Pearson correlations (SPC) and Pearson partial correlations (PPC) between the constructs are calculated. The (partial) correlation indicates the strength of the statistical (linear) relationship between two constructs. Partial correlations additionally consider all influences of all constructs among each other. The SPC can be distorted by the influence of further constructs. Within the framework of the PPC, the SPC of two constructs is adjusted for the influence of further

constructs. As a result, the resulting PPC can be stronger or weaker than the SPC (Hedderich & Sachs 2015).

First, it should be noted that the calculated correlations are indeed sample correlations. The interesting question is whether the results of the sample investigation can be transferred to the population (of all possible participants). For this purpose, a 95% confidence interval is given for each correlation. It must be taken into account that the more confidence intervals are given, the greater the probability of committing a statistical error of the 1st kind on the basis of the confidence interval. To counteract this, the confidence intervals are additionally subjected to a Holm correction (Holm 1979). As a result, there are four outcomes for each pair of constructs: SPC without Holm correction, PPC without Holm correction, SPC with Holm correction and PPC with Holm correction.

2.2 Validity: Testing by multiple regression with external criteria

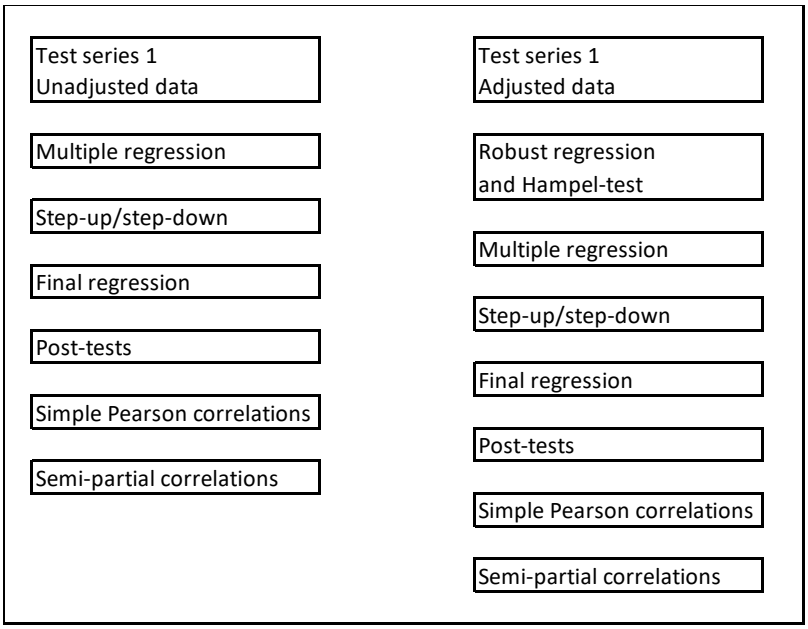
In a further step, it is examined whether the theoretically expected correlations between the constructs and the external criteria logic, job satisfaction, stress, and supervisor evaluation can actually be observed. In this framework, one construct at a time is linearly regressed simultaneously on all four external criteria.

The expectations are:

a) The higher the expression of the logic value, the higher the expression of each SC construct.
b) The higher the expression of job satisfaction, the higher the expression of each SC construct.
c) The higher the expression of the stress value, the lower the expression of each SC construct.
d) The higher the value of the supervisor's rating, the lower the value of each SC construct. (Note: The evaluation by the supervisor was done in the school grading system: the higher the value, the worse the grade).

The analysis is carried out in two ways (Figure 1).

Figure 1: Procedure within the framework of linear regression



Since outliers can potentially distort the analysis results, a robust linear regression using least median of squares (LMS) is performed in addition to multiple linear regression using least squares (OLS, von Auer 2011) (Rousseeuw & Leroy 2005). Testing for outliers is performed by applying the so-called Hampel identifier ("Hampel test") to the residuals of the LMS regression (Lehmann 2012). The step-up/step-down (SUSD) procedure is used to eliminate statistically irrelevant variables. Inclusion or exclusion criterion for variables is the so-called AIC values (Akaike Information Criterion, Hedderich & Sachs 2015). After completion of the SUSD, the model prerequisites of the linear regression were tested. Applied were the Shapiro-Wilk test (SW), the White test (WT), the Durbin-Watson test (DW), the Regression Equation Specification Error Test (RESET) and Variance Inflation Factors (VIF) (von Auer 2011). It should be noted that the use of VIF is only useful when more than one explanatory variable remains in the regression model after applying SUSD (Hedderich and Sachs 2015).

Additionally, the SPCs between the outside criteria and the constructs are calculated. Furthermore, the semi-partial Pearson correlations (SPCs) between the external criteria and the constructs are reported. All correlations are supplemented by the corresponding confidence intervals. All calculations are done for the unadjusted and for the adjusted data, respectively. Strictly speaking, the values of the SPC and the SPC are already included in the regression coefficients and the coefficient of determination of each regression and are therefore redundant. However, following the practice of psychometric statistics, they are reported.

2.3 Reliability: Quantification of Internal Consistency

Cronbach's alpha is used to assess internal consistency. It should be noted that an independent alpha must be calculated for each construct (Moosbrugger & Kelava 2011). Furthermore, each item was removed once (so-called drop). This resulted in a change of the alpha value in each case. A strong increase indicates that the item in question disturbs the internal consistency and thus does not fit the other items in terms of content. A strong decrease indicates that the item in question contributes significantly to internal consistency and that the measurement of the construct is less consistent without the item.

2.4 Objectivity

In addition to reliability and validity, objectivity is an important quality criterion for psychological tests. A test is objective if the result is independent of the examiner with regard to execution, evaluation and interpretation. Objective tests can lead to error-free results and enable reliable statements and conclusions. Only an impartial, objective procedure according to comprehensible rules in execution, evaluation and interpretation enables fair test results without systematic advantages or disadvantages. Objectivity is achieved through the most standardized test execution and automated evaluation possible, taking reference values into account.

2.5 Secondary quality criteria and feedback from participants

Participants are asked for feedback after completing the SC questionnaire. In this context, the degree of their agreement with given statements is quantified. The analysis of the feedback data was performed both descriptively and inferentially. Table 2 lists the methods used. The statements to be evaluated are given in Table 14 (see Appendix).

Table 2: Methods for analyzing the feedback data

Measure of location	**Measure of dispersion**	**Inferential Statistics**
Arithmetic mean (aM)	Standard deviation (SD)	U-test both with and without Holm correction
Median (M)	Median of deviations from the median (MAD)	Cohen's d effect size (calculated with aM and SD)

Minimum (Min)		
Maximum (Max)		

The named procedures are adequately described in Hedderich and Sachs (2015). The statements refer to the following secondary quality criteria: Degree of economy, degree of test fairness, degree of acceptance, degree of usefulness, degree of unfalsifiability, degree of transparency, and degree of normalization of the SC measurement procedure. The evaluation of the secondary quality criteria as well as their interpretation are based on Moosbrugger & Kelava (2011).

3. Results

3.1 Validity: Correlations of the constructs

Both weak SPCs (e.g., flexibility and status motivation, r=-0.02) and strong SPCs can be observed (e.g., self-confidence and enthusiasm, r=0.7). It is striking that the construct initiative is negatively correlated with most of the other constructs. However, these SPCs all tend to be weak.

Correlation quantifies the strength of the linear relationship between two traits. In the case of a nonlinear relationship, correlation is thus unsuitable for quantifying it. If it is nevertheless used, it would be possible for a predominantly positive non-linear relationship to be represented by the correlation as a purely negative relationship. This could be the case, for example, if predominantly data were observed in the adverse part of the nonlinear correlation. This could explain the unexpected negative PPCs.

The PPCs turn out to be smaller in magnitude than the SPCs. This is due to the fact that the SPC of two constructs does not take into account interactions with third-party variables (e.g., moderator variables). Also spurious correlations are possible causes for high discrepancies between SPC and PPC.

The PPC show much more negative correlations than the SPC. As an example, consider the negative PPC between flexibility and self-confidence (rPPC=-0.12 and rSPC=0.12). Both the positive and negative correlations can be plausibly explained. Individuals with a high degree of self-confidence face challenges and are convinced that they can master them. The high

level of self-confidence may result, for example, from previous experiences of success (which generated a high self-efficacy expectation). These people sometimes fall back on proven success strategies. However, these do not have to be ideal in order to adequately meet new challenges. The acquired experiential knowledge can thus result in a limitation of flexibility. High self-confidence could thus lead to low flexibility. On the other hand, it is to be expected that persons with a high level of self-confidence, which results from corresponding experiential knowledge to cope with problems, are able to adapt well to new challenges. Only through appropriate flexibility was it originally possible for these individuals to overcome numerous challenges and to acquire the resulting self-confidence. Thus, high flexibility should lead to high self-confidence. The overall result is: high flexibility leads to high self-confidence, which in turn leads to low flexibility. The relationship between the two constructs could therefore be non-linear or linked to a time course. Depending on which part of the time course a participant is in, the correlation could therefore be positive or negative. Thus, both the slightly positive SPC and the slightly negative PPC can be reasonably justified.

Similar reasoning can be found in the other cases where the correlations changed from positive to negative. As a result, both the SPC and PPC can be reasonably interpreted and are consistent with each other.

3.2 Validity: Testing by multiple regression

Based on the SPC (test series 1, Figure 1), it can be seen that the external criterion of job satisfaction correlates most strongly with the constructs (see Table 9 and Table 10). The external criterion stress shows low to medium correlations with a few constructs. Exemplary are the negative correlations between stress and urge to perform (rSPC=-0.18) and between stress and self-confidence (rSPC=-0.19). These are indeed consistent with expectations. Individuals whose achievement drive is strong use their work in the context of self-actualization. If a high degree of self-actualization is achieved through professional success, this can have a stress-reducing effect, for example, in the form of a reward effect or in the form of satisfaction. A high degree of self-confidence can also have a stress-reducing effect. People who have a high degree of self-confidence tend to have a positive attitude toward professional challenges and see them as an opportunity for self-development and self-actualization as well as for interesting experiences. The curiosity and prospect of success and recognition potentially associated with this has a stress-reducing effect. Furthermore, self-

confidence correlates positively with the drive to achieve (rSPC=0.73), which makes the negative correlation between self-confidence and stress appear additionally consistent with expectations.

The external criteria supervisor evaluation and logic value show only marginal correlations to all constructs. This impression is confirmed when the SPCs are considered (see Table 11 and Table 12). The multiple regression analyses also indicate that the external criterion job satisfaction in particular correlates with the constructs (Table 7 and Table 8). The results of the step-up/step-down procedures show that occasionally the external criteria logic value and stress also correlate weakly with the constructs and are suitable to predict them. Supervisor rating, on the other hand, hardly correlates with the constructs. It seems to be unsuitable as an external criterion. The external criteria logic value and stress are each suitable for about half of the constructs. With the exception of the construct initiative, the correlation between job satisfaction and the constructs is always positive, i.e., the higher the level of job satisfaction, the higher the expression of the respective construct. This is indeed in line with expectations. With regard to the construct initiative, further considerations are required. The correlation between initiative and job satisfaction is negative, i.e. the higher the job satisfaction, the lower the drive to act independently and without impetus or pressure from others. Consider a person who has a high level of job satisfaction, but at the same time operates in fixed structures that allow little initiative. He or she acts in response to specific instructions and rules. If, at the same time, the person in question exhibits a low willingness to take risks and a tolerance for uncertainty, clear guidelines and instructions will help her to find her way in everyday working life and thus make her working life easier. Their job satisfaction would therefore be higher than if they were expected to act on their own initiative.

In this context, the work biography is also interesting: was initiative always desired, or was it also fraught with disadvantages? What was the management style of the previous supervisors? How rigid or flexible were or are the hierarchical structures? As a result, it is not possible to postulate a positive or negative correlation between job satisfaction and initiative. In fact, there is a dependency on other variables.

The post-tests of the regression analyses indicate that the model specification was suboptimal. The approach of using SPC or multiple linear regressions makes sense in terms of

content, as this allows the intercorrelations of the external criteria to be taken into account. As a result, the correlations between the constructs and the external criteria are less likely to be overestimated compared to pairwise simple linear regressions. However, it should be noted that this approach is also subject to limitations. Practically, it is impossible to collect and statistically account for all external criteria that are in a dependency relationship with a construct. This is also indicated by the results of the post-test of the multiple regressions (Table 7). The effect of the unconsidered external criteria on the constructs manifests itself in non-random disturbances (so-called outliers or anomalies). Attempts were made to identify and eliminate these as much as possible using robust regression. However, the post-test results still indicate that a large proportion of the models are misspecified. Reasons for this may include missing external criteria, unaccounted for moderation relationships, or a non-linear relationship. In this sense, the multiple regression results are much more informative than looking at SPC or SPC in isolation between construct and one or more external criteria. Measured by the fact that the obtained adjusted coefficients of determination are for the most part in the acceptable (adj. R^2>0.13) to good range (adj. R^2>0.26), the found correlations between the constructs and the external criteria are for the most part to be rated as sufficient to good, in some places even very good. Overall, the results of the analysis indicate a high criterion validity.

3.3 Reliability: Quantification of Internal Consistency

The majority of the constructs quantified by SC have an internal consistency r>0.7 with a sample size of n=19372 (see Appendix Table 13). The internal consistencies of the constructs systematics (r=0.53), self-confidence (r=0.69), initiative (r=0.68), and agility (r=0.64) are to be rated as comparatively low in this context. It should be noted, however, that self-confidence and initiative fall just short of the threshold value of 0.7, which can be interpreted as a sampling effect. Thus, only the constructs systematics and agility show a slightly too low internal consistency.

Removing items did not lead to a significant increase or decrease in alpha values (see Table 13). It can be concluded from this that the scales are internally consistent. The items fit together in terms of content and no item is so essential that the scale is essentially based on only one or a few items.

3.4 Objectivity

The implementation and evaluation within the framework of the SC procedure is automated and computer-assisted. Interviewer effects and influences due to individual evaluation preferences of a consultant can be excluded.

3.4.1 Implementation objectivity

Implementation objectivity means that all participants are tested under comparable, standardized conditions. Since the SC procedure is conducted in a standardized manner, implementation objectivity is given.

3.4.2 Evaluation objectivity

Evaluation objectivity means that the same answers are always evaluated in the same way. The evaluation is automated and standardized. The same evaluation procedure is always used. Therefore the evaluation objectivity is also given.

3.4.3 Objectivity of interpretation

Objectivity of interpretation is ensured if the measured data are interpreted according to comprehensible and transparent rules. In particular, this means that different people must arrive at the same result when evaluating the same data set according to the given rules. On the one hand, the stored reference groups and their statistical distributions are known. On the other hand, the participants are provided with a detailed report of the results. In addition, the results are explained by a consultant specially trained in the SC procedure in order to avoid misinterpretations on the part of the participants. Thus, the objectivity of the interpretation can be considered as guaranteed.

3.5 Secondary quality criteria and feedback from participants

For the present study, feedback responses from a total of 157 participants in the SC process were evaluated. For example, it was determined to what extent the participants could identify with the result and whether the cost-benefit ratio was considered appropriate. Furthermore, the entire consultation process and its results were assessed.

3.5.1 Sample

The feedback data originate from 79 female and 78 male persons. The age distribution is shown in Table 3, and the distribution of hierarchical positions is shown in Table 4.

Table 3: Age distribution feedback study

Age group	16-24	25-34	35-49	50-64
Share in %	8	24	36	32

Table 4: Distribution of hierarchical positions

Level	Without PR	Middle M	Top M	Lower EL	S	Others
Share in %	33	11	8	7	24	7

PR=personal responsibility; M=management; EL=executive level; S=self-employed

The results show that, for example, participants rate the fit of the SC result on a scale of 1 = "does not apply at all" to 5 = "applies very much" on average with 4.41. Thus, the participants find themselves very much in line with the result. They also state that soft skills/potentials were identified (4.64) and that the consultation helped them personally (4.45). They also indicated that they learned about opportunities for improvement (4.50), which they also found helpful (4.59). The cost-benefit ratio is considered reasonable with an average of 4.69. Overall, the consultation receives very good marks based on the analyses: Assessed according to the German school grading system (1 = "very good" to 6 = "poor"), the overall grade for the consultancy based on the analyses averages 1.34. Participants are also very satisfied with the outcome of the consultancy (1.27). All other results of the overall feedback items are summarized in Table 14.

3.5.2 Economy

Test economy refers to the effort and benefit of a procedure. Optimally, a test should achieve a high gain in knowledge with little effort. The participants in the SC procedure state that the effort and benefit were in reasonable proportion to each other. For each result, a feedback discussion is held with a specially trained consultant. The time resource of the duration of the consultation is described as exactly fitting, and the participants also found the appointment arrangements to be very uncomplicated. SC can therefore be regarded as an economical test procedure.

3.5.3 Test Fairness

If a test does not systematically favor or disadvantage certain individuals, this is referred to as test fairness. The SC process does not discriminate with regard to a person's sociocultural, ethnic or gender affiliation, as this information is not included in the calculations of key figures and the derivation of potential and soft skills. Moreover, SC is currently available in 24 languages and provides equivalent conditions for diverse countries and cultures, which would be impossible in the case of systematic disadvantages. It can therefore be assumed that the degree of test fairness is sufficient.

3.5.4 Acceptance

The acceptability of a test describes the extent to which opinions, evaluations or sociopolitical convictions are cited against a test.

The participants state that they can identify with the SC description of results and would also be willing to use the procedure again. Furthermore, there is a high degree of willingness to recommend the test to others. Furthermore, data protection and IT security are guaranteed in accordance with current EU directives. Overall, the acceptance of the SC process can be rated as high.

3.5.5 Usefulness

The usefulness of a test is considered by many researchers to be the most important quality criterion, as it concerns practical relevance. On the basis of the test, it should be possible to answer the question under investigation. In addition, the decisions made on the basis of the test results should produce more benefit than harm.

Within the SC procedure soft skills and potentials should be uncovered. From the feedback of the participants it can be seen that these have been recognized. Furthermore, the participants receive incentives for improvement supplemented by concrete indications of potential. In this context, the consulting supports the achievement of goals and personal development. As a result, the usefulness of the procedure can be considered as given.

3.5.6 Unfalsifiability

This means that a person should not be able to specifically manipulate his or her own test score. The participant's response behavior is evaluated with the aid of an Honesty Factor. The internal control mechanisms are suitable for determining whether there are indications of certain patterns in the participant's response behavior. In detail, contradictory response

behavior, socially desirable response behavior as well as response behavior with a tendency towards the middle can be detected. The Honesty Factor is explicitly listed in the results report. If there are any abnormalities, this offers the opportunity to run through the SC procedure again.

3.5.7 Transparency

This secondary quality criterion includes comprehensible instructions for the test person in advance as well as appropriate feedback on the test and its results. Due to the comprehensible structured procedure and the detailed feedback discussion in which the constructs are explained, it is possible to speak of a transparent procedure.

3.5.8 Normalization

The quality criterion normalization refers to the reference sample (calibration sample) of the test. This is used as a standard of comparison for assessing the measured results. The reference sample should be representative, presented in detail and up-to-date. Standard values should be reviewed for validity every eight years (e.g. Moosbrugger & Höfling, 2007). DNLA has 38 reference groups in which individuals are compared. The norm values are up to date.

3.5.9 Summary

The study shows that both the framework conditions of the consultation and the consultation itself were experienced as very positive. The cooperation with the respective consultant and the results resulting from the process were also rated as very positive. The participants found themselves in their SC results and judged the cost-benefit ratio to be appropriate. The feedback on the procedure and the consulting service can therefore be rated as very good across the board.

Potential for improvement exists, but is marginal (Table 14). Even though the U-tests performed indicate that the optimum has not yet been reached, it must nevertheless be stated that the sample mean values are very close to the optimum ($\mu 0$). In this context, the low standard deviations indicate that the calculated arithmetic mean values adequately represent the totality of the feedback. The high mean satisfaction can thus be considered representative of overall satisfaction.

4. Summary of the results

4.1 Degree of fulfillment of the quality criteria

The internal consistency is predominantly rated as good to very good. The correlations of the constructs with each other as well as the results of the validity tests based on the external criteria indicate a high reliability of the SC procedure. Due to the high degree of automation and standardization, the objectivity in particular is to be emphasized positively. Overall, the quality criteria can be rated as fulfilled to a high degree. Minor potential for improvement exists and should be taken into account for further optimization of the SC procedure.

4.2 Potential for improvement

The scales for measuring the constructs systematics and agility should be revised. In this context, either an expansion of the scale with additional items or the reformulation of items would make sense.

The scale for measuring initiative should be reviewed and at the same time its theoretical connection to the other scales questioned. It may be necessary in future analyses not to postulate a simple positive or negative relationship, but to investigate a moderating relationship through an additional variable if necessary. The results of the statistical analyses would be more robust and the indications of validity clearer.

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6. Appendix

Table 5: SPC with and without tie bar correction

	Flexibilität	Kontakt-fähigkeit	Selbst-sicherheit	Selbstver-trauen	Motivation	Leistungs-drang	Systematik	Einsatz-freude	Initiative	Eigenverant-wortlichkeit	Emotionale Grundhaltung	Misserfolgs-toleranz	Status-motivation	Auftreten	Agilität
Flexibilität		0.47 (0.45, 0.49)	0.55 (0.53, 0.57)	0.12 (0.1, 0.14)	0.23 (0.21, 0.25)	0.51 (0.49, 0.53)	0.3 (0.28, 0.32)	0.24 (0.22, 0.26)	-0.15 (-0.18, -0.13)	0.25 (0.23, 0.27)	0.4 (0.38, 0.42)	0.54 (0.52, 0.56)	-0.02 (-0.03, 0)	0.44 (0.42, 0.46)	0.59 (0.57, 0.6)
Kontakt-fähigkeit	0.47 (0.46, 0.49)		0.65 (0.63, 0.66)	0.25 (0.23, 0.27)	0.42 (0.4, 0.44)	0.61 (0.59, 0.62)	0.39 (0.37, 0.41)	0.36 (0.34, 0.38)	-0.14 (-0.16, -0.12)	0.38 (0.36, 0.4)	0.51 (0.49, 0.53)	0.57 (0.55, 0.59)	0.18 (0.16, 0.21)	0.55 (0.53, 0.56)	0.41 (0.39, 0.43)
Selbst-sicherheit	0.55 (0.54, 0.56)	0.65 (0.64, 0.66)		0.25 (0.23, 0.27)	0.39 (0.37, 0.41)	0.73 (0.72, 0.74)	0.44 (0.42, 0.46)	0.33 (0.31, 0.35)	-0.15 (-0.17, -0.13)	0.4 (0.38, 0.42)	0.57 (0.55, 0.58)	0.73 (0.72, 0.74)	0.09 (0.07, 0.11)	0.65 (0.64, 0.67)	0.45 (0.43, 0.47)
Selbst-vertrauen	0.12 (0.1, 0.13)	0.25 (0.24, 0.26)	0.25 (0.24, 0.26)		0.4 (0.38, 0.42)	0.29 (0.27, 0.31)	0.11 (0.09, 0.13)	0.7 (0.69, 0.72)	0.33 (0.3, 0.35)	0.37 (0.35, 0.39)	0.12 (0.1, 0.14)	0.3 (0.28, 0.32)	0.45 (0.43, 0.47)	0.35 (0.33, 0.37)	0.41 (0.39, 0.43)
Motivation	0.23 (0.22, 0.24)	0.42 (0.41, 0.44)	0.39 (0.38, 0.4)	0.4 (0.38, 0.41)		0.37 (0.35, 0.39)	0.37 (0.35, 0.39)	0.64 (0.63, 0.65)	-0.07 (-0.09, -0.05)	0.47 (0.45, 0.49)	0.49 (0.47, 0.51)	0.36 (0.33, 0.38)	0.24 (0.21, 0.26)	0.27 (0.25, 0.29)	0.36 (0.33, 0.38)
Leistungs-drang	0.51 (0.5, 0.52)	0.61 (0.6, 0.62)	0.73 (0.73, 0.74)	0.29 (0.28, 0.3)	0.37 (0.36, 0.38)		0.43 (0.41, 0.45)	0.35 (0.33, 0.37)	-0.09 (-0.11, -0.07)	0.36 (0.34, 0.38)	0.56 (0.54, 0.58)	0.68 (0.67, 0.69)	0.12 (0.1, 0.14)	0.65 (0.64, 0.67)	0.45 (0.43, 0.47)
Systematik	0.3 (0.29, 0.32)	0.39 (0.38, 0.4)	0.44 (0.43, 0.45)	0.11 (0.09, 0.12)	0.37 (0.36, 0.39)	0.43 (0.41, 0.44)		0.26 (0.24, 0.28)	-0.23 (-0.25, -0.2)	0.37 (0.35, 0.39)	0.48 (0.46, 0.5)	0.36 (0.34, 0.38)	0.06 (0.04, 0.08)	0.31 (0.29, 0.33)	0.25 (0.23, 0.27)
Einsatz-freude	0.24 (0.23, 0.26)	0.36 (0.35, 0.37)	0.33 (0.31, 0.34)	0.7 (0.7, 0.71)	0.64 (0.63, 0.65)	0.35 (0.34, 0.36)	0.26 (0.25, 0.27)		0.15 (0.13, 0.17)	0.49 (0.47, 0.5)	0.33 (0.31, 0.35)	0.35 (0.33, 0.37)	0.39 (0.37, 0.41)	0.32 (0.29, 0.34)	0.47 (0.45, 0.49)
Initiative	-0.15 (-0.17, -0.14)	-0.14 (-0.15, -0.13)	-0.15 (-0.16, -0.13)	0.33 (0.31, 0.34)	-0.07 (-0.08, -0.05)	-0.09 (-0.1, -0.07)	-0.23 (-0.24, -0.21)	0.15 (0.14, 0.17)		-0.01 (-0.03, 0.01)	-0.26 (-0.28, -0.24)	-0.08 (-0.1, -0.06)	0.18 (0.16, 0.2)	-0.01 (-0.02, 0.01)	0.19 (0.17, 0.21)
Eigenverant-wortlichkeit	0.25 (0.24, 0.26)	0.38 (0.37, 0.39)	0.4 (0.39, 0.41)	0.37 (0.36, 0.38)	0.47 (0.46, 0.48)	0.36 (0.35, 0.38)	0.37 (0.36, 0.38)	0.49 (0.48, 0.5)	-0.01 (-0.02, 0)		0.36 (0.34, 0.38)	0.39 (0.37, 0.41)	0.27 (0.25, 0.29)	0.26 (0.24, 0.28)	0.39 (0.37, 0.41)
Emotionale Grundhaltung	0.4 (0.39, 0.41)	0.51 (0.5, 0.52)	0.57 (0.56, 0.58)	0.12 (0.11, 0.14)	0.49 (0.48, 0.5)	0.56 (0.55, 0.57)	0.48 (0.47, 0.49)	0.33 (0.32, 0.34)	-0.26 (-0.28, -0.25)	0.36 (0.35, 0.37)		0.46 (0.44, 0.48)	0 (-0.01, 0.01)	0.41 (0.38, 0.43)	0.3 (0.28, 0.32)
Misserfolgs-toleranz	0.54 (0.53, 0.55)	0.57 (0.56, 0.58)	0.73 (0.72, 0.74)	0.3 (0.28, 0.31)	0.36 (0.34, 0.37)	0.68 (0.67, 0.69)	0.36 (0.34, 0.37)	0.35 (0.34, 0.37)	-0.08 (-0.1, -0.07)	0.39 (0.38, 0.4)	0.46 (0.45, 0.47)		0.14 (0.11, 0.16)	0.58 (0.56, 0.59)	0.48 (0.46, 0.5)
Status-motivation	-0.02 (-0.03, 0)	0.18 (0.17, 0.2)	0.09 (0.08, 0.11)	0.45 (0.44, 0.46)	0.24 (0.22, 0.25)	0.12 (0.1, 0.13)	0.06 (0.05, 0.08)	0.39 (0.38, 0.41)	0.18 (0.16, 0.19)	0.27 (0.26, 0.28)	0 (-0.01, 0.01)	0.14 (0.12, 0.15)		0.05 (0.04, 0.07)	0.18 (0.16, 0.2)
Auftreten	0.44 (0.43, 0.45)	0.55 (0.54, 0.56)	0.65 (0.64, 0.66)	0.35 (0.34, 0.36)	0.27 (0.26, 0.29)	0.65 (0.64, 0.66)	0.31 (0.3, 0.33)	0.32 (0.3, 0.33)	-0.01 (-0.02, 0.01)	0.26 (0.24, 0.27)	0.41 (0.39, 0.42)	0.58 (0.57, 0.59)	0.05 (0.04, 0.07)		0.42 (0.4, 0.44)
Agilität	0.59 (0.58, 0.6)	0.41 (0.4, 0.42)	0.45 (0.44, 0.46)	0.41 (0.4, 0.42)	0.36 (0.34, 0.37)	0.45 (0.44, 0.46)	0.25 (0.24, 0.27)	0.47 (0.46, 0.48)	0.19 (0.18, 0.2)	0.39 (0.37, 0.4)	0.3 (0.28, 0.31)	0.48 (0.47, 0.49)	0.18 (0.17, 0.19)	0.42 (0.41, 0.43)	

Confidence intervals below (above) the diagonal were calculated without (with) Holm correction

Table 6: PPC with and without Holm correction

	Flexibilität	Kontakt-fähigkeit	Selbst-sicherheit	Selbst-vertrauen	Motivation	Leistungs-drang	Systematik	Einsatz-freude	Initiative	Eigenverant-wortlichkeit	Emotionale Grundhaltung	Misserfolgs-toleranz	Status-motivation	Auftreten	Agilität
Flexibilität		0.1 (0.08, 0.11)	0.09 (0.08, 0.1)	-0.12 (-0.13, -0.1)	-0.1 (-0.12, -0.09)	0.04 (0.03, 0.06)	0 (-0.01, 0.02)	0.06 (0.05, 0.08)	-0.18 (-0.2, -0.17)	-0.06 (-0.07, -0.04)	0.04 (0.03, 0.06)	0.14 (0.13, 0.16)	-0.09 (-0.1, -0.07)	0.03 (0.02, 0.04)	0.48 (0.47, 0.49)
Kontakt-fähigkeit	0.1 (0.08, 0.11)		0.16 (0.15, 0.17)	-0.05 (-0.06, -0.03)	0.11 (0.1, 0.12)	0.1 (0.09, 0.11)	0.02 (0.01, 0.04)	0.01 (0, 0.02)	-0.06 (-0.07, -0.05)	0.05 (0.03, 0.06)	0.09 (0.08, 0.11)	0.06 (0.04, 0.07)	0.15 (0.13, 0.16)	0.16 (0.15, 0.17)	0.02 (0, 0.03)
Selbst-sicherheit	0.09 (0.08, 0.1)	0.16 (0.15, 0.17)		0 (-0.02, 0.01)	0.03 (0.02, 0.05)	0.21 (0.2, 0.22)	0.06 (0.05, 0.08)	-0.05 (-0.07, -0.04)	-0.04 (-0.05, -0.02)	0.07 (0.06, 0.08)	0.12 (0.11, 0.13)	0.31 (0.3, 0.32)	0 (-0.02, 0.01)	0.21 (0.2, 0.22)	0 (-0.02, 0.01)
Selbst-vertrauen	-0.12 (-0.13, -0.1)	-0.05 (-0.06, -0.03)	0 (-0.02, 0.01)		-0.02 (-0.04, -0.01)	0.03 (0.01, 0.04)	-0.06 (-0.07, -0.04)	0.51 (0.5, 0.52)	0.2 (0.18, 0.21)	0.05 (0.04, 0.07)	-0.09 (-0.11, -0.08)	0.04 (0.03, 0.06)	0.24 (0.22, 0.25)	0.22 (0.2, 0.23)	0.09 (0.07, 0.1)
Motivation	-0.1 (-0.12, -0.09)	0.11 (0.1, 0.12)	0.03 (0.02, 0.05)	-0.02 (-0.04, -0.01)		-0.02 (-0.04, -0.01)	0.09 (0.07, 0.1)	0.42 (0.41, 0.43)	-0.08 (-0.1, -0.07)	0.11 (0.09, 0.12)	0.23 (0.22, 0.25)	0 (-0.01, 0.02)	0 (-0.01, 0.02)	-0.07 (-0.08, -0.05)	0.06 (0.04, 0.07)
Leistungs-drang	0.04 (0.03, 0.06)	0.1 (0.09, 0.11)	0.21 (0.2, 0.22)	0.03 (0.01, 0.04)	-0.02 (-0.04, -0.01)		0.08 (0.07, 0.1)	-0.01 (-0.03, 0)	0.03 (0.02, 0.05)	0 (-0.02, 0.01)	0.19 (0.18, 0.21)	0.21 (0.2, 0.22)	0.04 (0.02, 0.05)	0.24 (0.23, 0.26)	0.04 (0.02, 0.05)
Systematik	0 (-0.01, 0.02)	0.02 (0.01, 0.04)	0.06 (0.05, 0.08)	-0.06 (-0.07, -0.04)	0.09 (0.07, 0.1)	0.08 (0.07, 0.1)		0.01 (0, 0.03)	-0.13 (-0.14, -0.11)	0.16 (0.14, 0.17)	0.17 (0.15, 0.18)	-0.03 (-0.04, -0.01)	0.01 (0, 0.03)	0.02 (0.01, 0.04)	0.02 (0.01, 0.04)
Einsatz-freude	0.06 (0.05, 0.08)	0.01 (0, 0.02)	-0.05 (-0.07, -0.04)	0.51 (0.5, 0.52)	0.42 (0.41, 0.43)	-0.01 (-0.03, 0)	0.01 (0, 0.03)		0.02 (0.01, 0.04)	0.12 (0.11, 0.14)	0.08 (0.06, 0.09)	0 (-0.01, 0.02)	0.1 (0.08, 0.11)	-0.02 (-0.03, -0.01)	0.1 (0.08, 0.11)
Initiative	-0.18 (-0.2, -0.17)	-0.06 (-0.07, -0.05)	-0.04 (-0.05, -0.02)	0.2 (0.18, 0.21)	-0.08 (-0.1, -0.07)	0.03 (0.02, 0.05)	-0.13 (-0.14, -0.11)	0.02 (0.01, 0.04)		-0.02 (-0.04, -0.01)	-0.13 (-0.15, -0.12)	-0.02 (-0.03, -0.01)	0.03 (0.02, 0.04)	0.04 (0.03, 0.05)	0.28 (0.27, 0.29)
Eigenverant-wortlichkeit	-0.06 (-0.07, -0.04)	0.05 (0.03, 0.06)	0.07 (0.06, 0.08)	0.05 (0.04, 0.07)	0.11 (0.09, 0.12)	0 (-0.02, 0.01)	0.16 (0.14, 0.17)	0.12 (0.11, 0.14)	-0.02 (-0.04, -0.01)		0.05 (0.03, 0.06)	0.08 (0.07, 0.09)	0.09 (0.08, 0.11)	-0.1 (-0.11, -0.08)	0.12 (0.11, 0.13)
Emotionale Grundhaltung	0.04 (0.03, 0.06)	0.09 (0.08, 0.11)	0.12 (0.11, 0.13)	-0.09 (-0.11, -0.08)	0.23 (0.22, 0.25)	0.19 (0.18, 0.21)	0.17 (0.15, 0.18)	0.08 (0.06, 0.09)	-0.13 (-0.15, -0.12)	0.05 (0.03, 0.06)		-0.03 (-0.04, -0.01)	-0.12 (-0.13, -0.1)	0 (-0.02, 0.01)	-0.03 (-0.04, -0.01)
Misserfolgs-toleranz	0.14 (0.13, 0.16)	0.06 (0.04, 0.07)	0.31 (0.3, 0.32)	0.04 (0.03, 0.06)	0 (-0.01, 0.02)	0.21 (0.2, 0.22)	-0.03 (-0.04, -0.01)	0 (-0.01, 0.02)	-0.02 (-0.03, -0.01)	0.08 (0.07, 0.09)	-0.03 (-0.04, -0.01)		0.03 (0.01, 0.04)	0.06 (0.05, 0.08)	0.05 (0.04, 0.07)
Status-motivation	-0.09 (-0.1, -0.07)	0.15 (0.13, 0.16)	0 (-0.02, 0.01)	0.24 (0.22, 0.25)	0 (-0.01, 0.02)	0.04 (0.02, 0.05)	0.01 (0, 0.03)	0.1 (0.08, 0.11)	0.03 (0.02, 0.04)	0.09 (0.08, 0.11)	-0.12 (-0.13, -0.1)	0.03 (0.01, 0.04)		-0.14 (-0.16, -0.13)	0 (-0.02, 0.01)
Auftreten	0.03 (0.02, 0.04)	0.16 (0.15, 0.17)	0.21 (0.2, 0.22)	0.22 (0.2, 0.23)	-0.07 (-0.08, -0.05)	0.24 (0.23, 0.26)	0.02 (0.01, 0.04)	-0.02 (-0.03, -0.01)	0.04 (0.03, 0.05)	-0.1 (-0.11, -0.08)	0 (-0.02, 0.01)	0.06 (0.05, 0.08)	-0.14 (-0.16, -0.13)		0.03 (0.02, 0.05)
Agilität	0.48 (0.47, 0.49)	0.02 (0, 0.03)	0 (-0.02, 0.01)	0.09 (0.07, 0.1)	0.06 (0.04, 0.07)	0.04 (0.02, 0.05	0.02 (0.01, 0.04)	0.1 (0.08, 0.11)	0.28 (0.27, 0.29)	0.12 (0.11, 0.13)	-0.03 (-0.04, -0.01)	0.05 (0.04, 0.07)	0 (-0.02, 0.01)	0.03 (0.02, 0.05)	

Confidence intervals below (above) the diagonal were calculated without (with) Holm correction

Table 7: Regression of constructs on external criteria (unadjusted)

	Intercept	Logikwert	Arbeitszu-friedenheit	Stress	Vorgesetzten-bewertung	adj. R2	Shapiro-Wilk Test	White Test	Durbin-Watson	RESET	MAX VIF
Flexibilität	2.485 (2.262 , 2.709)		0.446 (0.399 , 0.492)			0.21	0	0.001	0.258	0.344	
Kontakt-Fähigkeit	2.592 (2.282 , 2.903)	0.013 (-0.004 , 0.03)	0.49 (0.439 , 0.542)	-0.001 (-0.002 , 0)		0.233	0	0	0.773	0.004	1.046
Selbst-sicherheit	1.292 (1.023 , 1.561)		0.637 (0.585 , 0.69)	-0.001 (-0.002 , -0.001)		0.33	0	0	0.004	0.03	1.044
Selbst-vertrauen	3.194 (2.79 , 3.598)	0.014 (-0.005 , 0.032)	0.07 (0.016 , 0.124)		0.125 (-0.016 , 0.266)	0.007	0	0.278	0.043	0.794	1.003
Motivation	2.703 (2.427 , 2.979)		0.352 (0.298 , 0.405)	0.001 (0 , 0.002)		0.111	0	0	0.085	0	1.044
Leistungs-Drang	2.328 (2.032 , 2.623)	0.014 (-0.003 , 0.03)	0.482 (0.433 , 0.531)	-0.001 (-0.002 , 0)		0.249	0	0.741	0.085	0.116	1.046
Systematik	2.529 (2.309 , 2.748)	0.023 (0.01 , 0.036)	0.354 (0.315 , 0.392)			0.21	0	0.21	0.151	0.001	1.002
Einsatz-Freude	3.08 (2.778 , 3.382)	0.014 (-0.004 , 0.032)	0.266 (0.214 , 0.319)			0.072	0	0.108	0.142	0.01	1.002
Initiative	5.102 (4.812 , 5.391)		-0.26 (-0.302 , -0.217)		0.098 (-0.013 , 0.209)	0.1	0	0.086	0.005	0.012	1.001
Eigenverant-wortlichkeit	2.216 (1.939 , 2.493)		0.426 (0.368 , 0.484)			0.136	0	0.032	0.022	0.248	
Emotionale Grundhaltung	1.724 (1.443 , 2.006)		0.615 (0.561 , 0.67)	-0.001 (-0.002 , 0)		0.289	0	0	0	0	1.044
Misserfolgs-toleranz	2.421 (2.142 , 2.701)		0.492 (0.438 , 0.546)	-0.001 (-0.002 , 0)		0.214	0	0.003	0.072	0.723	1.044
Status-motivation	4.116 (3.843 , 4.388)		0.075 (0.018 , 0.132)			0.004	0	0.554	0.209	0.886	
Selbst-sicherheit	1.292 (1.023 , 1.561)		0.637 (0.585 , 0.69)	-0.001 (-0.002 , -0.001)		0.33	0	0	0.004	0.03	1.044
Auftreten	2.287 (1.961 , 2.613)	0.018 (-0.001 , 0.037)	0.401 (0.344 , 0.458)			0.131	0	0.007	0.03	0.578	1.002
Agilität	4.065 (3.821 , 4.309)		0.182 (0.13 , 0.233)			0.035	0	0.781	0.406	0.493	

Indicated are the final OLS regression models for test series 1 after the step-up/step-down procedure (Figure 1). The external criteria logic value, job satisfaction, stress, and supervisor evaluation are the independent variables and the constructs are the dependent variables. For the post-tests (Shapiro-Wilk, White, Durbin-Watson, and RESET), only the p-values were reported. VIF could only be calculated when more than one independent variable was used.

Table 8: Regression of constructs on external criteria (adjusted)

	Intercept	Logikwert	Arbeitszu-friedenheit	Stress	Vorgesetzten-Bewertung	adj. R2	Shapiro-Wilk Test	White Test	Durbin-Watson	RESET	MAX VIF
Flexibilität	2.453 (2.23 , 2.676)		0.452 (0.405 , 0.499)			0.215	0	0	0.351	0.741	
Kontakt-fähigkeit	2.592 (2.282 , 2.903)	0.013 (-0.004 , 0.03)	0.49 (0.439 , 0.542)	-0.001 (-0.002 , 0)		0.233	0	0	0.773	0.004	1.046
Selbst-sicherheit	1.292 (1.023 , 1.561)		0.637 (0.585 , 0.69)	-0.001 (-0.002 , -0.001)		0.33	0	0	0.004	0.03	1.044
Selbst-vertrauen	3.194 (2.79 , 3.598)	0.014 (-0.005 , 0.032)	0.07 (0.016 , 0.124)		0.125 (-0.016 , 0.266)	0.007	0	0.278	0.043	0.794	1.003
Motivation	2.615 (2.341 , 2.89)		0.372 (0.319 , 0.426)	0.001 (0 , 0.001)		0.125	0	0.031	0.048	0.009	1.038
Leistungs-drang	2.293 (1.997 , 2.588)	0.013 (-0.003 , 0.03)	0.489 (0.44 , 0.538)	-0.001 (-0.002 , 0)		0.254	0	0.756	0.109	0.195	1.047
Systematik	2.529 (2.309 , 2.748)	0.023 (0.01 , 0.036)	0.354 (0.315 , 0.392)			0.21	0	0.21	0.151	0.001	1.002
Einsatz-freude	3.08 (2.778 , 3.382)	0.014 (-0.004 , 0.032)	0.266 (0.214 , 0.319)			0.072	0	0.108	0.142	0.01	1.002
Initiative	4 (4 , 4)					0.497	0	0.827	0		1.045
Eigenver-antwortlichkeit	2.216 (1.939 , 2.493)		0.426 (0.368 , 0.484)			0.136	0	0.032	0.022	0.248	
Emotionale Grundhaltung	1.678 (1.397 , 1.959)		0.624 (0.569 , 0.678)	-0.001 (-0.002 , 0)		0.294	0	0.002	0	0	1.046
Misserfolgs-toleranz	2.381 (2.101 , 2.661)		0.499 (0.445 , 0.553)	-0.001 (-0.002 , 0)		0.218	0	0.009	0.085	0.551	1.046
Status-motivation	4.116 (3.843 , 4.388)		0.075 (0.018 , 0.132)			0.004	0	0.554	0.209	0.886	
Selbst-sicherheit	1.292 (1.023 , 1.561)		0.637 (0.585 , 0.69)	-0.001 (-0.002 , -0.001)		0.33	0	0	0.004	0.03	1.044
Auftreten	2.287 (1.961 , 2.613)	0.018 (-0.001 , 0.037)	0.401 (0.344 , 0.458)			0.131	0	0.007	0.03	0.578	1.002
Agilität	4.065 (3.821 , 4.309)		0.182 (0.13 , 0.233)			0.035	0	0.781	0.406	0.493	

Indicated are the final OLS regression models for test series 2 following the step-up/step-down procedure (Figure 1). The external criteria logic value, job satisfaction, stress, and supervisor evaluation are the independent variables and the constructs are the dependent variables. For the post-tests (Shapiro-Wilk, White, Durbin-Watson, and RESET), only the p-values were reported. VIF could only be calculated when more than one independent variable was used.

Table 9: SPC between the constructs and the external criteria (unadjusted)

	Logikwert	Arbeits-zufriedenheit	Stress	Vorgesetzten-bewertung
Flexibilität	0.02 (-0.04 ,0.07)	0.46 (0.41 ,0.5)	-0.11 (-0.16 ,-0.05)	-0.03 (-0.08 ,0.02)
Kontaktfähigkeit	0.06 (0 ,0.11)	0.48 (0.44 ,0.52)	-0.16 (-0.21 ,-0.11)	-0.01 (-0.06 ,0.05)
Selbstsicherheit	0.04 (-0.01 ,0.1)	0.57 (0.53 ,0.61)	-0.19 (-0.24 ,-0.14)	-0.03 (-0.08 ,0.03)
Self-confidence	0.04 (-0.01 ,0.1)	0.07 (0.02 ,0.12)	0 (-0.06 ,0.05)	0.05 (-0.01 ,0.1)
Motivation	0.04 (-0.02 ,0.09)	0.33 (0.28 ,0.38)	-0.01 (-0.07 ,0.04)	0 (-0.05 ,0.06)
Leistungsdrang	0.06 (0.01 ,0.11)	0.49 (0.45 ,0.53)	-0.18 (-0.23 ,-0.13)	0 (-0.06 ,0.05)
Systematik	0.1 (0.05 ,0.16)	0.45 (0.41 ,0.49)	-0.1 (-0.15 ,-0.05)	-0.04 (-0.09 ,0.02)
Einsatzfreude	0.05 (0 ,0.1)	0.27 (0.22 ,0.32)	-0.04 (-0.09 ,0.02)	0.01 (-0.04 ,0.07)
Initiative	0.01 (-0.04 ,0.07)	-0.32 (-0.36 ,-0.27)	0.07 (0.02 ,0.12)	0.06 (0 ,0.11)
Eigenverantwortlichkeit	0.01 (-0.05 ,0.06)	0.37 (0.32 ,0.42)	-0.09 (-0.15 ,-0.04)	-0.01 (-0.06 ,0.05)
Emotionale Grundhaltung	0.02 (-0.04 ,0.07)	0.54 (0.5 ,0.57)	-0.16 (-0.21 ,-0.1)	-0.03 (-0.08 ,0.03)
Misserfolgstoleranz	0.04 (-0.02 ,0.09)	0.46 (0.42 ,0.5)	-0.16 (-0.21 ,-0.1)	0.01 (-0.04 ,0.07)
Statusmotivation	0.01 (-0.05 ,0.06)	0.07 (0.02 ,0.12)	-0.01 (-0.06 ,0.05)	0.01 (-0.04 ,0.07)
Auftreten	0.06 (0.01 ,0.12)	0.36 (0.31 ,0.41)	-0.08 (-0.14 ,-0.03)	0.02 (-0.04 ,0.07)
Agilität	0.04 (-0.01 ,0.09)	0.19 (0.14 ,0.24)	-0.03 (-0.08 ,0.02)	0.02 (-0.04 ,0.07)

The SPCs for test series 1 are given (Figure 1). The 95% confidence intervals are given in parentheses. The confidence intervals above the diagonal were adjusted by a Holm procedure. Angegeben sind die SPC für Testreihe 1 (siehe).

Table 10: SPC between the constructs and the external criteria (adjusted)

	Logikwert	Arbeits-zufriedenheit	Stress	Vorgesetzten-bewertung
Flexibilität	0.02 (-0.03 ,0.07)	0.46 (0.42 ,0.51)	-0.12 (-0.17 ,-0.06)	-0.03 (-0.08 ,0.03)
Kontaktfähigkeit	0.06 (0 ,0.11)	0.48 (0.44 ,0.52)	-0.16 (-0.21 ,-0.11)	-0.01 (-0.06 ,0.05)
Selbstsicherheit	0.04 (-0.01 ,0.1)	0.57 (0.53 ,0.61)	-0.19 (-0.24 ,-0.14)	-0.03 (-0.08 ,0.03)
Self-confidence	0.04 (-0.01 ,0.1)	0.07 (0.02 ,0.12)	0 (-0.06 ,0.05)	0.05 (-0.01 ,0.1)
Motivation	0.04 (-0.01 ,0.1)	0.35 (0.3 ,0.4)	-0.03 (-0.08 ,0.03)	0 (-0.05 ,0.06)
Leistungsdrang	0.06	0.5	-0.18	0

	(0 ,0.11)	(0.46 ,0.54)	(-0.23 ,-0.13)	(-0.06 ,0.05)
Systematik	0.1 (0.05 ,0.16)	0.45 (0.41 ,0.49)	-0.1 (-0.15 ,-0.05)	-0.04 (-0.09 ,0.02)
Einsatzfreude	0.05 (0 ,0.1)	0.27 (0.22 ,0.32)	-0.04 (-0.09 ,0.02)	0.01 (-0.04 ,0.07)
Initiative	NA (NA ,NA)	NA (NA ,NA)	NA (NA ,NA)	NA (NA ,NA)
Eigenverantwortlichkeit	0.01 (-0.05 ,0.06)	0.37 (0.32 ,0.42)	-0.09 (-0.15 ,-0.04)	-0.01 (-0.06 ,0.05)
Emotionale Grundhaltung	0.02 (-0.04 ,0.07)	0.54 (0.5 ,0.58)	-0.16 (-0.21 ,-0.1)	-0.03 (-0.08 ,0.03)
Misserfolgstoleranz	0.04 (-0.02 ,0.09)	0.46 (0.42 ,0.51)	-0.16 (-0.21 ,-0.1)	0.01 (-0.04 ,0.07)
Statusmotivation	0.01 (-0.05 ,0.06)	0.07 (0.02 ,0.12)	-0.01 (-0.06 ,0.05)	0.01 (-0.04 ,0.07)
Auftreten	0.06 (0.01 ,0.12)	0.36 (0.31 ,0.41)	-0.08 (-0.14 ,-0.03)	0.02 (-0.04 ,0.07)
Agilität	0.04 (-0.01 ,0.09)	0.19 (0.14 ,0.24)	-0.03 (-0.08 ,0.02)	0.02 (-0.04 ,0.07)

The SPCs for test series 2 are given (Figure 1). The 95% confidence intervals are given in parentheses. The confidence intervals above the diagonal were adjusted by a Holm procedure.

Table 11: SPC between the constructs and the external criteria (unadjusted)

	Logikwert	Arbeits-zufriedenheit	Stress	Vorgesetzten-bewertung
Flexibilität	0 (-0.06 ,0.05)	0.44 (0.39 ,0.48)	-0.01 (-0.07 ,0.04)	-0.02 (-0.07 ,0.04)
Kontaktfähigkeit	0.04 (-0.01 ,0.09)	0.45 (0.41 ,0.49)	-0.07 (-0.12 ,-0.02)	0.01 (-0.04 ,0.07)
Selbstsicherheit	0.02 (-0.03 ,0.08)	0.54 (0.5 ,0.58)	-0.09 (-0.14 ,-0.03)	-0.01 (-0.06 ,0.04)
Self-confidence	0.04 (-0.01 ,0.09)	0.07 (0.01 ,0.12)	0.01 (-0.05 ,0.06)	0.05 (-0.01 ,0.1)
Motivation	0.02 (-0.03 ,0.08)	0.33 (0.28 ,0.37)	0.06 (0 ,0.11)	0.01 (-0.04 ,0.07)
Leistungsdrang	0.05 (-0.01 ,0.1)	0.46 (0.42 ,0.5)	-0.09 (-0.14 ,-0.04)	0.02 (-0.04 ,0.07)
Systematik	0.1 (0.04 ,0.15)	0.43 (0.39 ,0.47)	-0.01 (-0.06 ,0.05)	-0.02 (-0.08 ,0.03)
Einsatzfreude	0.04 (-0.01 ,0.09)	0.26 (0.21 ,0.31)	0.02 (-0.04 ,0.07)	0.02 (-0.03 ,0.07)
Initiative	0.03 (-0.03 ,0.08)	-0.3 (-0.35 ,-0.25)	0 (-0.05 ,0.06)	0.05 (-0.01 ,0.1)
Eigenverantwortlichkeit	-0.01 (-0.06 ,0.05)	0.35 (0.3 ,0.4)	-0.02 (-0.07 ,0.04)	0.01 (-0.05 ,0.06)
Emotionale Grundhaltung	-0.01 (-0.06 ,0.05)	0.51 (0.47 ,0.55)	-0.05 (-0.11 ,0)	-0.01 (-0.06 ,0.04)
Misserfolgstoleranz	0.02 (-0.03 ,0.08)	0.43 (0.39 ,0.47)	-0.07 (-0.13 ,-0.02)	0.03 (-0.02 ,0.09)
Statusmotivation	0.01	0.07	0.01	0.01

	(-0.05 ,0.06)	(0.02 ,0.12)	(-0.05 ,0.06)	(-0.04 ,0.07)
Auftreten	0.05 (0 ,0.1)	0.34 (0.3 ,0.39)	-0.01 (-0.06 ,0.05)	0.03 (-0.02 ,0.08)
Agilität	0.03 (-0.02 ,0.09)	0.18 (0.13 ,0.23)	0.01 (-0.05 ,0.06)	0.03 (-0.03 ,0.08)

The SPC for test series 1 are given (Figure 1). The 95% confidence intervals are given in parentheses. The confidence intervals above the diagonal were adjusted by a Holm procedure.

Table 12: SPC between the constructs and the external criteria (adjusted)

	Logikwert	Arbeits-zufriedenheit	Stress	Vorgesetzten-bewertung
Flexibilität	0 (-0.05 ,0.06)	0.44 (0.4 ,0.49)	-0.03 (-0.08 ,0.03)	-0.01 (-0.07 ,0.04)
Kontaktfähigkeit	0.04 (-0.01 ,0.09)	0.45 (0.41 ,0.49)	-0.07 (-0.12 ,-0.02)	0.01 (-0.04 ,0.07)
Selbstsicherheit	0.02 (-0.03 ,0.08)	0.54 (0.5 ,0.58)	-0.09 (-0.14 ,-0.03)	-0.01 (-0.06 ,0.04)
Self-confidence	0.04 (-0.01 ,0.09)	0.07 (0.01 ,0.12)	0.01 (-0.05 ,0.06)	0.05 (-0.01 ,0.1)
Motivation	0.03 (-0.02 ,0.08)	0.35 (0.3 ,0.39)	0.04 (-0.01 ,0.1)	0.01 (-0.04 ,0.07)
Leistungsdrang	0.04 (-0.01 ,0.1)	0.47 (0.42 ,0.51)	-0.09 (-0.14 ,-0.03)	0.02 (-0.03 ,0.07)
Systematik	0.1 (0.04 ,0.15)	0.43 (0.39 ,0.47)	-0.01 (-0.06 ,0.05)	-0.02 (-0.08 ,0.03)
Einsatzfreude	0.04 (-0.01 ,0.09)	0.26 (0.21 ,0.31)	0.02 (-0.04 ,0.07)	0.02 (-0.03 ,0.07)
Initiative	0.02 (-0.05 ,0.09)	0.02 (-0.05 ,0.09)	0.03 (-0.04 ,0.1)	0.02 (-0.05 ,0.09)
Eigenverantwortlichkeit	-0.01 (-0.06 ,0.05)	0.35 (0.3 ,0.4)	-0.02 (-0.07 ,0.04)	0.01 (-0.05 ,0.06)
Emotionale Grundhaltung	-0.01 (-0.06 ,0.05)	0.51 (0.47 ,0.55)	-0.05 (-0.1 ,0)	-0.01 (-0.06 ,0.05)
Misserfolgstoleranz	0.02 (-0.03 ,0.08)	0.44 (0.39 ,0.48)	-0.07 (-0.12 ,-0.01)	0.03 (-0.02 ,0.09)
Statusmotivation	0.01 (-0.05 ,0.06)	0.07 (0.02 ,0.12)	0.01 (-0.05 ,0.06)	0.01 (-0.04 ,0.07)
Auftreten	0.05 (0 ,0.1)	0.34 (0.3 ,0.39)	-0.01 (-0.06 ,0.05)	0.03 (-0.02 ,0.08)
Agilität	0.03 (-0.02 ,0.09)	0.18 (0.13 ,0.23)	0.01 (-0.05 ,0.06)	0.03 (-0.03 ,0.08)

The SPC for test series 2 are given (see Figure 1). The 95% confidence intervals are given in brackets. The confidence intervals above the diagonal were adjusted by a Holm procedure.

Table 13: Internal consistency according to Cronbach's alpha

	Cronbach Alpha	Kleinstes Alpha bei drop	Größtes Alpha bei drop
Arbeitszufriedenheit	0,76	0,73	0,77
Auftreten	0,79	0,75	0,82
Selbstsicherheit	0,8	0,77	0,81
Systematik	0,53	0,45	0,54
Statusmotivation	0,73	0,68	0,73
Self-confidence	0,69	0,66	0,72
Motivation	0,71	0,68	0,72
Kritikstabilitaet	0,83	0,81	0,85
Leistungsdrang	0,79	0,75	0,78
Kontaktfaehigkeit	0,81	0,79	0,82
Initiative	0,68	0,63	0,67
Flexibilitaet	0,73	0,7	0,76
Emotionale Grundhaltung	0,76	0,73	0,79
Einsatzfreude	0,74	0,71	0,77
Eigenverantwortlichkeit	0,77	0,73	0,76
Agilität	0,64	0,58	0,65

Drop means that an item of a scale is removed. Cronbach's alpha is then calculated for the scale shortened by the item in question. This is done once for all items. It is sufficient to look at the largest changes in alpha value (i.e., decreases and increases) due to the omission of an item.

Table 14: Evaluation of the feedback study

Feedbackitem und statistische Kenngrößen	**Wert**
Das Gespräch fand an einem ruhigen und ungestörten Ort statt.	
aM (SD)	4.9 (0.3)
Median (MAD, [Min,Max])	5 (0, [4 , 5])
p-Wert (Holm)	0.0012
Cohens d	0.33
fehlende Werte	1

Die Dauer des Beratungsgesprächs fand ich... (5 viel zu lang - 4 etwas zu lang - 3 genau passend - 2 etwas zu kurz - 1 viel zu kurz).	
aM (SD)	3.04 (0.22)
Median (MAD, [Min,Max])	3 (0, [2 , 4])
p-Wert (Holm)	0.0822
Cohens d	0.17
fehlende Werte	0

Terminabsprachen mit dem Berater waren unkompliziert möglich.	
aM (SD)	4.9 (0.42)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0.0104
Cohens d	0.23
fehlende Werte	2

Der Berater stellte sich und seinen Kompetenzbereich vor.	
aM (SD)	4.69 (0.58)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0
Cohens d	0.54
fehlende Werte	2

Zu Beginn machte sich der Berater ein genaues Bild von meiner Situation.	
aM (SD)	4.71 (0.52)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.56
fehlende Werte	0

Der Berater erläuterte mir das Ziel des Gesprächs.	
aM (SD)	4.8 (0.42)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.48
fehlende Werte	1

Die Struktur/ der Verlauf des Beratungsgesprächs wurde mir vom Berater verständlich erklärt.	
aM (SD)	4.75 (0.48)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.53
fehlende Werte	0

Der Berater erläuterte mir die Bedeutung der einzelnen Faktoren des DNLA Gutachtens.	
aM (SD)	4.85 (0.38)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	1e-04
Cohens d	0.4
fehlende Werte	3

Der Berater bat mich wiederzugeben, inwieweit ich mich mit dem Testergebnis identifizieren kann.	
aM (SD)	4.9 (0.3)
Median (MAD, [Min,Max])	5 (0, [4 , 5])
p-Wert (Holm)	8e-04
Cohens d	0.34
fehlende Werte	0

Mir war bekannt mit welchen Personen (Referenzgruppe) mein Ergebnis verglichen wird.	
aM (SD)	4.67 (0.6)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0

Cohens d	0.55
fehlende Werte	1

Der Berater erklärte mir nachvollziehbar den Sinn des Honesty-Faktors (Antwortverhalten).	
aM (SD)	4.54 (0.84)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0
Cohens d	0.55
fehlende Werte	9

Der Berater erläuterte mir Sinn und Funktion des Stress-Faktors.	
aM (SD)	4.75 (0.62)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0
Cohens d	0.41
fehlende Werte	7

Mit der Ergebnisbeschreibung konnte ich mich identifizieren.	
aM (SD)	4.41 (0.63)
Median (MAD, [Min,Max])	4 (1, [1 , 5])
p-Wert (Holm)	0
Cohens d	0.94
fehlende Werte	0

Die Atmosphäre während des Beratungsgesprächs empfand ich als angenehm.	
aM (SD)	4.91 (0.31)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0.0038
Cohens d	0.29
fehlende Werte	1

Der Berater forderte ein Feedback zu seiner Beratungsleistung von mir ein.	
aM (SD)	4.1 (1.19)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0
Cohens d	0.76
fehlende Werte	6

Das Gespräch basierte auf gegenseitiger Sympathie.	
aM (SD)	4.89 (0.32)
Median (MAD, [Min,Max])	5 (0, [4 , 5])
p-Wert (Holm)	3e-04
Cohens d	0.36
fehlende Werte	0

Ich fühlte mich vom Berater wertgeschätzt.	
aM (SD)	4.96 (0.19)

Median (MAD, [Min,Max])	5 (0, [4 , 5])
p-Wert (Holm)	0.0786
Cohens d	0.2
fehlende Werte	1

Der Berater gestaltete unser Gespräch kompetent und professionell.	
aM (SD)	4.86 (0.37)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	1e-04
Cohens d	0.38
fehlende Werte	0

Das Beratungsgespräch war für mich gut strukturiert.	
aM (SD)	4.65 (0.52)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.67
fehlende Werte	1

Der Berater stellte am Ende durch Rückfragen sicher, dass wir die wichtigsten Themen angesprochen haben.	
aM (SD)	4.83 (0.45)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	1e-04
Cohens d	0.37
fehlende Werte	2

Gegenüber dem Berater konnte ich vollkommen offen sein.	
aM (SD)	4.89 (0.37)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0.089
Cohens d	0.28
fehlende Werte	110

Ich konnte mich im Gespräch so geben wie ich bin.	
aM (SD)	4.87 (0.34)
Median (MAD, [Min,Max])	5 (0, [4 , 5])
p-Wert (Holm)	0.0786
Cohens d	0.39
fehlende Werte	112

Der Berater empfahl mir am Ende des Beratungsgesprächs, in nächster Zeit an bestimmten Faktoren zu arbeiten.	
aM (SD)	4.64 (0.69)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0.0091
Cohens d	0.53
fehlende Werte	113

Der Berater gab mir konkrete Hinweise, wie ich fehlende Potenziale nachbilden kann.	
aM (SD)	4.46 (0.81)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	6e-04
Cohens d	0.67
fehlende Werte	111

Die Anregungen des Beraters zum Aufbau fehlender Potenziale empfand ich als hilfreich.	
aM (SD)	4.59 (0.75)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0.0023
Cohens d	0.55
fehlende Werte	111

Softskills/Potenziale wurden erkannt.	
aM (SD)	4.64 (0.58)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0
Cohens d	0.62
fehlende Werte	6

Verbesserungsmöglichkeiten erfahren.	
aM (SD)	4.5 (0.71)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0
Cohens d	0.7
fehlende Werte	6

Wurden die eigenen Ziele erreicht?	
aM (SD)	4.51 (0.81)
Median (MAD, [Min,Max])	5 (0, [1 , 5])
p-Wert (Holm)	0
Cohens d	0.61
fehlende Werte	45

Mit dem Ergebnis der Beratung bin ich ... zufrieden. (Schulnotenskala).	
aM (SD)	1.34 (0.49)
Median (MAD, [Min,Max])	1 (0, [1 , 3])
p-Wert (Holm)	0
Cohens d	0.7
fehlende Werte	3

Ich würde grundsätzlich wieder eine DNLA-Beratung in Anspruch nehmen.	
aM (SD)	4.47 (0.68)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0
Cohens d	0.78
fehlende Werte	1

Ich kann DNLA-Potenzialanalysen als Beratungsansatz weiterempfehlen.	
aM (SD)	4.49 (0.66)
Median (MAD, [Min,Max])	5 (0, [2 , 5])
p-Wert (Holm)	0
Cohens d	0.77
fehlende Werte	2

Ich würde meinen DNLA-Berater weiterempfehlen.	
aM (SD)	4.9 (0.32)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0.0025
Cohens d	0.31
fehlende Werte	3

Aufwand und Nutzen standen in einem angemessenen Verhältnis.	
aM (SD)	4.69 (0.53)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.58
fehlende Werte	3

Ich habe das Gefühl, dass mich die Beratung persönlich weiter gebracht hat.	
aM (SD)	4.45 (0.67)
Median (MAD, [Min,Max])	5 (0, [3 , 5])
p-Wert (Holm)	0
Cohens d	0.83
fehlende Werte	3

Das Beratungsgespräch hat mir geholfen, meine Ziele zu erreichen.	
aM (SD)	4.06 (0.83)
Median (MAD, [Min,Max])	4 (1, [1 , 5])
p-Wert (Holm)	0
Cohens d	1.13
fehlende Werte	11

Alles in allem würde ich das Beratungsgespräch wie folgt bewerten (Schulnotenskala).	
aM (SD)	1.27 (0.46)
Median (MAD, [Min,Max])	1 (0, [1 , 3])
p-Wert (Holm)	0
Cohens d	0.59
fehlende Werte	0

aM=arithmetischer Mittelwert; SD=Standardabweichung; MAD=Median der Abweichungen vom Median; p-Wert (Holm) gibt den p-Wert des U-Tests für die Prüfung der H0: $\mu=\mu_0$ nach Holm Korrektur an. μ_0 stellt den bestmöglichen Wert im Rahmen des Feedbacks dar. Für fast alle Feedbackitems gilt $\mu_0=5$. Ausnahmen: Feedbackitems, die auf einer Schulnotenskala bewertet wurden ($\mu_0=1$) und das Feedbackitem „Die Dauer des Beratungsgesprächs fand ich... (5 viel zu lang - 4 etwas zu lang - 3 genau passend - 2 etwas zu kurz - 1 viel zu kurz).“ ($\mu_0=3$). Cohens d=Effektstärkemaß für die Abweichung zwischen aM und μ_0 unter Berücksichtigung der Streuung;