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MEASUREMENT OF SOCIAL COMPETENCE IN PILOT SELECTION

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To ensure that pilots possess the necessary level of competence for effective teamwork during line operation, some airlines have introduced special test methods into their selection procedures that allow measuring different sub-components of Social Competence before a pilot applicant is being employed. Costs and benefits of these measures vary to some degree. For a German airline, we have conducted a validation study (N=292 ab-initio pilots) with several of these measures, including the Interpersonal Competence Questionnaire (Buhrmester, Furman, Wittenberg & Reis, 1988), the Social Skills Inventory (Riggio, 1989), the Temperament Structure Scales (Maschke, 1987), and Assessment Center methods (Hoefft & Pecena, 2004). Different sub-facets of Social Competence are described, which exhibit sufficient reliability and generality to be considered as predictors for pilot selection. The findings of this study reveal significant correlations between some personality scales and aspects of Social Competence. However, correlations with concrete behavior ratings in simulated social situations are low. On the other side, Assessment Center ratings based on behavior observations correlate substantially with the overall success of a candidate throughout the selection procedure. Questionnaire data contribute little extra variance to this equation. Results are discussed with reference to aspects of social desirability as well as costs and benefits of the different approaches to measure Social Competence in pilot selection.

Introduction

Effective crew performance has been identified as one of the most important safety barriers in commercial aviation. Crewmembers working together as a team to achieve common goals can substantially increase performance outcomes compared to individuals, provided that the team is cooperating well in a coordinated manner so that all available resources can be fully utilized. Operational standards and procedures support an organized work flow and proper task execution. However, still each crewmember's degree of competence to contribute effectively to the joint task execution determines the quality of the team performance. Their individual attitudes, motives, knowledge, and abilities can support or hinder the processes of interpersonal interaction. To ensure that pilots possess the necessary levels of competence for effective teamwork during line operation, some airlines have (in addition to training) introduced diagnostic methods in their selection procedures that allow determining different sub-components of social competence before a pilot is being employed.

In the psychological literature "Social Competence" is one of the more elusive terms. Different approaches are not in line with their understanding of the concept and how to best make it measurable. For example, in early intelligence research, the concept of "Social Intelligence" has originated as the ability to understand and manage people and to "act wisely in human relation" (Thorndike, 1920, p228). Social

psychologists have defined sets of "Social Skills" required to show socially competent behavior within interactions (Argyle, 1967). According to Riggio (1986) "basic social skills" during social interaction consist of receiving, sending, and controlling verbal and nonverbal information. From occupational psychology views emerged that efficient interpersonal behavior should be seen as a function of certain personality traits and styles such as Leadership or Assertiveness. However, the trait approach lacks the situational context to determine if a specific social behavior is efficient or not (Becker & Heimberg, 1988). According to our view, Social Competence encompasses an ensemble of both intellectual as well as non-intellectual components which shape social behavior between active adaptation and goal-oriented control of social contexts. On one side, it is expected that socially competent behavior is congruent with the social norms of the respective reference group. On the other side, a competent person is also expected to guide and control social contexts within given norms or if necessary even beyond specific norms if norm-compliance is given on a superior level or within a wider reference group. With other words, socially competent behavior balances between supporting others and guiding others, paying attention to common goals and at the same time merging them with individual goals. Social activity is one of the pre-conditions for Social Competence. Therefore, a passive person can hardly be socially competent.

In psychological selection, different measures have been developed to assess Social Competence. They reach from tests of social intelligence, via questionnaires to behavior exercises in actual social settings. In our study we compare different instruments to measure Social Competence and its components ranging from trait-oriented personality questionnaires via social skills inventories to more costly behavior-oriented Assessment Center (AC) measures. These different measurement instruments have been administered as part of the selection procedure for ab-initio pilots for a major German Airline. This research is motivated by the question whether simple questionnaire data of Social Competence can be considered as a low-cost alternative to ACs in personnel selection. Since questionnaire data are generally subject to tendencies of social desirability, we additionally have included a social desirability scale to examine to which extent this bias is significant and how it could be compensated.

Method

Three questionnaires and four AC exercises were administered to N=292 ab-initio pilot applicants. The Temperament Structure Scales (TSS) and the Assessment Center are part of the regular DLR pilot selection procedure. Two Social Competence Questionnaires were administered in addition.

Sample

N=292 applicants for pilot training in a major German airline are included in this study. The mean age is of 22 years (SD=2 years). 86% were male. All subjects had passed the basic pilot abilities tests. They had also completed higher education up to the university entrance level.

Measures

Results of three questionnaires and of the Assessment Center are part of this study as described below.

Interpersonal Competence Questionnaire (ICQ): A German version of the ICQ was used, which had been validated in several studies by Kanning (e.g. Kanning, 2006). As the original ICQ (Buhrmester, Furman, Wittenberg & Reiss, 1988), the German version has 40 behavior-related items distributed across five scales:

- Initiation of Interactions and Relationships (II)
- Assertion of Personal Interests (AI)
- Self-disclosure of Personal Information (SD)

- Emotional Support of Others (ES)
- Management of Interpersonal Conflicts (IC)

In addition we calculated a total score for the ICQ.

Social Skills Inventory (SSI): The original SSI of Riggio (1989) was translated into German by Radke (2001). It consists of 90 behavior-related items distributed equally across six different scales:

- Emotional Expressivity (EE)
- Emotional Sensitivity (ES)
- Emotional Control (EC)
- Social Expressivity (SE)
- Social Sensitivity (SS)
- Social Control (SC)

In addition we calculated a total score for the SSI.

Since self-presentation can easily be biased in questionnaires used for personnel selection 15 items of a standard social desirability scale (Kanning & Holling, 1999) were added to the combined social competence questionnaire. The whole package consisted of 145 items. Both, the ICQ and the SSI, were administered together with 4-point rating scales compared to the 5-point scales of the original. The intention of 4-point scales was to eliminate the neutral middle category, which some subjects may tend to use to prevent disclosing too much personal information.

The Temperament Structure Scales (TSS, Maschke, 1987), a non-clinical personality questionnaire developed by DLR in the 1970s is a regular part of the selection procedure. It contains 183 items referring to behavior intentions and actual past behavior distributed among different dimensions, like

- Extraversion (EX)
- Dominance (DO)
- Empathy (EM)
- Emotional Instability (EI)
- Aggressiveness (AG)
- Vitality (VI)
- Achievement Motivation (AM)
- Rigidity (RI)
- Mobility (MO)
- Openness (OP) as a control scale

The Assessment Center (AC) consists of four different exercises reflecting different aspects of social behavior relevant for pilots: two small-group problem solving games, a conflict role-play, and a dyadic cooperation test with two candidates working

together on two interconnected computers. It took about one full day for a candidate to go through all exercises. A team of four trained observers (airline pilots and aviation psychologists) assessed seven behavioral dimensions during these exercises for all subjects. These dimensions can be allocated to two competence areas. Both of these competence areas are subcomponents of Social Competence:

Interpersonal Competence (ICO):

- Cooperation (COO)
- Conflict Management (CMT)
- Empathy (EMP)
- Self-reflection (SRF)
-

Operational Competence (OCO):

- Initiative (INI)
- Flexibility (FLX)
- Stress Resistance (STR)

Final score: Each subject who could pass the whole selection procedure was graded on a nine-point scale as a career prognosis score. This score was agreed by the interview panel after completion of the concluding interview.

Results

Initial factor analyses are conducted to examine whether the German translation of the ICQ and SSI has affected the original factor structure of the questionnaire items. With procrustes rotation a fair match for most of the scales can be confirmed. The overall factor congruence coefficient for the ICQ is .92 and for SSI .93. ICQ Self-disclosure of Personal Information (.83) and SSI Social Expressivity (.84) score slightly lower. Cronbach's Alpha for the ICQ total score is .86 and for the SSI total score .81. The intercorrelation of ICQ and SSI is with $r=.54$ highly significant.

The correlations with the personality questionnaire TSS show a reasonable picture for both ICQ and SSI (see table 1 and 2). Social skills are moderately related to personality dimensions like extraversion, emotional stability, dominance (leadership), empathy and agreeableness.

Table 1. Significant correlations of ICQ and TSS

TSS	ICQ-Scales					
	II	AI	SD	ES	IC	ICQ
EX	.44		.22			.26

DO	.16	.17					.14
EM		-.27	.15	.31			
EI	-.30	-.27					-.22
AG	-.17		-.12	-.12	-.19		-.20
VI	.16						
AM							
RI							
MO	-.13	-.15					
OP	-.12	-.13	-.14	-.13	-.22		-.22

Table 2. Significant correlations of SSI and TSS

TSS	SSI-Scales						
	EE	ES	EC	SE	SS	SC	SSI
EX	.35	.20		.57		.24	.44
DO	.18			.24	-.19	.20	.19
EM		.36			.40	-.16	.14
EI	-.13		-.12	-.32	.57	-.41	-.12
AG				-.13	.19	-.22	
VI				.15		.12	.12
AM					.19		
RI							
MO		.12		-.14	.19	-.14	
OP					.13	-.17	

The intercorrelations of the questionnaire scales are rather high because TSS, ICQ, and SSI have some method variance in common. Therefore, correlations across different types of methods are a critical check of validity. The AC is based on behavior observation in actual social settings and is also addressing Social Competence. Table 3 shows the significant correlations between AC and the questionnaires.

Table 3. Significant correlations of AC-scales and questionnaire data

	AC-Scales									
	CO	CM	EM	SRF	INI	FLX	STR	ICO	OC	OC
ICQ				-.14						
II					.17					
AI						-.16				
SD										
ES										
IC			-.16	-.18						
SSI		.17			.16		.20			.20
EE		.19	.13		.16		.17	.14		.17
ES										
EC			-.14							
SE		.18			.20		.20			.21
SS					-.13					

SC		.16			.16		.20		.16
TSS									
EX									
DO		.15			.15				.16
EM	-.13								
EI		-.15							
AG									
VI									
RI						.17			
MO	-.14		-.18					.15	
OP									

Most frequent correlations occur for the SSI scales Emotional Expressivity, Social Expressivity, and Social Control.

As criterion for the predictive power of different measure of Social Competence, we have chosen the final result of the whole selection procedure. A candidate who passes the whole program is been graded at the end by the interview panel for individual career prospects. This score is used as the dependent variable in multiple regression analyses with different sets of predictors as shown in table 4.

Table 4. Multiple correlations for the overall selection score (* p < 0.05 ; ** p < 0.01)

Predictor variables	R ₁	R ₂
ICQ scales	.08	.14
SSI scales	.16	.12
TSS scales	.15	.31*
AC subscales	.47**	.35**
AC total scores ICO and OCO	.48**	.40**
AC ICO and OCO plus ICQ scales	.50**	.43**
AC ICO and OCO plus SSI scales	.50**	.42**
AC ICO and OCO plus TSS scales	.49**	.48**

¹ pass/fail during selection as dependent variable

² final career prognosis score as dependent variable

The best equation for the prediction of the final result and career prognosis is the fifth, with only two AC total competence scores for Interpersonal Competence and Operational Competence as predictors. With one exception the questionnaires cannot increase the multiple correlation coefficients significantly. Only for the career prognosis the TSS scores add some predictive value on top of the two AC scores.

Social desirability did turn out neither as a significant moderator nor as an additional predictor variable in these models. Therefore, our expectation that

answering bias in questionnaires may distort predictive validity is not confirmed with our data.

Discussion

This study has examined different approaches to measure Social Competence in pilot selection. The goal was to determine whether fast and easy methods such as questionnaires can seriously be considered as alternative to more expensive behavior oriented approaches for capturing aspects of Social Competence.

The results of several correlation analyses described in the upper section lead us to the following four conclusions:

- 1) Questionnaires of Social Competence show significant correlations with certain personality dimensions, if they are measured also by questionnaires. ICQ and SSI subscales are moderately correlated with personality dimensions like extraversion, emotional stability, agreeableness, dominance (leadership), and empathy. These factors are mainly reflected in Expressivity and Social Control of the SSI and in Initiation of Interactions and Emotional Support of the ICQ.
- 2) Questionnaire results seem to be a weak predictor for social behavior in specific situations. Only Conflict Management (CMT) and Initiative (INI) as observed during behavior exercises of the AC have more consistent but still low correlations primarily with SSI scales. Again Social and Emotional Expressivity as well as Social Control measured with the SSI seem to relate to some extent with AC observations.
- 3) ICQ and SSI do not contribute to the prediction of overall success of the subjects in the pilot selection. The fact to pass or fail is mainly related to the two AC subcomponents Interpersonal Competence and Operational Competence. Only the personality questionnaire can explain a small amount of additional variance. Therefore, questionnaires of Social Competence seem to be superfluous in a situation where sound AC exercises and a personality questionnaire are administered.
- 4) The assumption that response sets like social desirability are contributing to the weak correlations of questionnaire data with other methods cannot be confirmed. The reasons seem more complex. Questionnaires are

based on self-reported behavior intentions or self-reported past behavior. Both of these seem to be only minor sources of actual social behavior shown in real social settings.

Finally, if Social Competence is considered a necessary condition (not just “nice to have”) for the profile of a good airline pilot and later captain, suitable psychometric measures should be part of the selection procedure. Increasing age or flight time are neither a substitute nor do they directly foster the build up of Social Competence. Pilot training is still largely technical and procedure oriented but to a much lesser extent directed towards systematical development of social skills. Competence can at best be derived from observations of real behavior. Based on the results of this study, self-reported questionnaire data cannot be confirmed as having approximately equivalent predictive value as compared to ACs. This justifies the higher efforts of designing and conducting job-related behavior exercises during selection and to train a group of assessors with professional background.

During this study we did not have access to external criteria of validity. However, earlier research of DLR has reported several findings that demonstrate the predictive validity of AC measures for important aspects of job performance, training data as well as peer-ratings in several samples with licensed pilots, ab-initio pilots, and air-traffic controllers (Hoermann et al., 1997; Damitz et al. 2003; Hoefl & Pecena, 2004).

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