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Satow, Lars

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Improvements in Recruitment Processes: Selection of Employees with Online Tests and the Big Five Personality Model

Dipl.-Psych. Dr. Lars Satow
Unter Auen 7/1
88677 Markdorf
mail@drsatow.de
Tel. 07544 743 495

Abstract

The need for online testing has increased dramatically during the last decade. In 2011, more than 80% of US companies are using online testing and in Germany 7 out of 10 job applications are submitted in electronic form. The increasing demand for online testing is not only driven by generic trends such as globalization and the internationalization of business or the need for cost saving measures. Online testing offers substantial advantages over both paper-based and computer-based testing. With the help of online tests, it is relatively easy to implement worldwide standards for the selection process and to manage the selection process centrally.

In parallel, major advances have been made with developing a personality model which has proven to be successful in predicting job performance. Recent studies and meta analysis compared various predictors of job performance such as personality tests and assessment centers. These meta analyses show that personality tests based on the Big Five model are able to predict job performance better than intelligence tests and even better than assessment centers. The Big Five model is a personality model which integrates the various numbers of different personality traits and sets the foundation for a common taxonomy of personality dimensions.

To fulfill the need for an online selection method based on the Big Five personality model a psychological online test has been developed as an open access project under a Creative Commons License (Satow, 2011). Between July 2010 and December 2010, 4.597 participants completed the test.

The B5T consists of 5 scales (one for each personality dimension) which all reached good to very good reliability indices (Cronbachs alpha). Especially the two important scales Extroversion and Neuroticism showed a high internal consistency. Variance analysis (ANOVA) revealed significant differences between job profiles for four of the Big Five dimension. In a blockwise regression analysis Neuroticism (-.07), Openness (.14) and Agreeableness (- .07) were able to predict income. The overall explained variance increased from 23% to 25%.

The results are providing strong evidence that the open access B5T is reliable and valid measure of the Big Five personality model and allows differentiating between different job profiles.

1. INTRODUCTION

In 2006, 10% of major US companies were using online tests for the pre-selection of employees on the Internet. And another 22% were planning to use online tests in the future (Piotrowski & Armstrong, 2006). Only five years later the numbers have increased dramatically. In 2011, more than 80% of US companies are using online testing (Fallaw & Kantrowitz, 2011) and in Germany 7 out of 10 job applications are submitted in electronic form (Weitzel et al., 2011).

The increasing demand for online testing is not only driven by generic trends such as globalization and the internationalization of business or the need for cost saving measures. Online testing offers some substantial advantages over both paper-based and computer-based testing. With the help of online tests, it is relatively easy to implement worldwide standards for the selection process and to manage the selection process centrally. This simplifies organizational structures, saves resources and accelerates the recruitment process.

The most common three reasons for online testing (Fallaw & Kantrowitz, 2011) are:

1. Remote testing is more convenient for candidates. Online testing can be applied anywhere at any time, which has become more important as companies are transforming into international organizations and the Internet is generally available for the vast majority of people.

2. Remote testing is more convenient to administer for hiring managers and recruiters. Online tests can be administered centrally and applied locally. The degree of automatization minimizes the risk for errors.

3. The costs and resources required for on-site or supervised testing are reduced. According to some researchers (Lievens & Harris, 2003) Internet recruitment is at 1/10 of the cost of traditional methods and the amount of time between recruitment and selection can be reduced by 25%.

On the other hand, there are serious challenges related to unproctored online testing (Buchanan & Smith, 1999). The most important one is the identification of test takers: Identification is often difficult because it requires either extended hardware (thumbprint reader) or local test supervisors (proctors). The other challenge is related to the disclosure of the test materials and items: In online testing it is merely possible to prevent test takers from taking screen shots of the test materials or coping test items using hardware such a digital cams.

Both issues are increasing the risk for false positive decisions. Therefore, unproctored online tests should be used for pre-selection only where this risk for false positive decisions is manageable, because selected candidates have to undertake additional proctored assessments and interviews in the sub-sequence process steps.

2. SELECTION PROCESS WITH ONLINE TESTS

The ideal selection process with online tests (figure 1) begins with the definition of a job profile, which includes qualifications, competences, skills and traits. In the second phase, the HR department generates a pool of candidates through marketing campaigns and events. The pool is reduced by gross negative disqualifieres, such as no driving license. In the next step, candidates are selected based on soft skills (knowledge, motivation, intelligence, personality) measured with online tests. All selected candidates are invited to an assessment center or interview to validate the results. The main advantage of using psychological online tests to pre-select candiates is that candidates are not only invited based on information given by themselves in the CV but also on more objective psychological test data and soft skills. The usage of different data sources reduces the risk for false negative decisions.

To avoid false negative decisions the decision should not only be based on one criterion (final grades) but on at least two criteria from different domains, e.g. final grades and soft skills. Multiple criteria significantly reduce the risk for false negative decisions, e.g. a person is only excluded from the process if both final grades are poor and communication skills are below average.

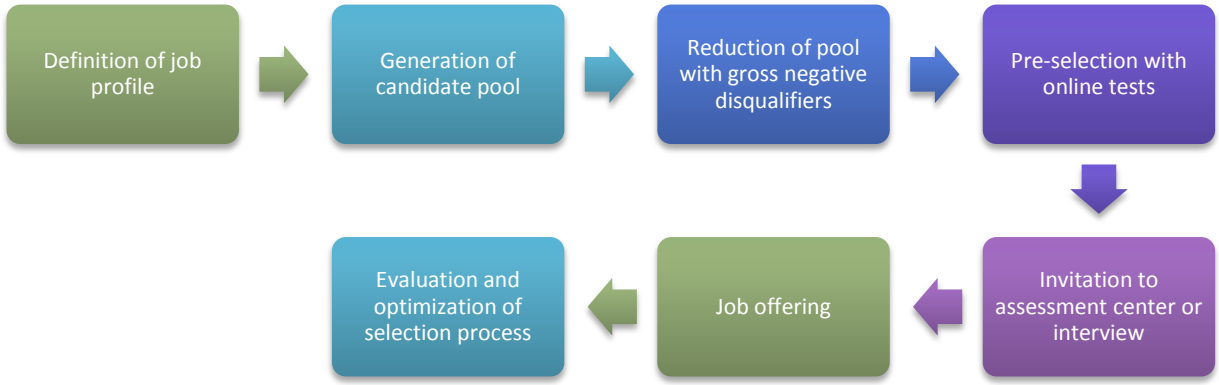

FIGURE 1: SELECTION PROCESS WITH ONLINE TESTS

All online tests which are used for the pre-selection should fulfill the following requirements:

1. Online tests should be easily applicable and should not take longer than 20 or 30 minutes. Otherwise the risk for data loss due to dropout and frustration increases dramatically.

2. It should not be possible for candidates to manipulate the results of the online tests. Modern psychological tests are able to manage “faking good” tendencies. In addition, the test instruction should include a hint that the test is repeated during a later interview to validate the results.

3. Only a reliable test can predict job performance or other criteria. Therefore the reliability index is of high importance in psychological testing. Based on the COTAN system the reliability of any test should be at least .80 or higher based on a norm population of at least 400 individuals (Evers, 2001).

4. The test should be easy to understand and highly acceptable to candidates. Test items should not be too complicated and private or sensitive questions should be avoided.

5. An online test should be relevant in the context of the industry and job profile. Otherwise it is unlikely that the test will be able to predict performance indicators.

Often intelligence tests are used in the pre-selection of candidates but often these tests fail to predict future job performance. On the other hand, major advances have been made with developing a personality model which has proven to be successful in predicting job performance. Recent studies and meta analysis compared various predictors of job performance such as personality tests and assessment centers. These meta analyses show that personality tests based on the Big Five model are able to predict job performance better than intelligence tests and even better than assessment centers (Ones et al., 2007).

3. The Big Five Personality Model

The Big Five model is a personality model which integrates the various numbers of different personality traits and sets the foundation for a common taxonomy of personality dimensions. A personality dimension is a broad and stable factor of clustered characteristics which explains emotional, behavioral and cognitive patterns. In contrast to earlier typologies, people are characterized on a continuum from low to high values rather than as types (either or). Two of the five dimensions of the Big Five model have already been described by Hans Jürgen Eysenck (1947) in his model of personality:

1. **Extraversion (E):** The idea for this factor was introduced by Jung (1921). Jung observed that people are either outward oriented (extraversion) or inwards oriented (introversion). Later, Eysenck (1947) used Extraversion as one of the major dimensions of his personality model. Extraverted people are characterized as talkative, assertive, active, energetic, and outgoing. The opposite is Introversion. Studies have shown that Extraversion is a prerequisite for successful managers. Extraversion correlates with leadership and general job performance (Lim & Ployhart, 2004). Often external persons are more satisfied with their job (Judge et al., 2002).

2. **Neuroticism (N):** The second factor of Neuroticism is independent of Extraversion and describes people as tense, anxious and nervous. The opposite of Neuroticism is Emotional Stability. Persons with high scores on the Neuroticism dimension are often less able to withstand stress and have a higher risk for psychological problems such as burn-out and depression.

These two main dimensions have been confirmed by other researchers and methodologies, e. g. by the lexical approach (Allport, 1937). The basic assumption of the lexical approach is that all important human qualities are reflected in the language. From the extensive analysis of adjectives and word lists, the two factors Extraversion and Neuroticism have been replicated and today they are included in the vast majority of all personality tests. In addition to these main dimensions, the lexical approach extracted three additional dimensions (Norman, 1963), which also have been confirmed by other research. All five dimensions have been coined as the Big Five Factors by Goldberg (1981).

The additional three factors are:

3. **Consciousness (C).** People with high values in this dimension are described as organized, thorough, tactical and efficient. This factor turned out to be one of the most effective factors in predicting job performance. It is highly related to integrity (Hankes, 2011).

4. **Openness (O):** People with high values have wide interests, are imaginative, often intelligent and original. While Extraversion and Consciousness are important in a stable and predictable working environment, Openness plays an important role in transition phases such as reorganization and uncertainty.

5. **Agreeableness (A):** People with high values are described as sympathetic, kind, appreciative and warm. Agreeableness is often unrelated to job performance but positively correlated with team building and a productive working group climate. On an individual level, Agreeableness increases the chances of being selected for a job.

4. Development of an Online Big Five Personality Test

To fulfill the need for an online selection method based on the Big Five personality model a psychological online test has been developed as an open access project under a Creative Commons License (Satow, 2011). The Big Five Test (B5T), its items and a detailed documentation can be downloaded from the electronic test archive of the German Leibniz Institute for Psychology Information (ZPID) under www.zpid.de. An online version is available under www.psychomeda.de/online-tests/. The development started with a pool of 70 Likert items, such as

I am a team player (fully disagree - disagree - agree - fully agree)

All items are directly related to one of the five personality dimensions and are designed to ensure high degrees of cultural fairness as well as high acceptance rates among candidates. The test engine has been designed as an open web service and can easily be included in any web page or web enabled user interface – even on mobile devices such as the iPad or smart phones.

The B5T has been made available as self test on several German websites such as job communities (killerfish.de), recruitment portals (career-test.de) and pages related to psychological testing (psychomeda.de). The test has been accessible to everyone without the need to register or to disclose name or address.

5. Results

Between July 2010 and December 2010, 4.597 participants completed the test. Because of the anonymity and the self test character, participants had no motivation for faking good. In addition, all participants were asked if they intended to answer all questions openly and honestly or if they just wanted to try out the test. After exclusion of inconsistent data and of participants who only wanted to try out the test, 3,088 persons remain in the final data set (44% male). Most participants were between 20 and 30 (34%) years old (table 1).

Age	Frequency
< 20 years	205 (7%)
20 - 30 years	1060 (34%)
31- 40	828 (27%)
41 – 50	643 (21%)
> 50	257 (8%)

TABLE 1. DISTRIBUTION OF AGE IN THE SAMPLE

Reliability of the Online Big Five Personality Test

The B5T consists of 5 scales (one for each personality dimension) which all reached good to very good reliability indices (Cronbachs alpha). Especially the two important scales Extroversion and Neuroticism showed a high internal consistency. In sum, all scales are reliable measures of the Big Five personality dimensions (table 2).

Skala	Items	M	SD	Cronbachs Alpha
Neuroticism	10	24,49	6,214	.88
Extraversion	10	26,85	5,171	.80
Consciousness	10	27,02	4,348	.74
Agreeableness	10	30,07	3,942	.74
Openness	10	27,98	4,356	.70

TABLE 2. RELIABILITY OF TEST SCALES

Construct Validity of the Online Big Five Personality Test

To examine the factorial validity a factor analysis has been conducted. The screen test confirmed a factor structure with five factors. Together these five factors explained 40% of the overall variance. In addition, an inter correlation pattern has been found similar to what has been reported by Linden et al. (2010). Extraversion is positively correlated with Openness and negatively with Neuroticism. Furthermore, Neuroticism and Extraversion are negatively correlated (table 3).

	Neuroticism	Extraversion	Consciousness	Agreeableness	Openness
Neuroticism	1				
Extraversion	-.36	1			
Consciousness	.06	-.14	1		
Agreeableness	-.07	.20	.22	1	
Openness	-.42	.50	-.16	.15	1

TABLE 3. INTER CORRELATION OF BIG FIVE DIMENSIONS

The Big Five Dimensions and Job Profiles

To investigate the relationship between the Big Five scale and the current job profile, analyses of variance have been conducted. The Variance analysis (ANOVA) revealed significant differences between job profiles for four of the Big Five dimension. The highest F value resulted for Neuroticism (F = 21.98) followed by Openness (F = 12.92) and Consciousness (F = 7.55) (table 4).

	F	df	sign	R^2
Neuroticm	21.98	7	< 0.001	0.05
Extraversion	6.19	7	< 0.001	0.01
Consciousness	7.55	7	< 0.001	0.02
Agreeableness	1.53	7	ns	
Openness	12.92	7	< 0.001	0.03

TABLE 4. ANOVA RESULTS*

*) groups: Company employees, Worker, Jobless, Clerks, Self-Employed, Students, other.

Figure 2 shows the profiles (scale means) for the different job categories. Especially self-employed people are in general characterized by high degrees of Emotional Stability and Openness (O), whereas clerks are characterized by Emotional Stability and Consciousness (C). In contrast, jobless people show the highest values for Neuroticism (N). Students achieving the highest scores for Extraversion (E).

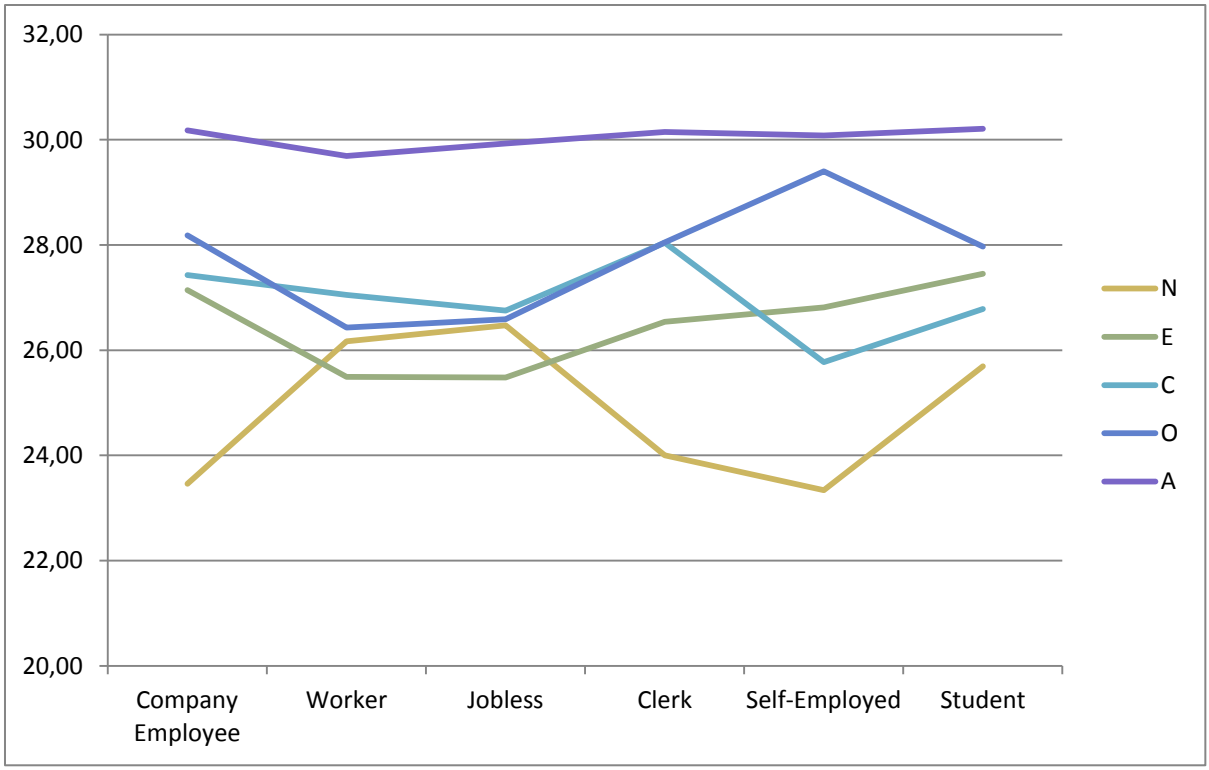

FIGURE 2. PERSONALITY PROFILE BY JOB CATEGORY

Prediction of Job Performance with the Big Five Scales

The personality profiles show significant differences between job categories. But is it also possible to predict job performance within job category with the Big Five Personality Test? To answer this question, company employees have been analyzed in detail and the income has been used as an indicator of job performance. Income depends on many variables, especially on gender, age and qualification. Thus the question is, whether

differences in income can be predicted by the Big Five dimensions beyond the differences explained by gender, age and qualification.

To answer this question a block wise regression analysis has been computed with income as the dependent variable and two blocks of predictor variables: sex, age, qualification (block 1) and the Big Five dimensions measured with the scales of the B5T (block 2).

In block 1, qualification was the most important predictor of income (beta = .29***), followed by age (beta = .24 ***) and gender (beta = .21***). The income was higher for older company employees with better qualifications. Together these three predictors explained 23% of the differences in income. The question was, whether the Big Five dimensions could explain additional variance.

In block 2 the Big Five dimensions entered the equation. Neuroticism (-.07), Openness (.14) and Agreeableness (- .07) were able to predict income and explain additional variance. The overall explained variance increased from 23% to 25%.

5. Discussion

An online test (B5T) has been developed to measure the dimensions of the Big Five personality model. The online test consists of 50-Likert items and has been implemented on several German web pages using an open web service technology. It fulfills the need for easy to understand and short online tests in recruitment processes.

All scales have proven to be reliable measures with an internal consistency between .70 (Openness) and .88 (Neuroticism).

A factor analysis confirmed the expected structure with five factors – one for each dimension of the Big Five personality model. The inter correlations where in line with the inter correlations of a meta analysis reported by Linden et al. (2010). Thus, the factorial structure as well as the inter correlation pattern provided strong evidence for the construct validity of the five scale.

In addition, analysis of variance revealed significant differences between job categories. Self-employed people achieved the highest values for Openness, and the lowest for Neuroticism. Clerks scored high on Consciousness and unemployed people showed the highest values for Neuroticism.

To clarify further the relationship between the Big Five scales of the B5T and job performance, the income for company employees has been analyzed. Differences in income were explained by gender, age and qualification. Beyond that, the Big Five scale Neuroticism, Openness and Agreeableness were able to explain additional variance, whereas Extraversion and Consciousness both failed to predict income in this equation. On the one hand, the results highlight the importance of the Big Five dimensions for job performance; one the other hand, it is unclear why Extraversion and Consciousness had no impact on income. One reason may be that income is mostly linked to collective labor agreements in Germany. Further analysis may show that Extraversion is a predictor of income in other job categories, e.g. for the self-employed.

In sum, this study shows that the B5T is already a reliable and valid measure of the Big Five personality model. Further enhancements of the B5T will improve the reliability of all scales to the COTAN level of at least .80. In addition, scales are needed to deal with faking good tendencies. The current version is suitable for pre-selection / screening of candidates to reduce the risk for false negative decisions. Results should be validated by subsequent process steps such as interviews and assessment center.

The online Big Five test is available under www.psychomeda.de

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