# ICPE 2018
# International Conference on Psychology and Education

# ADAPTATION OF THE BIG FIVE QUESTIONNAIRE TO THE PSYCHOLOGY RESEARCH PLATFORM

Evgeny Nikulchev (a)*, Dmitry Ilin (b), Victoria Ismatullina (c), Vladimir Belov (d)
*Corresponding author

(a) MIREA – Russian Technological University, Moscow, Russia, Russian Academy of Education, 8, Pogodinskaya str., Moscow, Russia, 119435, nikulchev@mail.ru
(b) MIREA – Russian Technological University, Moscow, Russia, Russian Academy of Education, 8, Pogodinskaya str., Moscow, Russia, 119435, i@dmitryilin.com
(c) Psychological Institute of the Russian Academy of Education, 9/4, Mokhovaya str., Moscow, 125009, Russia
(d) Russian Academy of Education, 8, Pogodinskaya str., Moscow, Russia, 119435, belov_v.a@mail.ru

## *Abstract*

The paper studies the possibility of Big Five technique implementation using questionnaires standard for the web-based platform. It is noted that the use of online tools for research in the field of psychology is becoming more relevant. Therefore, an experiment was set up. In this experiment, the technique was described in the JSON format for the use in web-based platform. The resulting file includes both elements of questionnaires and algorithms of scale values calculating. All 44 questions were marked with tags (5 tags for direct and 5 tags for reverse calculating). The aim of the study is checking if tests' format matches allotted tasks (support of questionnaire organization, scales values calculating) and search for possible disadvantages of defined format. The result suggested that the Big Five technique implementation is possible in the defined format, but it is advisable to supplement embedded domain-oriented language with functions that are related to the subject area directly.

**Keywords:** Psychology research, web-based platform, big five, JSON Schema, domain-specific language.

## 1. Introduction

Automated tools are used more often for the pursuance of the research in the field of psychology (Gosling & Mason, 2015; Zhou & Fishbach, 2016). There are a number of online services that offer research tools in the form of questionnaires (e.g., Survey Monkey, Qualtrics, LimeSurvey, EnKlikAnketa). One of these services was described in the following papers: Zakharov, Nikulchev, Ilin, Ismatullina, & Fenin, 2017; Nikulchev, Ilin, Kolyasnikov, Kasatonov, & Zakharov, 2017. It is suggested to use a single format for questionnaires description (Nikulchev, Ilin, Kolyasnikov, Ismatullina, & Zakharov, 2018). It is claimed that two main components (presentation of questionnaire to the subject and test results calculation) are encapsulated in a single file.

Many techniques that can be used in format of online-tests are known. The authors decided to set up an experiment to implement the Big Five technique (John & Srivastava, 1999) in a declared format because of its wide application in the research community (McAdams & Pals, 2006).

## 2. Problem Statement

The previously declared data format of psychological tests should be checked to see if it could be used for the Big Five technique implementation as one of the most common.

As a toolkit, the technologies described in the study (Nikulchev et al., 2018) were used: semistructured JSON data format with the limitations described in the JSON Schema format (Pezoa, Reutter, Suarez, Ugarte, & Vrgoč, 2016), and web-based platform tools (Nikulchev et al., 2018) for technique presentation.

## 3. Research Questions

The paper studies following two questions:

- Q1: whether the data format provides the necessary elements for the Big Five questionnaire organizing?
- Q2: whether the data format provides necessary tools for scales values calculating used in the Big Five technique?

## 4. Purpose of the Study

The aim of the study is checking if tests' format matches allotted tasks (support of questionnaire organization, scales values calculating) and search for possible disadvantages of defined format.

## 5. Research Methods

The authors set up an experiment to implement the Big Five test using the defined format. For the purpose, questions were numbered (from BF00 to BF43 - 44 questions) and divided into some groups that were assigned with tags. These tags correspond with direct and reverse calculation of scales values. Therefore, the test file contains 5 scales and 10 tags. The distribution of questions by tags and scales is presented in Table 1.

Result calculation algorithm was identical for each of scales. It can be described in the following way.

There are two vectors. The first one is the vector of the answers with the direct weight A. This vector contains *n* elements. The second one is the vector of the answers with reversed weight R. It contains *m* elements. In this case, scale results should be calculated in the following way:

$$s = \sum_{i=1}^{n} a_i + \sum_{i=1}^{m} 6 - r_i \ ,$$

where $s$ – scale result value, $a \in A, r \in R$.

**Table 01.** The distribution of questions by tags and scales

| Scale | Tags | Questions |
|---|---|---|
| Agreeableness | agreeableness | BF06, BF16, BF21, BF31, BF41 |
| | agreeableness-reversed | BF01, BF11, BF26, BF36 |
| Conscientiousness | conscientiousness | BF02, BF12, BF27, BF32, BF37 |
| | conscientiousness-reversed | BF07, BF17, BF22, BF42 |
| Neuroticism | neuroticism | BF03, BF13, BF18, BF28, BF38 |
| | neuroticism-reversed | BF08, BF23, BF33 |
| Openness | openness | BF04, BF09, BF14, BF19, BF24, BF29, BF39, BF43 |
| | openness-reversed | BF34, BF40 |
| Extraversion | extraversion | BF00, BF10, BF15, BF25, BF35 |
| | extraversion-reversed | BF05, BF20, BF30 |

## 6. Findings

The implementation can be divided into two components:

- Questionnaire presentation to the subject;
- Questionnaire results calculation.

The first component also includes the aspects responsible for test passing (e.g., the time limit, the presence of the questions that require an answer). In this case, there is no time limit but all questions require answers.

### 6.1. Questionnaire implementation.

The singleChoiceMatrix question type was used for test implementation. Each of tests contains five answers identical for every question (Figure 1).

```
17   {
18     "question": {
19       "type": "singleChoiceMatrix",
20       "request": {
21         "label": "Я считаю себя тем, кто..."
22       },
23       "category": {
24         "answer": {
25           "type": "number",
26           "order": "fixed",
27           "items": [{
28               "label": "1",
29               "value": 1,
30               "comment": "none"
31           },
32           {
33               "label": "2",
34               "value": 2,
35               "comment": "none"
36           },
```

**Figure 01.** Example of the source code of the questionnaire test – singleChoiceMatrix question type

Matrix rows are implemented as subquestions and contains independent keys, by which the results are accessible. Tags are used to combine questions on five characteristics. According to Table 1 for each of these characteristics two different tags are used: for calculation of direct and reversed scales. The corresponding implementation is shown in the figure 2.

```
55   "subquestion": {
56     "order": "fixed",
57     "items": [{
58         "variables": {
59           "key": "BF00",
60           "tags": [
61             "extraversion"
62           ]
63         },
64         "leftLabel": "... разговорчивый"
65     },
66     {
67         "variables": {
68           "key": "BF01",
69           "tags": [
70             "agreeableness-reversed"
71           ]
72         },
73         "leftLabel": "... склонен спорить и видеть в других недостатки
74     },
```

**Figure 02.** Example of the source code of the questionnaire test – rows of question matrix

Every question in the technique is require to answer. So "Hard reminder" mode was set up. For a better perception, the question were divided into groups of 8 questions (and 4 questions in the last group). The instructions for the test were duplicated on every page. Figure 3 shows the first page of the test and a help message about the missed question.

**Figure 03.** Example of the questionnaire visualization

It is necessary to note that visualization is different for mobile devices, because the width of mobile screens does not allow displaying questions in the table form. It may be deduced from the foregoing that the suggested standard questionnaires are sufficient to implement the Big Five tests.

### 6.2. **Implementation of scale values calculation.**

Many tags are necessary to calculate answer results with the direct and reverse calculation type. The scale values calculating rules are prepared in accord with the calculation formula and in web-based platform proposed declarative domain-oriented language. An example is shown in Figure 4.



```
752  "calculation": {
753    "scales": [{
754        "key": "agreeableness",
755        "expression": {
756          "add": [{
757            "sum": [{ "getAnswers": ["agreeableness", "value"] }]
758          },
759          {
760            "sum": [{
761              "map": [
762                { "getAnswers": ["agreeableness-reversed", "value"] },
763                { "subtract": [6, { "getVariable": ["element"] }] },
764                "element"
765              ]
766            }]
767          }]
768        }
769      },
```

**Figure 04.** Example of the source code of the questionnaire test –Agreeableness scale calculation rules

It means that embedded domain-oriented language is sufficient for the Big Five questionnaire results calculation. It is advisable to supplement this language with domain-specific function to increase the code readability and to speed up test implementation.

## 7. Conclusion

The paper studied the possibility of the Big Five technique implementation with the use of defined format and the corresponding tools. The authors set up an experiment in which both questions Q1 and Q2 were answered positively. The standard of the questionnaire is sufficient for the Big Five test and similar in the tests' structure. The functions' list of the embedded domain-oriented language meets the specified requirements, but it is worth noting that it is advisable to supplement it with functions that relate directly to the subject domain.

## Acknowledgments

## References

Gosling, S. D., & Mason, W. (2015). Internet research in psychology. *Annual review of psychology, 66*, 877-902. doi: 10.1146/annurev-psych-010814-015321

John, O. P., & Srivastava, S. (1999). The Big Five Trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 102-138). New York: Guilford Press.

McAdams, D. P., & Pals, J. L. (2006). A new big five: Fundamental principles for an integrative science of personality. *American psychologist, 61*(3), 204-217

Nikulchev, E., Ilin, D., Kolyasnikov, P., Ismatullina, V., & Zakharov, I. (2018). Development of a Common Format of Questionnaire Tests for a Web-based Platform of Population and Experimental Psychological Research. *ITM Web of Conferences, 18*, 04004.

Nikulchev, E., Ilin, D., Kolyasnikov, P., Kasatonov, S., & Zakharov, I. (2017). Evaluation Of Nosql Dbms Scalability For Storing Data For Psychology Web Platform. The European Proceedings of Social & Behavioural Sciences EPSBS, *33*, 263-271).

Pezoa, F., Reutter, J. L., Suarez, F., Ugarte, M., & Vrgoč, D. (2016, April). Foundations of JSON schema. In *Proceedings of the 25th International Conference on World Wide Web* (pp. 263-273). International World Wide Web Conferences Steering Committee.

Zakharov, I., Nikulchev, E., Ilin, D., Ismatullina, V., & Fenin, A. (2017). Web-based Platform for Psychology Research. *ITM Web of Conferences*, *10*, 04006.

Zhou, H., & Fishbach, A. (2016). The pitfall of experimenting on the web: How unattended selective attrition leads to surprising (yet false) research conclusions. *Journal of personality and social psychology, 111*(4), 493-504.
.