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DEVELOPMENT AND APPROBATION THE METHOD FOR STIMULI PRESENTATION DURING TESTING OF MULTIPLE INTELLIGENCES BY VIBRAIMAGE TECHNOLOGY

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Abstract: *The purpose of this article is to develop and approbate the method of presenting stimuli for testing multiple intelligences based on vibraimage technology. The possibilities of vibraimage technology in the implementation of tasks for HR, vocational guidance, recruiting, diagnostics of abilities and multiple intelligences profile measurement are explored.*

Keywords: *structure of the questionnaire, content of questions, stimulus material, multiple intelligences, abilities, vibraimage technology.*

In 2018, for the first time, the results of stimuli selection used in VibraMI program [1] were published based on the vibraimage technology [2, 3]. The principles of stimuli selection were analyzed: questions-stimuli and stimuli-images (factor of social desirability of answers, conflict of desires and possibilities, etc.). In the process of selecting stimuli, difficulties were identified in the dosing of the informational and emotional component, as well as a number of other problems that impede obtaining a statistically stable psychophysiological reaction. In this regard, it was decided to continue the study on the selection of incentives needed in working with software based on the vibraimage technology. VibraMI program presents the augmented and expanded to 12 types classification of Gardner's multiple intelligences [4, 5], indicating the possibility of self-realization in a specific professional sphere [5, 6, 7]. A questionnaire was developed in 24 questions, allowing diagnosing the severity of each of the multiple intelligences based on the current psycho-physiological state and the conscious responses of the subject. The resulting profile of multiple intelligence can be viewed from the perspective of an individual profile of abilities, sphere of interests and preferences [6]. Passing the test in 24 questions does not lead to mental exhaustion of the subjects. Automated as the test procedure itself, and interpretation. Vibraimage technology allows obtaining multidimensional dependences of the psychophysiological state (PPS) characteristics and record the change in energy and the direction of this change. The change in energy released (consumed) a person from the initial state to another energy measures state in kcal/min [7]. The psychophysiological approach and availability in its implementation based on the VibraMI program allows testing without the involvement of third-party narrow-profile specialists [8]. The method used the classical principles of psychophysiology based on the latest computer technology.

Materials and Methods. Questionnaire type

According to the content of Gardner_12, questionnaire belongs to the category of special abilities tests. The substantive side of the Gardner_12 questionnaire

incorporated in the VibraMI program meets the main criteria of the questionnaires of interests and attitudes, on the one hand, and — the test of special abilities, on the other hand. The content of each of the 24 questions is directly related to the potential interests of the respondent, and their formulation allows you to assess the orientation of the installations. The orientation of installations can be traced in the change of the information and energy component of the psychophysiological response to the question posed. Questionnaire Gardner_12 has a line-opposite structure. Each MI pair has a forced choice of two mutually exclusive issues. The respondent needs to answer 12 such pairs of questions, supplemented by stimulus images. The questions are structured in such a way that for each type of MI a person with developed relevant abilities, the first question of the couple is YES, and the second is NO. Accordingly, the linear opposition structure of the questionnaire implies an artificially modeled situation of choice from potentially mutually exclusive concepts.

The model in which each type of MI occupies its functional niche implies a sequence in writing followed by the location of pairs of MI. Therefore, first the wording of the questions is refined: to the first and twelfth pairs, then to the second and eleventh, etc. In the second place, if all the necessary conditions are met, the stimulus material / photo is selected. The presence of stimulus material is due to the need to increase the emotional load of the issues. The difficulty in its selection is in the dosing of the emotional load, the degree of which can be determined only in the process of repeated testing.

Thus, the structure and algorithm for writing the Gardner_12 questionnaire are closely related. It is necessary to experimentally confirm or disprove the validity of the existing incentives used in the linear opposition structure of the Gardner_12 questionnaire. In total, 72 adolescents studying in secondary schools were tested in the age range of 14–16 years. The ethnic and sexual composition of the group is relatively homogeneous. The test results of students whose Russian language is not native are considered separately, and in the present study (due to the small sample of people) they will not be analyzed. 40 boys and 32 girls were tested.

Results

A series of tests conducted during 2018 revealed some problems associated with the insufficiently correct selection of incentives in certain pairs of questions. Consider it in more detail. Based on the structure of the questionnaire, a pair of questions should negatively correlate with each other (the first pair of questions — with the twelfth, the second — with the eleventh, etc.). If this does not happen, then the incentives (the question and / or photo to it) are chosen incorrectly. What does this look like? (tab. 1)

The principle of MI pairs arrangement — opposition. The further in relation to the center (the sixth and seventh pairs form the center) are located pairs, the stronger the correlation. What is important: the correlation between questions responses is negative, not positive. The location of not only within the couple, but also for central symmetrical pairs is oppositional. Intrapersonal (IA) and interpersonal (IE) MI are located at the edges, forming a pair of 1 and 12. Couples IA and IE have negative correlation dependence (–0.26), (fig. 1).

Table 1

Correlation analysis of MI pairs, according to the questionnaire Gardner_12

	IA	ET	LM	BM	VS	NL	BK	MR	AS	VL	AB	IE
IA		-0,19	0,22	0,32		-0,61	-0,33	-0,51		-0,35	0,21	-0,26
ET	-0,19			-0,06	0,25	0,25		-0,35	0,28	0,26	0,12	-0,34
LM	0,22			0,73		-0,35	-0,38		-0,36	-0,62	0,31	-0,22
BM	0,32	-0,06	0,73		0,07	-0,33		-0,14	-0,48	-0,39	0,09	-0,35
VS		0,25		0,07		-0,17	-0,10		0,14	0,14	-0,12	0,20
NL	-0,61	0,25	-0,35	-0,33	-0,17		0,35	0,26	0,07	0,52	-0,25	
BK	-0,33		-0,38		-0,10	0,35			-0,05	0,43	-0,51	0,28
MR	-0,51	-0,35		-0,14		0,26			-0,25	0,06	-0,11	0,58
AS		0,28	-0,36	-0,48	0,14	0,07	-0,05	-0,25		0,36	0,11	0,32
VL	-0,35	0,26	-0,62	-0,39	0,14	0,52	0,43	0,06	0,36		-0,38	0,32
AB	0,21	0,12	0,31	0,09	-0,12	-0,25	-0,51	-0,11	0,11	-0,38		-0,27
IE	-0,26	-0,34	-0,22	-0,35	0,20		0,28	0,58	0,32	0,32	-0,27	

That is why, the questionnaire begins with these pairs of questions, and ends with them. The key in determining the humanitarian or technical profile are the Logical-Mathematical (LM) and Bohemian-Artistic (AB) MI pairs, (–0.62), which are no less opposition in nature. Approaching the center marks a weakening of the correlation dependencies, their decay or even a transition to positive values: a pair of Visual-Spatial (VS) and Musical-Rhythmic (MR) MI (no correlation), Natural (NL) and Body-Kinesis (BK) MI, (0.35).

Thus, the Philosophical couple (PH) and Bohemian-Artistic (AB) MI are the most alarming. For these pairs, a small positive correlation of 0.12 was obtained (the significance of differences with $p \leq 0.05$). There was a need to correct incentives. Initially, it was decided to replace incentives within the same pair. This pair has become Artistic-Bohemian (AB) MI. Since it is in this pair of questions (AB MI) the pair of affirmative answers (instead of the opposition ones) were most often encountered.

Table 2

Bohemian-Artistic/Creative MI types

Previous version Art-Bohemian (AB)	Current version Creative (CR)
21. I easily get used to the necessary style	21. Your creative nature doesn't know rest
22. I don't like to stand out from the crowd	22. Thinking are more important than an embodiment

The result of changing the wording of the questions was a shift in the content, from the artistic component of the personality, to a wider channel — the creative component. Artistic (as well as bohemian) are private manifestations of a creative person. In addition, opposition between ET-AB pairs was strengthened by shifting the focus to philosophical knowledge, in question 22. Thus, double opposition was achieved — within the AB pair and between PH-AB pairs. Accordingly, the name was changed from Bohemian-Artistic (AB) to Creative (CR). The changes also affected to visual stimuli (photo).

The selection of visual stimuli is closely related to the content of the questions. Changing the content of the question inevitably leads to the replacement of the stimulus-photo, which was done. In our opinion, the unusual architecture of the house should have caused pleasant associations for a creatively gifted person, additionally provoking a positive answer to question 21 (fig. 1). On the contrary, the existential choice between "comprehension" and "incarnation" was reflected in the form of the functional asymmetry of the brain (fig. 2).

21. Previous version

21. Current version

Fig. 1. Artistic-Bohemian-Creative MI, photo to question 21

22. Previous version

22. Current version

Fig. 2. Artistic-Bohemian/Creative MI types, photo to question 22

After replacing the stimuli questions and stimuli-photos in creative (CR) MI, the nature of correlation in the pairs themselves changed: Philosophical (PH)/Creative (CR) MI. The expected negative correlation was obtained, instead of the initial positive one, (tab. 3). However, the obtained correlation (–0.07), despite its negative values, turned out to be statistically unreliable. As it turned out, the majority of respondents answered in the affirmative as to question 3 of the Philosophical (PH), and to question 21 of the Creative (CR) MI type. Thus, the results obtained experimentally confirmed the need for further improvement of incentives, Creative (CR) MI, as well as the need to replace stimuli with Philosophical (PH) MI type.

Table 3

Correlation analysis of MI types, after stimuli changing in Gardner_12

	IA	PH	LM	BM	VS	NL	BK	MR	AS	VL	CR	IE
IA		0,25		0,31	0,16	-0,13		-0,30	0,08	-0,23	-0,09	-0,39
ET	0,25		-0,38	0,20	0,20		-0,15	0,17		0,07	-0,07	-0,32
LM		-0,38		-0,35	-0,24	0,29	0,09	-0,25	0,32	-0,38	-0,08	0,23
BM	0,31	0,20	-0,35		0,12	-0,39	-0,34	-0,16	-0,43	-0,05	0,11	-0,40
VS	0,16	0,20	-0,24	0,12		-0,10				-0,12	0,21	
NL	-0,13		0,29	-0,39	-0,10		-0,12		0,49	-0,37	-0,54	
BK		-0,15	0,09	-0,34		-0,12		0,18	0,34	0,35		-0,16
MR	-0,30	0,17	-0,25	-0,16			0,18		0,11	-0,06	-0,12	
AS	0,08		0,32	-0,43		0,49	0,34	0,11		-0,29	-0,63	-0,16
VL	-0,23	0,07	-0,38	-0,05	-0,12	-0,37	0,35	-0,06	-0,29		0,32	0,18
CR	-0,09	-0,07	-0,08	0,11	0,21	-0,54		-0,12	-0,63	0,32		0,18
IE	-0,39	-0,32	0,23	-0,40			-0,16		-0,16	0,18	0,18	

It was decided to strengthen the emphasis on the dynamic component of the issues: passive-creative philosophical and actively-applied creative (tab. 4). Replacement of stimuli-photo creative (CR) occurred within 22 questions, which, in our opinion, should have been sufficient. The replacement of the stimulus-photo-philosophical (PH) was complete, due to significant changes in the content of the questions themselves. As a result, the control and relevant issues of CR and PH turned out to be strongly opposed to each other in a pair, as well as to each other in relation to each other between MI pairs (cross).

Table 4

Creative (CR) and Philosophical (PH) MI types, the result of changes in stimuli questions (final version)

MI type	Previous version	Current version
Creative (CR)	21. I easily get used to the necessary style	21. Your creative nature doesn't know rest
	22. I don't like to stand out from the crowd	22. Thinking are more important than an embodiment
Philosophical (PH)	3. Philosophy gives readiness for every twist of fate.	3. Lying on the couch and thinking is more important than fussing
	4. Person must act, not thinking	4. I have abilities to create something extraordinary

After replacing the stimuli photos and stimuli questions in PH and CR MI, a statistically significant negative correlation was obtained (–0.29), (tab. 5) between PH-CR pair. The obtained result shows that current stimuli questions and stimuli photos between ET-CR couple are chosen correctly for the line-opposite structure of the Gardner_12 questionnaire.

Table 5

Correlation matrix analysis of MI types, after stimuli changing in Gardner_12 (final version)

	IA	PH	LM	BM	VS	NL	BK	MR	AS	VL	CR	IE
IA		0,29	0,08	0,14	0,21	-0,13	-0,13			0,15		-0,19
ET	0,29		-0,19	0,14	0,08	-0,05	0,06				-0,29	
LM	0,08	-0,19		0,18	0,27	0,07		-0,18		-0,35	0,31	
BM	0,14	0,14	0,18				-0,14	-0,07	-0,35		0,22	-0,24
VS	0,21	0,08	0,27			-0,12	-0,36	0,22	0,16	-0,18		-0,09
NL	-0,13	-0,05	0,07		-0,12		0,25	-0,14	0,06		0,19	-0,13
BK	-0,13	0,06		-0,14	-0,36	0,25		0,20		0,13	-0,20	0,19
MR			-0,18	-0,07	0,22	-0,14	0,20		-0,14	0,24	0,10	0,08
AS				-0,35	0,16	0,06		-0,14		0,06	-0,28	0,11
VL	0,15		-0,35		-0,18		0,13	0,24	0,06			0,30
CR		-0,29	0,31	0,22		0,19	-0,20	0,10	-0,28			-0,05
IE	-0,19			-0,24	-0,09	-0,13	0,19	0,08	0,11	0,30	-0,05	

21. Previous version

21. Current version

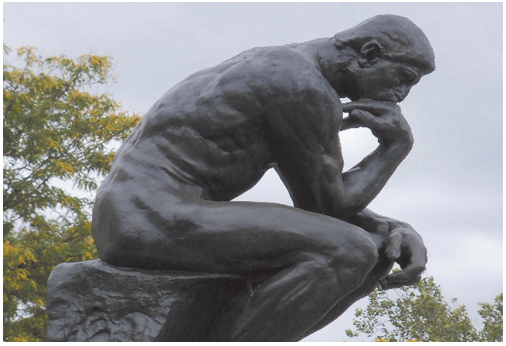
WITHOUT CHANGES

22. Previous version

22. Current version

Fig. 3. Creative MI type, the result of changes in incentive photo (final version)

3. Previous version



3. Current version

4. Previous version

4. Current version

Fig. 4. Philosophical (PH) MI type, the result of changes in stimuli photos (final version)

Discussion

It is difficult to predict how stable the psychophysiological response of subjects will be with an increase in the sample size by an order of magnitude. May require further adjustment of individual issues, incentives or photo incentives. The probability of the influence of gender stereotypes of psycho-emotional evaluation of stimuli is also not excluded. These and many other nuances of human response to the questionnaire's stimuli are the subject of further research.

Conclusions

Of course, it is quite difficult to identify adequate stimuli for a statistically stable psychophysiological response of wide tesees groups to certain types of multiple intelligence, without repeated pilot studies. However, properly selected stimuli can achieve this goal. In the process of multiple testing, we were able to prove the validity of the existing incentives used in the linear opposition structure of the Gardner_12 questionnaire. Compatibility of the vibraimage technology with the mathematical apparatus of comparative testing of conscious and unconscious responses of the tested allows statistically reliably asserting or rejecting the hypotheses and assumptions put forward.

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