

**Research article**

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## **Innovativeness, Regulation of Vital Activity and Value Orientations of Young Men and Women: The Effect of the COVID-19 Pandemic**

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**Abstract: Introduction.** The pandemic was a challenge to our contemporaries and focused the attention of researchers on psychological resources that facilitate its overcoming. Empirical studies of the psychological regulation system of the personality's vital activity during this period, reflected in the special aspects of the innovative, value and regulatory characteristics of representatives of various social groups, are quite limited, which led to the relevance and novelty of this study. **Methods.** The scale "Self-Assessment of Personality's Innovative Qualities" by N. M. Lebedeva and A. N. Tatarko was used, which allows for studying the psychological components that determine innovative human behaviour. Regulatory characteristics were studied using the "Personal Readiness for Activity (PRA)" scale by S. A. Bogomaz, I. V. Atamanova and I. A. Fileenko. Value orientations were determined using the Schwartz's questionnaire "Portrait Value Questionnaire-Revised (PVQ-R)", modified by K. V. Sugonyaev. To evaluate the studied variables concerning the pandemic influence, the authors used such criteria as a test of differences and network analysis of partial correlations using the EBICglasso regularization method. **Results.** The results of the study showed significant changes in several innovative, value and regulatory characteristics in the conditions of the pandemic, most of which were associated with the gender factor. The restructuring of the network structure of psychological indicators during the pandemic is going in opposite directions in groups of young men and women. The female sample shows attenuation of moderate and strong network relationships during the transition from 2019 to 2020, which means the network structure becomes more amorphous. For the male sample group, the opposite trend is observed – in 2020, initially, the amorphous network structure becomes multi-connected, structured, and clearly expressed. **Discussion.** The non-specific and specific effects of the pandemic on the psychological characteristics that ensure the regulation of vital activity in young men and women aged 17 to 28 years are discussed.

**Keywords:** innovativeness, creativity, risk for the sake of success, value orientations, readiness for activity, regulation of vital activity, student youth, gender differences, pandemic, network analysis

### Highlights:

- The nonspecific effects of the pandemic on young men and women were manifested in the growth of such variables as creativity and openness to change.
- The specific features of young men in the conditions of a pandemic show their orientation towards proactive behaviour due to the need to solve life tasks through actions aimed at taking risks while reducing personal security.
- For young women, the specific effects of the pandemic are associated with a shift in life priorities from the future to the present, with a decrease in life satisfaction, an increase in the value of security, avoidance of proactive behaviours, a weak focus on innovation with a simultaneous increase in creativity.

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### Introduction

The global coronavirus pandemic has exposed as much as possible the existing contradictions between the need of modern society to respond effectively to rapidly changing conditions and a person's readiness for appropriate transformations in the context of his life (Zinchenko et al., 2020). Both the transformational processes themselves and the new conditions of human life that arise at the same time require a deep understanding of their psychological content.

The accelerating development of modern civilization is largely due to scientific and technological achievements, based on which it becomes possible to implement numerous innovations in the practice of social and economic activities, as well as in the daily life of most of our contemporaries. Innovation is defined as the successful implementation of new ideas in an organizational environment or "as the intentional introduction and application of ideas, procedures, processes or products that are new to the relevant unit of adoption and designed to significantly benefit the individual, the group, the organization and the wider society" (Schmidt & Lebedeva, 2014, p. 5). Innovation requires employees with innovative behaviour or the ability to implement their new ideas and improve technological processes. Innovations can be incorporated into everyday life only through the innovative behaviour of specific people, which is characterized as "individual actions directed at the generation, introduction and or application of beneficial novelty at any organizational level" (Kleisen & Street, 2001, p. 285).

Since innovative behaviour in the modern world is the source of social systems development, researchers focused on personal, organizational, and sociocultural factors directed at supporting innovation or inhibiting their implementation. At the same time, the phenomena of creativity and risk-taking are also included in the studied problem field, without which the description of the phenomenon of innovativeness will obviously not be complete. The following psychological factors influencing the innovative behaviour of people are considered: individual cognitive characteristics (creativity (Slåtten et al., 2011; Hussain & Wahab, 2021); divergent and convergent thinking (Kenworthy et al., 2021); cognitive styles (Miron-Spektor et al., 2011); personality traits (extraversion, openness to experience, courage, wisdom, originality, optimism, hope, self-efficacy, resilience (viability) (Sameer, 2018), rigidity (Zalevsky, 2004; Pavlova, 2020)); emotional states

(positive and negative affects, flow state (Kumar & Bharadwaj, 2016)); regulatory (Bykova, 2017; Pavlova, 2020; Perikova et al., 2020) and intentional processes (motivation, value orientations, socio-psychological attitudes) (Lebedeva et al., 2020; Pavlova, 2020).

The above psychological factors in Russian psychology are united by the concept of 'human innovation potential', which includes three main blocks: personality traits, competence (project competence, communicative competence, information competence), vitality (features of the value-sense organization of the life world, resilience, sovereignty, ability to work, mobilization potential, level of self-regulation, the orientation of a person to a certain quality of life) (Klochko, Galazhinsky, 2009). In foreign psychology, the concept of 'psychological capital' is used to describe such phenomena, which, by forming a focus on innovative behaviour, contributes to improving the efficiency and competitiveness of an organization, as well as ensuring the quality of an employee's working life (Ratnaningsih et al., 2016). These psychological indicators may be culturally conditioned and have varying degrees of severity in certain social groups, which makes it hard to generalize empirical studies of the phenomena under consideration and the results obtained in this direction are characterized by fragmentation and sometimes inconsistency.

Value orientations significantly influence people's goals and actions and are also the most important driving forces of behaviour in organizational conditions. Therefore, this paper will also include the study of personal values, which, according to several authors, are the most significant variables associated with innovativeness (Anderson et al., 2014; Sousa & Coelho, 2011). Modern research states that the three structural components of the value of conservation (in the model of value orientations by Schwartz), which are tradition, conformity, and security, are negatively associated with creative achievements (Dollinger et al., 2007). People who highly rate the conservation values were less creative compared to those who have the highest regard for the values of openness to change (Sousa & Coelho, 2011). These values are positively associated with innovation and creativity (Arieli & Tenne-Gazit, 2017). It was found that the values of self-enhancement of employees are positively associated with their innovative behaviour, while the values of conservation and self-overcoming are negatively associated with it (Purc & Lagun, 2019). The study of innovative characteristics and personal values of employees of firms in Vietnam allowed us to conclude that the values of universalism and benevolence positively influence innovative behaviour (Le et al., 2021). The study results of employees in Korean and Chinese organizations using the methodology of G. Hofstede showed that the value of power distance is negatively related to organizational innovation behaviour, and the value of avoiding uncertainty is positively related (Kim & Zhou, 2018).

The values of openness to change have a significant positive, and the values of conservation have a significant negative influence on the innovative behaviour of employees in Russian organizations (Schmidt & Lebedeva, 2014). A later study by the authors confirmed these results and also showed that perceived self-efficacy moderates the influence of values of openness to change on innovative behaviour in organizations (Lebedeva et al., 2020). It was found that the values of 'modesty', 'conformity – rules', 'security: personal', and 'tradition' prevent the adoption of innovations in the adult (over 45 years old) generation of Russians. And the value of 'security: public', on the contrary, stimulates the adoption of innovations (Fedotova, 2017). Among young people (up to 25 years old), the values of 'independence of thought', 'stimulation', 'achievement', 'power: dominance', and 'power: resources' stimulate the adoption and implementation of innovations and the values of 'universalism: caring for others', 'conformism:

interpersonal', 'security: public' 'security: personal', on the contrary, hinder the adoption of innovations (Fedotova, 2017).

Many studies have noted that the innovative behaviour of individuals is not self-sufficient but rather represents a response function during the continuous process of an individual's interaction with emerging situations that are characterized by organizational and social impacts. Encountering such situations in the presence of adequate resources (which include the person's psychological resources) can contribute to innovative behaviour. The increased density and intensity of non-standard life or organizational situations can have an ambiguous effect on the introduction of innovations. In this regard, the problem arises of studying the nature of the transformation of innovative behaviour in conditions of significant global changes (economic crises, pandemics, etc.), which may also be accompanied by changes in value orientations or regulatory characteristics of people.

In modern studies of personality values, it has been found that in conditions of significant social changes, their structure changes: the high conservation value intensification and the reduction of the value of openness to change directly after the peak of the economic crisis of 2008 – in 2009 and 2010, in comparison with the earlier time (Sortheix et al., 2019). It is noted that in the conditions of the COVID-19 pandemic, most people should expect a decrease in commitment to the values of self-enhancement and openness to change, as well as an increased commitment to the values of self-transcendence and conservation (Wolf et al., 2020). The results of an empirical study showed that under the conditions of the pandemic (2020), students exhibited an intensive increase in the conservation value level, the role of this variable in the structure of the psychological system of ensuring the vital activity of young people and a decrease in the role of the value of openness to change (Fileiko & Bogomaz, 2022). These changes were accompanied by the transformation of the indicators of the regulatory sphere, in particular – an intensive decrease in the variables of planning, reflection, and general readiness for activity. However, in the study of Perikova & Byzova (2022), using the example of students of natural science training areas, it was shown that during the COVID-19 pandemic, there was a statistically significant increase in metacognitive awareness and intrapersonal emotional intelligence in comparison with the indicators of a similar sample in the pre-pandemic period, while reducing the degree of interpersonal emotional intelligence.

It should also be considered that certain social groups show specific reactivity concerning difficult life situations. Thus, many studies have described significant differences between men and women in emotional and behavioural manifestations during the pandemic. In particular, women are at increased risk of anxiety disorders, depression, and loneliness, which is reflected in a decrease in their mental health indicators compared to men (Gonzalez–Sanguino et al., 2020; Li & Wang, 2020). It is noted that the pandemic had a more pronounced negative influence on the levels of stress, mental health, social isolation, and academic performance of female students compared with male students (Prowse et al., 2021). It was found that female students, unlike male peers, are more likely to use unproductive strategies for coping with stress during the COVID-19 pandemic (Hagan et al., 2022). These and other works create prerequisites for the study of the specifics of changes in psychological characteristics during the pandemic in connection with the sexual differences of people.

The need to further study the role of personal and environmental factors in the formation of innovative behaviour of our contemporaries is the basis for *the purpose of this study* – to identify

changes in the characteristics and informativeness, regulation of life and value orientations of students in the conditions of the COVID-19 pandemic, considering the sex factor.

## Methods

The study sample included 460 students studying in Tomsk (79.5 % of the sample) and other Russian cities (Moscow, St. Petersburg, Novosibirsk, Kemerovo, and Sochi). The age of the respondents ranged from 17 to 28 years inclusive ( $19.8 \pm 1.8$  years). The sample was formed by two equal groups of 230 people: group 1 (participated in the 2019 study, before the pandemic), average age  $19.4 \pm 1.2$  years, 40.9 % – men; group 2 (2020 study, during the pandemic), average age  $20.3 \pm 2.2$  years, 33.5 % – men.

The following methods were used in the study: the scale "Self-Assessment of Personality's Innovative Qualities" (Lebedeva & Tatarko, 2009); the methodology of Personal Readiness for Activity (PRA) (Atamanova & Bogomaz, 2018; Fileenko et al., in print) and the questionnaire "Portrait Value Questionnaire-Revised (PVQ-R)", developed by Schwartz, modified by K. V. Sugonyaev (Schwartz et al., 2012; Sugonyaev, 2018).

The scale "Self-Assessment of Personality's Innovative Qualities" includes 12 statements, the quantitative assessment of which is carried out using a 5-point Likert scale, which allows determining the following indicators: creativity (4 points); Risk for the sake of success (4 points); focus on the future (4 points), and also the general index of personality innovativeness, which is calculated as the arithmetic mean on all 3 scales. The methodology of personal readiness for activity includes five scales: 'goal setting' (4 points) and 'planning' (3 points), developed based on the methodology "Self-Organization of Activity Questionnaire" (Mandrikova, 2010), while the initial indexes were converted from a 7-point evaluation scale to 5-point; 'reflection' (developed based on the questionnaire "Differential Test of Reflection (DTR)" (Leont'ev & Osin, 2014)), includes 6 of the most informative items out of 12 primary ones, which are measured on a 5-point scale; the scale 'Life satisfaction' based on the scale of the same name by E. Diner (Osin & Leont'ev, 2020) – 4 points are used, which are evaluated on a 5-point scale; a general scale measuring the total 'personal readiness for activity index'. In the method of Schwartz (modified by K. V. Sugonyaev), the points were evaluated using a 5-point Likert scale. In this paper, the following primary variables were analyzed: 'security: public' and 'security: personal' (the 'security index' was calculated as the arithmetic mean of the mentioned scales); 'traditions', 'conformism – interpersonal', 'conformism – rules', 'modesty' (the index of the value of the highest was calculated according to them of the order 'conservation', hereinafter 'conservation metavalues'); 'independence – thoughts', 'independence – actions'; 'stimulation' (according to them, the index of the value of the highest order 'openness to change' (hereinafter referred to as the 'openness metavalues') was calculated.

Data processing was conducted in the IBM SPSS Statistics 10.0 and jasp 0.14.1 programs. Primary statistics were determined in the study, and the nonparametric Mann–Whitney U-test, parametric Student t-test, and test related to the Bayes factor calculation (Bayes factor10) were used. Network analysis of partial correlations for the studied indicators was conducted using the EBICglasso regularization method.

## Results

Table 1 presents the results of descriptive statistics for the general group of respondents.

**Table 1**

*Descriptive statistics for the general group of respondents (N = 460)*

Variables	Average mean	Median	Standard deviation	Skewness	Skewness standard error	Kurtosis	Kurtosis standard error
Creativity	3.8	3.75	0.73	-0.502	0.114	0.029	0.227
Risk for the sake of success	3.23	3.25	0.744	-0.032	0.114	-0.181	0.227
Focus on the future	3.56	3.5	0.672	-0.32	0.114	0.268	0.227
Innovativeness index	3.53	3.50	0.558	-0.031	0.114	0.277	0.227
Goal-setting	3.77	3.75	0.829	-0.628	0.114	0.163	0.227
Planning	3.23	3.33	1.14	-0.113	0.114	-0.955	0.227
Reflexion	3.98	4	0.663	-0.891	0.114	1.210	0.227
Life satisfaction	3.02	3	0.812	-0.237	0.114	-0.129	0.227
PRA index	3.50	3.54	0.590	-0.315	0.114	-0.135	0.227

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Variables	Average mean	Median	Standard deviation	Skewness	Skewness standard error	Kurtosis	Kurtosis standard error
Openness metavalue	4.03	4	0.516	-0.19	0.114	-0.249	0.227
Conservation metavalue	3.57	3.56	0.488	-0.118	0.114	0.368	0.227
Security index	4.1	4	0.592	-0.526	0.114	0.487	0.227

*PRA index – personal readiness for activity index.*

At the first stage of statistical data analysis, the criteria of difference were applied (Student's t-test for variables with normal distribution and Mann–Whitney U-test for deviation of distributions from normal) to compare the studied variables before the pandemic (2019) and during the pandemic (2020) (Table 2). The factor was also calculated Bayes<sub>10</sub>, which was used as an alternative measure of differences (Jarosz & Wiley, 2014; Garcia & Puga, 2018).

**Table 2**

*Comparative characteristics of psychological indicators of groups 1 and 2 using Student's t-test, Mann–Whitney U-test and Bayes Factor<sub>10</sub>*

Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes Factor <sub>10</sub>
Creativity	1	<b>3.65</b>	0.878 (0.381)	<b>20011 (&lt; 0.001)</b>	<b>645.9</b>
	2	<b>3.94</b>			
Risk for the sake of success	1	3.26	0.878 (0.381)		0.150
	2	3.20			

Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes Factor <sub>10</sub>																																												
Focus on future	1	<b>3.49</b>	<b>-2.337 (0.020)</b>		<b>1.445</b>																																												
	2	<b>3.64</b>				Innovativeness index	1	<b>3.47</b>	<b>-2.39 (0.017)</b>		<b>1.62</b>	2	<b>3.59</b>	Goal-setting	1	3.81		25760 (0.627)	0.175	2	3.73	Planning	1	<b>3.40</b>		<b>22170 (0.003)</b>	<b>10.511</b>	2	<b>3.07</b>	Reflexion	1	4.04		24665 (0.209)	0.645	2	3.92	Life satisfaction	1	3.05	0.890 (0.374)		0.152	2	2.99	PRA index	1	<b>3.57</b>	<b>2.72 (0.007)</b>
Innovativeness index	1	<b>3.47</b>	<b>-2.39 (0.017)</b>		<b>1.62</b>																																												
	2	<b>3.59</b>				Goal-setting	1	3.81		25760 (0.627)	0.175	2	3.73	Planning	1	<b>3.40</b>		<b>22170 (0.003)</b>	<b>10.511</b>	2	<b>3.07</b>	Reflexion	1	4.04		24665 (0.209)	0.645	2	3.92	Life satisfaction	1	3.05	0.890 (0.374)		0.152	2	2.99	PRA index	1	<b>3.57</b>	<b>2.72 (0.007)</b>		<b>3.65</b>	2	<b>3.43</b>				
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	2	<b>3.43</b>																																															



Indicators	Group	Average mean	Student's t-test statistics (significance of differences, p)	Statistics of the Mann–Whitney U-test (significance of differences, p)	Bayes Factor <sub>10</sub>
Openness metavalue	1	4.00	-1.407 (0.160)		0.270
	2	4.07			
Conservation metavalue	1	3.60	1.275 (0.203)		0.227
	2	3.54			
Security index	1	4.06		23901 (0.071)	0.250
	2	4.14			

The results for indicators showing statistically significant differences ( $p < 0.05$ ) are highlighted in bold. PRA index – personal readiness for activity index.

From the results given in Table 2, it follows that during the pandemic, there is a significant increase in indicators: 'creativity' – from 3.65 to 3.94 points ( $p < 0.001$ ); 'Focus on the future' – from 3.49 to 3.64 points ( $p = 0.020$ ); 'innovativeness index' – from 3.47 to 3.59 points ( $p = 0.017$ ); as well as the tendency to increase the variable 'security index' – from 4.06 to 4.14 points ( $p = 0.071$ ). A significant decrease in indicators was found: 'planning' – from 3.40 to 3.07 points ( $p = 0.003$ ); 'PRA index' – from 3.57 to 3.43 points ( $p = 0.007$ ).

Since modern publications describe significant differences in emotional and behavioural manifestations during the pandemic in men and women (Gonzalez-Sanguino et al., 2020; Li & Wang, 2020; Prowse et al., 2021; Hagan et al., 2022), the second stage of the study compared the subgroups of 2019 and 2020 G. in separate samples of men and women. Sample size: men before the pandemic (2019), N1 = 94 people during the pandemic (2020), N2 = 78 people; women before the pandemic (2019), N1 = 136 people, during the pandemic (2020), N2 = 152 people. At the same time, distribution indicators were also determined for these subgroups, after which a decision was made on the application of parametric or nonparametric difference criteria. The results of this stage are presented in Table 3.

**Table 3**

*The results of the psychological indicators comparison between “before” and “during” the pandemic, separately for young men and women*

Indicators	Group	Men N <sub>1</sub> = 94, 2019; N <sub>2</sub> = 78, 2020				Women N <sub>1</sub> = 136, 2019; N <sub>2</sub> = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>	Average mean	Student's t-test statistic (significance of differences, p)	Mann–Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>
Creativity	1	<b>3.70</b>				<b>3.62</b>			
			<b>-2.088 (0.038)</b>		<b>1.232</b>		<b>7564</b>	<b>110.787</b>	
Risk for the sake of success	2	<b>3.92</b>				<b>3.95</b>			
	1	3.43	0.037 (0.970)		0.166	3.14	0.782 (0.435)		0.174
Focus on the future	2	3.43				3.07			
	1	<b>3.51</b>				3.48			
			<b>2.888 (0.004)</b>	<b>2501 (&lt; 0.001)</b>	<b>7.465</b>		-0.873 (0.383)		0.187
	2	<b>3.82</b>				3.54			

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Indicators	Group	Men N <sub>1</sub> = 94, 2019; N <sub>2</sub> = 78, 2020				Women N <sub>1</sub> = 136, 2019; N <sub>2</sub> = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>	Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>
Innovativeness index	1	<b>3.55</b>				3.41			
	2	<b>3.72</b>		<b>2799 (0.008)</b>	<b>0.945</b>		-1.79 (0.075)		0.593
Goal-setting	1	3.76	0.488 (0.626)		0.185	3.85		9989 (0.621)	0.213
	2	3.69				3.75			
Planning	1	2.99	0.251 (0.802)		0.171	<b>3.68</b>		<b>4.425 (&lt; 0.001)</b>	<b>1161.976</b>
	2	3.03				<b>3.09</b>			
Reflection	1	3.99				4.07		9686 (0.355)	0.479
	2	3.88		3329 (0.297)	0.303	3.94			

Indicators	Group	Men N <sub>1</sub> = 94, 2019; N <sub>2</sub> = 78, 2020				Women N <sub>1</sub> = 136, 2019; N <sub>2</sub> = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>	Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>
Life satisfaction	1	2.80				<b>3.23</b>			
			0.821 (0.413)		0.226		<b>2.225 (0.027)</b>		<b>1.357</b>
	2	2.91				<b>3.03</b>			
PRA index	1	3.39				<b>3.71</b>			
			0.079 (0.937)		0.166		<b>3.68 (&lt; 0.001)</b>		<b>73.025</b>
	2	3.38				<b>3.45</b>			
Openness metavalue	1	4.04				3.97			
			-0.379 (0.705)		0.177		-1.553 (0.122)		0.408
	2	4.07				4.07			
Conservation metavalue	1	<b>3.59</b>				3.61			
			<b>2.877 (0.005)</b>		<b>7.248</b>		-0.413 (0.680)		0.141
	2	<b>3.37</b>				3.63			

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Indicators	Group	Men N <sub>1</sub> = 94, 2019; N <sub>2</sub> = 78, 2020				Women N <sub>1</sub> = 136, 2019; N <sub>2</sub> = 152, 2020			
		Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>	Average mean	Student's t-test statistic (significance of differences, p)	Mann-Whitney U-test statistic (significance of differences, p)	Bayes factor <sub>10</sub>
	1	3.97				<b>4.13</b>			
Security index	2	3.87	1.064 (0.289)		0.280	<b>4,28</b>	<b>-2.395 (0.017)</b>	<b>1.961</b>	

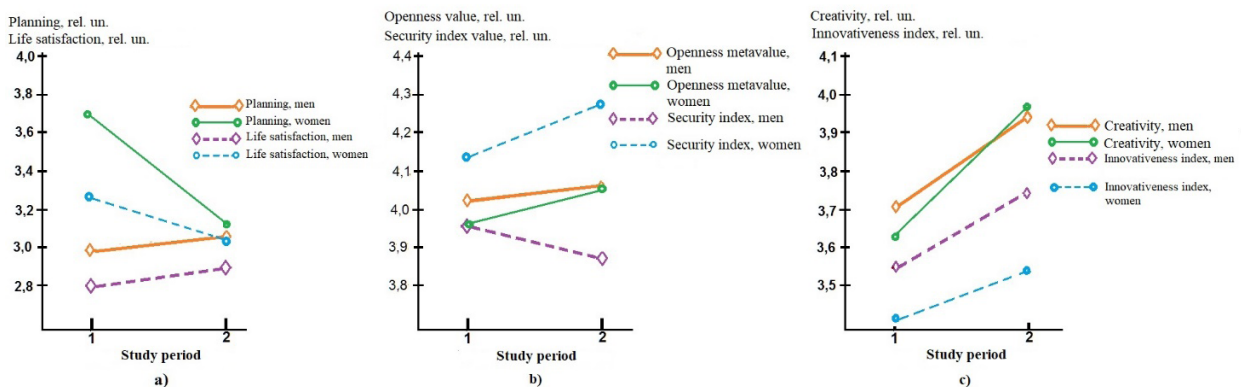
*PRA index is Personal Readiness for Activity index. Bold font indicates results for variables showing statistically significant differences (p < 0.05).*

Table 3 shows that in 2020, compared to 2019, both men and women had a significant increase in the 'creativity' indicator (for men, from 3.70 to 3.92 points, p = 0.038, for women, from 3.62 to 3.95 points, p < 0.001). However, other variables are characterized by specific changes in connection with sex of the respondents. In particular, for men, a significant increase is observed for the characteristics 'focus on the future' (from 3.51 to 3.82 points, p = 0.004), and 'innovativeness index' (from 3.52 to 3.72 points, p = 0.008) (for women, only a tendency to differences for this indicator was revealed – it increases from 3.31 to 3.52 points, at p = 0.075). In men, the indicator 'conservation metavalue' is significantly decreased – from 3.59 to 3.37 points, p = 0.005. In women, the following indicators significantly decrease: 'planning' – from 3.68 to 3.09 points, p < 0.001; 'life satisfaction' – from 3.23 to 3.03 points, p = 0.027; 'PRA index' – from 3.71 to 3.45 points, p < 0.001. An increase in the 'security index' indicator is also observed – from 4.13 to 4.28 points, p = 0.017.

Figure 1 indicates changes in psychological characteristics that showed the most significant differences between groups of young men and women "before" and "during" the COVID-19 pandemic.

**Figure 1**

Changes in psychological characteristics that showed the most distinctive differences between groups of young men and women «before» and «during» the COVID-19 pandemic: 1 – 2019-year data; 2 – 2020-year data.



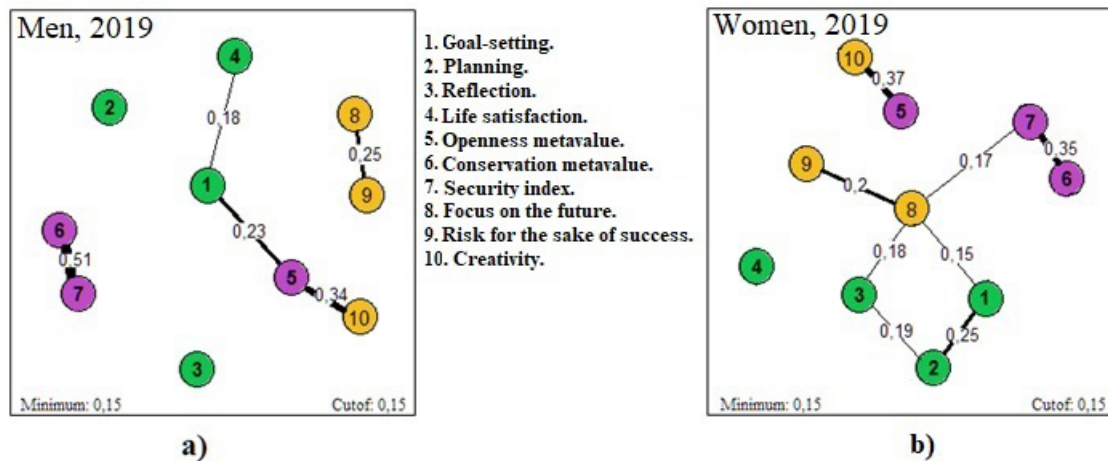
Of greatest interest are the opposite trends in connection with the transformation of the following indicators in men and women: 'planning' (Fig. 1a), 'life satisfaction' (Fig. 1a), 'security index' (Fig. 1b), as well as a significant increase in the indicator 'creativity' in women, which before the pandemic had values lower than in men, and during the pandemic exceeded values found in men (Fig. 1c).

To detail the patterns of changes in psychological characteristics, considering the sex factor, in the third stage of the study, a partial correlation network analysis was carried out using the EBICglasso regularization method (Artemenkov, 2021; Epskamp et al., 2018). The results of which are presented for groups of men (Fig. 2a, Fig. 3a), and women (Fig. 2b, Fig. 3b), before the pandemic (2019), and during the pandemic (2020). The network structures shown in the figures are limited by the minimum value of the correlation coefficient  $r = 0.15$  to highlight the most significant connections for analysis. For these network structures, their statistical stability was also assessed based on the calculation of 95 % confidence intervals for each edge using the bootstrap procedure (number of extractions  $N = 1000$ ) according to modern recommendations (Epskamp et al., 2018). The bootstrap results showed that the edges of the networks shown in Fig. 2a, 3a, 3b, with correlation coefficients  $r \geq 0.2$  are characterized by sufficient reliability, that being said, they are likely to be reproducible in similar studies in other groups. All edges shown in Fig. 1a, as well as edges in other figures with correlation coefficients  $r < 0.2$ , are less reliable, so their analysis should be approached with caution.

In addition, the network sparseness coefficients were calculated, which for the group of men changed from 0.667 to 0.556, and for the group of women from 0.556 to 0.442. In both groups, the sparseness of the network decreased, that is, the networks became solid, more saturated with numerous correlations. However, these changes in men are more characteristic of moderate and strong connections with  $r > 0.15$ , and in women – of weak connections with  $r < 0.15$ .

**Figure 2**

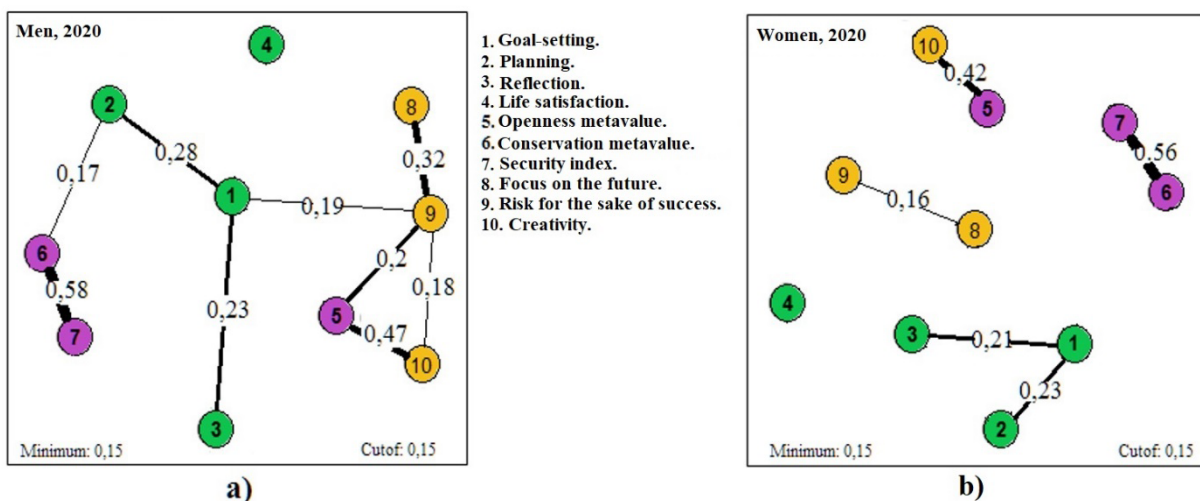
Partial correlation networks for groups of young men (a) and women (b) in the pre-pandemic period, 2019.



The value indicators nodes are highlighted in purple; in green – the indicators of the personal readiness for activity (PRA) scale; brown – for the methodology “Self-Assessment of Personality’s Innovative Qualities” (SAPIQ); the numbers indicate the coefficients of partial correlations.

**Figure 3**

Partial correlation networks for groups of young men (a) and women (b) during the pandemic period, 2020.



The figure legend is the same as in Figure 2.

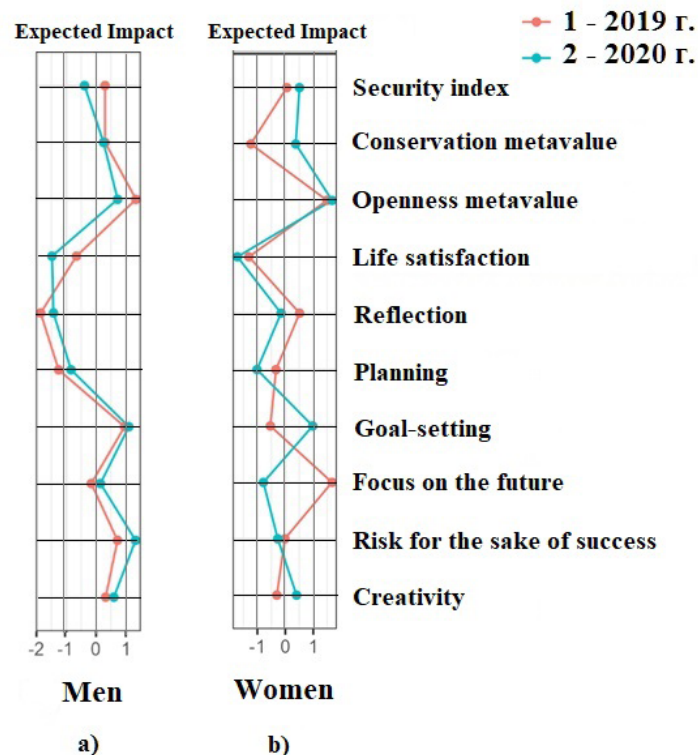
The results presented in Figures 2 and 3 allow us to draw the following conclusions:

- Indicators that measure innovative, regulatory, and value characteristics are more connected to their related scales, forming certain microclusters (for example, ‘conservation metavalue – security index’ and ‘focus on the future – risk for the sake of success’ in Fig. 2a).
- There are nodes that connect different microclusters; for example, the ‘focus on the future’ indicator in Fig. 2b links together the characteristics related to various psychological aspects – value, regulatory, and innovative. In Fig. 3a, a similar function is performed by the indicator ‘risk for the sake of success’.
- The change in the network structure for men and women during the pandemic heads in opposite directions, which is manifested in the weakening of moderate and strong relationships for the female sample during the transition from 2019 to 2020, that is the network structure becomes more amorphous. For the male sample, the opposite trend is observed: in 2020, the initially amorphous network structure becomes multiply connected, structured, and clearly expressed.

In the fourth stage, central measures (centrality indices) were calculated for networks of partial correlations – betweenness, proximity, and strength (Artemenkov, 2021; Epskamp et al., 2018), on the basis of which, for each node (indicator), the characteristic of the expected impact for subgroups of men and women in 2019 and 2020 was determined (Fig. 4).

**Figure 4**

Values of expected impact indicators in partial correlation networks for young men and women in 2019 and 2020.





From the data in Figure 4, it follows that in 2019, for young men, the most significant nodes in terms of the degree of network impact were the nodes 'openness metavalue', 'goal-setting', and 'risk for the sake of success'; and the least significant is the 'reflection' node. In 2020, the 'risk for the sake of success' node becomes the leading center, the second and third most important nodes are the 'goal-setting' and 'openness metavalue'.

For young women in 2019, 'focus on the future' and 'openness metavalue' had the most impact on the network structure. In 2020, the leading nodes were: 'openness metavalue', 'goal-setting', 'security index'.

## Discussion

The differences in the changes in the indicators of personality innovation in young men and women during the pandemic (Table 3) could be mediated by specific changes in the values of the representatives of these groups. For women, the priority of the conservation and security values increases significantly, while for men, in contrast, these values become less significant in the pandemic (Table 3). This is consistent with the findings (Purc & Lagun, 2019; Schmidt & Lebedeva, 2014; Fedotova, 2017), showing that increased commitment to conservation and security values negatively impacts innovation behavior.

Another factor contributing to differences in the presence of innovativeness among men and women during the pandemic are the peculiarities of the regulation of their activities. In particular, the personal system of ensuring the vital activity, including cognitive resources for regulating behavior (goal-setting, planning, reflection), under new difficult conditions, in young men turn out to be more stable (their 'PRA index' and the 'planning' indicator remain practically unchanged in 2020, compared to 2019). In young women there are significant decreases in its basic characteristics (first of all, the indicators 'PRA index' and 'planning', Table 3). In other words, men are able to use their regulatory resources during the pandemic to the utmost, as they were before it began, while for women these resources are largely blocked during the pandemic. One can assume that this blockage is most likely due to the specifics of the perception of possible risks to personal health, which is reflected in negative emotional states (increased levels of stress, mental tension, state anxiety, depression), which, as recent studies show, are more expressed in groups of women compared to men (Gonzalez-Sanguino et al., 2020; Li & Wang, 2020; Prowse et al., 2021).

An analysis of the network of partial correlations confirms these conclusions, since in the network structures of 2020 for women (Fig. 3b) we see a decrease in systemic relationships for moderate and strong correlations compared to 2019 (Fig. 2b). That is, the personal system of ensuring vital activity in its most significant respects becomes more amorphous, simple, and semi-structured. In 2020, the 'security-conservation' dyad (microcluster 1) becomes the leading one for women, and the 'openness-creativity' dyad (microcluster 2) becomes the second most important connection, which ensures active behavior under difficult conditions. However, the activity of microcluster 2 is determined mainly by the features of its weak connections with microcluster 1 and its dominant (in life perspective) functioning. Due to this, the active behavior of women in many aspects is limited by attitudes toward increased safety and the preservation of their health, as well as

the rejection of any behavioral risk (including those associated with innovative practices) in the pandemic. These attitudes will lead them to prefer avoidance coping strategies. At the same time, risk taking is one of the components of innovative behavior. Therefore, the structural features of network relationships in the women's group also create prerequisites for understanding weak changes in innovative behavior among women in 2020 compared to 2019.

The men group is characterized by other regularities in the functioning of network structure. In particular, in the period of 2020, two mesoclusters can be distinguished in it (Fig. 3a). The first of them includes 4 elements associated with such indicators as 'openness metavalues', 'risk for the sake of success', 'creativity', 'focus on the future'. Meanwhile, the central node of this structure is the 'risk for the sake of success' indicator. In other words, men take a proactive form of behavior in the pandemic, focused on being open to challenges, taking risks and overcoming them in possible innovative ways. That being said, men have an increased growth in the innovation indicator. These results are consistent with other researchers (Arieli & Tenne-Gazit, 2017; Schmidt & Lebedeva, 2014), who found positive impacts of the value of openness to change on innovation processes. The second mesocluster includes three nodes (Fig. 3a): 'planning', 'conservation metavalues', 'security index'. Although in this mesocluster the correlation between the values of conservation and security is almost the same in strength as in the female group, it remains open for interaction with other elements and clusters, which as a whole form one megacluster that combines 9 out of 10 studied indicators into a system of integral relationships. This megacluster is connected to two central nodes for its functioning ('goal-setting' and 'risk for the sake of success'), which can be considered as a systemic polycentric formation. It is the basis for the vital functioning of young men in the pandemic.

That is, young men are building their proactive actions in difficult life circumstances in the context of the pandemic based on the actualization of goal-setting as a means of overcoming risk using innovative approaches. This is also evidenced by the data presented in Fig. 4a, from which it follows that in 2020, in young men the node 'risk for the sake of success' becomes the most significant in terms of the degree of network impact; and the second most important is 'goal-setting'.

For young women, the disappearance of the 'focus on the future' indicator from the group of system-forming factors (factors of maximum expected impact (Fig. 4b)), and the inclusion of the 'security index' indicator in this group imply that women's high activity aimed at the future is suppressed. Concurrently, the current vital activity, largely determined by the need to maintain personal security, turns out to be low, because it is framed by instrumental factors (there are no appropriate methods or approaches to overcome new life risks) and the avoidance of any forms of activity for the sake of maintaining personal safety and health. Ultimately, it will lead to a decrease in the innovative capacity of women during the pandemic.

Based on the processing, analysis and interpretation of data, the following *conclusions* can be obtained:

1. The results obtained indicate significant changes in the innovative characteristics, processes of regulation of vital activity, and the system of value orientations of student youth, which are associated with the pandemic situation. The nonspecific effects of the pandemic have shown themselves in some general aspects characteristic of young men and women: in particular, in a significant increase in creativity and a moderate increase in openness to change indicators.
2. Specific features are reflected in a greater shift in value priorities from the tasks of the future to solving the problems of the present (for women), and in reverse trends (for men), as well as in a greater orientation of men toward proactive behavior. It is explained by the need to solve life problems through actions related to risks and reducing personal security, as well as through the intensive use of the potential of innovative behavior and regulatory resources (planning, the general level of personal readiness for activity).
3. For women, a shift in life priorities from the future to the present in conditions of increased risk levels leads to a significant decrease in life satisfaction, an increase in the value of security, and less active behavior poorly oriented toward innovation, to a decrease in the levels of regulatory processes (planning). It is compensated through an increase in the creativity indicator, allowing one to solve several new problems of ensuring one's vitality.
4. The results presented in the article indicate the need to use new approaches to the methodology of modern research that study dynamic processes in complex social and psychological systems. This way, one can enhance the understanding of the considered phenomena and re-evaluate the patterns found due to the transition from the use of criteria of difference, regression and factor models to network analysis.

The results obtained can serve as the basis for the development of systemic psychological and pedagogical measures to develop readiness for innovative behavior, mobilize personality resources to overcome risks, and increase the vital capacity of young people in conditions of intense global changes, considering the factor of sex and age characteristics.

The limitations of this study are related to the choice of indicators and methods used, as well as the relatively small age range (from 17 to 28 years) of the respondents who participated in the study. However, these limitations did not affect the representativeness of the results obtained and the description of the possible psychological mechanisms that characterize its features.

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#### Author Contributions

**I. A. Fileiko** conducted statistical analysis of the data, carried theoretical analysis of the literature, interpreted the results, and prepared the text of the article.

**I. V. Atamanova** collected empirical data, interpreted the results, edited the text of the article, designed the text of the article in accordance with the requirements of the journal.

**S. A. Bogomaz** developed the research methodology, collected empirical data, interpreted the results, edited the text of the article.

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#### **Conflict of Interest Information**

The authors have no conflicts of interest to declare.