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RESEARCH OF THE FEATURES AND RELATIONSHIP OF INTERNAL MOTIVATION AND PSYCHOLOGICAL WELL-BEING OF YOUNG PEOPLE WHO ARE PASSIONATE ABOUT PROGRAMMING

INVESTIGACIÓN DE LAS CARACTERÍSTICAS Y RELACIÓN DE LA MOTIVACIÓN INTERNA Y EL BIENESTAR PSICOLÓGICO DE JÓVENES APASIONADOS POR LA PROGRAMACIÓN

Anastasia Moreva¹

E-mail: moreva_an@mininuniver.ru

ORCID: <https://orcid.org/0000-0003-2610-2868>

Larisa Skitnevskaya¹

E-mail: skitla@mail.ru

ORCID: <https://orcid.org/0000-0002-9353-2430>

¹Minin Nizhny Novgorod State Pedagogical University, Russian Federation.

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ABSTRACT

At present, education in programming is one of the most popular and developed fields of education. Identifying and studying prerequisites for successful programming education as an activity, determining conditions that promote the anchoring of future professionals in this profession, and establishing psychological mechanisms for high achievement in the field of programming constitute topical tasks. The research aims to investigate the condition of psychological well-being and intrinsic motivation in young people who are passionate about programming. Intrinsic motivation is examined using the Professional Motivation Questionnaire (PMQ-2), and psychological well-being is analyzed via the Russian-language version of the PERMA-Profiler questionnaire. The results indicate that the well-being of young people who passionate about programming is at the level typical of Russian youth in general. However, this group of youth demonstrates higher levels of intrinsic, integrated, and identified motivation. Most indicators belonging to autonomous motivation positively correlate with general well-being and the PERMA scales "Positive emotion", "Engagement", "Relationships", "Meaning", and "Accomplishment". The authors suggest that enthusiasm for different types of activities acts as an indicator of the development of intrinsic motivation for the activity and psychological well-being.

Keywords:

Intrinsic motivation, psychological well-being, programming studies, passion for activities.

RESUMEN

En la actualidad, la educación en programación es uno de los campos de educación más populares y desarrollados. Identificar y estudiar los requisitos previos para el éxito de la educación en programación como actividad, determinar las condiciones que promuevan el anclaje de los futuros profesionales en esta profesión y establecer mecanismos psicológicos para un alto rendimiento en el campo de la programación constituyen tareas de actualidad. La investigación tiene como objetivo investigar la condición de bienestar psicológico y la motivación intrínseca en jóvenes apasionados por la programación. La motivación intrínseca se examina mediante el Cuestionario de Motivación Profesional (PMQ-2), y el bienestar psicológico se analiza mediante la versión en ruso del cuestionario PERMA-Profiler. Los resultados indican que el bienestar de los jóvenes apasionados por la programación está al nivel típico de la juventud rusa en general. Sin embargo, este grupo de jóvenes demuestra mayores niveles de motivación intrínseca, integrada e identificada. La mayoría de los indicadores pertenecientes a la motivación autónoma se correlacionan positivamente con el bienestar general y las escalas PERMA "Emoción positiva", "Compromiso", "Relaciones", "Significado" y "Realización". Los autores sugieren que el entusiasmo por diferentes tipos de actividades actúa como un indicador del desarrollo de la motivación intrínseca por la actividad y el bienestar psicológico.

Palabras clave:

Motivación intrínseca, bienestar psicológico, estudios de programación, pasión por las actividades.

INTRODUCTION

Among the activities of modern youth, programming takes the leading position. This particular attention to programming as an activity owes both to the interest of young people in the creation of new products, which requires analytical and creative skills, and to their desire to produce a new unique product, as well as to master this new profession.

At present, there is little clarity about the ontological status of programming as an activity. The conditions that promote effective learning and reveal the psychological essence of this activity are studied insufficiently. Furthermore, the individual and personal prerequisites for the successful mastery of software development and the achievement of high and exclusive results in programming have not been explored (Volkova et al., 2022a).

Empirical research under the Self-Determination Theory demonstrates that the ratio of autonomous and controlled motivation determines a person’s performance and psychological well-being. In this, autonomous motivation acts as a stable predictor of perseverance, effort, and emotional well-being in activity, while controlled motivation is associated with emotional exhaustion and professional burnout (Csikzentmihalyi & Csikzentmihalyi, 1988; Deci & Ryan, 2017; Sheldon et al., 2020; Chua & Ayoko, 2021).

While the issues of the well-being of young people are well covered in research (Volk & Savel’eva, 2017; Byzova & Perikova, 2018; Gordeeva & Sychev, 2021), there are very few works on intrinsic motivation in youth (Mandrikova, 2010; Zubova, 2018; Veselova et al., 2021), and works devoted to young people passionate about programming are lacking altogether.

The purpose of the study is to research the features of psychological well-being and intrinsic motivation among young people who are passionate about programming.

MATERIALS AND METHODS

Psychological well-being in youth was researched using the Russian-language version of PERMA-Profilier (Isaeva et al., 2022), based on Martin Seligman’s PERMA well-being model, where well-being (“prosperity”) is defined as “a state of sustainable balance expressed in high levels of emotional, psychological, and social well-being” (Butler & Kern, 2016; Isaeva et al., 2022).

Intrinsic motivation was assessed via the Professional Motivation Questionnaire (PMQ-2) (Osin et al., 2017), developed based on Deci & Ryan (2017), Self-Determination Theory. In this theory, the construct of intrinsic motivation describes a type of determination of behavior, whose

initiating and regulating factors arise from the personal Self and reside completely in the behavior itself. “Intrinsically motivated activities have no rewards other than the activity itself. People engage in the activity for its own sake, not for the achievement of any external rewards. Such activity is an end in itself, not a means to achieve some other goal” (Osin et al., 2017; Volkova et al., 2022b).

The resulting questionnaire transferred into Google Forms was offered to young people in the Nizhny Novgorod region via online resources, such as the VK social network. Young people passionate about programming were recruited for the study through the specialized classes of lyceums and gymnasiums, organizations of additional education, clubs, and special courses with classes on programming and preparation for IT lympiads. The study was anonymous and conducted on a voluntary gratuitous basis.

The data obtained were processed by descriptive statistics, frequency analysis, and analysis of variance using IBM SPSS STATISTICS 26 software.

The study sample included 302 participants aged 14-35 years old (M=19.7). Of these, 161 people (53.3%) were interested in programming, and 141 people (46.7%) – in areas outside of programming. 151 young people were male (50.0%) and 151 – female (50.0%).

Detailed information on the study sample is provided in Table 1.

Table 1. Sample characteristics.

Characteristic	Young people with an interest in programming (N=161), N	Young people with interests in other areas (N=141), N
Age		
mean (M)	19.31	20.1
standard deviation (SD)	3.69	4.1
minimum (min)	14	14
maximum (max)	35	34
Age group		
14-17 years old	38 (23.6%)	25 (17.8%)
18-21 years old	100 (62.1%)	88 (62.4%)
22-35 years old	23 (14.3%)	28 (19.9%)
Gender		
Male	108 (67.1%)	43 (29.8%)
Female	53 (32.9%)	98 (69.5%)
Education		
student (school/technical school/college)	39 (24.2%)	32 (22.7%)

university student	105 (65.2%)	89 (63.1%)
secondary education	3 (1.9%)	20 (14.2%)
higher education	4 (2.5%)	23 (16.3%)
Experience in programming		
under 1 year	41 (25.5%)	57 (40.4%)
1-2 years	55 (34.2%)	5 (3.5%)
3-5 years	46 (28.6%)	4 (2.8%)
6-8 years	9 (5.6%)	19 (13.7%)
over 8 years	2 (1.2%)	10 (7.1%)
NA	8 (5.0%)	23 (16.3%)

RESULTS AND DISCUSION

The indicators of the well-being of the young people included in the study fall within the average values. The highest scores were found on the “Accomplishment” (M=7.47±1.43) and “Engagement” (M=7.39±1.45) scales in the group of young people passionate about programming and on the “Positive emotion” (M=7.78±1.69), “Relationships” (M=7.70±1.69), and “Accomplishment” (M=7.70±1.40) scales in the group of youth with interests in other activities.

The indicators of general well-being and the “Positive emotion” and “Relationships” scales, as well as the additional Happiness scale, were significantly lower in the group with an interest in programming (p≤ 0.05) (Table 2).

Table 2. Indicators of psychological well-being in young people engaged in various activities (N=302).

Scale	Group 1		Group 2		t	p
	M	SD	M	SD		
General well-being	7.28	1.50	7.68	1.47	2.33	0.020*
Positive emotion	7.27	1.84	7.78	1.69	2.49	0.013*
Relationships	7.11	2.13	7.70	1.95	2.53	0.012*
Engagement	7.39	1.45	7.44	1.48	0.37	0.744
Meaning	7.14	2.06	7.51	1.94	1.58	0.116
Accomplishment	7.47	1.43	7.70	1.40	1.39	0.166
Negative emotion	5.54	2.15	5.71	1.96	0.70	0.484
Health	6.66	2.20	7.10	2.08	1.80	0.073
Loneliness	4.72	2.92	4.35	2.74	1.12	0.265
Happiness	7.28	2.12	7.92	1.83	2.80	0.005**

Designations: Group 1 – sample of persons with hobbies in programming; Group 2 – sample of persons with hobbies in various areas other than programming; M – arithmetic mean; SD – standard deviation; t – Student’s t-test; p – statistical significance of Student’s t-test; * – p ≤0.05; ** – p ≤0.01.

In students aged between 18 and 21, significant differences were found in most components of psychological well-being when comparing people interested in programming and other types of activities (Table 3). However, no such differences can be seen in the age groups of 14-17 years old and 22-35 years old.

Table 3. Indicators of psychological well-being in young people engaged in various activities, depending on age (N=302).

Scale	18-21 years old		p
	M (SD)		
	G1 (N=100)	G2 (N=88)	
General well-being	6.91 (1.50)	7.53 (1.49)	0.004**
Positive emotion	6.94 (1.87)	7.65 (1.75)	0.006**
Relationships	6.71 (2.16)	7.52 (2.02)	0.006**
Engagement	7.09 (1.52)	7.34 (1.59)	0.324
Meaning	6.66 (2.12)	7.38 (1.94)	0.012*
Accomplishment	7.11 (1.53)	7.54 (1.36)	0.042*
Negative emotion	5.86 (2.05)	5.74 (1.97)	0.825
Health	6.22 (2.26)	7.12 (2.24)	0.005**
Loneliness	5.11 (2.81)	4.24 (2.77)	0.030*
Happiness	6.97 (2.14)	7.72 (1.91)	0.013*

Designations: G1 – sample of persons with hobbies in programming; G2 – sample of persons with hobbies in various areas other than programming; p – statistical significance of the Mann-Whitney U test; * – p ≤0.05; ** – p ≤0.01.

The results concerning the specifics of motivation in both groups indicate higher values of intrinsic, integrated, and identified motivation, which are attributed to autonomous motivation (Deci & Ryan, 2017) compared to controlled motivation, i.e. introjected and extrinsic motivation, and amotivation (Table 4).

Table 4. Indicators of young people’s motivation for activities of interest to them (N=302).

Scale	Group 1		Group 2		t	p
	M	SD	M	SD		
Intrinsic motivation	4.05	1.03	4.50	0.80	4.22	0.000**
Integrated motivation	3.66	1.06	4.22	0.88	4.96	0.000**
Identified motivation	3.85	0.97	3.99	0.87	1.35	0.179
Introjected motivation	1.64	0.76	2.07	1.01	4.27	0.000**
External motivation	1.92	0.91	1.79	0.93	1.19	0.233
Amotivation	2.02	1.05	1.94	1.03	0.74	0.460

Designations: Group 1 – sample of persons with hobbies in programming; Group 2 – sample of persons with hobbies in various areas other than programming; M – arithmetic mean; SD – standard deviation; t – Student’s t-test; p – statistical significance of Student’s t-test; * – $p \leq 0.05$; ** – $p \leq 0.01$.

Intrinsic motivation had the highest values compared to other types of motivation in both groups ($M_1=4.05 \pm 1.03$ and $M_2=4.50 \pm 0.80$). However, the types of motivation higher in autonomy were expressed to a lesser extent in the group of young people passionate about programming.

Significant differences in the indicators of young people’s motivation for activities of interest to them depending on age are presented in Table 5.

Table 5. Indicators of young people’s motivation for activities of interest to them, depending on age (N=302).

Scale	14-17 y.o.			18-21 y.o.			22-35 y.o.		
	M±SD		p	M±SD		p	M±SD		p
	G1 (N=38)	G2 (N=25)		G1 (N=100)	G2 (N=88)		G1 (N=23)	G2 (N=28)	
Intrinsic motivation	4.43 (0.79)	4.49 (0.99)	0.294	3.78 (1.10)	4.45 (0.77)	0.000**	4.59 (0.60)	4.70 (0.70)	0.196
Integrated motivation	3.75 (1.08)	3.80 (1.28)	0.647	3.47 (1.06)	4.24 (0.72)	0.000**	4.39 (0.65)	4.57 (0.72)	0.293
Identified motivation	4.05 (0.92)	3.84 (1.21)	0.674	3.68 (1.01)	4.00 (0.77)	0.051	4.27 (0.68)	4.00 (0.99)	0.388
Introjected motivation	1.48 (0.59)	1.95 (0.82)	0.037*	1.69 (0.75)	2.11 (1.05)	0.007**	1.66 (1.00)	1.92 (0.84)	0.039*
Motivation	1.69 (0.75)	1.70 (0.71)	0.952	2.00 (0.88)	1.86 (1.01)	0.086	1.98 (1.14)	1.67 (0.85)	0.450
Amotivation	1.62 (0.74)	1.98 (1.21)	0.451	2.25 (1.09)	1.98 (1.04)	0.077	1.72 (1.05)	1.81 (0.95)	0.662

Designations: Group 1 – sample of persons with hobbies in programming; Group 2 – sample of persons with hobbies in various areas other than programming; M – arithmetic mean; SD – standard deviation; t – Student’s t-test; p – statistical significance of Student’s t-test; * – $p \leq 0.05$; ** – $p \leq 0.01$.

In the age group of 18-21 years old, significant differences between the groups of young men and women passionate about programming versus other types of activities were found on the scales of “Intrinsic motivation”, “Integrated motivation”, and “Introjected motivation” (Table 5). “Introjected motivation” also shows significant differences in the 14-17 and 22-35 age groups.

No differences were found in the indicators of psychological well-being and motivation for activity in young women and men of different age groups.

Correlation analysis demonstrates that the indicator of general well-being significantly correlates with all motivation indicators in young people keen on programming. In addition, there are many various statistically significant correlations between the indicators of motivation and psychological well-being (Table 6).

Table 6. Relationships between the indicators of motivation to activity and psychological well-being of young people interested in programming (N=161).

Psychological well-being	Motivation					
	Intrinsic motivation	Integrated motivation	Identified motivation	Introjected motivation	Extrinsic motivation	Amotivation
General well-being	0,348**	0.367**	0.284**	-0.156*	-0.281**	-0.284**
Positive emotion	0.199*	0.239**	0.172*	-0.168*	-0.229**	-0.181*
Relationships	0.157*	0.206**	0.090	-0.085	-0.121	-0.030
Engagement	0.388**	0.396**	0.330**	-0.145	-0.257**	-0.287**
Meaning	0.464**	0.465**	0.429**	-0.112	-.349**	-.461**
Accomplishment	0.457**	0.444**	0.362**	-0.101	-0.233**	-0.368**

Negative emotion	-0.250**	-0.185*	-0.077	0.344**	0.419**	0.361**
Health	0.293**	0.291**	0.264**	-0.014	-0.140	-0.104
Loneliness	-0.116	-0.141	-0.052	0.262**	0.291**	0.114
Happiness	0.115	0.113	0.073	-0.152	-.195*	-0.121

Note: the table shows the values of Pearson's r

Most of the scores of autonomous motivation – intrinsic, integrated, and identified – positively correlate with general well-being and scores on the PERMA scales of “Positive emotion”, “Relationships”, “Engagement”, “Meaning”, and “ Accomplishment”. One exception is the lack of a significant correlation between identified motivation and the “Relationships” scale and correlations with the additional Loneliness and Happiness scales.

Correlations of the controlled motivation types, i.e. introjected and extrinsic motivation, are much weaker and negative (Table 6).

Table 7 presents results on the relationships between motivation for activity and psychological well-being in young people with interests in activities other than programming.

Table 7. Relationships between the indicators of motivation to activity and psychological well-being of young people with hobbies in different areas other than programming (N=141).

Psychological well-being	Motivation for activity					
	Intrinsic motivation	Integrated motivation	Identified motivation	Introjected motivation	Extrinsic motivation	Amotivation
General well-being	0.241*	0.342**	0.351**	-0.019	-0.186	-0.292**
Positive emotion	0.195	0.332**	0.282*	-0.090	-0.216	-0.238*
Relationships	0.168	0.142	0.112	-0.101	-0.245*	-0.222*
Engagement	0.256*	0.388**	0.372**	0.087	-0.052	-0.244*
Meaning	0.264*	0.382**	0.421**	0.032	-0.125	-0.362**
Accomplishment	0.129	0.253*	0.389**	0.072	-0.046	-0.183
Negative emotion	-0.131	-0.233*	-0.050	0.217	0.332**	0.305**
Health	0.200	0.286**	0.245*	-0.052	-0.127	-0.238*
Loneliness	-0.228*	-0.082	0.030	0.424**	0.542**	0.473**
Happiness	0.205	0.275*	0.271*	-0.053	-0.215	-0.222*

Note: the table shows the values of Pearson's r

Table 7 demonstrates that intrinsic, integrated, and identified motivation (included in autonomous motivation) positively correlate with the integral indicator of well-being. In addition, positive correlations are found between these types of motivation and particular PERMA scales (e.g., “Engagement” and “Meaning”).

Introjected and extrinsic motivation (belonging to controlled motivation) are not related to the integral indicator of well-being. Moreover, there are very few links between these types of motivation and the PERMA scales.

It is a fact that the specifics of motivation are defined by the features of personal and social factors in activity.

The reasons behind the lower values of autonomous motivation in young people who study are passionate about programming, in our view, can be explained by the characteristics and nature of this activity: the high difficulty of tasks, uncertainty in decisions, mediation of communications by artificial language sign systems, specificity of feedback, the obviousness of success/failure both in solving a particular task and in the activity as a whole.

Passion for programming (compared to other activities) may be more intertwined with reasons outside of the activity itself (prestige, demand, the popularity of programming, etc.). This assumption is supported by lower values of autonomous motivation in youth engaged in programming.

The two studied groups have similar correlations between intrinsic motivation and psychological well-being.

Positive correlations are found between the autonomous types of motivation and general well-being and other well-being parameters. Meanwhile, the group of people with interests in other activities shows less of such statistically significant correlations. This especially applies to intrinsic motivation, as general well-being has no correlations with the scales of "Positive emotion", "Relationships", and "Accomplishment", as well as the additional indicators "Negative emotion" and "Health". In addition, in the group of youth with interests outside of programming, there are fewer correlations between extrinsic motivation (activity performed for the sake of external reward or avoiding negative consequences) and the indicators of psychological well-being.

Despite the general trends of relationships between psychological well-being and motivation, a major part in the nature of these relationships is played by the content of the activity, its specifics, and its structure.

The presence of significant differences in the components of psychological well-being and various types of motivation in the group of 18-22-year-olds interested in programming versus other activities may be due to the greater representation of young men and women in it compared to other groups.

CONCLUSIONS

The conducted study gives insight into the characteristics of psychological well-being in young people interested in different activities.

Based on the obtained results, we can conclude that:

Interest in activity is indicative of the development of intrinsic motivation for the activity and the individual's psychological well-being.

Young people who are keen on programming have less pronounced intrinsic, integrated, and introjected motivation, compared to the development of these types of motivation in young people interested in other activities. This owes to the specificity of programming as an activity and the content of motives for it.

The level of psychological well-being of young people enthusiastic about programming is on par with the indicators typical of Russian youth in general.

Interrelations of motivation for activity in young people interested in programming versus other types of activities are similar in structure and orientation. These interrelations have some specific features in young people keen on programming, expressed in a greater number of statistically significant interrelations of psychological well-being

indicators with intrinsic (positive correlations) and extrinsic (negative correlations) motivation.

The findings can be used to design and organize activities related to working with young people interested in programming.

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