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## **The View of Russian Psychology Students on Whether Psychology is a Science**

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The Psychology as Science scale (PAS; Friedrich, 1996) was administered to 525 psychology students from 9 Russian universities, with a majority of students being women (86.3%), to assess their beliefs about the nature of the discipline. Based on the PAS total score, about half of the study participants (49.6%) generally agreed that psychology may be called a scientific discipline. Based on 3 PAS Factor scores, 71.5% of the sample agreed that psychology may be placed in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology; 39.9% of the sample expressed beliefs in the need for psychological research and the value of methodological training; and 43.1% of the sample shared views of determinism and belief in the predictability of behavior. Participants who took 3 methodology courses shared significantly stronger beliefs in the need for psychological research and the value of methodological training compared to students who did not take any methodology courses. Furthermore, participants with Russian specialist's degree had significantly stronger beliefs that psychology is a science compared to students who had just finished school. In terms of their career aspirations, only a small percentage of participants picked careers associated with potential research activities. Regardless of the study limitations, these findings have potential implications for Russian psychology instructors.

*Keywords:* psychology, Russian psychology, science, education, training in psychology

Is psychology a science? One would expect that at the age of the advent of cognitive, affective, behavioral, and social neuropsychology, when the scientist-practitioner model has been the dominant model of education and training in psychology programs for more than four decades (Baker & Benjamin 2000; Barlow, Hayes, & Nelson, 1985), psychologists in training would answer this question positively. However, in line with the longstanding public skepticism of psychology and doubts about whether psychology is a science (Lilienfeld, 2012; Lilienfeld, Lynn, Ruscio, & Beyerstein, 2010; Teo, 2012), research conducted in the United States revealed that college students majoring in psychology and especially those enrolled in introductory classes often hold misconceptions about psychology as a discipline (Friedrich, 1996; Hughes, Lyddy, & Lambe, 2013; Lilienfeld et al., 2010; Mercer, 2010; Stanovich, 2013), endorsing erroneous beliefs such as “opposites attract,” “it is easy to tell a liar by their facial expressions”, or “we use only 10% of our brain power” (Green, Page, Rasekhy, Johnson, & Bernhardt, 2006; Herculano-Houzel, 2002; Hughes et al., 2013; Lilienfeld et al., 2010; Lyddy & Hughes, 2011; Vaughan, 1977).

In fact, a series of American research studies that assessed students' perceptions of psychology as a science using the total score of the Psychology as Science (PAS) questionnaire (Friedrich, 1996) indicated that introductory psychology students only weakly or moderately agreed that psychology is a science (Amsel, Baird, & Ashley, 2011; Amsel et al., 2009; Gervasio, Wendorf, & Yoder, 2010; Pettijohn et al., 2015). However, after completion of several psychology courses, especially more advanced research-oriented courses, students

tend to have higher scores on the PAS compared to beginners, suggesting that the tendency to see psychology as a science may be increased with particular academic experience (Amsel et al., 2011; Bartels, Hinds, Glass, & Ryan, 2009; Friedrich, 1996; Holmes & Beins, 2009; Pettijohn et al., 2015). Moreover, students with higher PAS scores are more involved in psychological research (Friedrich, 1996), and, in general, are more interested in science, tending to endorse the idea of conducting research in the future (Gervasio et al., 2010; Holmes & Beins, 2009).

Expanding this area of research in order to increase the internationalization of psychology and to provide American psychologists with a basis for scientific collaboration, our group over the past decade has conducted studies on whether students across several universities in the south and northeast of Brazil consider psychology to be a science (Bartoszeck, Abramson, & Place, 2005; Morales, Abramson, Nain, Junior, & Bartoszeck, 2005). Based on three factor scores of the PAS, namely reflecting students' beliefs about psychology as a science, their appreciation of psychological research, and their views about predictability of behavior, we found that students in the northeast (Morales et al., 2005) and the south (Bartoszeck et al., 2005) of Brazil were ambivalent toward the status of psychology as a science and that this is due in part to the lack of published research and the maintaining of psychology research laboratories throughout Brazil. These conclusions are consistent with recent research conducted with American samples, which found that students' beliefs associated with psychology as a science were positively associated with professors' appreciation of psychology as a science (Amsel, Ashley, Baird, & Johnston, 2014; Amsel et al., 2009) and with participation in courses that emphasize research methodology and/or require students to complete a research project (Amsel et al., 2011; Friedrich, 1996; Holmes & Beins, 2009; Pettijohn et al., 2015).

The experience of working in Brazil stimulated our interest in whether Russian students consider psychology in the same category as such natural sciences. In Russia, the development of psychology as a science has been hindered by multiple obstacles caused by political, economic, and sociocultural reasons (Koltzova, 1996; Mironenko, 2008a, 2014; Zinchenko & Petrenko, 2011). Although Russian psychology was an integrative and a well-established part of international science before the Russian Revolution of 1917, in the Soviet era, Russian psychology was strictly controlled by the Soviet government (Mironenko, 2008a; Vassilieva, 2010; Zhuravlev, Ushakov, & Yurevich, 2015), along with its isolation from Western science behind "the iron curtain" (Aleksandrova-Howell, Abramson, & Craig, 2011; Mironenko, 2008a, 2013a, 2015; Yasnitsky, 2011). At that time, only three research-oriented university psychology departments with fully equipped laboratories funded by the Soviet government continued to function as educational institutions (Mironenko, 2014, 2015). With perestroika, all financial support of science and education was stopped (Mironenko, 2013b, 2014, 2015); however, more than 300 institutions of higher education in psychology emerged (Mironenko, 2008a, 2014, 2015).

Unfortunately, the increased number of psychology graduates has been accompanied by a decline in the quality of education and a complete rift between psychological research and practice (Mazilov, 2006; Mironenko, 2008b, 2013b, 2015; Vasilyuk, 1996; Yurevich, 2005b, 2007a, 2008, 2015). After perestroika, applied psychology developed in such a way that it was almost completely independent from scientific psychology (Orlov, 2012; Vasilyuk, 1996; Yurevich, 2000, 2015; Zelenkova, 2015), and was considered more of an art than a science that could be scientifically tested (Yurevich, 2012; Zhuravlev et al., 2015).

Today, Russian psychologists unanimously agree that in order to rejuvenate Russian psychology and to eliminate the split between research psychology and psychological practice, it is important to draw a line between scientific and nonscientific psychology (Mironenko, 2013b, 2015; Yurevich, 2005a, 2005b), fight the "enemy" in the face of folk or popular psychology (Mironenko, 2008b, 2015; Yurevich, 2007b), and boost

students' interest in conducting research (Arzhanik, Lyurya, & Chernikova, 2012; Oleinik, 1996; Ostapenko, 2011; Shmelev, 2006; Velichkovsky, 2009; Zinchenko & Petrenko, 2011). Russian authors often link students' research activity with their competencies related to research design and statistics (Ostapenko, 2011; Shmelev, 2006) as well as the excessively formal presentation of the courses' materials and lack of interest and experience in research in students' advisors and faculty members (Malyutina, 2014; Rakitina, 2015; Shmelev, 2006; Zinchenko & Petrenko, 2011). Although all the above factors are definitely important, students' beliefs about psychology as a science may be particularly important (Bartels et al., 2009; Friedrich, 1996; Holmes & Beins, 2009). For example, if a student does not believe that psychology is a science, teaching the student to apply scientific methods to psychology may be ineffective.

Thus, we designed the present study with a number of goals in mind. The first goal was to describe the sample in terms of students' beliefs about psychology as a science. We wanted to know to what extent Russian psychology students in general believe that psychology is a science. We also explored the sample in terms of differences in the strength of endorsement of psychology as a hard science, appreciation of research, and views about predictability of behavior. The second goal of this study was to obtain some specific information related to students' beliefs about psychology as a hard science, appreciation of research, and views about predictability of behavior depending on (1) the number of methodology courses taken by students, (2) level of education at the moment of assessment, and (3) career aspirations. Finally, the third goal was to describe the sample of Russian psychology students in terms of their professional aspirations. Specifically, we wanted to know what percent of students' psychology careers would be associated with research.

Results of this study may help Russian psychology educators to have a better vision that students' beliefs about psychology may be enhanced or modified. In addition, the results may serve psychologists wishing to work with their Russian colleagues on the state of psychological research in Russia.

## Method

### Participants

A convenience sample of 555 students were recruited from nine Russian universities located in seven Russian cities: Moscow, Perm, Ulyanovsk, Tomsk, Abakan, Samara, and Yaroslavl. Data from 30 participants were eliminated due to incomplete responses for a final sample of 525. The sample consisted of 453 women (86.3%) and 72 men (13.7%). The majority of the study participants were from Perm National Research Polytechnic University ( $n = 87$ ), followed by Ulyanovsk State University ( $n = 73$ ), Tomsk State University ( $n = 63$ ), Khakas State University named after F. Katanov ( $n = 61$ ), Russian Presidential Academy of National Economy and Public Administration ( $n = 59$ ), Samara State Academy of Social Sciences & Humanities ( $n = 54$ ), Yaroslavl State Pedagogical University named after K. D. Ushinsky ( $n = 52$ ), Moscow State University of Design and Technology ( $n = 51$ ), and University of the Russian Academy of Education ( $n = 25$ ). Students reported 21 different nationalities.

In Russia, applicants at higher education institutions must indicate their area of study before entry, so all participants were working toward a degree in psychology. In terms of their highest educational qualification, 428 participants finished high school (81.5%), 45 participants held a specialist's degree (8.6%), 29 had a bachelor's degree (5.5%), and 17 participants had a vocational school degree (3.2%). Of note, according to the Russian legislation there are three levels of higher professional education. The specialist's and master's degree refer to the same, second level. For obtaining a specialist's degree, students have to study continuously 5-6 academic years and to perform an academic work in volume of 300-360 credits (Lukichev & Skorobogatova, 2016).

Students' career choices included psychologist ( $n = 227$ , 43.2%), clinical psychologist ( $n = 62$ , 11.8%), counseling psychologist ( $n = 41$ , 7.8%), educational/school psychologist supporting children's development in educational settings ( $n = 28$ , 5.3%), organizational psychologist ( $n = 25$ , 4.8%), child psychologist ( $n = 13$ , 2.5%), forensic psychologist ( $n = 10$ , 1.9%), family psychologist ( $n = 9$ , 1.7%), coaching psychologist ( $n = 9$ , 1.7%), neuropsychologist ( $n = 8$ , 0.4%), social psychologist ( $n = 7$ , 1.3%), conflict resolution psychologist ( $n = 4$ , 0.8%), rehabilitation psychologist ( $n = 3$ , 0.6%), sport psychologist ( $n = 3$ , 0.6%), political and military psychologist ( $n = 3$ , 0.6%), zoo psychologist ( $n = 1$ , 0.2%), and health psychologist ( $n = 1$ , 0.2%). Only a small percentage of students

picked careers associated with potential research activities. For example, seven students expressed willingness to become university faculty member ( $n = 7$ , 1.3%), such as college professors or instructors of psychology. Only two psychology students (0.4%) wanted to become scientists or researchers. Answering a question about their future career, 59 students (11.2%) were indecisive about their career aspirations and indicated several possible psychology careers (e.g., counseling psychologist and family psychologist, counseling psychologist and clinical psychologist).

## Procedure

Ethical approval for this study was obtained from the relevant university ethics committee. Participants were sampled from regularly scheduled face-to-face classes at the beginning of the semester across the psychology curriculum. Prior to completing the questionnaires, students were informed that their participation in the study was voluntary and that all given information would remain confidential. Once participation had been agreed, participants completed a consent form and completed a paper-and-pencil version of the survey. All study materials were translated from English into Russian by a bilingual author of the study (MAH) who has a degree in linguistics.

The translation was examined using the parallel blind technique (Behling & Law, 2000). The translation was discussed with other Russian speaking authors to be able to evaluate the equivalence of the source and target versions in four areas: semantic, idiomatic, experiential, cultural, and conceptual equivalence (Harkness, Villar, & Edwards, 2010). For example, bearing in mind that there is no option of a bachelor's of science degree in Russia, we modified the Item 3 to read "Psychology students must not only acquire practical skill, but also learn how to do research."

## Measures

Similar to our Brazilian studies, we assessed students' tendencies to perceive psychology as a natural science using the Psychology as Science scale (PAS; Friedrich, 1996). The scale comprises 20 items, 15 of which ascertain students' beliefs in psychology as a science, and five of which are filler items (see Table 1). The items are shown in Table 1, organized by factor. The 20 items of the scale, including filler items, are rated on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Although in the original study (Friedrich, 1996) the PAS total score was calculated as a sum of 7 negatively keyed (reverse scored) and 8 positively keyed items, in the present study the PAS was alternatively scored by taking the mean of the 15 scale items (after appropriate reverse-scoring), with higher scores indicating greater inclination to perceive psychology as a science.

Originally, Friedrich (1996) designed PAS as a unidimensional measure of students' tendency to view psychology as a science, but he also identified three factors in the scale. Thus, in addition to the total PAS score, in this study, we also used three PAS factor averaged scores (Friedrich, 1996). Factor 1 of the scale is composed of Items 3, 4, 12, and 13, measuring "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (e.g., "It's just as important for psychology students to do experiments as it is for students in chemistry and biology"). Factor 2 is composed of Items 10, 14, 17, 18, and 20, addressing "beliefs in the need for psychological research and the value of methodological training" (e.g., "Courses in psychology place too much emphasis on research and experimentation"). Factor 3 is composed of Items 6, 7, 8, 9, 16, and 19 that tap "views of determinism and belief in the predictability of behavior" (e.g., "Carefully controlled research is not likely to be useful in solving psychological problems").

Our sample had a coefficient alpha of .67, which was equal or lower than coefficient alphas taken solely from American student samples, including coefficient alphas in the .67 to .80 range identified by Friedrich (1996), coefficient alphas of .72, .75, .76, .83, and .86 identified across several American samples (Amsel et al., 2011; Bartels et al., 2009; Holmes, 2014; Holmes & Beins, 2009) and a cross-cultural sample (Roberts & Povee, 2014), higher than coefficient alphas of .58 and .44 of the Brazilian samples (Bartoszeck et al., 2005; Morales et al., 2005), and coefficient alphas of .64 of the Australian sample (Provost et al., 2011). Although it is generally agreed that the lower limit for Cronbach's alpha value is .70 (Nunnally, 1967), in the social sciences, it may decrease to .60 and still be acceptable, especially in exploratory studies and in research (Hair, Black, Babin, Anderson, & Tatham, 2006). Cortina (1993) noted that generally-agreed guidelines need to be used with caution because the value of alpha ( $\alpha$ ) depends on the number of items on the scale. Furthermore, in psychology research, Cronbach's  $\alpha$  of .60 or even lower could be adequate (Aron & Aron, 1999; Kline, 1999). Thus, unlike our previous studies (Bartoszeck et al., 2005; Morales et al., 2005), in this study, we used both the total and the three factors PAS averaged scores. Cronbach's alphas for Factors 1, 2, and 3 for the entire sample were .63, .45, .51, which were lower than Cronbach's alphas of .70, .67, and .61 for the subscales in the American sample (Bartels et al., 2009), and higher than Cronbach's alphas of .46, .36, and .48 for the three PAS factors in the Australian sample (Provost et al., 2011) and Cronbach's alphas of .52 (.40), .24 (.06), and .57 (.39) found using Brazilian samples (Bartoszeck et al., 2005; Morales et al., 2005).

Table 1

*Psychology as Science Scale (Friedrich, 1996)*

		Items
Factor 1	3.	Psychology students must not only acquire practical skill, but also learn how to do research.
	4.	It's just as important for psychology students to do experiments as it is for students in chemistry and biology.
	12.	Government funding of experimentation is as necessary for expanding what we know about psychology as it is for gaining knowledge in areas like chemistry and physics.
	13.	The study of psychology should be seen primarily as a science.
Factor 2	10.	Psychological advice given in popular books and magazines is often as useful as more research-based claims. (R)
	14.	Courses in psychology place too much emphasis on research and experimentation. (R)
	17.	Psychologists working as counseling professionals do not need to be so concerned with research findings. (R)
	18.	Psychological theories presented in the media should not be trusted unless they are supported by experiments.
	20.	Students get little benefit from learning about procedures for conducting psychology experiments. (R)
Factor 3	6.	Research conducted in controlled laboratory settings is essential for understanding everyday behavior.
	7.	Even though each person is unique, it is possible for science to find general laws explaining human behavior.
	8.	Carefully controlled research is not likely to be useful in solving psychological problems. (R)
	9.	Our ability as humans to behave in any way we choose makes our attempts to predict behavior ineffective. (R)
	16.	Psychological research can enable us to anticipate people's behavior with a high degree of accuracy. (R)
	19.	Psychology will never be a true science because its predictions of individual behavior are seldom exact or certain.
Filler items	1.	A psychology course is an important part of any person's college education.
	2.	The different areas within psychology seem very unrelated to each other.
	5.	An introductory psychology course should cover as broad a range of topics as possible.
	11.	Studying specific examples of how psychology is used is the most interesting part of a psychology course.

*Note.* (R) denotes items that are reverse scored.

## Research Design

Preliminary analyses performed in this study included procedures addressing missing data, descriptive analysis of demographic information and study variables, reliability analysis, tests of assumptions, and cross tabulation analysis. Primary analyses comprising Kruskal-Wallis one-way ANOVA for  $k$ -samples test (Kruskal & Wallis, 1952) and post hoc pairwise comparisons using Dunn's test (1964) with Bonferroni correction were performed. Kruskal-Wallis test ( $p \leq .05$ ) with post hoc pairwise comparisons using Dunn's test with Bonferroni correction ( $p \leq .05$ ) were chosen to test the study hypotheses due to unequal sample sizes, as well as non normal distributions of the dependent variables (Pett, 2015).

## Results

The surveys from all participants were combined into a single data set. Using the PAS summed score for comparison purposes, our aggregate sample of psychology students ( $N = 525$ ) produced scores ( $M = 76.81$ ,  $SD = 9.20$ ) only slightly lower than scores in Friedrich's (Friedrich, 1996) validation sample ( $M = 77.80$ ,  $SD = 10.0$ ) and higher than scores in Gervasio et al.'s (2010) sample ( $M = 74.63$ ,  $SD = 8.61$ ). However, for our analyses, the PAS was alternatively scored by taking the mean of the 15 scale items (after appropriate reverse-scoring). The averaged total PAS score for the whole sample was  $M = 5.12$  ( $SD = 0.61$ ), which was comparable with the average PAS scores ( $M = 5.15$ ) produced by Pettijohn and colleagues (2015). All the above studies were addressing perceptions of psychology as a science using samples of American students. Taking into consideration the fact that the PAS total scores were normally distributed, the sample mean of the PAS represented the average scores of 525 Russian students' perceptions of psychology as a science.

### Analysis of the PAS Total and Factor Scores

The students' total PAS (Friedrich, 1996) score represented their tendency to perceive psychology as a science. According to the cross-tabulation analysis (see Table 2), 24.20% of the whole sample of Russian students strongly agreed that psychology is a science. When 25.41% of participants from the next category (Category 6, *mostly agree*) was included, the percentage increased to 49.61%, meaning that almost half of the sample generally agreed that psychology is a science.

Factor 1 comprises Items 3, 4, 12, and 13, which address respondents' "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (Friedrich, 1996, p. 12). Analysis indicated that 40.48% of respondents strongly agreed with four items of Factor 1 (Category 7). When 31.05% of participants from the adjacent category (Category 6, *mostly agree*) were added, a total of 71.52% of the students generally agreed that psychology is a hard science, such as physics, chemistry, and biology, based on information that can be measured and verified by other scientists. With regard to specific items, 40.76% of participants strongly agreed that it is as important for psychology students to do experiments as it is for students in chemistry and biology (Item 4). When 34.10% of participants from the adjacent category (Category 6, *mostly agree*) were added, this percentage increased to 74.86%. Likewise, 35.05% of students strongly agreed that the study of psychology should be seen primarily as a science (Item 13). This percentage increased to 66.86% when 31.81% of participants from the adjacent category (Category 6, *mostly agree*) were included.

Table 2

*Frequencies of students' response choices and measures of Central Tendency and Dispersion for the PAS Factors and the PAS Total Scale (N = 525)*

		Students' Frequencies of Response Choices									
		1	2	3	4	5	6	7	<i>M</i>	<i>SD</i>	<i>Mdn</i>
<b>Factor 1</b>	<b>Item</b>										
	3	5	7	24	48	65	168	208	5.85	1.32	6.00
	4	6	10	13	36	67	179	214	5.94	1.27	6.00
	12	2	5	14	51	71	138	244	6.00	1.22	6.00
	13	1	12	29	66	66	167	184	5.71	1.34	6.00
	Total	14	34	80	201	269	652	850	<b>5.87</b>	<b>0.89</b>	<b>6.00</b>
	%	0.67	1.62	3.81	9.57	12.81	31.05	40.48			
<b>Factor 2</b>	<b>Item</b>										
	10R	53	105	143	54	67	73	30	4.40	1.74	3.00
	14R	28	95	109	110	92	61	30	4.15	1.60	4.00
	17R	3	16	33	74	106	130	163	2.51	1.42	6.00
	18	19	31	61	80	89	138	107	4.96	1.68	5.00
	20R	3	12	33	74	88	147	168	2.44	1.39	6.00
	Total	106	259	379	392	442	549	498	<b>4.69</b>	<b>0.88</b>	<b>4.60</b>
	%	4.04	9.87	14.44	14.94	16.84	20.91	18.97			
<b>Factor 3</b>	<b>Item</b>										
	6	21	27	56	99	100	151	71	4.84	1.59	5.00
	7	3	9	25	39	103	180	166	5.73	1.26	6.00
	8R	16	46	88	125	111	90	49	3.60	1.54	4.00
	9R	8	51	79	130	123	95	39	3.57	1.46	4.00
	16	6	21	69	36	165	145	83	5.10	1.43	5.00
	19R	7	24	39	76	90	139	150	2.65	1.54	6.00
	Total	61	178	356	505	692	800	558	<b>4.97</b>	<b>0.79</b>	<b>5.00</b>
	%	1.94	5.65	11.30	16.03	21.97	25.40	17.71			



Table 1 (continued).

PAS	Total	181	471	815	1098	1403	2001	1906	5.12	.61	5.13
	%	2.30	5.98	10.35	13.94	17.82	25.41	24.20			

Note: Response choices are 1 for *strongly disagree*, 2 for *mostly disagree*, 3 for *slightly disagree*, 4 for *neutral*, 5 for *slightly agree*, 6 for *mostly agree*, and 7 for *strongly agree*. “R” next to the item number means *reversed*.

Factor 2 consists of items that assess students’ “beliefs in the need for psychological research and the value of methodological training” (Friedrich, 1996, p. 12). The results from the analysis of Items 10, 14, 17, 18, and 20 indicated that 18.97 % strongly agreed (Category 7) that psychological research is important and that training in psychological methodology is necessary. When 20.91% of participants from the next category (Category 6, *mostly agree*) were included, the percentage increased to 39.89%. Item 17 (reversed) is representative of this factor: 31.81% of students strongly agreed (Category 7) that psychologists working as counseling professionals need to be concerned with research findings. This percentage increased to 56.57% when 24.76% of participants from the next category (Category 6, *mostly agree*) were included. As to Item 20 (reversed), 32% of students strongly agreed (Category 7) that students benefit from learning about procedures for conducting psychology experiments. When the next category (Category 6, *mostly agree*) was considered and 28% of participants were included, the percentage increased to 60%. Moreover, 32% of participants strongly agreed (Category 7) that students benefit from learning about procedures for conducting psychology experiments (Item 20, reversed). This increased to 60% when the adjacent category (28%, Category 6, *mostly agree*) was included. Interestingly, 10.10% of students appeared to have misconceptions about psychology, strongly agreeing (Category 7) that psychological advice given in popular books and magazines is often as useful as more research-based claims (Item 10). Overall, 30.10% of students generally valued advice given in popular books and magazines when 20% of participants from the next category (Category 6, *mostly agree*) were included. Only 5.71% of students strongly disagreed (Category 1) that psychological advice given in popular books and magazines is as useful as research-based claims. This increased to 19.61% when the adjacent category (13.90%, Category 2, *mostly disagree*) was included.

Factor 3 consists of Items 6, 7, 8, 9, 16, and 19, which assess students’ “views of determinism and belief in the predictability of behavior” (Friedrich, 1996, p. 12). Only 17.71% strongly agreed (Category 7) that behavior is predictable. This percentage increased to 43.11% when 25.40% of participants from the next category (Category 6, *mostly agree*) were included. Looking at each item individually, results indicated that only 9.33% of students strongly agreed (Category 7) that carefully controlled research is useful in solving psychological problems (Item 8, reversed). This percentage increased to 26.47% when 17.14% of participants from the next category (Category 6, *mostly agree*) were included. In terms of another item representative of Factor 3, 15.81% of students strongly agreed (Category 7) that psychological research “can enable us to anticipate people's behavior with a high degree of accuracy” (Item 16). This percentage increased to 43.42% when 27.62% of participants from the next category (Category 6, *mostly agree*) were included. Answering a more general question about psychology as a true science (Item 19), 28.57% of students strongly disagreed (Category 1) that psychology will never be a true science because its predictions of individual behavior are seldom exact or certain. When 26.48% of participants from the next category (Category 2, *mostly disagree*) were included, a total 55.05% generally disagreed that psychology will never be a true science. Only 1.33% of Russian students strongly agreed (Category 7) that psychology will never be a true science because its predictions of individual behavior are seldom exact or certain (Item 19). This percentage increased to 5.90%, when 4.57% of participants from the adjacent category (Category 6, *mostly agree*) were included.

### **The PAS Total and Factor Score Differences by Number of Methodology Courses**

In terms of differences in the students' perceptions of psychology as a natural science, similar to biology, chemistry, and physics (PAS Factor 1), a Kruskal-Wallis test showed that the number of methodology courses did not have a significant effect on how willing students were "to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (PAS Factor 1; Friedrich, 1996, p. 12),  $\chi^2(6, N = 525) = 9.43, p = 0.15$ . Interestingly, students who took five research courses ranked higher (mean rank = 313.86) than students who took six research courses (mean rank = 295.26). Similarly, students who took one research course ranked higher (mean rank = 261.92) than students who took two research courses (mean rank = 242.08). Examining differences in students' "beliefs in the need for psychological research and the value of methodological training" (PAS Factor 2; Friedrich, 1996, p. 12), a Kruskal-Wallis test demonstrated that the number of methodology courses had a significant effect on how much students believed "in the need for psychological research and the value of methodological training" (PAS Factor 2),  $\chi^2(6, N = 525) = 21.46, p < 0.01$ . Although students who took six research courses scored the highest (mean rank = 341.85), and students who did not take any research courses scored the lowest (mean rank = 227.45), the Dunn's test (1964) with Bonferroni correction indicated that students who took three methodology courses had significantly higher scores than students who did not take any methodology courses,  $p = 0.04$ . Finally, in terms of differences in students' "views of determinism and belief in the predictability of behavior" (PAS Factor 3; Friedrich, 1996, p. 12), a Kruskal-Wallis test revealed that the number of research courses taken did not have a significant effect on students' "views of determinism and belief in the predictability of behavior" (PAS Factor 3; Friedrich, 1996, p. 12),  $\chi^2(6, N = 525) = 7.11, p = 0.31$ . Again, it was a surprise that students who took two research courses scored lower (mean rank = 255.97) than students who took one research course (mean rank = 258.80).

Because the Cronbach's alphas for the PAS Scale factors were low, percent responses to each individual item on Factor 1 and 2 were compared based on the number of methodology courses students reported having taken. Statistically significant differences in responses based on the number of methodology courses taken were found on Item 12 [ $\chi^2(6) = 19.37, p < 0.01$ ] (Factor 1), Item 9 (reversed) [ $\chi^2(6) = 17.26, p = 0.01$ ] (Factor 3), and Item 19 (reversed) [ $\chi^2(6) = 14.14, p = 0.03$ ] (Factor 3). For example, results of the Dunn's test with the Bonferroni correction indicated that, on Item 12, students who took four methodology courses had significantly higher scores than students who did not take any methodology courses,  $p = 0.04$ , having a stronger level of agreement with a statement that government funding of experimentation is necessary for expanding the field of psychology. Likewise, on Item 9 (reversed),  $p = 0.01$ , students who took six methodology courses had significantly higher scores compared to students who did not take any methodology courses, expressing stronger agreement with a statement that human ability to behave in any chosen way does not make attempts to predict behavior ineffective. There were no statistically significant post hoc comparisons on Item 19 when evaluating pairwise comparisons based on number of methodology courses taken. The above means that the number of methodology courses had an effect on students' "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (Factor 1; Friedrich, 1996, p. 12) and their "views of determinism and belief in the predictability of behavior" (Factor 3; Friedrich, 1996, p. 12).

### **The PAS Total and Factor Score Differences by Education Attained**

A Kruskal-Wallis test was conducted to evaluate differences in the total PAS score and three PAS factor scores based on whether students had a high school diploma, a vocational school degree, a bachelor's degree, or a specialist degree at the time of evaluation. It was assumed that individuals with a specialist degree were

more exposed to psychology as a science and took more methodology courses.

Results of the Kruskal-Wallis test demonstrated that the prior education had a modest significant effect on how students perceived psychology as a science (PAS total),  $\chi^2(3, N = 525) = 15.53, p = 0.01$ . A post hoc comparison test using Dunn's test with Bonferroni correction indicated that students who had a specialist degree had significantly higher scores than students who only had a high school diploma,  $p = 0.01$ .

A Kruskal-Wallis test showed that previous education had a significant effect on students' "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (Factor 1; Friedrich, 1996, p. 12),  $\chi^2(3, N = 519) = 12.39, p = 0.01$ . A post hoc comparisons test using Dunn's test with Bonferroni correction indicated that students who had a specialist's degree had significantly higher scores than students who had a high school diploma,  $p = 0.02$ .

A Kruskal-Wallis test demonstrated that attained degree had a modest significant effect on how students' "beliefs in the need for psychological research and the value of methodological training" (PAS Factor 2; Friedrich, 1996, p. 12),  $\chi^2(3, N = 519) = 12.77, p = 0.01$ . However, a post hoc test using Dunn's test with Bonferroni correction did not show significant differences in students' scores based on their prior level of education.

According to the results of the Kruskal-Wallis test, there was no statistically significant difference in Factor 3 (Friedrich, 1996, p. 12) scores reflecting students' "views of determinism and belief in the predictability of behavior",  $\chi^2(3, N = 519) = 3.21, p = 0.36$ .

Because the Cronbach's alphas for the three factors were low, percent responses to each individual question regarding students' perception of psychology as a science were compared based on the number of methodology courses students reported having taken. Statistically significant differences in responses based on the number of methodology courses taken were found on questions on PAS Factor 2 and Factor 3: 14 [ $\chi^2(3) = 8.31, p = 0.04$ ], 20 [ $\chi^2(3) = 8.08, p = 0.04$ ], 9 [ $\chi^2(3) = 15.95, p < 0.01$ ], and 19 [ $\chi^2(3) = 13.43, p < 0.01$ ].

On Question 14 (reversed), stating that "courses in psychology place too much emphasis on research and experimentation", a post hoc comparisons test using Dunn's test with Bonferroni correction did not reveal any differences between students' scores depending on their level of prior education. Similarly, there were no differences between students' scores depending on their level of prior education on Question 20 (reversed), stating that students get little benefit from learning about procedures for conducting psychology experiments. On Question 9 (reversed), stating that "our ability as humans to behave in any way we choose makes our attempts to predict behavior ineffective", a post hoc comparisons test using Dunn's test with Bonferroni correction indicated that students who had a bachelor's degree had significantly higher scores than students who had a high school diploma,  $p = 0.01$ . On Question 19 (reversed), stating that "psychology will never be a true science because its predictions of individual behavior are seldom exact or certain", a post hoc comparisons test using Dunn's test with Bonferroni correction indicated that students who had a bachelor's degree had significantly higher scores than students who had a high school diploma,  $p = 0.01$ .

### **The PAS Total and Factor Score Differences by Students' Future Career Choices**

A Kruskal-Wallis test was conducted to evaluate differences in the total PAS score and three PAS factor scores based on students' future career choices, including counseling, clinical, school, family, and child psychologists (Group 1), social, military, forensic, organizational, and sports psychologists (Group 2),

academic psychologists (Group 3), and group of students who did not have clarity about their careers or did not want to have careers in psychology (Group 4). Results of the Kruskal-Wallis test demonstrated that students' career choices had a significant effect on how they perceived psychology as a science (PAS total),  $\chi^2(3, N = 525) = 18.35, p < 0.01$ . A post hoc comparisons test using Dunn's test with Bonferroni correction indicated that students who wanted to be counseling, clinical, school, family, and child psychologists (Group 1) and academic psychologists (Group 3) had significantly stronger beliefs that psychology is a science than students who did not choose any specialization, those who did not decide what their career would be, and those who did not want to work as psychologists (Group 4) ( $p = 0.01$  and  $p < 0.01$ , respectively). Among participants belonging to these four groups, students who wanted to pursue career in academia (Group 3, mean rank = 326.04) ranked the highest, followed by participants who wanted to be counseling, clinical, school, family, and child psychologists (Group 1, mean rank = 271.27).

A Kruskal-Wallis test showed that students' future careers had a significant effect on students' "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (PAS Factor 1; Friedrich, 1996, p. 12),  $\chi^2(3, N = 525) = 8.70, p = 0.03$ . The Dunn's post hoc test with Bonferroni correction indicated that students who wanted to be counseling, clinical, school, family, and child psychologists (Group 1) had significantly higher scores on PAS Factor 1 than students who did not have clarity about their future careers or did not want to work as psychologists (Group 4),  $p = 0.01$ . Following the pattern related to responses to PAS total items, students who wanted to pursue a career in academia (Group 3, mean rank = 291.21) ranked the highest, followed by future clinicians from Group 1 (mean rank = 272.40).

A Kruskal-Wallis test demonstrated that students' career aspirations had a significant effect on students' "beliefs in the need for psychological research and the value of methodological training" (PAS Factor 2; Friedrich, 1996, p. 12),  $\chi^2(3, N = 525) = 18.39, p < 0.01$ . The Dunn's post hoc test with Bonferroni correction indicated that students who wanted to be counseling, clinical, school, family, and child psychologists (Group 1) and students who wanted to be academic psychologists (Group 3) had significantly higher scores on Factor 2 than students who did not have clarity about their future careers or did not want to work as psychologists (Group 4), ( $p = 0.01, p < 0.01$ , respectively). Similar to responses to PAS total and Factor 1 items, students who wanted to pursue career in academia (Group 3, mean rank = 327.02) ranked the highest, followed by future clinicians from Group 1 (mean rank = 270.77).

According to the results of the Kruskal-Wallis test, there were no statistically significant differences in Factor 3 scores reflecting students' "views of determinism and belief in the predictability of behavior" (PAS Factor 3; Friedrich, 1996, p. 12),  $\chi^2(3, N = 525) = 4.66, p = 0.20$ . However, participants from the academic and research-oriented Group 3 ranked the highest (mean rank = 304.79), followed by social, military, forensic, organizational, and sports psychologists from Group 2 (mean rank = 263.55).

Because the Cronbach's alphas for PAS factors were low, percent responses to each individual question regarding students' "views of determinism and belief in the predictability of behavior" (Factor 3) were compared based on their' future career choices. No statistically significant differences in responses to Factor 3 items based on career preferences were found.

## Discussion

The first goal of our investigation was to describe Russian psychology students in terms of their beliefs about psychology as a science generally and specifically. For example, we explored individual differences related students' endorsement of psychology as a hard science, their appreciation of research, and their views about predictability of behavior. The second goal of this study was to obtain some specific information related to students' beliefs about psychology as a science depending on the number of methodology courses taken by students and the level of education at the moment of assessment. Finally, the third goal was to know what percentage of psychology students would like to have careers associated with research.

Our final sample comprised 525 students from nine Russian universities. The majority of participants were women (86.3%). Study results suggested that Russian psychology students were similar to American students in their beliefs about psychology as a science (Friedrich, 1996; Gervasio et al., 2010; Pettijohn et al., 2015), on average "slightly agreeing" that psychology is a science. However, Russian psychology students were less consistent in their responses reflecting their "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (PAS Factor 1; Friedrich, 1996, p. 12), "beliefs in the need for psychological research and the value of methodological training" (Factor 2), and "views of determinism and belief in the predictability of behavior" (Factor 3) compared to American students (Bartels et al., 2009), and more consistent than Australian and Brazilian students (Bartoszeck et al., 2005; Morales et al., 2005; Provost et al., 2011). Low internal consistency in students' responses may be explained by cultural differences in Russian students' beliefs compared to American students affecting experiential and conceptual equivalence of the items (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Borsa, Damásio, & Bandeira, 2012). For example, it is possible that Russian students could have understood Item 14, which stated that "courses in psychology place appropriate amount of emphasis on research and experimentation," differently compared to American students due to differences in Russian and American curricula placing different emphasis on research and experimentation. Likewise, it is possible that Russian professors could have encouraged students' appreciation of psychological theories not supported by experiments (Item 18) because Russian psychologists working in academia often value clear theoretical conceptualization of psychological phenomena over scientific study of the psyche (Bodalev & Stolin, 1988). Indeed, historically one of the strengths of Russian (Marxist) psychology has been "harmony and transparency of the methodological and theoretical basis" grounded in "the most abstract and indisputable wording" (Dvoinin, 2015, p. 147).

Based on aggregated responses, 49.61% of participants generally (mostly and strongly) agreed that psychology is a science (PAS total score; Friedrich, 1996), including those who strongly agreed (24.20%) that psychology is a science. Moreover, 71.53% of the sample generally (mostly and strongly) expressed "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (Factor 1; Friedrich, 1996, p. 12), including 40.48% of the students who strongly agreed that psychology is a hard science. These results were similar to those reported by Morales and colleagues (2005) for a sample of northeastern Brazil students. Moderate students' perceptions that psychology is a hard science may be explained by the fact that after perestroika, Russian psychologists have been viewing psychology not as a natural science, but as a social or human science, with the natural science paradigm being "under siege" (Mironenko, 2006; Yurevich, 2005a).

As to students' "beliefs in the need for psychological research and the value of methodological training" (Factor 2; Friedrich, 1996, p. 12), only 39.89% of students generally (mostly and strongly) agreed that psychological research is important and training in psychological methodology is necessary, with only

18.97% of students strongly supporting psychological research and valuing methodological training. Answering individual questions, 60% of responders generally (mostly and strongly) agreed that students benefit from learning about procedures for conducting psychology experiments (Item 20, reversed), including 32% of participants who strongly believed in benefits of training in psychology experiments for psychology students. It may be concerning that only 56.57% of students generally (mostly and strongly) agreed that counseling professionals need to be interested in research findings (Item 17), including 31.81% of students who strongly agreed with this statement. Interestingly, 30.10% of students continued to value (mostly and strongly) advice given in popular books and magazines (Item 10), supporting previous research on students' misconceptions about psychology (Amsel et al., 2009; Friedrich, 1996; Holmes & Beins, 2009).

Overall, low interest in research in Russian psychology students in our study is consistent with previous research conducted on samples of Russian psychology students (Balabanov, Bednyy, & Mironos, 2007; Mironov, 2004; Rakitina, 2014; Rasskazov & Stepanova, 2009), Western psychology students (Luebbe Radcliffe, Callands, Green, & Thorn, 2007; VanderVeen, Reddy, Veilleux, January, & DiLillo, 2012), and Western academic and practicing psychologists (Boisvert & Faust, 2006; Cohen, Sargent, & Sechrest, 1986; Lilienfeld, Ritschel, Lynn, Cautin, & Lutzman, 2013; Morrow-Bradley & Elliott, 1986; Safran, Abrue, Ogilvie, & DeMaria, 2011; Stewart & Chambless, 2007). It is possible that students' low beliefs in the need for psychological research and the importance of training in methodology may be linked with the fact that Russian psychology has been historically developing a science of its own guided by a strong theoretical framework not requiring experimental and mathematical explanations (Rozin, 2007, 2010; Vygotskiy, 1983).

Lack of passion for research in Russian future practitioners (Zhuravlev, Nestic, & Yurevich, 2016) could be expected to occur also due to a longstanding rift between scientific research and practice in psychology (Dvoinin, 2015; Mazilov, 2006, 2015; Mironenko, 2008b, 2013b, 2015; Vasilyuk, 1996; Yurevich, 2012, 2015), characterized by lack of interest in scientific research findings among practicing psychologists (Mazilov, 2006; Orlov, 2012; Yurevich, 2000, 2012, 2015; Zhuravlev et al., 2015, 2016). In fact, Russian psychologists have started to look for scientific basis of psychotherapeutic interventions and for evidence for practice only recently (Karitsky, 2002, 2007; Katkov, 2016; Kholmogorova, 2002a, 2002b, 2009, 2010; Pugovkina, Nikitina, Kholmogorova, & Garanyan, 2009; Tukayev, 2004).

While public awareness of scientific psychological knowledge has been purposefully promoted in United States and Australia (Kaslow, 2015; Werner-Seidler, Perry, & Christensen, 2016), nonscientific ways of providing help to people with mental health concerns derived from folk or popular psychology sources flooding Russian TV channels and book stores have been extremely popular among the Russian population (Mironenko, 2008b, 2015; Yurevich, 2007b), resulting in a very low public awareness of psychology as a science. Furthermore, lack of students' interest in research may be associated with the fact that psychology instructors teaching at Russian universities are not motivated to do research because requirements for faculty to publish scientific papers are very low or nonexistent (Velichkovsky, 2009).

Psychology professors often openly express their skeptical and negative attitude to mathematical methods and approaches in the field of general and applied psychology directly during lectures and seminars (Shmelev, 2006). It is possible that students model their professors' lack of appreciation for natural scientific paradigm, low motivation to do research, and their theoretical cognitive style characterized by high level of abstraction associated with a preference for conceptual analysis of psychological phenomena over scientific examination of reality (Allakhverdov, 2005; Bodalev & Stolin, 1988; Dvoinin, 2015; Mironov, 2004). It is not surprising that Russian psychology professors and advisers holding such beliefs (Amsel et al., 2014) and having low involvement in research (Morales et al., 2005) do not see any value in students' research activities

for their professional success and fail to show benefits of research to their students (Rakitina, 2015; Yurevich, 2012). This is the opposite to the current trend in the United States, where it is expected that psychologists would integrate scientific knowledge in psychological practice (American Psychological Association, 2013; APA Task Force on Evidence-Based Practice, 2006; Lambert & Archer, 2006; Melchert, 2016; Spring, 2007), and where psychology students are trained in evidence-based practice (Babione, 2010; Bauer, 2007; Hershenberg, Drabick, & Vivian, 2012; Lack & Doan, 2018; Leffler, Jackson, West, McCarty, & Atkins, 2013).

With regards to students' "views of determinism and belief in the predictability of behavior" (Factor 3; Friedrich, 1996, p. 12), 43.11% of students generally (mostly and strongly) agreed that human behavior is highly predictable. Only 17.71% of participants strongly agreed with this statement. Likewise, only 26.47% of participants generally agreed (mostly and strongly) that carefully controlled research is useful in solving psychological problems, with only 9.33% of students who strongly agreed with this statement (Item 8). Students were slightly more positive when asked about the role of psychological research in the predictability of human behavior (Item 16) with less than a half of participants (43.42%) who generally (mostly and strongly) agreed that psychological research may help to anticipate human behavior (Item 16) and only 15.81% of students who strongly agreed with this statement.

On one hand, findings related to low students' "views of determinism and belief in the predictability of behavior" (Factor 3; Friedrich, 1996, p. 12) are surprising, because such prominent Russian behaviorists as Ivan Pavlov, Vladimir M. Bekhterev, and Ivan M. Sechenov (Byford, 2016; Araujo, 2014; Grigoriev & Grigorian, 2007; Razran, 1965; Windholz, 1997) could be role models for psychology students. On the other hand, it could be expected because behaviorism has not been the most popular theoretical orientations in Russia (Sukhodolsky, Tsytsarev, & Kassinove, 1995), and brain-based psychological research has not been very well developed (Kholmogorova & Rychkova, 2017). Overall, these findings suggest that Russian students do not have sufficient experience noticing trends in human behavior through exposure to scientific research.

In our sample, a lack of significant difference in students' "views of determinism and belief in the predictability of behavior" (Factor 3; Friedrich, 1996, p. 12) based on the number of methodology courses, may be explained by the fact that students who took five methodology courses scored lower than students who took four methodology courses, and students who took two methodology courses scored lower than students who took one methodology course. Although students did not differ in their beliefs in predictability of behavior (Factor 3) based on the number of research courses taken, we found that students who took six methodology courses shared significantly stronger beliefs in predictability of behavior regardless human ability to make autonomous decisions (Item 9) compared to students who did not take any methodology courses. Overall, these findings suggest that the contents and the quality of research courses seldom help Russian students to learn that behavior is (in principle) predictable and that experimental findings may be replicable (Friedrich, 1996; Hedges, 1987).

Furthermore, we found that students' tendency to perceive psychology as a science was highly dependent on the level of education at the time of the evaluation. Students holding a specialist's degree, an equivalent of a master's degree, had significantly stronger beliefs that psychology is a scientific discipline compared to students with a high school diploma (PAS total). Looking at students' specific beliefs, we found that students with a specialist's degree had significantly higher "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (PAS Factor 1; Friedrich, 1996, p. 12). We did not find any differences in students' "beliefs in the need for psychological research and the value of methodological training" (PAS Factor 2; Friedrich, 1996, p. 12) depending on the level of their previous education. Lack of significant differences in students' scores may be explained by lower

appreciation for research in students with a specialist's degree compared to students with a bachelor's and vocational degree. More than a half (52.27%) of students with a specialist's degree were over 25 years and could have their previous research exposure long before they started the stage of education in question. Low research interests in these students may be explained by inhibited research self-efficacy (Bard, Bieschke, Herbert, & Eberz, 2000; Kahn & Scott, 1997; West, Kahn, & Nauta, 2007) associated with lack of recent research experience (Vaccaro, 2009). It is also possible that students with a specialist's degree reentered the field to get master's or doctoral degrees with very strong service commitments and ambivalence in attitudes towards research (Betz & Taylor, 1982; Frank, 1984; Gelso, 1979).

Similarly, we found that the level of previous education did not affect students' general "views of determinism and belief in the predictability of behavior" (PAS Factor 3; Friedrich, 1996, p. 12). However, we found differences in students' responses to individual items depending on their level of education. For example, compared to students with high school diploma, students with a bachelor's degree had significantly stronger beliefs about effectiveness of attempts to predict human behavior (Item 9) and about psychology being a true science due to predictability of behavior (Item 19). Consistent with previous research, higher understanding of human behavior among bachelor's students may be explained by their academic development (Provost et al., 2011) and recent exposure to both introductory and research methods psychology courses (Bartels et al., 2009; Gervasio et al., 2010; Friedrich, 1996; Pettijohn et al., 2015). Lack of more pronounced differences in students' perceptions based on the level of acquired education may be due to the quality of classroom instructions and interventions during their previous education (Bauer, 2007; Bloom & Tam, 2015; Hughes et al., 2013; Lack & Doan, 2018; Lilienfeld et al., 2013) as well as lack of effective one-on-one interactions with faculty (Bjomsen, 2000; Hollingsworth & Fassinger, 2002; Kowalski & Taylor, 2009; Waples, 2016). For example, students holding specialist's degrees could be affected by lack of emphasis (Vasilyuk, 2003; Zhuravlev & Ushakov, 2015) or training in evidence-based practices (Collins, Leffingwell, & Belar, 2007; Lilienfeld et al., 2013; Luebbe et al., 2007), reinforcing their interest in questionable (Katkov, 2016) and even pseudoscientific practices (Kholmogorova, 1996) "masquerading" as genuinely scientific among Russian psychologists (Lilienfeld, 2010, p. 286). Professors' reservations concerning the use of scientific evidence to inform clinical practice (Lilienfeld et al., 2013), their tendency to rely on common sense, experience, and theoretical orientation as grounds for therapeutic interventions (Boisvert & Faust, 2006; Lilienfeld, 2010; Riley, Lee, Cooper, Fairburn, & Shafran, 2007; Safran et al., 2011; Stewart, Chambless, & Baron, 2012), and their insufficient research involvement (Cronan-Hillix, Gensheimer, Cronan-Hillix, & Davidson, 1986; Galassi, Brooks, Stoltz, & Trexler, 1986; Gelso, 2006; Morales et al., 2005; Shmelev, 2006; Velichkovsky, 2009) could also hinder the adoption of research-based explanations of human behavior among their students. Moreover, students' scores could be affected by pre-existing deeply-rooted misconceptions (Lilienfeld et al., 2010) regarding human nature reflecting poor understanding of psychology's scientific worth among most laypersons, especially its contributions to society and the broad applicability to a myriad of everyday problems (Janda, England, Lovejoy, & Drury, 1998; Lilienfeld, 2012; Penn, Schoen and Berland Associates, 2008; Wood, Jones, & Benjamin, 1986).

We found that career choices significantly affected participants' beliefs about psychology as a science (PAS total). Specifically, we found that students who wanted to be counseling, clinical, school, family, and child psychologists (Group 1) and academic psychologists (Group 3) had significantly stronger general beliefs that psychology is a science compared to students who did not choose any specialization, were indecisive about their future careers, or did not want to work as psychologists (Group 4) (PAS total). In terms of significant differences in students' "willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology" (Factor 1; Friedrich, 1996, p. 12) depending on their career choices, we found that future practitioners including counseling, clinical, school, family, and child



psychologists (Group 1) had significantly higher appreciation of psychology as a natural science compared to those who were undecided, did not have clear career aspirations, or chose a career outside of psychology (Group 4). Overall, answering questions about the need for psychological research and appreciation for training in methodology, students who wanted to work in academia ranked the highest (Group 3) followed by mental health practitioners (Group 1). Likewise, students' career choices were associated with significant differences in students' beliefs in the need for psychological research and the importance of training in methodology (PAS Factor 2). Students who wanted to have careers in mental health including counseling, clinical, school, family, and child psychologists (Group 1) and who wanted to work in academia (Group 3) shared significantly stronger appreciation for research and methodology training compared to students who were undecided, did not have clarity about their specialization, or chose careers not related to psychology (Group 4). Students who wanted to work in academia ranked the highest (Group 3), followed by students who chose careers in applied mental health (Group 1). Although there were no differences in responders' "views of determinism and belief in the predictability of behavior" (PAS Factor 3; Friedrich, 1996, p. 12), similar to results on Factor 1 and Factor 2, students wishing to work in academia (Group 3) ranked the highest and students who were undecided or did not want to be psychologists (Group 4) ranked the lowest.

These findings are consistent with previous research conducted with Russian students indicating that motivation to succeed in academic career is associated with students' interest and participation in research (Rakitina, 2014, 2015). Our results also support Western studies indicating that psychology students who have intrinsic interest in academic work have strong perceptions of psychology as a hard-science (Amsel et al., 2011; Bartels et al., 2009; Friedrich, 1996; Gervasio et al., 2010; Holmes & Beins, 2009). Additionally, our findings are consistent with previous research showing that American psychology students are ambivalent over the role of science and research in their careers and have a greater interest in clinical practice (Gelso, 1979, 1993, 2006; Gelso, Baumann, Chui, & Savela, 2013; Gelso & Lent, 2000; Parker & Detterman, 1988; Perl & Kahn, 1983) and do not value research activities as much (Betz, 1997; Deemer, Martens, & Podchaski, 2007; Fitzgerald & Osipow, 1988).

## **Limitations**

Although this study addressed an important subject of students' beliefs about psychology as a science and contributed to the understanding of factors associated with students' beliefs, it is important to interpret the findings within the study limitations. First, one limitation of our research is that it may be difficult to generalize the results to other populations including students attending Russian universities not participating in this study. Second, this study relied on a cross-sectional and correlational study design. In other words, causal conclusions cannot be inferred due to the nonexperimental data and lack of establishing temporal precedence (Field, 2013; Thomas & Hersen, 2008). Third, in this study, the data was collected using traditional paper/pencil instruments (Lefever, Dal, & Matthiasdottir, 2007). Online administration of the study questionnaires could be more beneficial due to more clean and accurate data collection, fewer time limitations, less socially desirable behavior, enhanced experience, and increased anonymity for study participants (Aluja, Rossier, & Zuckerman, 2007; Ballard & Prine, 2002; Buchanan, 2002; Cronk & West, 2002; Davis, 1999; Holbrook, Green, & Krosnick, 2003; Kreuter, Presser, & Tourangeau, 2008; Raat, Mangunkusumo, Landgraf, Kloek, & Brug, 2007; Riva, Teruzzi, & Anolli, 2003; Ward, Clark, Zabriskie, & Morris, 2014). The fourth shortcoming of the present study is that we used a nonparametric Kruskal-Wallis test to analyze the data, a non-robust test only appropriate for analyzing simple, one-way layouts, not allowing to analyze interactions between variables (Campbell & Swinscow, 2009; Lix, Keselman, & Keselman, 1996; Pett, 2015; Sawilowsky, 1990; Zimmerman, 1998, 2000). Finally, use of the PAS scale (Friedrich, 1996) could present a limitation because this scale was not originally intended to be used with Russian participants. The rather low alpha coefficients of the PAS total scale and the

three factors of the PAS indicated that the scale and its subscales had rather low degree of internal consistency (Cronbach, 1951; Streiner, 2003a,b), suggesting that a limited portion of the variance in the test may be attributable to general and group factors (Cortina, 1993) and that this questionnaire is not very reliable for a population of Russian examinees (Streiner, 2003b; Wilkinson & Task Force on Statistical Inference, American Psychological Association, Science Directorate, 1999). Similarly, it is not clear if the PAS is a valid measure of psychology as a science in Russian students because, although we translated and adapted the PAS, the cross-cultural validation of this scale could be more rigorous (Beaton et al., 2000; Borsa et al., 2012; Eremenco, Cella, & Arnold, 2005).

Future studies should measure construct validity of the PAS by estimating its association with other variables or measures of the same construct (Cronbach & Meehl, 1955). For example, it may be beneficial to use other scales such as the Research Training Environment Scale – Revised (Gelso, Mallinckrodt, & Judge, 1996), the Interest in Research Questionnaire (Bieschke & Bishop, 1994), the Research Self-Efficacy Scale (RSES; Bieschke, Bishop, & Garcia, 1996), and the Science Knowledge and Attitudes scale (Provost et al., 2011).

## **Implications**

The current study had several notable strengths, including objectively assessing beliefs of Russian students about psychology as a science and assessing differences in students' beliefs about psychology depending on the number of research and methodology courses taken, previous education, and future career choices. Our findings have several implications for Russian psychology educators. Although students who took more methodology courses have higher beliefs in the need for psychological research and the importance of training in methodology, it appears that pure number of research and methodology courses is not the only factor influencing students' beliefs about psychology as a science. We recommended that educators focus on research training environment including factors enhancing students' motivation and participation in research and not only students' performance in research and methodology courses (Gelso, 2006; Gelso et al., 1996; Gelso et al., 2013; Gelso & Lent, 2000; Mallinckrodt, Gelso, & Royalty, 1990; Royalty & Reising, 1986).

Moreover, we recommend that Russian psychology professors keep in mind that the quality of education of young students who have just finished school can influence their further aspirations and development as students and researchers. At that age, not all students know if they want to engage in research and become researchers. However, if they decide to engage in research at any point in the future, it is necessary to equip them with advanced scientific thinking as early as possible (Soyyılmaz et al., 2017). Also, because high school graduates have more misconceptions and biased beliefs about psychology as a science that need attention and interventions, we propose classroom practices which afford opportunities to represent scientific information about a topic independently from their own misconceptions (Hughes et al., 2013; Miller, Wozniak, Rust, Miller, & Slezak, 1996), for example, by inducing them to think like their psychology professors (Amsel et al., 2009; Amsel et al., 2014; Holmes, 2014). We recommend that educators working with students who have specialist's degrees address their beliefs in the need for psychological research for their careers and importance of training in methodology.

Furthermore, we encourage psychology educators to address students' career aspirations and challenge those students who have not decided about their specialization and who have doubts about future careers in psychology. The group of students who want to be organizational, coaching, forensic, social, and military psychologists deserves more attention also. Psychology educators may discuss application of research and implications of research findings for these professions.

It is worth mentioning that Russian researchers interested in evidence-based practice (Katkov, 2016; Kholmogorova, 2009, 2010; Pugovkina et al., 2009) need to continue to articulate the importance of evidence-based practice to the forthcoming generation of psychology practitioners, educators, and researchers. In terms of specific classroom interventions, Russian psychology faculty need to go beyond students' research skill level (including quantitative skills) (Malyutina, 2014) and influence students at the motivational level, lighting "a fire under our students-to show them how research (as well as practice) can be exciting and rewarding" (Gelso, 2006, p. 4). Psychology instructors need to emphasize that all research studies are limited and flawed in one way or another and demonstrate how science and practice can be wedded (Gelso, 2006).

Instructors need to provide sufficient reasons for students to accept psychology as a science in order to trust information from experiments as a basis to understand human nature (Friedrich & Douglass, 1998). Similarly, instructors need to encourage students to think scientifically about human behavior and to apply authentic scientific practices through activity and social interaction (Brown, Collins, & Duguid, 1989). Interventions may address students' misconceptions about psychology (Hughes et al., 2013; Kowalski & Taylor, 2009; Lilienfeld et al., 2010; Lilienfeld, Ammirati, & David, 2012) and pragmatic, educational, and attitudinal sources of resistance to adopt evidence-based practice views (Baker, McFall, & Shoham, 2008; Chambless & Ollendick, 2001; Lilienfeld et al., 2013; Luebbe et al., 2007). Educators should also aim to deconstruct ineffective or harmful pseudoscientific therapeutic practices (Lilienfeld, 1998, 2011; Lilienfeld et al., 2012; Lilienfeld & Landfield, 2008; Lilienfeld, Lohr, & Morier, 2001; Lilienfeld, Lynn, & Lohr, 2015; Ruscio, 2006; Thyer & Pignotti, 2015) often supported by Russian practicing psychologists (Dvoinin, 2015; Mazilov, 2006; Vasilyuk, 1996; Yurevich, 2015; Zhuravlev & Ushakov, 2015).

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