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Research Competences of Early-Career Researchers[4]

Abstract: Development of human resources and empowerment of young scientists is one of the basic measures for achieving Serbia's current strategic scientific and technological development goals. The aim of our research was to determine which scientific *production quality determinants (assumptions) of early-career researchers* can strengthen their scientific research capacities and thus increase their scientific research quality. The research was performed using a descriptive method. An e-questionnaire for early-career researchers was prepared (N = 423). The results confirm that early-career researchers assess their scientific research competence differently depending on the scientific field in which they work, or have done their PhD. There are obvious differences in their assessments depending on the length of their work experience. Such results indicate that institutions and individuals need to intensify professional support for early-career researchers.

Keywords: scientific research, early-career researchers (ECRs), researchers' competence, scientific production quality determinants.

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Strategic Requirements for Early-Career Researchers

The changes that have taken place in higher education and scientific research in recent decades, as a result of the Bologna Process, and the implementation of the High Education Law (*Zakon o visokom obrazovanju*, 2017) and the Law on Science and Research (*Zakon o nauci i istraživanjima*, 2019) have aimed at improving the conditions for both studying and research in Serbia. In Europe and globally, the dominant idea is that research, development and innovation represent the key lever that has no alternative and is a quintessential factor for the development of a modern knowledge-based society. The prevailing understanding is that economic, and thus overall social development, is crucial and increasingly dependent on human capital, rather than natural resources. As Jenkins et al., (2003) emphasize, "The emerging 'knowledge economy' is one that requires individuals with creativity and ability to develop, find and synthesize new knowledge" (p. 24). Accordingly, the importance given to the quality of education, research and innovation has increased (Šipka, 2016). In 2007, the European Council determined that one of the priorities in the development of Europe was to strengthen investment in knowledge, i.e. to create better framework conditions for research, development and innovation. That same year, the European Commission implemented the idea of creating a single European Research Area (ERA), with the aim of defragmenting research capacities and making them more attractive for investment in research and development (Kronja et al., 2011). These measures were aimed at developing scientific research potential, bringing researchers from less developed countries closer to European higher education, as well as the integration of most scientists into the European research space. The sustainability of these ideas, among other things, can be achieved by intensive development of early-career researchers (hereinafter: ECRs), which in terms of higher education practice in the world, focuses on the human factor – professional development of ECRs, as it needs to provide highly qualified professionals capable of initiating creative and innovative changes in their professional field (Atamanova & Bogomaz, 2011; OECD, 2007).

Literature suggests that there are differences in defining *early-career* in research (Bazeley, 2003). An early-career researcher can be described as a "transition stage between PhD and senior academic position" (Christian et al., 2021, p. 1). The term early-career researcher is not necessarily associated with the age of the researcher/scientist since, in some disciplines, one might start a research career at an older age (Bazeley, 2003). Ocokoljić et al. (2015) point out that, in the Republic of Serbia, the term early-career researcher refers to: junior researchers and research assistants (Law on Science and Research, 2019) and teaching assistants and PhD students (High Education Law, 2017). In addition to them, we decided

to include in the category of early-career researchers also assistant professors, a beginning-level university teaching position. We decided to set an additional age criterion – ECRs under 40, which is in line with university requirements for funding ECRs' projects (University of Kragujevac, 2022).

In light of the above considerations, the national Scientific and Technological Development Strategy sets out measures for preserving and strengthening the existing potentials for scientific research and innovation, in order to improve the quality and efficiency of science in the Republic of Serbia. The basis of this potential certainly comprises researchers and research teams, i.e. their scientific production. Early-career researchers are a resource of great importance for the dynamic further development of scientific research and innovation system, recognizable in the international framework (Strategy of Scientific and Technological Development for the 2021–2025 Period, 2021).

Responding to Challenges Met by Early-Career Researchers

The Republic of Serbia has launched several mechanisms to support ECRs, and in this context, early-career researchers have some, but still obviously insufficient (Valić Nedeljković & Kmezić, 2013), institutional and non-institutional support for development and implementation of their scientific research. The ECRs' scientific research is supported by various regulations, enactments, internal decisions and regulations of the line ministries, as well as by scholarship programs for research, stays and financing of scientific research projects within various programs and national and EU funds, etc. However, the research results show that ECRs, especially in social sciences, face many problems, e.g. lack of funds for empirical research and data collection, insufficient mentorship, excessive administrative work (Ocokoljić et al., 2015; Valić Nedeljković & Kmezić, 2013;), some of which are not even recognized in strategic documents. According to the research results, good mentoring, adequate consultations with more experienced colleagues and continuous career support can help ECRs to more successfully overcome challenges that are set before them (Machovcova et al., 2022).

Also, as regards the quality of the ECRs' scientific work, insufficient mastery of methodological disciplines necessary for theoretical and empirical research is one of the major problems faced by scientists in Serbia (Urošević & Pavlović, 2013). This primarily refers to insufficient knowledge of quantitative and qualitative approaches based on causal inference, mathematical modelling of social phenomena, etc., which is a consequence of weak requirements during studies (especially at the PhD level). This conclusion is supported by the results of a study

conducted in 2018, the aim of which was to examine the quality of PhD studies at faculties in the field of social sciences and humanities in Serbia (Vušurović Lazarević et al., 2018). PhD students recognize methodology and research work as one of the weakest aspects of their studies and believe that this is one of the main reasons why the quality of their papers and research is not at the level of those of researchers from other countries. Basic criticisms of PhD study programs include objections that not enough time is devoted to acquiring appropriate methodological research knowledge and skills, developing a methodological framework for research, and learning about research techniques and data collection methods. Most PhD students, except those in psychology and sociology, point out that the study programs do not include content related to the application of quantitative research methods (use of software tools, data analysis, research presentations, etc.), and that they were forced to master them independently.

The Strategy of Scientific and Technological Development for the 2021–2025 Period (2021) provides an overview of the implementation of measures from the previous Strategy. As per strengthening scientific research of youth, it says that the measure concerning the involvement of early-career researchers in projects has been implemented, through calls by the Ministry of Education, Science and Technological Development and programs of the Science Fund of the Republic of Serbia. Improvement of the scientific research assessment system, ECR mobility, strengthening of cooperation with the diaspora and regional cooperation, strengthening of researchers' participation in European science and innovation programs have all been partially achieved. The Strategy also confirms that no measures had been taken to improve PhD studies programs, which included staff training, scholarships for young and talented people, procurement of scientific and professional literature, publication of scientific works (Strategy of Scientific and Technological Development for the 2021–2025 Period).

In addition to improving basic research quality and increasing funding for science, the 2021–2025 Strategy confirms the need to improve the status of human resources, especially of early-career researchers, in order to strengthen the scientific research system in the Republic of Serbia. This includes their education and training in scientific research, enhancing the quality of ECRs' scientific results and creating conditions for their participation in projects. Therefore, it is important to narrow down and examine the assumptions of ECRs' scientific production quality. These include the professional competence for better and more efficient scientific production (i.e. research competence): the ability to select reference literature and a meaningful theoretical approach to research a question or problem, clearly define the of research methodology, apply different research techniques and procedures, process statistical data and interpret and analyze re-

search results. Also, the ECRs' professional competence for scientific research implies that they have basic knowledge of publishing process and rules for the preparation of scientific papers and their publication in journals or presentations at conferences, as well as that they have mastered various concepts of the review process. These determinants of scientific research quality can be considered basic and can be a significant starting point for its valorization. At the same time, these determinants also pose a challenge to researchers searching for answers to numerous research questions, such as the question of the ECRs' scientific production quality. The British system of scientific production assessment, the Research Assessment Exercise, has treated productivity (number of published papers) as the main measure of researchers' performance (Moed, 2008).

Scientific production and its quality have been in focus in recent decades, especially since electronic databases, open access electronic scientific journals, and a large number of publications and scientific reports have become widely available to researchers around the world. A number of authors (Moed, 2008; Šipka, 2016) often talk about the hyper production of scientific papers, bringing into question scientific research quality, their essential importance for the further development of science, as well as the validity of results published in scientific papers. Especially if we bear in mind a significant number of "predatory journals" for which profit is important, rather than the quality of scientific papers they publish (Brezgov, 2019; Djuric, 2015).

The results obtained by the analysis of online citation databases of peer-reviewed literature confirm that Serbia's scientific production really has increased in the past few years. However, according to the authors of the research, this increase may be disputed in absolute terms, since the increase in the Serbian production of scientific papers (for example in WoS) has been accompanied by a decrease in quality of the published scientific papers. It is evidenced by the results whose interpretation leads to a discrepancy between Serbian scientific productivity and citations in WoS, when both of these performance dimensions are observed in relation to other countries (Šipka, 2016). The analysis of the citation index of mentioned papers supports this claim, which, according to the research results, is low – below average in relation to Europe, which, on the one hand, may indicate that quality of the scientific papers in recent years is not a priority (Benčetić Klaić & Klaić, 2004; Ivanović & Ho, 2014). However, on the other hand, it may indicate that a large number of papers are published in a short period of time, wherefore authors/researchers do not have enough time to access all the available academic research databases on a particular topic, or to study them thoroughly and properly, that they thus lack timely and relevant citation, which certainly cannot be a measure of the quality of the published papers.

Methodology of Research

Research aim and objectives

The aim of this research was to determine, based on the respondents' self-assessment, which *determinants (assumptions) of ECRs' scientific production quality* can strengthen their scientific research capacities and thus improve their scientific research quality. Starting from this, the following research tasks were defined:

(1) determine the ECRs' ability to meaningfully and clearly *define their research methodology*;
(2) determine the ECRs' ability to *choose reference literature as a starting point for a quality theoretical approach to the research problem*;
(3) determine the level of the ECRs' ability *to apply different research techniques and procedures, and interpret and analyze the obtained research results*.

Also, we strongly believe that it is important to determine whether these scientific production quality assumptions are determined by the following independent variables: the educational and scientific field of the researchers and the length of their work experience.

Method

The presented study examines quantitative data, which represent a subset of a larger study of early-career researchers in the Republic of Serbia. A descriptive method and a content analysis procedure were applied. The ECRs' attitudes were examined by an instrument developed specifically for this research, within the inter-institutional scientific project, implemented by the Faculty of Education in Jagodina and the Faculty of Education in Vranje (Professional Competence of Scientific Research Youth in the System of University Education, 2021–2022).

Instrument

The instrument used was a questionnaire which consisted of two parts. The first part collected background information about the ECRs (years of work experience and PhD study program). The second part of the instrument contained the ECRs' Self-Perceived Research Competence Scale (SPRC). SPRC is a five-point

Likert-type scale containing 13 items (Table 1). It was developed by the team of researchers (including co-authors of this paper) to determine the ECRs' self-reported level of research competence. The participants were asked to self-assess their own research competence in relation to the three research domains.

Table 1. SPRC scale items

Subscale	Items Code	Items
RS1	C1	I can formulate appropriate and current topics for writing papers.
	C2	I can define relevant problem statements and research aims.
	C3	I can define research hypotheses.
RS2	C4	I use various academic research databases to find relevant papers.
	C5	I can write an adequate review of relevant research studies in the introductory part of the paper.
	C6	I adequately paraphrase the claims of other authors.
RS3	C7	I can apply different data collection techniques.
	C8	I can apply different statistical procedures for quantitative data processing.
	C9	I can interpret the results of different statistical procedures for quantitative data processing.
	C10	I can apply different approaches to qualitative data analysis.
	C11	I can interpret the results of different approaches to qualitative data analysis.
	C12	I apply argumentation skills when discussing research results.
	C13	I can deduce research results and their implications for scientific theory development.

The process of designing the instrument was conducted in two phases. In the first phase, 25 ECRs volunteers were asked to draw up a list of issues and challenges they were facing regarding their research competence. In the second phase, research items were constructed based on the first phase results and in accordance with some previous studies and literature (Rockinson-Szapkiw, 2018; Swank & Lambie, 2016; Urošević & Pavlović, 2013; Vušurović Lazarević et al., 2018). We identified three research competence domains: (a) literature search and writing the theoretical framework, (b) research design knowledge, and (c) application of various data collection and analysis procedures, and interpretation of research results. Familiarity with the topic and thinking about it both critically and theoretically are important features of research competence. Writing the theoretical framework is considered one of the most important aspects of the research process since it provides a grounding base for both a literature review and methods and analysis (Grant & Osanloo, 2014). The literature review process and ability to critically assess, integrate relevant literature

and present it in a clear, concise and cohesive manner are important steps when conducting research (Rockinson-Szapkiw, 2018; Swank & Lambie, 2016). Research methodology knowledge and skills, which include methodological procedures (such as research design, data sampling and collection), data analysis and interpretation, are another crucial part of research competence (Swank & Lambie, 2016). For the purpose of our study, we divided research methodology knowledge and skills into two domains: thefirst regarded the ability to define the problem statement and research aim and to construct clear, concise research questions/hypothesis, while the second concerned the adequate use of quantitative and qualitative data collection and analysis procedures and the ability to interpret the research results.

Cronbach's alpha reliability coefficient of the SPRC indicated very good reliability (α=0.900). The maximum score was 60 and the lowest possible score was 12. The SPRC consisted of three subscales corresponding to three research competence domains: *Research design* (RS1), *Literature search/theoretical framework* (RS2) and *Data collection/analysis procedures and interpretation of research results* (RS3). Cronbach' alpha for subscales RS1 (α=0.814) and RS3 (α=0.861) indicate good reliability and acceptable reliability for subscale RS2 (α=0.684). Items C1, C2 and C3 assessed the ECRs' competence to meaningfully and clearly define the methodology of their research (Table 1). The competence to choose reference literature and prepare a quality theoretical approach to the research problem was assessed by items C4, C5 and C6. Items C7-C13 assessed the ECRs' competence to apply various research techniques and procedures, to interpret and analyze research results.

Analysis

The statistical analysis was conducted using SPSS for Windows, version 23.0. P values lower than 0.05 were considered statistically significant for statistical analysis. The normality of data was assessed via the Shapiro-Wilk test of normality. For the quantitative data analysis, descriptive statistics methods were used (frequency, percentage, mean, standard deviation, mean ranks), while the Kruskal-Wallis H test with Dunn post hoc was used for non-parametric variables. Before performing the Kruskal-Wallis test, the necessary assumptions, such as level of measurement, independence of observations and normality, were checked. Length of work experience and PhD study program were the independent variables in the data analysis.

Sample

The research was conducted during 2021 and 2022 and included a sample of 423 ECRs in the Republic of Serbia. The participants were invited by using the state universities' and institutes' email lists of the ECRs they employed. We also contacted vice-deans and heads of departments and asked them to forward the invitation to ECRs at their institutions (both to those employed and those not employed there).

As noted, the term early-career researcher in this study referred to: junior researchers, research assistants, teaching assistants, assistant professors and PhD students under 40. All ECRs were categorized by their PhD study program into four groups of educational-scientific fields: Social Studies & Humanities (SS&H), Natural Sciences & Mathematics (NS&M), Technical and Technological Sciences (TTS) and Medical Sciences (MS). This categorization was in compliance with the classification provided by the National Council for Higher Education (*Nacionalni savet za visoko obrazovanje*, 2017) in the Republic of Serbia. The sample structure with regard to PhD study programs is given in Table 2. In relation to the years of work experience (WE), all ECRs were categorized into four groups as shown in Table 2.

Table 2. Sample breakdown by length of WE and PhD study program

	Length of WE				PhD study program			
	1–5	6–10	11 +	unemployed	SS&H	NS&M	TTS	MS
f	187	138	66	32	220	91	79	33
%	44.2	32.6	15.6	7.6	52.0	21.5	18.7	7.8

Results and Discussion

Before we begin the interpretation of results regarding the levels of ECRs' research competence, for which the participants in our research conducted a self-assessment, we need to note that an individual's score on the SPRC scale (RC) represents the mean-item summated score of the individuals' responses. A mean-item summated score is calculated by dividing an individual's summated score by the number of items constituting the scale, which creates a mean-item score for each individual that falls within the range of the values for the response continuum options (Warmbroad, 2014).

Table 3. The level of self-reported research competence

Subscale	Items Code	M	SD
	C1	4.13	0.90
RS1	C2	4.17	0.81
	C3	4.14	0.86
	C4	4.53	0.72
RS2	C5	4.27	0.82
	C6	4.41	0.76
	C7	4.18	0.86
	C8	3.37	1.24
	C9	3.57	1.14
RS3	C10	3.61	1.07
	C11	3.66	1.04
	C12	4.16	0.86
	C13	3.85	0.97
RC		4.00	0.63

On the Likert average scale, [1.00–1.80) indicates a very low level, [1.80–2.60) indicates a low level, [2.60–3.40) indicates a moderate level, [3.40–4.20) indicates a high level, while [4.20–5.00] indicates a very high level of self-reported competence (Narli, 2010).

Results show that, in general, the ECRs' self-reported competence for scientific research indicates a high level *(M =4.00, SD = 0.63*). As for the subscales, ECRs reported a higher level of competence for RS2 (*M=4.40, SD=0.60*) than for RS1 (*M=4,15, SD=0.73*) and RS3 (*M=3.77, SD=0.76*).

As per individual items, the statistical parameter values (mean, standard deviation) indicate that ECRs reported a high level of research competence for all items except for item C8 (I can apply different statistical procedures for quantitative data processing), where they reported a moderate level (Table 3).

The Shapiro-Wilk test of normality revealed that the RC scores were not normally distributed across the groups, both in regard to the years of work experience and the PhD study program. Hence, we used Kruskal-Wallis test to examine the differences between groups of ECRs, and Dunn's multiple comparison test to identify which groups were different. The results demonstrated that there was a statistically significant difference in self-reported research competence in general (RC) depending on the years of work experience ($\chi 2 = 12.732$, $p = 0.005$). Early-career researchers working 6–10 years rate their competence higher than those working 1–5 years ($p = 0.003$). On the other hand, we found that there was no statistically significant difference in self-reported research competence in general (RC) depending on the PhD study program ($\chi 2 = 4.542$, $p = 0.209$).

ECRs' Competence to Meaningfully and Clearly Define the Research Methodology

The first research task was to determine the ECRs' ability to meaningfully and clearly define their research methodology and whether this scientific production quality assumption is determined by the researchers' educational-scientific field and length of work experience. The Kruskal-Wallis test was performed in order to examine if there was a statistically significant difference in levels of self-reported competence in RS1 between different groups regarding their years of work experience and PhD study program.

We determined that there was a statistically significant difference in the RS1 competence in general, both depending on the PhD study program and years of work experience (Table 4). In order to identify the difference among the groups, the Dunn test was performed to reveal in which groups a significant difference in the RS1 scores occurred. Early-career researchers, whose field of dissertation is the SS&H, assess their competence with a higher grade than those whose dissertation is in the field of NS&M (p = 0.000).

In regard to the years of work experience, ECRs who have been working 6–10 years report a higher level of competence than those who have been working 1–5 years (p=0.037).

Table 4. ECRs' competence to define the research methodology depending on their length of WE and PhD study program

			Kruskal-Wallis test	
		Mean Ranks	χ2	Sig.
PhD study program	SS&H	233.16	18.086	0.000
	NS&M	171.15		
	TTS	200.40		
	MS	211.38		
Length of WE	1 – 5	193.58	10.830	0.013
	6 – 10	230.48		
	11 +	234.76		
	unemployed	193.00		

The Kruskal-Wallis test was performed in order to examine whether there were any differences in individual items. The attitudes of ECRs in our sample confirm that some of the listed research competences are significantly determined by their length of work experience, as well as the educational-scientific field in which they have been working on their dissertation or in which they have a PhD. With regard to their ability to define problem statements and research aims (C2), we found

a statistically significant difference in their attitudes in relation to their length of work experience ($\chi 2 = 13.415$, $p = 0.004$). Although ECRs working for 6 or more years assessed their ability to define research aims and objectives better, a post-hoc test using Dunn's test with Bonferroni correction showed no specific statistically significant differences between the groups when they were compared with each other.

As per the ability to define research hypotheses (C3), a statistically significant difference was found in the ECRs' attitudes about the mentioned ability ($\chi 2 = 8.657$, $p = 0.034$). Dunn's post hoc test showed that there is a statistically significant difference in favor of those who have been working 6–10 years ($p = 0.016$), but also in favor of those who have been working 11 or more years ($p = 0.022$) compared to those who have been working 1–5 years.

The second independent variable was the educational-scientific field in which the ECRs have been doing their PhD dissertation or have a PhD. The research results confirm that their ability to *formulate appropriate and current topics for writing papers* (C1) is determined by this variable ($\chi 2 = 25.228$, $p = 0.000$). There is a statistically significant difference in the ECRs' attitudes about the mentioned ability, between the fields of Social Studies & Humanities (SS&H) and Natural Sciences & Mathematics (NS&M). A statistically significant difference is evident, in favor of the SS&H field ($p = 0.000$). Interestingly, there is a statistically significant difference in attitudes about this ability between the ECRs in the Natural Sciences & Mathematics (NS&M) and Medical Sciences (MS) categories, at the level of $p = 0.004$ in favor of the MS.

The next ECRs' competence concerns their already mentioned ability to *define relevant problem statements and research aims* (C2). It was confirmed that there is a statistically significant difference ($\chi 2 = 13.074$, $p = 0.004$) between the SS&H field and the NS&M, in favor of the SS&H ($p = 0.002$).

Similar results were obtained with regard to the ECRs' ability to *define research hypotheses* (C3). We found that a statistically significant difference in the ERCs' attitudes in relation to the educational-scientific field ($\chi 2 = 8.738$, $p = 0.033$) between the SS&H and the NS&M categories ($p = 0.049$) in favor of the SS&H.

ECRs' Competence to Choose Reference Literature as a Starting Point for a Quality Theoretical Approach to the Research Problem

The second research task was to determine the ECRs' ability to *choose reference literature* as a starting point for a quality *theoretical approach to the research problem* and whether this scientific production quality assumption is determined by their educational-scientific field of research and length of work experience.

We determined that there was no statistically significant difference in the RS2 competence in general, both in relation to the PhD study program and years of work experience (Table 5).

Table 5. ERCs' competence to choose literature and prepare the theoretical framework depending on the length of WE and their PhD study program

			Kruskal-Wallis test	
		Mean Ranks	$\chi 2$	Sig.
PhD study program	SS&H	221.29	4.965	0.174
	NS&M	188.56		
	TTS	215.13		
	MS	207.21		
Length of WE	1 – 5	197.05	6.381	0.094
	6 – 10	227.08		
	11 +	227.07		
	unemployed	203.22		

With regard to the ECRs' ability to write an adequate review of relevant research studies in the part of the paper on the theoretical approach to the research problem (research question) (C5), our study confirmed that this ability is determined by the researchers' work experience ($\chi 2 = 7.886$, $p = 0.048$). The Dunn test was performed to identify the differences among the groups and reveal in which groups a significant difference occurred. The results show that the ECRs with longer work experience (6–10 years) have developed this competence better than those with less work experience (1–5 years), which is indicated by a statistically significant difference at the level of $p = 0.047$. We also found that the educational-scientific field in which an ECR is writing a PhD or has a PhD determines their ability ($\chi 2 = 15.785$, $p = 0.001$) to adequately paraphrase the claims of other authors (C6). There is a statistically significant difference between the SS&H category and the NS&M category ($p = 0.009$) in favor of the SS&H. A statistically significant difference was found between the categories SS&H and MS, in favor of the SS&H ($p = 0.019$).

ECRs' Competence to Apply Different Research Techniques and Procedures, and Interpret and Analyze the Research Results

The third research task was to determine the ways in which ECRs are trained to apply various research techniques and procedures and interpret and analyze the research results and whether these scientific production quality assumptions are determined by their educational-scientific field and work experience.

The Kruskal-Wallis test results pointed out that there was a statistically significant difference in RS3 competence in general, in relation to the length of work experience (Table 6). We performed the Dunn's post hoc test for pairwise differences. The results showed that ECRs who have been working for 6–10 years reported a higher level of competence than those who have been working for 1–5 years. There was no statistically significant difference with regard to the PhD study program, (Table 6).

Table 6. ECRs' competence to apply research procedures and interpret results depending on their length of WE and PhD study program

			Kruskal-Wallis test	
		Mean Ranks	$\chi 2$	Sig.
PhD study program	SS&H	213.33	5.288	0.152
	NS&M	211.60		
	TTS	226.75		
	MS	168.94		
Length of WE	1 – 5	192.61	11.884	0.008
	6 – 10	239.24		
	11 +	215.16		
	unemployed	201.30		

The attitudes of ECRs in our sample confirm that the *listed professional competences* (abilities) for scientific research are determined by the years of work experience, as well as the educational-scientific field in which they are working on their PhD or have a PhD. With regard to their ability to interpret the results of various statistical procedures for data processing (C9), the study showed a statistically significant difference ($\chi 2 = 12.134$, $p = 0.007$) between the category of ECRs with 1–5 years of WE and the category of ECRs who have been working 6–10 years ($p = 0.004$) in favor of those with longer service. Also, with regard to the ECRs' ability to apply different approaches to qualitative data analysis (C10), a statistically significant difference was found between these categories ($\chi 2 = 9.381$, $p = 0.025$), in favor of researchers with longer experience ($p = 0.022$). The ECRs' attitudes about their ability to interpret the results of different approaches to qualitative data analysis (C11) were determined by the length of their work experience ($\chi 2 = 11.348$, $p = 0.010$). There is a statistically significant difference between the above, in favor of those who have worked 6–10 years, compared to researchers who have worked 1–5 years ($p = 0.013$).

With regard to their ability to *apply different statistical procedures for quantitative data processing* (C8), we found a statistically significant difference ($\chi 2 = 8,858$, $p = 0.031$) in relation to the educational-scientific field in which the ECRs

are writing their PhD or have a PhD. Dunn's post hoc test showed that there were no statistically significant differences between respondents in these educational-scientific fields. However, having in mind their ability to derive the implications of research results for scientific theory development (C13), the results confirm that there is a statistically significant difference ($\chi 2 = 11{,}606$, $p = 0.009$) between the SS&H category and the MS category, in favor of the SS&H ($p = 0.002$).

Conclusion

The ECRs' scientific production, with regard to the quality of their research and presentation of results, is a significant assumption of their scientific research competence, which is determined by the national strategy on scientific and technological development.

Our goal within this research was to discover which determinants of the ECRs' scientific production quality can strengthen their scientific research capacities. These determinants include their ability to meaningfully and clearly define the research methodology, perform an informed selection of reference literature for a theoretical approach to the research problem, apply various research techniques and procedures, and interpret and analyze the research results. We also endeavored to determine whether these assumptions about the ECRs' scientific production quality are determined by the field of their research and length of work experience.

The presented results confirm that the ECRs in our sample, who have or are writing their PhD is in the field of social sciences and humanities, have a better assessment of their scientific research competence, than those whose dissertations are in the field of natural, mathematical and medical sciences. These competences refer to their ability to formulate appropriate and current topics for writing papers, to define the relevant problems, goals and research hypotheses, to adequately paraphrase the claims of other authors and to derive implications from the research results, important for further scientific theory development.

As we have assumed, in relation to the length of ECRs' work experience, those with longer work experience estimate that they have better developed scientific research competence. These are competences that entail their ability to define the relevant problems, goals and research hypotheses, write an adequate review of relevant research studies for the theoretical approach to the problem (research question), apply statistical procedures for quantitative data processing, apply different approaches to qualitative data analysis and interpret the results determined by such approaches. The fact that researchers with the shortest work experience

assess their scientific research competence the most poorly may be related to insufficient attention to the acquisition of methodological research knowledge in PhD study programs, as indicated by Vušurović Lazarević et al. (2018).

We believe that such research results are a good starting point for further research, in order to identify the reasons behind significant differences in determining the ECRs' quality of competence in different scientific fields.

Furthermore, the presented results lead to the conclusion that more attention must be paid to the ECRs' scientific production issues, in terms of continuous support provided by the institutions and individuals, all with a view to increasing the quantity and quality of the ECRs' scientific results.

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Istraživačke kompetencije istraživača na početku karijere[8]

Apstrakt: Razvoj ljudskih resursa i osnaživanje mladih naučnika jedna je od osnovnih mera za ostvarenje trenutnih strateških ciljeva Republike Srbije u oblasti nauke i tehnološkog razvoja. Naše istraživanje je imalo cilj da utvrdi koje *determinante (pretpostavke) kvaliteta naučne produkcije* mladih istraživača mogu da ojačaju njihove naučnoistraživačke kapacitete i tako unaprede kvalitet njihovih naučnih istraživanja. Ovo istraživanje je sprovedeno primenom deskriptivnog metoda. Pripremljen je e-upitnik za mlade istraživače (N = 423). Rezultati potvrđuju da mladi istraživači različito ocenjuju sopstvene naučnoistraživačke kompetencije zavisno od naučne oblasti u kojoj rade ili u kojoj su doktorirali ili će doktorirati. Utvrđene su i očigledne razlike u njihovim ocenama zavisno od dužine radnog iskustva. Ti rezultati ukazuju na to da institucije i pojedinci treba mladim istraživačima intenzivnije da pružaju profesionalnu podršku.

Ključne reči: naučna istraživanja, mladi istraživači, kompetencije istraživača, determinante kvaliteta naučne produkcije

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