Superhero or hands-off supervisor? An empirical categorization of PhD supervision styles and student satisfaction in Russian universities

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Abstract

This article presents the results of a cross-institutional survey on PhD students' supervision at Russian universities. It is aimed at answering three questions concerning (1) styles of PhD supervision and their prevalence, (2) the relation between supervision style and PhD students' satisfaction with their supervisor, and (3) the relation between supervision style and PhD students' expected time-to-degree. We propose the empirically driven categorization of six supervision styles: superhero, hands-off supervisor, research practice mediator, dialogue partner, mentor, and research advisor. The most problematic category, characterized by providing no help for PhD students, was named "hands-off supervisors." For this category PhD students reported the lowest level of satisfaction, and the highest expected time-to degree. Nonetheless, the large share of PhD students who are satisfied with hands-off supervisors may evidence a presence of a disengagement compact between PhD students and supervisors in Russian universities. Two categories of supervisors characterized by the highest level of PhD students' satisfaction and shortest expected time-to-degree were named "superheroes" and "mentors." These supervisors are reported to perform managerial and expert functions, which emphasizes the critical importance of these functions.

Keywords Doctoral education · Academic supervision · Style of supervision · Disengagement compact · Educational reforms

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Introduction

In the last 30 years, the landscape of doctoral education experienced dramatic changes worldwide. Most national systems of doctoral education faced the processes of massification and internationalization (Enders 2004; Halse 2007; Powell and Green 2007; Sadlak 2004), which resulted in the emergence of new and growth of old issues. A number of studies emphasized such global problems in doctoral education as overproduction of PhD holders (Cyranoski et al. 2011; Fox 1997; Halse 2007), low quality of PhD graduates (Bao et al. 2018; Cyranoski et al. 2011), high attrition rates (Bao et al. 2018; Gardner 2008; Kehm 2006; Nerad 2004), and poor supervision (Bao et al. 2018; Maloshonok and Terentev 2019a). While the scale of these problems varies in different countries, they form the global agenda for researchers and policy-makers. Overcoming these problems requires a comprehensive evidence-based view on doctoral education and its aspects in different contexts. One of the key issues that requires data-driven discussion is doctoral supervision, which is shown to be of a major importance for PhD completion (Mainhard et al. 2009; Van Ours and Ridder 2003), students' satisfaction (Harman 2003; Zhao et al. 2007), and decreasing the time-to-degree (De Valero 2001; Wao and Onwuegbuzie 2011).

This paper is aimed at providing new evidence on supervision of doctoral students at Russian universities. Since 2012, Russia has been experiencing radical changes in the organization and status of doctoral education, in line with global trends, such as movement toward structured doctoral programs with intensive training and fixed deadlines, instead of a very limited volume of coursework and one-by-one communication with a supervisor which is typical for traditional "master-apprentice" model (see more about different models: Park 2005; Pearson 2005). While this transition is far from completion, most challenges and trends for doctoral education in Russia are the same as for other countries (Maloshonok and Terentev 2019a).

In this paper, we present the results of a cross-institutional survey of doctoral students in Russia conducted in 2016. We argue that doctoral students' supervision is highly functionally differentiated. We also show that different combinations of functions performed by the supervisor may correspond to different levels of students' satisfaction and expected time-to-degree (TTD). Despite the idea that academic supervision is not always the same list of functions is not new (Franke and Arvidsson 2011; Rose 2005; Zhao et al. 2007; Lee 2008), according to a comprehensive review done by Boehe (2016), most of the studies are conceptual by style or founded on qualitative methods, while there is little research based on quantitative data. Moreover, there is little evidence on how different supervisory styles are linked with student progress and satisfaction (Zhao et al. 2007; Lee 2008). While some studies show that a "hands-off" approach to PhD supervision (when a supervisor does not control their PhD students) leads to an increase in PhD student failures (Sinclair 2004), there is no evidence of the links between different styles of "hands-on" approach and the results of PhD training. PhD student satisfaction with the supervision process and evaluation of expected TTD are suitable indicators to measure the effects of different supervisory styles since they are linked with the overall result of PhD training, as it was shown in previous studies (Mainhard et al. 2009; Gillingham et al. 1991).

Approaching doctoral supervision and its differentiation

The quality of academic supervision is of major importance for increasing completion rates and quality of dissertations (Holdaway et al. 1995; Hockey 1991; Holdaway; Lipschutz 1993;

Mainhard et al. 2009; Zhao et al. 2007), as well as for maintaining high rates of students' satisfaction (Harman 2003; Zhao et al. 2007) and decreasing TTD (De Valero 2001; Jiranek 2010; Seagram et al. 1998; Wao and Onwuegbuzie 2011).

Three aspects are discussed in literature in this relation. The first is concerned with the professional and personal qualities a supervisor should possess to promote PhD students' development in the best way. For instance, particularly important are accessibility for students and willingness to support (Johnson and Huwe 2003; Taylor et al. 2018), as well as knowledge of the research field (Donald et al. 1995). The second aspect is related to supervisors' behavior, i.e., the functions he or she performs and the manner (or style) in which they do them (Zhao et al. 2007). The third aspect emphasizes that successful supervision is also a result of establishing a good student-supervisor relationship (Ali et al. 2016; Fillery-Travis and Robinson 2018; Golde 2000; Grant et al. 2014; Linden et al. 2016; Mainhard et al. 2009; Pyhältö et al. 2015; Taylor et al. 2018). We argue that supervisors' behavior is the least studied among these three aspects. Although, as pointed out by Lee (2008), many works concentrate on listing functions of doctoral supervision, most of them analyze what supervisors should do (e.g., Taylor et al. 2017) instead of what they actually do. In this regard, Halse and Malfroy (2010) give a comprehensive description of supervisors' functions, experiences, and professional expertise. Based on the data from 26 semi-structured interviews, they describe doctoral supervision through 5 categories: the learning alliance, which is about establishing relations with the student and organizing the work around a common goal, habits of mind that allow supervisors to show empathy and curiosity towards student's experience, scholarly expertise that accounts for participating in the production of knowledge, and techne that deals with the educational function of supervision and contextual expertise about institutional and disciplinary context of a student's research. However, their work is qualitative by method and aims to separate doctoral supervision as a whole by approaching it as professional work. It does not account for differences within supervisors' work and their relation to outcomes of supervisor-student interaction.

To describe the differences in how doctoral supervision is performed, researchers employ the notion of supervisory style, which is approached in many different ways: from style as a particular part of academic culture (Delamont et al. 2000) to a psychological concept of cognitive styles (Armstrong 2004). Franke and Arvidsson (2011) carry out 30 interviews with a Swedish faculty and analyze how academic supervisors perceive their experience. They reveal two ways of structuring supervisory work: (1) research practice-oriented, when there is an engagement in common research and (2) research relation-oriented, when the connection between the student and supervisor is based on common interests. Within research practice-oriented supervision, authors reveal three supervisor roles: to transfer a research tradition, to mediate a research practice, and to perform as a supervisor and as a project leader at the same time (double roles). Research relation-oriented supervision may imply such aspects as being a dialogue partner, a mediator of knowledge and experience, a mentor, and a supervisor feels they fall short. Lee (2008) tries to push the discussion about doctoral supervision away from listing functions of supervisors and suggests exploring differences in supervision through analyzing concepts of what it is: managing, enculturation, critical thinking, emancipation, or developing a quality relationship. Devos et al. (2015) extract types of support from self-determination theory and develop a hypothesis about the crucial role of trust from supervisors towards students. A more recent paper (Ali et al. 2016) discusses differences in doctoral supervision by describing attitudes of students and supervisors towards the process of supervision. The authors reveal three dimensions underlying faculty views on how PhD supervision should be done: leadership, knowledge, and support.

Boehe (2016) points out that there are two fundamental dimensions for the majority of doctoral supervision typologies: product and process. This idea is very familiar to what Franke and Arvidsson (2011) call experiencing double roles. According to Boehe (2016), each supervisory manner underlies this orthogonal: to control a PhD thesis as a project with particular attention to its formal parts or to behave as "equal collaborator" who is occupied mainly with joint work on generating knowledge. From this point of view, style is a set of understandings and practices shared and employed by a faculty member that structure interactions with students. Since this concept concerns the quality of relations, it is hard to be measured empirically using quantitative methods. That is why most research on supervisory styles builds on qualitative methods. Thus, the literature about supervisory styles gives little information about how actual functions of the supervisors are differentiated, although this issue is crucial for understanding what patterns of supervisors' behavior are associated with better results by students.

Touching upon the differences in approaches to supervision, we try to overcome this limitation by analyzing doctoral students' reports about what their supervisors do to support their training and dissertation research. A similar approach is implemented in the research conducted by Zhao et al. (2007). They concentrate on doctoral supervisors' behavior and investigate all of its aspects, including personal approach with students. In the current research, we focus exclusively on the process of academic advising and develop its empirically driven categorization of styles and discuss possible causes of this categorization.

Our research questions were the following:

1. What functions do supervisors perform and how can these functions be categorized?
2. Does the style of supervision relate to PhD students' satisfaction with their supervisor?
3. Does the style of supervision relate to expected TTD?

Overview of PhD education in Russia

In the last 7 years, doctoral education in Russia experienced serious transformations. With the new Federal Law "On Education in the Russian Federation," doctoral programs became a third level of education, which implied a shift from the unstructured "master-apprentice" model of PhD training to the model of structured doctoral programs. This shift entailed a series of transformations, both in the essence and organization of doctoral education. Among the most prominent changes was the dramatic increase in the volume of the organized coursework and tougher requirements for PhD candidates. While previously PhD students had to attend only three obligatory courses in history and philosophy of science, foreign language, and area of specialization that should be completed during the first year of PhD training, the new model implies that PhD students should attend a large number of classes (mainly in the area of their specialization) during the first 2 years of their study and complete research and pedagogical internships. Since 2013, prior to the defense, PhD students should have no less than two or three publications (depending on their field of study) on the topic of the dissertation, compared to one or two publications before 2013 (to see more about the reform, see Zavgorodnayaya 2016; Maloshonok and Terentev 2019a). With the reform, old issues of doctoral education in Russia, such as low completion rates and poor quality of dissertations, became particularly relevant (Maloshonok and Terentev 2019a).

However, academic supervision is one of the aspects that have not undergone profound changes. A supervisor still represents a main figure for a PhD student being usually the only person who controls the research process and helps with socializing in a scientific community. Team or joint supervision is not common for Russian universities and exists in several very local cases (Maloshonok and Terentev 2019b, forthcoming). As shown in a recent study, the traditional model of one-by-one supervision sometimes results in doctoral students becoming excessively dependent on their supervisor, which increases the risk of academic failure (Maloshonok and Terentev 2019a).

There are no unified guides for supervisors on how to organize the supervision process, but in the last several years, some universities introduced their own regulations and prescriptions for supervisors. Normally, it is expected that supervisors play a key role in the whole process of PhD training including the preparation and organization of dissertation defense. Besides the help with the preparation of the dissertation and giving advice and comments on the field research, it is expected that the supervisor helps in preparing the publications, finding reviewers for the dissertation, informing about scientific events in the area of specialization, and organizing the defense procedure.

There are some formal requirements for PhD supervisors in Russia. First, a supervisor should have a PhD (preferably in the area of the PhD student's specialization). Second, he or she should have several publications in the area of the PhD student's specialization in the previous 5 years.

Currently, about 44,400 academic staff are involved in the supervision of PhD students in Russia. On average, each supervisor has two PhD students.[1] Currently, about 93,000 students are enrolled in doctoral programs in Russia. PhD programs last for 3 to 5 years depending on the form and field of study (3 years for full-time PhD students in social sciences and humanities, 4 years for full-time PhD students in engineering, math, and natural sciences; for part-time students, it increases to 4 and 5 years, respectively). Dissertation defense is not mandatory upon completion of a doctoral program. Currently, out of about 18,000 students who complete the programs annually, only approximately 2000 defend their dissertation (Russian Federal State Statistics 2018). However, all students who successfully pass the exams and complete their 3–5 years of study receive a diploma that certifies them as a researcher and lecturer. In order to receive a PhD, they need to defend the dissertation.

Method and data

This paper is based on the results of a quantitative survey of PhD students at Russian universities conducted in April–July 2016. The targeted sample was universities which participate in the Russian Academic Excellence Initiative-Project 5–100[2] and federal universities.[3] These universities represent the body of leading Russian universities that demonstrate

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[1] Training of Academic Staff in Russia, 2018. http://csrs.ru/archive/stat_2018_staff/. Accessed 29 May 2007.

[2] Project 5–100 is a special governmental program which was launched in 2013 by the Ministry of Education and Science to develop Russian universities. Under this project, 15 and later 6 more leading Russian universities received financial support in order to maximize their positions in the global university rankings. See http://5top100.com/ for more details.

[3] Under the federal higher education development program introduced by the Russian Ministry of Education and Science, 10 universities with special status of federal universities were created between 2006 and 2014. Most of them appeared as a result of university mergers. The main goal of the program was the development of the regional higher education systems and strengthening the ties between regional economy and higher education system (to see more: Arzhanova and Knyazev 2013).

the best results in global and local university rankings. About 40% of all PhD students in Russia study in these universities. While these universities do not represent the Russian system of doctoral education in general, they play a significant role in the governance of the doctoral education. Thus, the examination of the situation in these universities is highly important because it can be seen as symptomatic for the whole system of doctoral education in Russia. Moreover, their experience as globally oriented universities which develop in line with global trends (Maloshonok and Terentev 2019a) can be more relevant to the understanding of international context.

The sample consists of 12 universities—participants of the Project 5–100 and two federal universities which represent about half of all universities participating in the 5–100 Project and federal universities. The selection of universities was based on the willingness of the administrative departments to participate in the survey and capability to conduct online survey according to proposed design (several universities had no lists of their PhD students' e-mails and personal accounts in learning management systems). Survey participation was voluntary. All PhD students in the selected universities received the individual link to the survey via e-mail or an online learning management system and had a chance to complete the questionnaire. Three reminders about the survey were sent to each PhD student. Students' personal and corporate e-mails were provided by the university administration. Two thousand thirty-four PhD students participated in the survey (25% of all PhD students studying in the selected universities, $N = 8{,}136$). Depending on the university, response rates varied from 11% ($N = 1127$) to 53% ($N = 802$). The main characteristics of the overall sample are presented in Table 1.

Unfortunately, we have no full information about the characteristics of the general population of PhD students in the selected universities[4] and cannot compare it to the composition of the obtained sample. However, we could assume that there are significant differences for such characteristics as year and form of study, based on the general statistics for the doctoral education in Russia.[5] PhD students of first and second years of study and full-time PhD students are overrepresented in the survey sample compared to general population. Since these characteristics can have a significant impact on supervision practices, we analyzed the differences in the results across years and form of study and included these variables as control ones to the regression models.

The survey section on supervision included questions concerning (1) the functions performed by the supervisor, (2) aspects of communication with the supervisor (frequency, difficulties, communication beyond the work on dissertation), and (3) satisfaction with the supervisor (desire to change the supervisor).

The data was analyzed using the R packages for statistical analysis. To describe the functions performed by supervisors and their differentiation across fields and years of study, we used descriptive statistics and contingency tables (where we interpreted standardized residuals with values 1.96 or more). To check the homogeneity of supervisors in accordance with functions which they perform, we used cluster analysis. To analyze the link between the style of supervision and PhD students' satisfaction with their supervisors, and the link between the style of supervision and expected TTD, we used contingency tables (where we interpreted standardized residuals with values 1.96 or more) and multilevel mixed-effects logistic regressions.

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[4] Not all universities provided such information.
[5] Training of Academic Staff in Russia, 2018. http://csrs.ru/archive/stat_2018_staff/. Accessed 29 May 2007.

Table 1 Main characteristics of the sample ($N = 2{,}034$)

Characteristics	Percent
Year of study	
1st	39
2nd	32
3rd	20
4th	9
Field of study	
Mathematical and natural sciences	30
Humanities	9
Engineering and technological sciences	30
Social sciences	26
Education	4
Gender	
Male	55
Female	45
Form of education	
Full time	88
Part time	12
Form of financing	
State-funded	85
Commercial	15

Supervision styles and their prevalence

PhD students were asked about the functions performed by their supervisors ("Which of the following does your supervisor perform?") with the following response options: (1) recommends literature on the subject of the dissertation, (2) recommends experts for consultation, (3) organizes interaction with experts, (4) helps in the organization of the field research, (5) gives advice concerning the methods of data analysis, (6) comments on results and conclusions, (7) edits the text of the dissertation, (8) edits the text of articles, (9) informs students about relevant scientific events, (10) helps to prepare publications, and (11) helps in finding reviewers. The question had a binary Yes/No scale for each option. Respondents could choose all appropriate options.

The list of functions performed by the supervisor which were included in the questionnaire was based on the analysis of universities regulations on the PhD supervision process. It overlaps partially with the list of functions studied by Zhao et al. (2007) and contains alternatives that can be attributed to both dimensions of supervision (process and product) that Boehe (2016) finds fundamental for supervisory process.

To check the homogeneity of supervisors, with reference to functions which they perform, we conducted a cluster analysis using the k-means method. The results of the analysis are presented in the Table 2. We distinguished six different categories (supervision styles). For convenience purposes, we assigned them the following labels: (1) superheroes, (2) hands-off supervisors, (3) research supervisors, (4) research practice mediators, (5) dialogue partners, and (6) mentors. The labeling was made based on previous work on PhD supervision styles (Franke and Arvidsson 2011; Grover and Malhotra 2003), but some new categories were added to existing categorizations to show higher variance of supervision styles which were observed in the survey.

Table 2 The results of a cluster analysis on the styles of academic supervision[a]

	Superheroes	Hands-off supervisors	Research advisors	Research practice mediators	Dialogue partners	Mentors
Recommends literature and research on the subject of the dissertation	+ (0.96)	− (0.46)	+ (0.84)	+ (0.82)	+ (0.82)	+ (0.85)
Recommends experts with whom to communicate on the subject of the dissertation	+ (0.93)	− (0.21)	− (0.04)	− (0.32)	− (0.24)	+ (0.93)
Organizes interaction with experts to discuss various tasks and issues	+ (0.83)	− (0.07)	− (0.08)	− (0.08)	− (0.11)	+ (0.59)
Helps in the organization of the field research	+ (0.62)	− (0.13)	+ (0.57)	− (0.08)	− (0.24)	− (0.20)
Gives advice concerning the research methods	+ (0.90)	− (0.05)	+ (0.87)	+ (0.63)	+ (1.00)	+ (0.56)
Comments on results and conclusions	+ (0.98)	− (0.48)	+ (0.92)	+ (0.88)	+ (0.82)	+ (0.93)
Edits the text of the dissertation	+ (0.97)	− (0.09)	− (0.27)	+ (1.00)	− (0.13)	− (0.02)
Edits the text of articles	+ (0.97)	− (0.21)	+ (0.89)	+ (0.94)	− (0.10)	− (0.48)
Informs students about scientific events related to the topic of the dissertation	+ (0.90)	− (0.23)	+ (0.75)	+ (0.61)	− (0.33)	+ (0.78)
Helps to prepare publications	+ (0.94)	− (0.25)	+ (0.98)	+ (0.81)	− (0.24)	+ (0.74)
Helps in finding reviewers	+ (0.86)	− (0.13)	− (0.44)	− (0.37)	− (0.10)	− (0.44)
% out of the overall sample (N = 2,034)	*22*	*16*	*15*	*18*	*13*	*16*

[a] K-means method with six clusters was used to conduct the analysis. Question: "Which of the following does your supervisor perform?". Respondents could choose all appropriate options. "+" means that the majority of respondents from this cluster chose the option. "−" means that the majority of respondents from this cluster did not choose the option. Final cluster centers are presented in brackets

We used the label "superheroes" for supervisors who show the highest level of engagement in PhD student's work (22% in the overall sample). Superheroes not only help with the dissertation (commenting on the results, recommending literature, and editing the text) but also give advice about the field research and help with its organization, recommend experts and reviewers, and help to prepare publications.

The second style, which we, following Grover and Malhotra (2003), labeled hands-off supervisors, is opposite to the superheroes. The majority of supervisors who fall into this category perform none of the listed functions. The share of this category in the overall sample is 16%.

The third category was named "research advisors" (15% of the overall sample). These supervisors are strongly engaged in PhD students' research (including organization of the field research, advice on research methods, and participation in the preparation of publications) but usually do nothing related to the dissertation itself (editing text, recommending experts and organizing interactions with them, finding reviewers).

The "research practice mediator" category is characterized by non-participation in the organizational work accompanying the research process and preparation for dissertation defense. Such supervisors usually do not help with searching for experts and reviewers and do not participate in the organization and field research stage. At the same time, research practice mediators are engaged in the work with the text of the dissertation, as well as with publications. The share of this category in the overall sample is 18%. We borrow the label for

this category from Franke and Arvidsson (2011) and speculatively suggest that this kind of behavior can be a result of the unwillingness to experience tensions associated with combining project leader and mentor functions.

Again, following Franke and Arvidsson, we used the term dialogue partners for the supervisors who carry out primary consultative work—recommending literature on the subject of the dissertation, giving advice on research methods, and commenting on the results and conclusions of the dissertation. Dialogue partners constitute 13% of the overall sample.

The last type—"mentors"—is close to dialogue partners. However, mentors usually execute more functions related to the navigation in the academic world such as recommending experts and organizing communication with them, informing students about scientific events and helping with publications. We can assume that mentors are one of the research practice-oriented manners of supervision, while dialogue partners relate more to research relation-oriented supervision. The share of category mentors in the overall sample is 16%.

The prevalence of categories of supervisors differs significantly depending on the year of study (Table 3). First, the share of superheroes increases with the increase in the year of study (from 18% in the first year to 32% in the fourth year). This trend can be explained by the specifics of the educational process in different years of study. During the first year, PhD students are usually focused on the literature analysis and on the development of a field research design. Consequently, they may not yet need help in editing their dissertation and publication texts, and in finding reviewers. In accordance with the first finding, we could assume the decrease of the hands-off supervisors share with the increase of the year of study. However, even though the largest share of hands-off supervisors is, indeed, observed among the first year PhD students (19%), this indicator for the students of second to fourth year are nearly the same varying between 13 and 15%.

The prevalence of categories also differs significantly depending on the field of study (Table 4). Mathematical and natural sciences are characterized by the largest share of super-heroes (29%) and comparatively small share of research practice mediators (13%). Engineering and technological sciences shows the largest share of research advisors (18%) and smaller share of research practice mediators (14%). The smallest share of superheroes (16%) is observed among supervisors of PhD students in social sciences. They are also characterized by the comparatively larger shares of research practice mediators (25%) and dialogue partners (17%), and smaller shares of research advisors (11%). The largest share of research practice mediators is observed for humanities (30%).

Table 3 Prevalence of different categories of academic supervisors depending on the year of study (%)[a]

	Superheroes	Hands-off supervisors	Research advisors	Research practice mediators	Dialogue partners	Mentors
1st year (N = 748)	*18*	*19*	15	15	*16*	17
2nd year (N = 621)	24	13	15	18	14	16
3rd year (N = 384)	24	15	11	*23*	*9*	17
4th year (N = 170)	*32*	14	17	18	8	11

Italics indicates that standardized residuals are 1.96 or more

[a] The significance test is chi-square test. $\chi2 = 55.802$, df = 15, $p < .000$

Table 4 Prevalence of different categories of scientific supervisors depending on the field of study (%)[a]

	Superheroes	Hands-off supervisors	Research advisors	Research practice mediators	Dialogue partners	Mentors
Mathematical and natural sciences ($N = 581$)	*29*	13	17	*13*	11	17
Engineering and technological sciences ($N = 594$)	21	17	*18*	*14*	12	18
Social sciences ($N = 521$)	*16*	18	*11*	25	*17*	13
Education ($N = 72$)	22	17	10	21	12	18
Humanities ($N = 165$)	24	11	9	**30**	11	15

Italics indicate that standardized residuals are 1.96 or more

[a] The significance test is chi-square test. $\chi^2 = 94.591$, df $= 20$, $p < .000$

PhD students' satisfaction with the supervisor

To answer the second research question, we analyzed the link between the styles of supervision and the desire of PhD students to change their supervisor ("*If you had the opportunity, would you change your current academic supervisor?*" measured on a four-pointed scale: "Definitely yes," "Probably yes," "Probably no," "Definitely no").

The results of the chi-squared test showed significant differences between styles of supervision in the level of PhD students' satisfaction ($\chi^2 = 235.261$, df $= 5$, $p < 0.001$). The largest shares of PhD students who are satisfied with their supervisors are observed among PhD students with supervisors classified as superheroes and mentors (98% and 97% respectively). The largest share of those, who would like to change their supervisor, was observed among PhD students with hands-off supervisors (36%). The second largest share of PhD students who would like to change their supervisor was also observed in the group whose supervisors were classified as dialogue partners (10%). Values for research advisors and research practice mediators are 5% and 6% respectively.

It should be emphasized that around two-thirds of PhD students, who reported that their supervisors did nothing (hands-off supervisors), do not want to change them. We can propose two possible explanations for this finding. The first one is that a significant share of PhD students are accomplished researchers, who need little guidance. Supervisor intervention can hinder their work rather than help it. Another possible explanation refers to the effect that Kuh (1999, 2003) named "disengagement compact." This means that supervisors and PhD students leave each other alone: both have no extra work, and everyone is satisfied. While this effect was observed primarily for undergraduate education, it is possible that we can also extrapolate it to the postgraduate education.

To control for a number of personal characteristics of PhD students, characteristics of their study, and a university, we conducted a multilevel mixed-effects logistic regression. The model estimates a random intercept at the university level. We used the dissatisfaction with the supervisor (1 = definitely or probably would like to change their supervisor) as the dependent variable. The following control variables were included in the model: gender, age, form of education, form of financing, university, field of study, year of study. The results of regression analysis (conditional R-squared $= 0.284$) are presented in Table 5.

Table 5 Predicting the willingness to change a supervisor: multilevel mixed effects logistic regression with random intercept coefficients

	B (S.E.)	Exp (B)
Intercept	−4.08*** (0.69)	0.02*** [0.004, 0.07]
Fixed parameters		
Style of supervision		
Hands-off supervisors	2.88*** (0.35)	17.88*** [8.98, 35.59]
Research advisors	0.68 (0.44)	1.98 [0.84, 4.66]
Research practice mediators	0.89** (0.40)	2.42** [1.10, 5.32]
Dialogue partners	1.53*** (0.39)	4.60*** [2.12, 9.54]
Mentors	0.17 (0.48)	1.18 [0.46, 3.03]
Males	−0.23 (0.19)	0.79 [0.54, 1.16]
Age	−0.01 (0.01)	1.00 [0.96, 1.02]
Year of study		
Second year	0.50** (0.23)	1.65** [1.06, 2.56]
Third year	0.76*** (0.25)	2.15*** [1.32, 3.48]
Fourth year	0.22 (0.38)	1.25 [0.59, 2.62]
Area of study		
Engin. and Tech. Sciences	0.12 (0.26)	1.13 [0.69, 1.87]
Soc. Sciences	0.12 (0.28)	1.13 [0.65, 1.93]
Edu. and Pedag. Sciences	0.14 (0.51)	1.15 [0.43, 3.10]
Humanities	−0.13 (0.40)	0.88 [0.40, 1.91]
State-funded	0.09 (0.33)	1.07 [0.56, 2.03]
Full time	0.05 (0.37)	1.01 [0.50, 2.07]
Random parameters		
Intercept: variance	0.15 (0.38)	
Observations	1,916	
	Marginal R-squared 0.251	
	Conditional R-squared 0.284	
	AIC = 930.0, BIC = 1030.0, logLik = −447.0	

Standard error is presented in parentheses and 95% CI in brackets. Reference category in the style of supervision—"Superheroes". Reference category in the year of study—first year. Reference category in the field of study—Math and Natural Sciences

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Even while controlling for a number of variables, there are statistically significant differences in the reported willingness to change supervisor between different styles of supervision. Reporting that the supervisor does nothing (hands-off supervisors) increases the probability that a PhD student will want to change his/her supervisor by almost 18 times (Exp(B) = 17.88, $p < 0.001$) compared to superheroes. Two other problematic categories are dialogue partners and research practice mediators—belonging of supervisors to these groups increases the probability that the PhD student will want to change supervisor by 4.6 and 2.4 times respectively compared to superheroes (Exp(B) = 4.60, $p < 0.001$, Exp(B) = 2.62, $p < 0.01$ for dialogue partners and research practice mediators respectively). There are no significant differences between superheroes, research advisors, and mentors.

Expected TTD

Since the participants of the survey were current PhD students, we have no information about their final success or failure in the defense of their dissertations. However, we used a question about the expected TTD ("*Which year do you plan to defend your dissertation?*") as a subjective indicator of PhD students' progress. Understanding the limitations of using such

an indicator related to the underestimation of actual TTD and dependence on the year of study (Gillingham et al. 1991), we did not focus on the actual values of this indicator and used it in comparative way to show the differences between supervision styles and include the year of study into the regression model for control purposes. The question had the following response options: "2016," "2017," "2018," "2019," "2020," "2021," and "2022", "I am not sure that I will defend my dissertation", "I am not going to defend my dissertation".

To make the analysis clearer, we recoded all responses to dichotomous options "Plans to defend dissertation on time" and "Does not plan to defend dissertation on time". The results of chi-squared test showed the significant association between the style of supervision and expected TTD ($\chi^2 = 31.444$, df = 5, $p < 0.001$). While overall PhD students are quite optimistic about their TTD which verifies previous findings about underestimation of actual TTD by PhD students (Gillingham et al. 1991), there is a significant variation in shares of those, who plan to defend their dissertation during the expected period (4 or 5 years), depending on the style of supervision. The largest share of PhD students who plan to defend their dissertations during the expected period is observed among those, whose supervisors were classified as super-heroes (84%). PhD students of research advisors are also relatively optimistic (80%). The most pessimistic group consists of PhD students with hands-off supervisors (68%). PhD students, whose supervisors were classified as dialogue partners are also quite pessimistic (71%). In the middle are groups of PhD students supervised by research practice mediators (75%) and mentors (76%).

To control for a number of personal characteristics of PhD students, characteristics of their study and university, we conducted a multilevel mixed-effects logistic regression with the self-estimated time to dissertation defense as a dependent variable (1 = plans to defend the dissertation during the normative period) and a random intercept at the university level. We included the following control variables into the model: gender, age, form of education, form of financing, university, field of study, year of study. Even while controlling for a number of variables, there are statistically significant differences in expected TTD, depending on the style of supervision (conditional R-squared = 0.376, Table 6). The belonging of PhD student's supervisor to a group of hands-off supervisors or dialogue partners decreases the probability that PhD student will be optimistic about the planned time to defense almost by 5 times (Exp(B) = 0.21, $p < 0.001$, and Exp(B) = 0.22, $p < 0.001$, for hands-off supervisors and dialogue partners respectively) compared to superheroes supervisors. The probabilities that PhD students whose supervisors were classified as research advisors and research practice mediators will be optimistic about the time of defense are 2 and 2.5 times lower respectively compared to superheroes. We found no significant differences between superheroes and mentors.

Conclusion and discussion

This paper provides new evidence on the PhD supervision process and the relation between supervision styles and PhD students' satisfaction, and self-esteemed progress measured as expected TTD. In contrast to the majority of studies in the field (Boehe 2016), our survey is based on the quantitative methodology which enabled an empirically driven categorization of PhD supervision styles with the quantitative estimates of their prevalence. Based on the results of cluster analysis, we distinguished six categories of supervisors which were labeled super-heroes, hands-off supervisors, research advisors, dialogue partners, research practice

Table 6 Predicting expected TTD: multilevel mixed effects logistic regression with random intercept coefficients

	B (S.E)	Exp (B)
Intercept	3.79*** (0.91)	44.27*** [7.41, 264.41]
Fixed parameters		
Style of Supervision		
Hands-off supervisors	− 1.58*** (0.31)	0.21*** [0.11, 0.38]
Research advisors	− 0.70* (0.35)	0.50* [0.25, 0.98]
Research practice mediators	− 0.93** (0.33)	0.39** [0.21, 0.75]
Dialog partners	− 1.50*** (0.33)	0.22*** [0.12, 0.43]
Mentors	− 0.36 (0.37)	0.69 [0.34, 1.44]
Males	0.09 (0.19)	1.10 [0.76, 1.58]
Age	0.03 (0.03)	1.03 [0.98, 1.08]
Year of study		
Second year	− 0.40 (0.22)	0.67 [0.44, 1.03]
Third year	− 0.63* (0.25)	0.53* [0.33, 0.87]
Fourth year	− 1.11*** (0.31)	0.33*** [0.18, 0.60]
Area of study		
Engin. and Tech. Sciences	0.20 (0.25)	1.22 [0.75, 1.98]
Soc. Sciences	− 0.06 (0.26)	0.94 [0.57, 1.57]
Edu. and Pedag. Sciences	− 0.89* (0.42)	0.41* [0.18, 0.94]
Humanities	0.74 (0.46)	2.09 [0.85, 5.11]
State-funded	− 0.05 (0.32)	0.95 [0.50, 1.78]
Full time	− 0.72 (0.40)	0.49 [0.22, 1.06]
Random parameters		
Intercept: variance	0.24 (0.49)	
Observations	1,916	
	Marginal R-squared: 0.331	
	Conditional R-squared: 0.376	
	AIC = 1018.4, BIC = 1118.4, logLik = −491.2	

Standard error is presented in parentheses and 95% CI in brackets. Reference category in the style of supervision—superheroes. Reference category in the year of study—first year. Reference category in the field of study—Math and Natural Sciences

*$p < 0.05$; **$p < 0.01$; *** $p < 0.001$

mediators, and mentors. This categorization expands the widely used in research literature distinction between hands-off and hands-on supervision styles (Grover and Malhotra 2003; Sinclair 2004; Deuchar 2008) to a more complex model of different approaches to hands-on supervision based on the functions performed by supervisor. We assume that differences within hands-on supervision can be explained by two dichotomies discussed in literature: project versus process-oriented supervision (Boehe 2016) and research practice versus research relation-oriented supervision (Franke and Arvidsson 2011). Process-oriented supervisory manner, as well as research relation-oriented supervision, may result in neglecting important organizational functions. The results of the analysis show that the prevalence of revealed categories differs depending on the field and year of study. Thus, our findings confirm previous studies (Sinclair 2004) showing that hands-off style is more common for social sciences and humanities rather than natural sciences. Also, the relation between the year of study and style of supervision lays the foundation for the development of dynamic models of PhD supervision styles (Gatfield 2005; Gurr 2001).

Second, we found a statistically significant link between the style of supervision and PhD students' satisfaction with the supervisor (measured by the desire to change supervisors) and between the style of supervision and expected TTD. Unsurprisingly, the largest share of PhD students who are dissatisfied with their supervisors was observed among those who work with

hands-off supervisors. However, about two thirds of PhD students, whose supervisors do nothing, are still satisfied with them. We assume that this situation can be explained by the so-called disengagement compact (see Kuh 1999, 2003). The causes of such a phenomenon may lie in the field of recent institutional transformations of doctoral education which resulted in the increasing of both PhD students' and supervisors' workload. Consequently, the weakening of doctoral supervision may be the result of a spontaneous adaptation of PhD students and supervisors to the new reality. Supervisors have more time for their own research, and students, particularly those who do not have motivation to complete their dissertation, can avoid being excluded from the program. Given the fact that professional control in post-soviet Academia is rather weak (Abramov 2010) and that disengagement compact is widespread in undergraduate education (Froumin and Dobryakova 2012), it is quite likely that this phenomenon also persists in PhD programs.

Our results also verify the findings of previous studies which showed that it is critically important for supervisors to perform administrative and expert functions related to their roles as "project managers," who help in the administration of the research process and control over the research progress, and "gatekeepers," who provide their PhD students with learning resources, expert opinions, and networks (Lee 2008). Two categories which showed the highest level of PhD students' satisfaction and biggest shares of those who expect to defend a dissertation during the normative period are superheroes and mentors, whose main distinctive feature is the provision of administrative and expert functions such as recommending experts and organizing communication with them and helping in conducting of field research.

Of course, doctoral education in Russia has a lot of peculiarities and differs substantially from the USA, Australia, and many Western European countries. The Russian case is also unusual because of the transition period, when PhD programs start functioning as a third level of higher education. Nevertheless, our research shows that doctoral supervision manners and its perception by students in Russia is in many aspects consistent with the findings revealed in previous research, conducted in different educational environments. We argue that the reason of it is that doctoral supervisor-student relationship is an essential part of almost any educational system and thus it deserves further attention in future research.

Limitations and ideas for future research

Some limitations should be taken into account in order to better understand the generalizability of the results. First, the participants of the survey were PhD students of leading Russian universities. The educational process there is different to other Russian universities. For example, the leading universities may impose additional requirements for incoming PhD students and supervisors. Consequently, the generalization of our findings to a broader context of Russian doctoral education might be problematic. Second, the presented data about academic supervision are subjective and reflect the view of only PhD students. Unfortunately, we cannot verify these data by objective indicators or present the view of other "stakeholders"—supervisors, faculty, and administrators. Third, the proposed classification is based on the data derived from a close-ended binomial question about supervisor's functions. This question was non-sensitive to variations in intensity and frequency of performance of said functions. Questions with a more extensive response scale would be beneficial for a more sophisticated analysis. Finally, there are some limitations for the use of output indicators included in the analysis (desire to change a supervisor and expected TTD). Since the desire to change a supervisor can correspond not only to the dissatisfaction with the supervisor and vice

versa, use of the additional indicators of PhD students' satisfaction with supervision would be beneficial. The same is relevant for the expected TTD. It would be beneficial to use objective data about some indicators of PhD students' progress—their actual TTD, publications, etc. This survey should be seen as a touchstone in the empirically based study of research supervision and lay the foundation for future research. First, dyadic research, presenting both PhD students' and their supervisors' view on the supervision process, will be beneficial. Second, the analysis of objective data about the supervision process will give a more thorough and accurate picture of PhD supervision. Third, further research should consider disciplinary differences revealed in this paper and analyze peculiarities of supervisory types within different fields. The results of these surveys could create the foundation for the evidence-based doctoral education policy.

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