Positive and negative experiences related to doctoral study conditions

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Abstract

During their doctoral studies, students undergo an emotionally and intellectually intensive process involving a wide range of positive and negative experiences. This paper analyses PhD students' perceptions of the most positive and negative experiences related to doctoral study conditions. Previous researchers have primarily focused on analysing experiences that negatively affect doctoral work and have related these experiences to institutional, social and individual variables. However, little is known regarding positive experiences and how both positive and negative experiences are interpreted and related to variables connected with doctoral study, such as discipline, funding, enrolment type, and the stage of the doctoral process. In total, 1173 doctoral students from 56 Spanish universities completed an open-ended online survey. The findings indicate that opportunities for PhD students to communicate their scientific advances, receive expert feedback and interact with other researchers have a high positive influence on their doctoral journey. However, funding difficulties, particularly for students in the social sciences, and relationships with the research community, principally with the supervisor, were perceived as the main negative challenges. Experiences related to research design, data collection and analysis were perceived either negatively – primarily for mid-level students – or positively. These results should be considered in future doctoral programme policies to determine when, how and why to provide specific support during the doctoral process.

Keywords: Doctoral education; doctoral study conditions; experiences; higher education.

Introduction

Research is crucial to successfully addressing the challenges faced by innovative societies. Over the years, the number of PhD students has increased exponentially (OECD, 2014). However, being a researcher is not easy. PhD students must manage the uncertainty of an academic career

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(Author, 2015), which has been related to feelings of inadequacy, dropout intention and a high attrition rate (Author, 2017).

During their doctoral studies, PhD students undergo an emotionally and intellectually intensive process involving a wide range of positive and negative experiences. These experiences contribute to the way students formulate their identity as researchers (McAlpine, Jazvac-Martek, & Hopwood, 2009). Greater knowledge of the experiences PhD students perceive as the most positive and negative might be informative and contribute to improving the quality of doctoral programmes.

A review of the literature reveals that research on doctoral studies has primarily focused on analysing experiences that negatively affect the doctoral process, such as experiences of disengagement (Vekkaila, Pyhältö, & Lonka, 2013), abandonment (Bair & Haworth, 2004; Gardner, 2009), and stress (Pyhältö, Toom, Stubb, & Lonka, 2012).

Researchers have drawn attention to the many challenging experiences that affect PhD students. Certain experiences are related to social and institutional factors, such as relationships with other researchers, supervisors, peers and other faculty members, and to the conditions of the working environment (Jairam & Kahl, 2012; Pyhältö, Nummenmaa, Soini, Stubb, & Lonka, 2012). Experiencing support, particularly from one's supervisor, has been reported as an important factor that fosters degree completion and doctoral satisfaction (Bair & Haworth, 2004; Barnes & Randall, 2012; McAlpine, & McKinnon, 2013). Meanwhile, disengagement is more likely to occur when students experience tension, a lack of social support, disappointing supervision or funding difficulties (Jairam & Kahl, 2012; Pyhältö, Vekkaila, & Keskinen, 2012; Zhao, Golde & McCormick, 2007). These negative experiences may entail feelings of inefficacy, cynicism, exhaustion and isolation during doctoral studies (Ali & Kohun, 2006; Pyhältö et al., 2012;

Vekkaila et al., 2013), which negatively affect the identity of doctoral candidates and increase the risk of attrition.

Challenges related to individual factors that are encountered in the course of doctoral study have also been highlighted as important. These factors have been related to developing competencies as researchers (e.g., defining research questions, resolving methodological issues, collecting and analysing data) or as scientific communicators (e.g., managing research genres in writing and oral communication or publishing) (Author, 2013; Cotterall, 2013). Additionally, scholars have observed students' difficulties in perceiving themselves as active relational agents (e.g., creating their own networks) (Pyhältö & Keskinen, 2012), in overcoming time pressure or in maintaining a healthy work-life balance, particularly for PhD students enrolled part-time (Gardner & Gopaul, 2012). Moreover, there is evidence that the stage of the doctoral process influences the type of challenge the student experiences (Gardner, 2010).

However, fewer studies have focused on analysing the positive experiences of PhD students, and to our knowledge, no study has extensively analysed the relationships between PhD students´ most positive and negative experiences and variables related to doctoral study conditions, such as discipline, funding, enrolment type, and the different stages of the doctoral process.

Our specific research questions were as follows:

a) What were PhD students' perceptions regarding the most positive and negative experiences in their doctoral studies?

b) Were these perceptions different depending on the stage of their studies?

c) Were these experiences related to discipline, funding and full-time/part-time enrolment?

Method

The study was part of a wider Spanish research project aimed at analysing early career researcher identity (Author., 2017; Author, 2017). It adopted a cross-sectional design based on answers to open-ended questions from a large, representative sample.

Context

In Spain, the past 10 years have seen significant changes to the regulations governing doctoral studies and how these programmes are structured. These modifications were undertaken to fulfill the requirements of the European Higher Education Area and the Bologna process. Each university has created a doctoral school, responsible for the coordination and development of doctoral programmes. All these programmes incorporate seminars, structured courses and other activities for advanced research training, and include the creation and presentation of an original thesis. PhD students can be enrolled full-time or part-time. Full-time students are expected to complete their studies in three years. Part-time students can invest up to five years (Real Decreto 99/2011).

Participants

Doctoral programmes at all the research-intensive universities in Spain were contacted to request participation. In total, 56 universities (74%) agreed to participate and sent their PhD students (n=1888) the link to the online survey. We collected 1280 questionnaires. After discarding uncompleted and partially completed responses, 1173 questionnaires remained and were included in the analysis. Therefore, the response rate was 67.76%, which can be considered high for this type of study (Nulty, 2008). The 1173 PhD students in the final sample (mean age: 36.3 years; SD: 8.9) were from different disciplines (Table 1). Most participants were part-time students (56.06%) at the mid-level stage (51.3%) of the doctoral process (Table 1).

Table 1
Socio-demographic data

Variables	Frequency	Percentage
Gender		
Men	438	40.3

Women	649	59.7
Age		
Under 30	288	27. 2
30 to 39	452	42.7
40 to 49	204	19.3
50 or older	114	10.8
Discipline		
Education	285	24.3
Humanities	171	14.6
Economy	156	13.3
Psychology	154	13.1
Other sciences	259	22.1
Law	90	7.7
Architecture and engineering	57	4.9
Doctoral Stage		
Initial (1-2 year)	50	4.7
Mid-level (3-4 year)	542	51.3
Advanced (5 or more)	464	44
Enrolment		
Full-time	467	43.94
Part-time	596	56.06
Funding		
University job	114	10.5
Pre-doctoral scholarship	278	25.5
Research project scholarship	30	2.8
Job outside the university	351	32.3
No funding	164	15.1
Others	150	13.8

Procedure

Data collection

Data were collected through the online *Doctoral Students' Experience* questionnaire (DSE), which was adapted from previously validated instruments (Author, 2017). The first section of the questionnaire elicits sociodemographic information regarding the participant's gender, age, discipline, funding, enrolment type (part- or full-time) and year of doctoral studies through multiple-choice items. In the second section, information regarding the most positive and negative experiences throughout the doctoral process was collected through the following four open-ended statements.

1) The most positive experience from the beginning of my doctorate until now was when…

2) This experience was important to me because…

3) The most negative experience from the beginning of my doctorate until now was when...

4) This experience was important to me because…

Students were allowed to describe these experiences using their own words and without word limits.

A multistage procedure was applied for data collection. First, doctorate-granting schools were approached, and when they agreed to collaborate, faculty from their doctoral programmes provided information regarding their research projects and sent the questionnaire link to their PhD students (after receiving consent according to the research ethics clearance procedures in the respective jurisdictions). The link was available for a three-month period, and three reminders were sent to encourage students to complete the questionnaire.

Data analysis

Data analysis was performed in two phases. In the first phase, all participant responses were content-analysed following a three-step procedure. a) After iteratively reading one-third of the total responses, preliminary parental codes were defined in a top-down manner based on previous research categories (McAlpine et al., 2009; Pyhältö et al., 2012). Incongruences,

imbalances, and overlapping among these preliminary codes were revised until consensus was reached to classify positive and negative experiences into six parental codes (Table 2). b) Responses within each parental code were thematically analysed to establish bottom-up emergent categories (Table 2). These categories were thoroughly discussed and revised to account for the variability in responses. c) Two researchers, who were previously trained and familiar with the study, independently analysed 33% of the total responses using an instrument created for this analysis (Table 2). The level of agreement between these researchers ranged from 0.76 to 0.89 in the categories related to positive experiences and from 0.68 to 0.87 in the categories related to negative experiences (kappa coefficient). Once reliability was established, the two researchers independently analysed the remaining data.

Table 2
Types of positive and negative experiences during the doctoral journey

Parental codes	Categories	Description	Example Positive Experience	Example Negative Expe
1. Research community	*Types/locations of individuals, groups.*	*Relationships with others doing research; supervisor, research team, doctoral programme peers, and colleagues in department, institution and/or externally.*		
	1.1 Relationship with the supervisor.	Experiences regarding the election of the supervisor, changes in management, assistance and guidance received, etc. Additionally, aspects related to the quality of communication with the supervisor.	In the second year, I changed my doctoral programme and got another tutor with a completely different work dynamic from the one I had before (1575).	My supervisor returned me my first chapter but without any positive comment (1595).
	1.2 Relations with the local community.	Relationship with other researchers, both from the research team and department, own institution and/or doctoral programme.	The university asked me to continue collaborating with the department, and all this time I had been working with them was fantastic; I knew the research process very closely (1518).	My department overloaded me with other tasks that were not related to my thesis (1902).
	1.3 Relationship with the extended community.	Relationship with researchers not related to the immediate environment, own department or institution. Research stays are included as	The stay abroad enriched me on a professional level because I learned a lot about the field of my	At a conference late last year, I realized how little I knew about my own theme (358).

Parental codes	Categories	Description	Example Positive Experience	Example Negative Expe...
		an essential aspect of this subcategory. Additionally, it includes relations with other researchers that are forged at conferences or scientific events.	thesis, and on a personal level, it was also very enriching (1331).	
	1.4 Peer relationships.	Experiences with other PhD students, whether close or not.	Knowledge sharing with my peers from the seminar (39).	Peers who think they know everything and do things better than everybody, and that makes me very sad (1594).
	1.5 Teaching experience.	Teaching experiences during the doctorate at both the national and international levels.	When I gave my first short course in a foreign university (1563).	The most complicated thing is to combine teaching with my thesis. In the end, it is more urgent to thoroughly prepare the classes that I was teaching for the first time than to devote hours to my thesis (64).
2. Research process	*Stage in research process*	*Research design-related experiences.*		
	2.1 Topic focus and references	Experiences in choosing, changing or redefining the research topic or experiences referring to the bibliographic references.	Choosing the topic made me realize you could start working in a direction (1889).	The literature search for the theoretical approach overwhelmed me (1346).
	2.2 Design, data collection and analysis	Experiences related to the research design or the need to make changes. Additionally, aspects related to access to the sample, data collection or data analysis.	The data collection at schools. All the participants (teachers, students) were involved in my research (1543).	When I started to administer the questionnaires at the schools, a lot of teachers refused to participate (1353).
3. Scientific communication		*All aspects/processes underlying communication of research; written and oral production (range of genres), outputs, feedback.*		
	3.1 Writing	All experiences related to the writing process, whether thesis chapters, articles or abstracts at conferences. The results of the writing process (publications) are not included in this subcategory. The writing process of the thesis project, grants or other documents necessary for the doctorate are also included.	Writing my first article (1585).	When I started to write an article, I had a lot of difficulties (1200).
	3.2 Publication	Experiences related to the (positive or negative) results of the writing process, i.e., the publication or rejection of an article, book chapter or conference abstract.	My first submission of preliminary results. It gave me the confidence to present my research (1593).	An international journal rejected my article for publication (1025).
	3.3 Oral Communication	Experiences of oral research communication at conferences and/or seminars at both the	I presented my work through communication at a	I did my first presentation of my

Parental codes	Categories	Description	Example Positive Experience	Example Negative Expe...
		national and international levels. They also include academic situations where oral communication is held.	conference, and people were impressed (1942).	thesis, and it was not very good (191).
	3.4 Expert feedback and assessment	Experiences explicitly tied to expert feedback, evaluation or recognition by the academic community. They also refer to the formative assessment of written texts or oral presentations throughout the doctorate (response of members of academic commissions, feedback from a communication presented at a conference, etc.) and recognition by the academic community (awards, etc.).	I presented my work and received positive feedback (1024).	A member of the assessment committee asked if I knew what I was talking about (1324).
4. Resources, affordances and limitations	*Categories of affordances or constraints*	*Influence of (lack of) access to institutional resources on progress.*		
	4.1 Training	Experiences related to training processes directly provided by the doctoral programme.	The seminar to discuss our thesis project during the doctorate programme. We shared our projects and this was a rich learning experience (742).	Some courses and topics in the doctoral training did not satisfy my expectations (385).
	4.2 Funding	Experiences related to obtaining grants or other financial resources for a doctorate.	I got a scholarship (1391).	When I was refused financial assistance from the Ministry (903).
	4.3 Time	Experiences linked with deadlines and the need to complete the doctorate in a particular period of time.	I realized how little time I have left (1971).	I felt that I did not have time to finish (921).
	4.4 Administrative procedures	Experiences directly linked with administrative formalities, for which compliance has a clear connection with the completion of the doctorate.		I found that administrative limitations slowed down my process (1957).
5. Agency and cognitive-affective regulation		*Experiences related to trying to make progress in research/PhD; values and motivation for PhD work; efforts to achieve goals; emotional responses and resilience to challenges.*		
	5.1 Research competencies	Experiences linked to competencies and personal skills necessary to conduct research, such as those related to work management strategies and problem-solving processes.	I realized I could perform complex procedures; I felt that I was able (1917).	I needed more skills in statistics (1944).
	5.2 Emotional management	Experiences related to writer's block, emotional overcoming and high frustration. Additionally, experiences of not progressing due to emotional reasons.	The little progress day by day made me feel good (467).	Early in the second year of my PhD, I had a kind of "emotional block" that affected my academic performance; that

Parental codes	Categories	Description	Example Positive Experience	Example Negative Expe...
				period was very difficult because I felt I could not move forward with my research project (1578).
	5.3 Motivation/meaning	Experiences related to the reasons guiding the decision to pursue a PhD. Values that students attribute to the scientific community.	I discovered that the effort is worthwhile (638).	I spent years trying to find a way while others started a much more interesting and fulfilling work and personal life (1546).
	5.4 Career expectations	Experiences related to future work expectations and career development.		I realized it is very difficult to find a job related to research, which is what I like (1551).
6. Personal and extra-academic life	*Nature of the balance*	*Experiences with the interaction between research work and the rest of life (family, extra-academic work, etc.)*		
	6.1 Research work-family balance	Experiences related to work-family life balance during the doctorate.		Efforts to balance family life (1574).
	6.2 Extra-academic work-research work balance	Experiences related to research work and extra-academic work (for those working outside the university) balance during the doctorate.		In some periods, because of my job, I had to travel a lot, and this delayed my thesis schedule (1429).
	6.3 Others	Other personal aspects		The absence of family. The death of my father (1530).

In the second phase of the analysis, differences among the types of experience, the affective value of the experiences – positive or negative – and the doctoral study conditions (discipline, funding, stage of the doctoral process (initial: 1-2 years; mid-level: 3-4 years; advanced; 5 or more years) and enrolment type,) were analysed through a chi-square test (SPSS, v22). When required, the typified residuals were calculated.

Results

Positive experiences in the doctoral process related to doctoral study conditions

The three most positive experiences mentioned by participants – which represent 82.8% of the total sample – were *scientific communication* (30.8%)*, research community* (26.2%) and *research process* (25.8%, Table 3). All of these positive experiences were influenced by *funding*

type ($\chi2$ (25) = 49.990, p< .01) (Table 5), *enrolment type* (full- or part-time) ($\chi2$ (5) = 17.481, p < .01) (Table 6), and *discipline* ($\chi2$ (30) = 51.897, p < .01) (Table 7) but not by *doctoral stage* (Table 4).

Experiences related to *scientific communication* (30.8%), which were noted as the experiences with the highest positive influence during the doctoral process, were related to receiving *expert feedback and assessment* (11.6%), *publishing* (8.2%) and presenting *oral communications* at conferences (7.8%), whereas a low percentage was attributed to the activity of *writing* itself (3.2%, Table 3). These positive experiences were mentioned more often by economics students (43.8%) and less by humanities students (24.3%, Table 7).

Relationships with the *research community* were the second-most positive experiences (26.2%, Table 3) mentioned by participants, although psychology students mentioned them less often (20%, Table 7). Within this category, the most frequently cited experiences were relationships with the *extended community* (12.1%), followed by relationships with *supervisors* (7.3%), the *local community* (4.3%) and *peers* (1.2%, Table 3).

Finally, experiences related to the management of the *research process* (19.1%), particularly *design, data collection and analysis (19.1%)*, were reported by participants as the third most common positive experiences (Table 3). These experiences were more often mentioned by students without funding (33.8%, Table 5) and by those in economics (15.7%, Table 7).

The least often mentioned positive experiences, which represented only 17.2% of the total sample, were related to a) *resources, affordances and limitation*s (8.9%)*, primarily with respect to access to funding (5.1%); b) *agency and cognitive-affective regulation* (8.2%), which refers to the development of research competencies (4.5%) and the attribution of *meaning and motivation* to doctoral studies (3.4%); and c) *personal and extra-academic life* (0.1%), which was only mentioned once (Table 3).

Unsurprisingly, positive experiences related to *resources, affordances, and limitations* were mentioned more often by PhD students with scholarships (16.6%) and less often by those with jobs outside the university (5.9%, Table 5) or by part-time students (11.4%, Table 6). Aditionally, such positive experiences were mentioned more often by students in education discipline (11.8%) and less often by science and economics students (5.6% and 4.6%, respectively; Table 7).

Finally, positive experiences related to *agency and cognitive-affective regulation* were mentioned more often by full-time students (10.7%, Table 6) and less often by those with scholarships (5.6%, Table 5).

Negative experiences in the doctoral process related to doctoral study conditions

The results regarding participant negative experiences were more diverse than those regarding the positive experiences and were influenced by *funding* ($\chi2$ (25) = 59.057, p< .01), *enrolment* (full- or part-time) ($\chi2$ (5) = 27.874, p < .01) *discipline* ($\chi2$ (30) = 51.814, p < .01) and *stage of the doctoral process* ($\chi2$ (10) = 22.12, p < .05) (Tables 4, 5, 6 and 7).

The most common negative experiences were attributed to managing *resources, affordances, and limitations in accessing institutional resources* (25.8%). These experiences predominantly concerned difficulties obtaining financial resources (13.5%, Table 3) and were primarily reported by PhD students working outside the university (33%) and those in the fields of law and humanities (36.5% and 33%, respectively; Table 7). Students with scholarships (15.8%) reported these difficulties less often (Table 5).

Relationships with the *research community* were the second-most common negative experiences (20.1%). These experiences primarily concerned difficulties with the *supervisor* (12.4%) and, to a lesser extent, difficulties with the *local community* (5.3%), including relationships with the research team, department or institution (Table 3). Surprisingly, these

negative experiences were reported more often by PhD students with scholarships (26.3%) than by those with jobs outside the university (13.9%, Table 5). Additionally, these negative experiences were reported more often by part-time students (23.2%) than by full-time students (16.3%, Table 6).

The third-most common negative experiences were related to the competencies required to manage the *research process* (11.8%), particularly for mid-level students (i.e., third- or fourth-year students) (22.3%, Tables 3 and 4). Those in the advanced level (the fifth year or higher) reported this type of experience less often (13.8%, Table 4). In addition, the PhD students in the field of law (6.8%, Table 7) also mentioned this type of negative experience less often.

Negatives experiences related to *agency and cognitive-affective regulation* (16.5%) primarily concerned a lack of perceived *research competencies* (5.5%), loss of *motivation and meaning* in the doctoral process (5.4%) and difficulties in *managing emotions* (e.g., mental blocks or frustration) (4.6%, Table 3). Particular attention must be paid to economics students, who mentioned these difficulties more often (22.6%), while psychology students mentioned them less often (10.9%, Table 7). However, percentages were lower at the beginning of doctoral studies (6%, Table 4). In addition, students with no funding mentioned this issue less often (11.3%, Table 5).

Negative experiences related to *scientific communication* were mentioned by a small percentage (11.6%) and primarily concerned difficulties with publishing (4.3%), receiving expert feedback and assessment (3.7%) and writing (2.4%, Table 3). These difficulties were mentioned in particular by PhD students with research project scholarships (23.3%, Table 5) and by part-time students (13.5%, Table 6). In addition, economics students (16.8%) reported this type of negative experience more often. In contrast, students in the humanities (7.1%) reported this type of experience less often (Table 7).

Surprisingly, the less-mentioned types of negative experience were related to *personal and extra-academic life* (7.8%), which primarily concerns difficulties balancing research with extra-academic work (3.2%) and family (2.1%, Table 3). These negative experiences were most likely to affect students with jobs outside the university (11.3%) and full-time students (11.7%, Table 6). In contrast, this type of experience was reported less often by students at the mid-level stage of their studies (6.2%, Table 4), economics students (2.9%, Table 7), and students with a scholarship (3.3%, Table 5).

Table 3
Frequency and percentage of the different types of significant experiences.

Parental codes	Categories	Positive Experience	Negative Experience
1. Research Community		301 (26.2%)	213 (20.1%)
	1.1 Relationship with the supervisor	84 (7.3%)	131 (12.4%)
	1.2 Relations with the local community	49 (4.3%)	56 (5.3%)
	1.3 Relationship with the extended community	139 (12.1%)	10 (0.9%)
	1.4 Peer relationships	14 (1.2%)	10 (0.9%)
	1.5 Teaching experience	15 (1.3%)	6 (0.6%)
2. Research process		295 (25.8%)	193 (18.2%)
	2.1 Topic focus and references	77 (6.7%)	68 (6.4%)
	2.2 Design, data collection and analysis	218 (19.1%)	125 (11.8%)
3. Scientific communication		353 (30.8%)	122 (11.6%)
	3.1 Writing	37 (3.2%)	25 (2.4%)
	3.2 Publication	94 (8.2%)	45 (4.3%)
	3.3 Oral communication	89 (7.8%)	13 (1.2%)
	3.4 Expert feedback and assessment	133 (11.6%)	39 (3.7%)
4. Resources, affordances and limitations		102 (8.9%)	272 (25.8%)
	4.1 Training	40 (3.5%)	27 (2.6%)
	4.2 Funding	58 (5.1%)	143 (13.5%)
	4.3 Time	4 (0.3%)	44 (4.2%)
	4.4 Administrative procedures	0	58 (5.5%)
5. Agency and cognitive-affective regulation		93 (8.2%)	174 (16.5%)
	5.1 Research competencies	51 (4.5%)	58 (5.5%)
	5.2 Emotional management	1 (0.1%)	49 (4.6%)
	5.3 Motivation/meaning	39 (3.4%)	56 (5.4%)
	5.4 Career expectations	2 (0.2%)	11 (1%)
6. Personal and extra-academic life		1 (0.1%)	82 (7.8%)
	6.1 Research work-family balance	1 (0.1%)	22 (2.1%)
	6.2 Research work – extra-academic work balance	0	34 (3.2%)

6.3 Others	0	26 (2.5%)

Table 4
Relationship between negative experiences and the stage of the doctoral process.

	Research community	Research process	Scientific communication	Resources affordances and limitations	Agency and cognitive-affective regulation	Personal and extra-academic life
	N	N	N	N	N	N
Stage n=1056 (-)	n= 213	n= 193	n= 122	n= 272	n= 174	n= 82
Initial stage n= 50	10 (20%)	8 (16%)	7 (14%)	18 (36%)	3 (6%)* z= -2.0	4 (8%)
Mid-level n= 542	100 (18.5%)	121 (22.3%)* z= 3.5	65 (12%)	130 (24%)	92 (17%)	34 (6.2%)* z= -1.9
Advanced level 464	103 (22.2%)	64 (13.8%)* z= -3.3	50 (10.8%)	124 (26.7%)	79 (17%)	44 (9.5%)

Note: *p ≤ .05; **p < .01; z = established residual values

Table 5
Relationship between experiences and PhD studies funding.

	Research community		Research process		Scientific communication		Resources affordances and limitations		Agency and cognitive affective regulation		Personal and extra-academic life	
	P	N	P	N	P	N	P	N	P	N	P	N
Funding n= 1063 (+) n= 982 (-)	n= 277	n=197	n=277	n= 187	n= 326	n= 114	n= 96	n= 250	n= 86	n= 159	n= 1	n= 75
University job n= 113 (+) n= 98 (-)	34 (30.1%)	16 (16.3%)	28 (24%)	22 (22.4%)	39 (34.5%	8 (8.2%)	7 (6.6%)	26 (26.5%)	5 (4.8%)	16 (16.3%)	0 (0%)	10 (10.3%)
PhD scholarship n= 271 (+) n= 247 (-)	66 (24.4%)	65 (26.3%)** z= 2.8	62 (22%)	51 (20.6%)	83 (30.6%)	35 (14.2%)	45 (16.6%)** z= 5.0	39 (15.8%)** z=-4.0	14 (5.6%)** z= -2.0	49 (19.8%)	1 (0.8%)	8 (3.3%)** z=-3.0
Research project scholarship n= 30 (+) n= 30 (-)	8 (26.7%)	5 (16.7%)	7 (23%)	6 (20%)	10 (33.3%	7 (23.3%)** z= 2.0	2 (7%)	5 (16.7%)	3 (10%)	5 (16.7%)	0 (0%)	2 (6.6%)
Job outside the university n= 341 (+)	81 (23.7%)	43 (13.9%)** z= -3.3	90 (26.4%)	55 (17.8%)	115 (33.7%)	28 (9,1%)	20 (5.9%)** z= -2.5	102 (33%)* z= 3.7	35 (10.3%)	46 (14.9%)	0 (0%)	35 (11.3%)** z= 2.9

n= 309 (-)												
No funding n=160 (+) n=160 (-)	47 (29.3%)	34 (21.3%)	54 (33.8%)** z= 2.4	29 (18.1%)	40 (25%)	22 (13.8%)	7 (4.4%)** z= -2.2	46 (28.7%)	12 (7.5%)	18 (11.3%)** z= -1.9	0	11 (6.8%)
Others n= 148 (+) n= 138 (-)	41 (27.7%)	34 (24.6%)	36 (24.3%)	24 (17.4%)	39 (26.4%)	14 (10.1%)	15 (10.1%)	32 (23.2%)	17 (11.5%)	25 (18.2%)	0	9 (6.5%)

Note. *p ≤ .05; **p < .01; z = corrected established residual values

Table 6
Relationship between significant experiences and types of enrolment.

	Research community		Research process		Scientific communication		Resources affordances and limitations		Agency cognitive-affective regulation		Personal and extra-academic life	
	P	N	P	N	P	N	P	N	P	N	P	N
Enrolment n=1063 (+) n=981 (-)	n= 277	n= 198	n= 276	n= 187	n= 326	n= 113	n= 96	n= 249	n= 87	n= 159	n= 1	n= 75
Full-time n=467 (+) n= 424 (-)	118 (25.3%)	69 (16.3%)** z= -2.7	131 (28%)	82 (19.3%)	140 (30%)	38 (9%)** z= -2.2	28 (6%)** z= -3.1	116 (27.4%)	50 (10.7%)** z= 2.7	69 (16.3%)	0	50 (11.7%)** z= 4.3
Part-time n=596 (+) n= 557 (-)	159 (26.7%)	129 (23.2%)** z= 2.7	145 (24.3%)	105 (18.9%)	186 (31.2%)	75 (13.5%)** z= 2.2	68 (11.4%)** z= 3.1	133 (23.9%)	37 (6.2%)** z= -2.7	90 (16.2%)	1 (0.2%)	25 (4,3%)** z= -4.3

Note. *p ≤ .05; **p < .01; z = corrected established residual values

Table 7
Relationship between experiences and disciplines.

	Research community		Research process		Scientific communication		Resources affordances and limitations		Agency cognitive-affective regulation		Personal and extra-academic life	
	P	N	P	N	P	N	P	N	P	N	P	N
Discipline n=1146 (+) n=1056 (-)	n= 301	n= 213	n=295	n= 193	n= 353	n= 122	n= 103	n= 272	n= 93	n= 174	n= 1	n= 82
Psychology n= 150 (+) n=138 (-)	30 (20%)** z= -1.9	32 (23.2%)	44 (29.3%)	33 (23.9%)	46 (30.7%)	16 (11.6%)	18 (12%)	33 (23.9%)	12 (8%)	15 (10.9%)** z= -1.9	0 (0%)	9 (6.5%)

Education n= 280 (+) n=261 (-)	77 (27.5%)	45 (17.2%)	81 (28.9%)	56 (21.5%)	75 (26.8%)	32 (12.3%)	33 (11.8%)** z=1.9	59 (22.6%)	14 (5%)** z=-2.2	51 (19.5%)	0 (0%)	18 (6,9%)
Economy n= 153 (+) n= 137 (-)	38 (24.7%)	26 (19%)	24 (15.7%)** z=-3.1	27 (19.7%)	67 (43.8%)** z=3.7	23 (16.8%)** z=2.1	7 (4.6%)** z=-2.1	26 (19%)** z=-1.9	16 (10.5%)	31 (22.6%)** z=2.1	1 (0.7%)** z=2.5	4 (2.9%)** z=-2.3
Law n= 89 (+) n=74 (-)	30 (33.7%)	12 (16.1%)	16 (18%)	5 (6.8%)** z=-2.7	27 (30.3%)	7 (9.5%)	8 (9%)	27 (36.5%)** z=2.2	8 (9%)	16 (21.6%)	0 (0%)	7 (9.5%)
Humanities n= 169 (+) n=155 (-)	45 (26.6%)	32 (20.6%)	49 (29%)	23 (14.8%)	41 (24.3%)** z=-2.0	11 (7.1%)** z=-1.9	19 (11.2%)	51 (33%)** z=2.2	15 (8.9%)	21 (13.5%)	0 (0%)	17 (11%)
Architecture and Engineering n= 54 (+) n=55 (-)	14 (26%)	16 (29.1%)	12 (22.2%)	10 (18.2%)	20 (37%)	6 (10.9%)	4 (7.4%)	11 (20%)	4 (7.4%)	6 (10.9%)	0 (0%)	6 (10.9%)
Science n= 251 (+) n=236 (-)	67 (26.7%)	50 (21.2%)	69 (27.5%)	39 (16.5%)	77 (30.7%)	27 (11.4%)	14 (5.6%)** z=-2.1	65 (27.5%)	24 (9.5%)	34 (14.4%)	0 (0%)	21 (9%)

Note. *p ≤ .05; **p < .01; z = corrected established residual value

Discussion and conclusions

Our study contributes to identifying the experiences that influence the doctoral process, and our analyses relate these experiences to the doctoral study conditions in order to better understand differences in perceptions of the doctoral experience. Previous research has primarily focused on analysing the variables that negatively affect the doctoral process. However, research has rarely focused on the role of positive experiences. To our knowledge, this study is the first to collect qualitative data from a large sample of student perceptions to determine the quantitative relationships between these perceptions and variables that influence doctoral study.

Overall, the results show substantial agreement in terms of participants' perceptions of the main positive experiences throughout the different stages of the doctoral process, although the positive experiences mentioned are influenced by funding, enrolment and discipline conditions.

The variation in the responses as to perceived negative experiences reveals a diverse scenario that is influenced by all the doctoral study conditions analysed. These results reflect a complex picture that might have implications for developing doctoral education.

First, we found that experiences related to *scientific communication* were perceived as the most positive. Although previous research has repeatedly noted the difficulties PhD students face in scientific writing (Author., 2013; Cotterall, 2013), in our sample, a majority of students evaluated writing positively when it enabled them to communicate their scientific advances to the research community and receive feedback. However, these perceptions were influenced by discipline, which reinforces the diverse roles attributed to scientific communication in different disciplines, as previous research has noted (Hyland, 2004). These results point to the need for doctoral programmes to acknowledge the value of communicating research to other researchers in disciplinary contexts (particularly in the social sciences), as well as PhD students to receive appropriate feedback and an assessments of their scientific outcomes.

Second, the relevance of relationships within the *research community*, either as positive or negative experiences, as noted by the sampled PhD students, is worthy of attention. The literature has confirmed the role that supervisors and the research team can have in the socialization of PhD students (Gardner, 2010; Jairam & Kahl, 2012; McAlpine & McKinnon, 2013). However, our results point to interesting nuances that merit further research. On the one hand, it is interesting that the most common positive experiences in this category concerned the relationship with the extended community, which might reinforce the perceived benefits of research stays, as well as attendance at conferences or scientific events during doctoral process, all of which enable students to expand their networks (Sweitzer, 2009). However, within this category of experiences, only a small percentage of positive experiences were related to the research team, department, institution

or peers, although previous studies have emphasized the relevance of these aspects (Jairam & Kahl, 2012).

On the other hand, the most common negative experiences were related to the relationship with the supervisor and other researchers from local communities (i.e., departments or research teams), which confirms the concern for supervision as a problematic issue, and suggests the need for more departmental and institutional support during the doctoral process to promote structured and systematic support, as noted in previous research (McAlpine, 2013; McAlpine & McKinnon, 2013; Zhao et al. 2007). These negative experiences were more often mentioned by part-time students and by students with scholarships. By way of explanation for these apparently contradictory results, it might be the case that having a scholarship (thus, being a full-time PhD student) requires taking on more responsibilities, engaging in more interaction with the supervisor, and having more involvement in the research community, all which could entail greater difficulties in the socialization process. In contrast, part-time students might experience more difficulties in becoming involved in the research community or less satisfaction with the research community's support, as previous studies have highlighted (e.g., Castelló et al. 2017; Gardner & Gopaul, 2012; Neumann & Rodwell, 2009). Socialization in the research community is a challenge for PhD candidates (Gardner, 2010; Gardner & Gopaul, 2012). Previous research noted that simply being part of a research team is insufficient and that relationships and practices within these teams should be carefully analysed in order to come to a greater understanding of their role in the doctoral candidate's journey and the subsequent socialization in the research community (McAlpine & Amundsen, 2009). Our results confirm these assumptions and present a complex scenario that calls for more research in order to fully understand when, why and how relationships with other researchers contribute to the research engagement and identity development of PhD students.

Third, *resources and limitations,* mostly related to funding, were perceived as the most common negative experience, particularly by PhD students working outside the university and those in social science disciplines. This result might be explained by considering Spanish doctoral funding policies. Many PhD students in Spain work mostly outside the university, and the number of students in the social sciences with a doctoral scholarship is extremely low compared to that of students in other scientific disciplines (AQU, 2017).

Finally, the third most significant experiences, both positive and negative, were related to the management of the *research process*. Previous studies have noted that experiencing difficulties in addressing important aspects of the research process, such as design, data collection and analysis, has a negative impact on project completion, research engagement and student satisfaction (Pyhälto et al., 2012) but our results contribute to identify that these difficulties were more often mentioned by mid-level students (i.e., third- or fourth-year students), and that these aspects may also be reported as positive.

On the other hand, variation among disciplines seems to indicate that certain practices embedded in doctoral education are dependent on the discipline and that the existing research culture might influence these practices (Hyland, 2004). However, these assumptions remain relatively unexplored and thus deserve an analysis using specific comparative designs to understand the relationship between disciplines.

Despite these contributions, the study has limitations. First, the participants were asked to report only two main significant experiences instead of a list of positive and negative experiences encountered during the doctoral process. This approach provided knowledge regarding which experiences were perceived as the most significant during the doctoral process. However, while it did help us develop a more focused and powerful analysis, it might have caused us to overlook other, less significant experiences. Additionally, because of the cross-sectional survey format, we

could not follow up with the participants, and we were unable to further analyse how the significant experiences evolve and change over time. Skakni and McAlpine (2017) found that post-PhD researchers' positive feelings towards a significant experience persist over time, but that their negative feelings evolve through self-reflection We have already started to collect qualitative data to analyse these aspects in future research.

We hope that the results of this study contribute to the formulation of doctoral policies that consider when, how and why to provide specific support during the doctoral process to improve doctoral education and student experiences.

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