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Predictors of emotional engagement in doctoral education

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ABSTRACT

The study of learning/research engagement in doctoral education has aroused increasing interest among education researchers, given its influence on PhD candidates' experiences and outcomes. However, even if doctoral education has been recognised as emotionally intense, there is still a gap in the literature regarding the emotional dimension of engagement. This study aims to analyse the predictors of emotional engagement of PhD candidates enrolled in Portuguese higher education institutions. Data was collected through a survey and analysed using multiple linear regression and mediation analysis. Results showed that emotional engagement was fostered by autonomy-focused supervision, perceived relevance of the research project, personal development motivation, and inclusive academic context; and was hindered by professional motivation. Furthermore, our results showed that autonomy-focused supervision mediated the relationship between inclusive or competitive context and emotional engagement. This study reinforces that doctoral education has a strong emotional component and that promoting positive experiences should be an ethical imperative. As such, developing supervisors' competencies and practices that nurture the autonomy of PhD candidates requires inclusive research contexts and working conditions that allow supervisors to dedicate the necessary time and effort to support their supervisees. It also draws attention to the need to choose research topics perceived as relevant by PhD candidates and manage motivations and expectancies.

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Emotional engagement; doctoral education; supervision; integration in the academic context; motivation; affective education

Introduction

The study of learning/research engagement in doctoral education (DE) has been arousing increasing interest among researchers in the area of education (Kusurkar et al. 2021; Pyhältö et al. 2023; Rönkkönen et al. 2023; Tikkanen et al. 2021; Vekkaila, Pyhältö, and Lonka 2013b; Virtanen and Pyhalto 2012).

Learning engagement may positively impact higher education students' achievement and retention and enhance their satisfaction (Kahu 2013), well-being, transformative learning, self-efficacy and self-esteem (Bowden, Tickle, and Naumann 2021). Furthermore, increased academic engagement may distal impact students' citizenship, work success and lifelong learning (Kahu 2013). According to Martínez et al. (2019), higher education students' academic engagement (vigour, dedication

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and absorption) enhanced academic performance; however, this relationship was mediated by self-efficacy, hope, optimism and resilience. Other studies concluded that higher levels of engagement and lower levels of disengagement in DE were related to more timely completion and decreased dropout risk (Pyhältö et al. 2023; Vekkaila, Pyhältö, and Lonka 2013a; Virtanen, Taina, and Pyhältö 2017) and higher levels of satisfaction with the PhD (Pyhältö et al. 2023).

Despite the existence of different models, there has been some agreement on a conceptualisation of student engagement as a multidimensional meta-construct (Bowden, Tickle, and Naumann 2021; Fredricks, Blumenfeld, and Paris 2004; Kahu 2013; Pyhältö et al. 2023; Schaufeli et al. 2002), and most studies consider at least three dimensions: behavioural, cognitive and emotional engagement (Fredricks, Blumenfeld, and Paris 2004; Kahu 2013), which may be defined as student's activating (activity-facilitating) emotions with varying levels of positive valence towards learning/research activities (Wong and Liem 2022). Emotional engagement may be distinguished from emotional disengagement, defined as students' deactivating (activity-withdrawing) emotions towards learning/research activities, with varying levels of negative valence (Wong and Liem 2022). Although engagement and disengagement seem related and can coexist, they are distinct processes with different antecedents and outcomes (Pyhältö et al. 2023; Wong and Liem 2022).

The doctoral process has been described as an intense 'emotional rollercoaster' (Morrison-Saunders et al. 2010). PhD candidates may experience positive emotions, such as pleasure (Vekkaila, Pyhältö, and Lonka 2013a) satisfaction, joy (Alves et al. 2023; Vekkaila, Pyhältö, and Lonka 2013a) elation, enthusiasm, excitement, satisfaction (Morrison-Saunders et al. 2010) or personal fulfilment (Alves et al. 2023), but also negative emotions such as loneliness, sadness, suffering, exhaustion, despair, discouragement, frustration, insecurity (Alves et al. 2023), distress or meaninglessness (Vekkaila, Pyhältö, and Lonka 2013a; Virtanen, Taina, and Pyhältö 2017).

Although unpleasant emotions such as frustration and anxiety may have a creative function, predisposing PhD candidates to review and readjust their PhD work, potentially improving the outcomes (Weise, Aguayo-González, and Castelló 2020), negative emotions such as fear, frustration and loneliness may hinder PhD candidates' motivations and performance (Morrison-Saunders et al. 2010), and emotional exhaustion and distress have been found to foster the intention to withdraw (Castelló et al. 2017; Devos et al. 2017). On the contrary, positive emotions such as hopefulness and enjoyment may contribute to PhD candidates' self-validation, self-reinforcement, and sense of security, increasing their motivation to persist (Weise, Aguayo-González, and Castelló 2020).

Despite the growing interest in these topics, engagement in DE and its antecedents and consequences remain under-theorised, and none of the previous studies specifically addressed the emotional dimension of engagement in DE.

This study aims to contribute to the knowledge about the emotional dimension of engagement by identifying predictors of emotional research/learning engagement in DE.

This valorisation of emotional engagement approaches DE as an emotional and embodied activity, standing as an alternative to a vision excessively focused on accountability that has been prevalent under neoliberal policies in higher education (Burford 2017; Selkrig, Manathunga, and Keamy 2021). The emphasis on emotions draws attention to the need to hold higher education institutions responsible for caring for the integrity (wholeness) of the academic community members (Best 2005). Furthermore, this study assumes that emotions can also be understood as a relevant outcome (Alves et al. 2023; Stevens-Long, Schapiro, and McClintock 2011) instead of only a process whose value depends on its impact on achieving other valued outcomes of DE.

Emotional engagement

Some of the studies regarding engagement in doctoral education (Pyhältö et al. 2023; Tikkanen et al. 2021; Vekkaila, Pyhältö, and Lonka 2013b) were based on the model of Schaufeli et al. (2002), which conceptualises academic engagement as a combination of vigour (effort, mental resiliency and persistence towards obstacles), dedication (pride, inspiration, passion and perceived meaningfulness)

and absorption (involvement in academic activities). Other authors distinguished between behavioural, cognitive and emotional engagement, which was defined as affective reactions towards learning activities, including interest, boredom, happiness, sadness, anxiety (Fredricks, Blumenfeld, and Paris 2004; Kahu 2013), the presence of task-facilitating emotions (e.g. interest, curiosity, and enthusiasm) and the absence of task-withdrawing emotions (e.g. distress, anger, frustration, anxiety, and fear) (Reeve 2012, 151), or experiencing activation emotions with varying levels of positive valence (Wong and Liem 2022). Although the authors have used different designations, emotional engagement is similar to the dimension of dedication described by Schaufeli et al. (2002).

This study defines emotional engagement as activating (task-facilitating) positive emotional reactions to research/learning activities (Fredricks, Blumenfeld, and Paris 2004; Kahu 2013; Reeve 2012; Wong and Liem 2022). Emotions will be holistically approached as intraindividual reactions to relevant stimuli (Frijda 2008), comprising affective, cognitive, expressive, motivational, physiological (Hascher 2010; Pekrun and Linnenbrink-Garcia 2012), social and cultural components (Mesquita, Boiger, and Leersnyder 2016; Mesquita and Boiger 2014), resulting from 'a historical and social never-ending process where the construction and internal organisation of individuals as subjects of meanings, emotions, thoughts and actions take place' (Coimbra 2005, 4–5).

Emotions may have different valences (positive/negative) and arousal levels (deactivating/activating). Arousal and valence are orthogonal dimensions, making it possible to group emotions into four broad categories of emotions: activating positive (e.g. enjoyment); deactivating positive (e.g. relief); activating negative (e.g. frustration), and deactivating negative (e.g. hopelessness) (Pekrun and Linnenbrink-Garcia 2012).

Factors and processes related to engagement in higher and doctoral education

Previous research identified some factors and processes related to academic engagement in higher education, such as emotional intelligence and prior affective engagement at school (Maguire et al. 2017), or higher autonomy support (Okada 2023). Nevertheless, most studies did not specify the factors and processes related to the dimensions of academic engagement. According to Kahu (2013), academic engagement is influenced by psychosocial processes, such as the relationship with the academic community, by factors and processes related to the university (e.g. teaching practices), and factors related to the student (e.g. motivation, skills, identity, self-efficacy). However, both engagement and engagement antecedents may also be influenced by structural factors such as the political and social environment, academic culture, policies, or students' family background. Involvement (perceived relevance) and expectations also have an influence on higher education students' engagement (Bowden, Tickle, and Naumann 2021).

Only a few studies addressed the factors and processes related to engagement in doctoral education. Vekkaila, Pyhältö, and Lonka (2013b) identified three qualitatively different forms of engagement in DE: adaptive engagement (more common at the beginning of the PhD) relied on PhD candidates' adaptation and adjustment to the academic community; agentic engagement (more common at the midst or at the end of the PhD) relied on an active and reforming interplay with the academic community through which they were able to create knowledge; work-life inspired engagement relied on the interplay between the academic community, PhD candidates, and their professional contexts which allowed knowledge application. Based on the self-determination theory (Ryan and Deci 2000), Kusurkar et al. (2021) concluded that the satisfaction of the basic psychological needs of autonomy, competence and relatedness enhanced the autonomous motivation (driven by genuine interest and great valuing of learning) of PhD candidates in Medicine and both autonomous motivation and the satisfaction of basic psychological needs were related to engagement. Tikkanen et al. (2021) concluded that PhD candidates in Medicine who were integrated into research groups had higher odds of belonging to a profile characterised by higher engagement and lower burnout (exhaustion and cynicism) levels. According to Virtanen and Pyhalto (2012), PhD candidates' engagement was favoured by experiences, mainly in research activities, activities with the academic community, which promoted perceived competence, sense of

belonging and contribution, or autonomy. Other studies concluded that PhD candidates' engagement was related to higher levels of support from the supervisor and the research community (Rönkkönen et al. 2023), meaningful relationships and organisational support, or opportunities to develop and demonstrate skills (Crome et al. 2019).

The context of the study

Over the last decades, the Portuguese higher education system has experienced significant growth (Cerdeira, Gil Cabrito, and Mucharreira 2019) and internationalisation (DGEEC 2023a). These movements were fostered by the democratic revolution in 1974 and the adoption of the Bologna Declaration in 1999 (Cerdeira, Gil Cabrito, and Mucharreira 2019). The number of PhDs concluded in the country increased from 8.5 per 100 thousand inhabitants in 2004 to 20.1 in 2021 (FFMS 2023b), and the number of PhD candidates registered in Portuguese higher education institutions increased from 2605 in 1998 to 24616 in 2022 (FFMS 2023a). The number of PhD scholarships awarded by the Fundação para a Ciência e a Tecnologia (FCT) (the leading research funding agency in Portugal) increased from nearly 850 per year in the decade 1994–2003 to 2030 in 2007, decreasing to 685 in 2013 (which may be attributed to the economic crisis of 2008) and increasing to 1451 in 2022 (FCT n.d; OECD 2019).

Doctoral education in Portugal is aligned with the principles of the Bologna Process and is primarily formally structured in doctoral programmes, which must be accredited by the A3ES Quality Assurance Agency (OECD 2019), although some PhDs may not have a teaching component. There is no formal distinction between different models of doctoral degrees (which is why, in this study, doctoral degrees are designated as PhDs). However, university-industry networks have been encouraged through scholarships and PhD programme funding (Cardoso, Tavares, and Sin 2019). Many PhD candidates hold non-academic full-time employment while enrolled in a PhD, spending their funds to support PhD expenses (e.g. tuition fees) (Alves et al. 2021).

Despite the recognition of the relevance of doctoral education for the country's development (Santos, Horta, and Heitor 2016), doctoral education still faces some challenges, such as insufficient structuring (e.g. a defined cohort of PhD candidates; integration in doctoral schools) (OECD 2019), poor focus on the competencies most valued by employers beyond academia, lack of strategic prioritisation of the public investment in PhD training, and lack of attractive career opportunities for PhD holders (Carvalho, Diogo, and Vilhena 2022; OECD 2019).

Aim and research questions

According to the integrative model of nested contexts, doctoral processes occur within multiple nested and interacting contexts with more direct influences between close contexts than between contexts further apart: the context of the supervisee-supervisor relationship (influenced by the individual characteristics of the PhD candidate and the supervisor(s) and the dynamics of the relationship between them); the departmental-disciplinary context in which the acculturation experiences in communities of practice or academic tribes occur; the institutional context; and the societal/supra-societal contexts (McAlpine and Norton 2006).

Based on the model of nested contexts, previous research from the authors and the literature, this study aimed to identify predictors of emotional research/learning engagement in doctoral education, which were situated in the supervisee-supervisor relationship and the departmental-disciplinary contexts.

The following research question was addressed: What are the most relevant predictors of emotional engagement in doctoral education?

Based on the results of multiple linear regression and results from previous research and literature review, two further questions were addressed: What is the mediating effect of autonomy-focused supervision on the relationship between inclusive context and emotional engagement? What is the mediating effect of autonomy-focused supervision on the relationship between competitive context and emotional engagement?

Methods

Data collection

Data were collected through an online survey between November 2022 and March 2023 using the Lime Survey application. The questionnaire was sent to the services post-graduation, communication services, deanery and doctoral schools of 15 Portuguese universities and 5 responded, informing that they were going to disseminate the survey through their mailing lists or webpages. Furthermore, the survey was released through posts and messages on social media (Facebook, Twitter, LinkedIn).

Participants

Altogether, 291 participants (69% women and 31% men) completed the questionnaire (Table 1). The participants were PhD candidates enrolled in 15 Portuguese universities (five private and 10 public); however, nearly half (n = 147, 51%) were enrolled in one university in the country's Northern Region.

Table 1. Background variables.

	N	%
Gender		
Women	202	69
Men	89	31
Age (years)		
29 or less	127	44
30 - 39	94	32
40 - 49	46	16
50 - 59	17	6
60 or more	7	2
Country of birth		
Portugal	234	80
Others	57	20
Dependent children		
No	227	78
Yes	64	22
Under 18 years old	49	17
With 18 years old or older	17	6
Financial problems		
Never	101	35
Rarely	67	23
Sometimes	103	35
Always	20	7
Professional profile[ab]		
Scholarship holder	190	65
Professional (beyond academia)	72	25
Professional (in academia)	30	10
Others[c]	13	5
Scientific area of the PhD		
STEM[d]	160	55
HASS[e]	130	45
Year in which s/he enrolled for the first time		
2010-2013	5	2
2014-2016	16	6
2017-2019	101	35
2020-2022	169	58
Enrolment year		
1	54	19
2	63	22
3	96	33
4	78	27

Notes: a) 10 had hybrid careers (professionals in academia and beyond academia), and 5 accumulated a professional activity with the scholarship; b) n = 290; c) retired, unemployed or student only (without a scholarship or paid employment); d) Science, Technology Engineering and Mathematics; e) Humanities, Arts and Social Sciences

Most participants (76%) were less than 40 and were born in Portugal (80%). Less than a quarter (22%) had dependent children, most of them (17%) under the age of 18. Most participants (58%) never or rarely felt difficulties paying their bills. Most participants received a PhD or other research scholarship (65%). Regarding the scientific area of the PhD, 55% were enrolled in PhD programmes in Science, Technology, Engineering and Mathematics (STEM) and 45% in the areas of Humanities Arts and Social Sciences (HASS). The study included participants who enrolled in doctoral education for the first time since 2010, but most participants (93%) enrolled for the first time in the last six years (from 2017 onwards). Most participants (60%) were enrolled in the third or fourth years of the PhD.

Measures

The survey included 46 questions and was available in Portuguese. The questions regarded the following dimensions: sociodemographic information (e.g. gender, age, number and age of the dependent children); professional path (e.g. professional status before and during the PhD); academic path (e.g. year in which s/he enrolled for the first time; interruptions of the PhD; scientific area of the PhD); motivations to attend the PhD; doctoral education processes (e.g. perceptions about the academic context; supervision; withdrawal intention; scientific products); comments/suggestions; availability to participate in a follow-up. In order not to compromise anonymity, participants who volunteered to participate in the follow-up could click on a link to another questionnaire in which they were asked to provide their e-mail addresses.

In this study, we used data from the following scales using a 7-point Likert scale from '1' corresponding to 'completely disagree' to '7' corresponding to 'completely agree': emotional engagement, perceptions about the academic context, supervision, motivation for doctoral education, and perceived relevance (see Appendix 1). Other variables include gender (open-ended question), professional path (scholarship holder yes/no), and year in which s/he enrolled for the first time.

Emotional engagement was assessed through a four-item scale including items adapted from the subscale 'engagement' (Pyhältö et al. 2023) and developed by the researchers based on previous research and literature analysis. Emotional engagement was defined as enthusiasm, fulfilment, happiness and a sense of ownership towards the PhD research work.

Perceptions about the academic context were measured through an eight-item scale adapted from the subscales 'collegial research environment' and 'harsh tone' (Herrmann and Wichmann-Hansen 2017) or developed by the researchers. The scale included three subscales: 'inclusive context' (e.g. 'I feel like I am part of a research community'); 'learning context' (e.g. 'I developed relevant knowledge and competencies in interaction with my PhD colleagues'); 'competitive context' (e.g. 'I feel that the researchers are harsh and negative rather than constructive when giving feedback on each other's work').

Supervision was assessed through a 23-item scale adapted from the subscales 'academic support', 'personal support', 'autonomy support', 'supervisor availability' (Overall, Deane, and Peterson 2011), 'interpersonal relation with the supervisor', 'non-directive supervision' (Herrmann and Wichmann-Hansen 2017), 'reflexive education' and 'secure base' (Nogueira, Silva, and Conceição 2019), or developed by the researchers. The scale included two subscales: autonomy-focused supervision (e.g. (my supervisor/s) 'let me take control of my project'; 'is/are friendly, supports and reassure/s me when I am feeling down'); and task-focused supervision (e.g. 'help/s me to plan and manage the different research tasks').

Motivation was measured through a 16-item scale adapted from the subscales 'interest in doctoral studies' (Cornér et al. 2021) and 'motivations to undertake doctoral studies' (Guerin, Jayatilaka, and Ranasinghe 2015), or developed by the researchers, based on previous research and literature analysis. The scale included four subscales: 'personal development motivation' (e.g. to 'deepen my personal development'; 'intellectual challenge'); research motivation (e.g. 'to contribute to the research field'); 'professional motivation' (e.g. 'demands of my profession'); and 'prestige motivation' (e.g. 'prestige of the doctoral degree').

Perceived relevance was measured through two items developed by the researchers regarding perceptions about the relevance of the contribution to the disciplinary/scientific area and the betterment of society.

Data analysis

The internal structure of the scales was analysed through exploratory factorial analysis. The reliability of each subscale was analysed through the Chronbach alpha. Data was analysed through multiple linear regression analysis to explore the relationship between emotional engagement and predictor variables. To examine the mediating effect of supervision on academic context and emotional engagement mediation analysis was also conducted using Hayes' Process 4.3 macro. The confidence intervals were computed using bootstrapping. The analysis used the Statistical Package for the Social Sciences (IBM, SPSS), versions 29 and Jamovi version 2.4.11.

Research ethics

The study followed the ethical guidelines of the Portuguese Society of Educational Sciences (SPCE 2014) and was approved by the Ethics Committee of [name of the faculty] and the Data Protection Commission of the [name of the university]. Participation in the study was voluntary and based on informed consent. The data collected was anonymous to protect the identity of the participants. Data security was managed and controlled.

Results

Results from our study reveal a high level of emotional engagement (M = 5.18). The academic context was more highly perceived as a learning context (M = 5.04) than as an inclusive (M = 4.05) or competitive context (M = 3.84). Regarding supervision, the results revealed both high levels of autonomy-focused supervision (M = 5.58) and task-focused supervision focused (M = 5.09). The study showed very high levels of personal development (M = 6.03), research (M = 5.98) motivation, medium levels of prestige (M = 4.22), and professional (M = 4.18) motivation (Table 2). The average level of perceived relevance was high (M = 5.52).

Multiple linear regression analysis was conducted to identify predictors of emotional engagement (Table 3).

The subscales of academic context were entered at step 1, explaining 17% of the variance of emotional engagement explained by the model [$F(3,260) = 18.23$, $p < .001$]. This model had two significant predictors: inclusive context [$t(263) = 5.01$, $p < .001$, $B = 0.30$, $\beta = 0.34$, $SE = 0.06$]; competitive context [$t(263) = -2.365$, $p < .05$, $B = -0.13$, $\beta = -0.14$, $SE = 0.06$].

Table 2. Descriptive statistics (mean and standard deviation, minimum and maximum).

	Mean	SD	Mín	Max
Emotional engagement	5.18	1.43	1	7
Academic context				
Learning context	5.04	1.48	1	7
Inclusive context	4.05	1.58	1	7
Competitive context	3.84	1.55	1	7
Supervision				
Autonomy-focused supervision[a]	5.58	1.45	1	7
Task-focused supervision[a]	5.09	1.51	1	7
Motivation				
Personal development motivation	6.03	0.95	1	7
Research motivation	5.98	1.02	1	7
Prestige motivation	4.22	1.71	1	7
Professional motivation	4.18	1.30	1	7
Perceived relevance	5.52	1.35	1	7

Notes: n = 291; a) n = 264

Table 3. Multiple linear regression analysis. Independent variable: emotional engagement.

	1	2	3	4
Academic context				
Inclusive context	.34**	.16*	.18**	.22**
Learning context	.05	.03	-.04	-.06
Competitive context	-.14*	-.04	-.05	-.05
Supervision				
Autonomy-focused supervision		.33**	.34**	.33**
Task-focused supervision		.19*	.04	.04
Motivation				
Personal development motivation			.22**	.21**
Research motivation			.04	.06
Professional motivation			-.09*	-.09*
Prestige motivation			-.04	-.05
Perceived relevance			.33**	.33**
Gender (feminine)				-.03
Scholarship holder				-.06
Year of enrolment				-.08
R^2	.17	.37	.56	.57
Adjusted R^2	.16	.35	.54	.55
Δ R^2	.17**	.19**	.20**	.01

* $p < .05$; ** $p < .001$

The subscales of supervision were entered at step 2, increasing the percentage of the variance of emotional engagement explained by the model to 37% [$F(2,258) = 29.72$, $p < .001$]. In this model, autonomy-focused supervision was the strongest predictor of emotional engagement [$t(263) = 3.86$, $p < .001$, $B = 0.33$, $\beta = 0.33$, $SE = 0.09$], however, task-focused supervision [$t(263) = 2.24$, $p < .05$, $B = 0.18$, $\beta = 0.19$, $SE = 0.08$], and inclusive environment [$t(263) = 2.57$, $p < .05$, $B = 0.15$, $\beta = 0.16$, $SE = 0.06$] were also significant predictors.

Perceived relevance and the subscales of motivation for doctoral education were entered at step 3, increasing the percentage of the variance of emotional engagement explained by the model to 56%. There were five significant predictors: autonomy-focused supervision [$t(263) = 4.64$, $p < .001$, $B = 0.33$, $\beta = 0.34$, $SE = 0.07$]; perceived relevance [$t(263) = 6.70$, $p < .001$, $B = 0.36$, $\beta = 0.33$, $SE = 0.05$]; personal development motivation [$t(263) = 4.03$, $p < .001$, $B = 0.35$, $\beta = 0.22$, $SE = 0.09$]; inclusive context [$t(263) = 3.39$, $p < .001$, $B = 0.16$, $\beta = 0.18$, $SE = 0.05$]; professional motivation [$t(263) = -2.01$, $p < .05$, $B = -0.10$, $\beta = -.09$, $SE = 0.05$].

Gender, scholarship holder and year of enrolment were entered at step 4, however, the R2 change was not significant, so model 3 was the best fit.

Results from regression analysis suggested that when supervision is controlled, the effect of inclusive context in emotional engagement decreases, and the effect of competitive context loses significance; however, when other individual variables were included in the model, the effect of task-focused supervision also became not statistically significant. Thus, to examine the mediating effect of autonomy-focused supervision on the relationship between inclusive context and emotional engagement, a mediation analysis was conducted (Figure 1). The results showed that the effect of inclusive context on autonomy-focused supervision was significant ($\beta = .41$, $z = 7.28$, 95%CI [.26, .49], $p < .001$), and the effect of autonomy-focused supervision on emotional engagement was also significant ($\beta = .49$, $z = 8.95$, 95%CI [.34, .61], $p < .001$). The total effect of the model was found to be significant ($\beta = .38$, $z = 7.03$, 95%CI [.24, .45], $p < .001$), and there was also a statistically significant direct effect of inclusive context on emotional engagement ($\beta = .20$, $z = 3.59$, 95%CI [.08, .28], $p < .001$). A statistically significant indirect effect was also found ($\beta = .20$, $z = 5.65$, 95%CI [.11, 0.26], $p < .001$). These results suggest that autonomy-focused supervision mediates the relationship between inclusive context and emotional engagement.

A mediation analysis was also conducted to examine the mediating effect of autonomy-focused supervision on the relationship between competitive context and emotional engagement (Figure 2). The results showed a statistically significant negative effect of competitive context on autonomy-

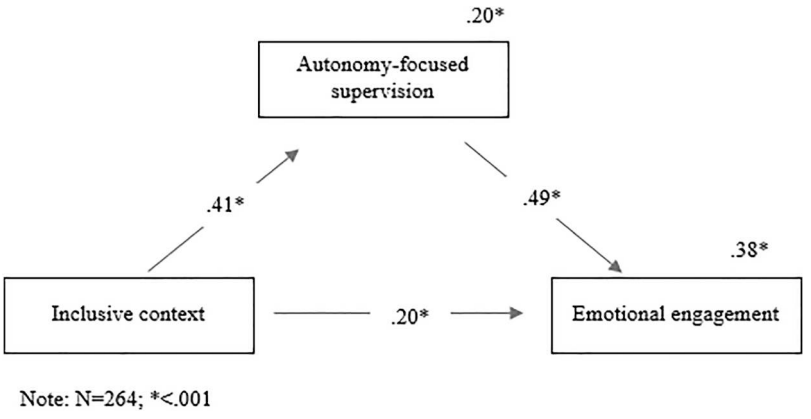

Figure 1. Mediating effect of autonomy-focused supervision on inclusive context and emotional engagement.
Note: $N = 264$; $^*p < .001$

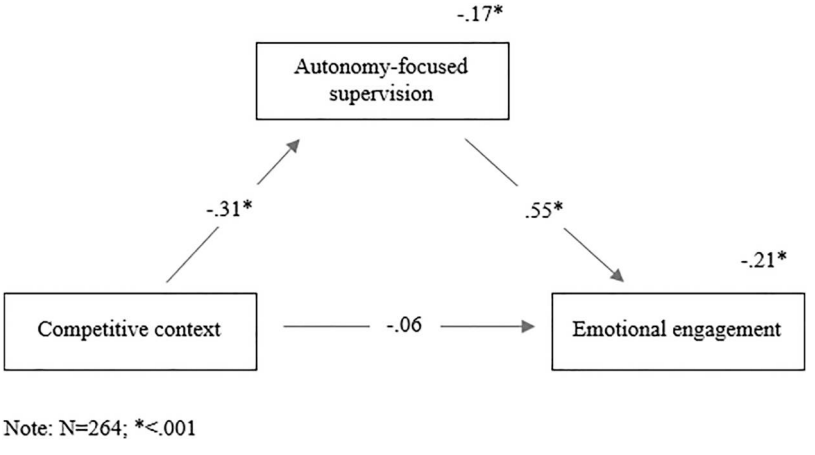

Figure 2. Mediating effect of autonomy-focused supervision on competitive context and emotional engagement.
Note: $N = 264$; $^*p < .001$

focused supervision (β = -.31, z = −5.29, 95%CI [-.41, -.16], $p < .001$), and the effect of autonomy-focused supervision on emotional engagement was also significant (β = .55, z = 10.28, 95%CI [.41, .68], $p < .001$). The total effect of the model was found to be negative and significant (β = -.21, z = −3.57, 95%CI [-.32, – .08], $p < .001$), and there was a statistically significant indirect effect (β = -.17, z = −4.70, 95%CI [-.25, – .08], $p < .001$), however, the direct effect of competitive context on emotional engagement was not significant (β = -.06, z = −1.12, 95%CI [-.18, .06], $p = .27$). These results suggest that when autonomy-focused supervision is included in the model, the direct effect of competitive context on emotional engagement is no longer significant, however, competitive context still has an indirect negative effect on emotional engagement through its negative effect on autonomy-focused supervision.

Discussion

To identify predictors of PhD candidates' emotional engagement, this study explored the effects of the academic context, supervision, motivation, perceived relevance, gender; professional status

(scholarship holder) and year of enrolment – thus considering the combined influence of contextual, interpersonal and individual variables as suggested by the integrative model of nested contexts (McAlpine and Norton 2006). Results from multiple linear regression showed that emotional engagement was predicted by an inclusive context, autonomy-focused supervision, perceived relevance, and personal development motivation and hindered by professional motivation. In accordance with the model of nested contexts, these predictors are situated in different nested contexts. However, results from regression analysis also suggested that when supervision is controlled, the effect of inclusive context in emotional engagement decreases, and the effect of competitive context loses significance. Considering this, two mediation analyses were conducted to explore the mediation effect of autonomy-focused supervision on the relationship between inclusive/competitive context and emotional engagement. Results from mediation analysis showed that inclusive context had a direct effect on emotional engagement but also an indirect effect, considering that it promotes autonomy-focused supervision, which also promotes emotional engagement. Furthermore, results showed that once supervision focused on autonomy is controlled, the direct effect of competitive context is no longer significant, however, is still had an indirect and negative effect on emotional engagement through the hindering of autonomy-focused supervision. These findings show that autonomy-focused supervision mediates the relationship between academic context and PhD candidates' emotional engagement, reaffirming the positive effects of an inclusive context, but although it can mitigate the negative effects of a competitive context on emotional commitment, it carries over some of these effects.

Results about the effect of the academic context align with previous research, which concluded that learning engagement in doctoral education was related to the integration in the research context (Tikkanen et al. 2021; Vekkaila, Pyhältö, and Lonka 2013b), and the fulfilment of the psychological need of relatedness (Kusurkar et al. 2021).

The effect of autonomy-focused supervision follows previous research which concluded that PhD candidates' positive emotions were related to supervisors' support, feedback, and friendly manners (Cotterall 2013). Furthermore, other authors also considered that PhD candidates' engagement was related to activities that promoted their sense of autonomy (Virtanen and Pyhalto 2012) and teaching practices that enhance their autonomy and perceived efficacy, which contribute to the satisfaction of the basic needs for autonomy and competence and reinforce autonomous motivation (Kusurkar et al. 2021). However, considering the study from Vekkaila, Pyhältö, and Lonka (2013b), which indicated that different categories of engagement might be related to different levels of autonomy, it could be interesting to expand the concept of emotional engagement and explore if different levels of autonomy could be related to different categories of emotional engagement. Interestingly, when the academic context, motivation and perceived relevance were controlled, the effect of task-focused supervision on emotional engagement was minimal and not significant revealing that although direct help to complete academic activities may be related to other processes and outcomes, such as research self-efficacy (Overall, Deane, and Peterson 2011), thesis writing, or completion (Lindsay 2015) it may not be a relevant predictor of emotional engagement. Further research is needed to explore this supervision style and its interactions with other relevant processes and outcomes.

Furthermore, results from this study also align with results from previous research which concluded that research engagement was influenced by academic context and supervision and identified a relationship between the level of support from supervisors and from the research community (Rönkkönen et al. 2023); however this study goes further focusing specifically on emotional engagement and exploring how the supervision style based on autonomy support may be enhanced by an inclusive context and hindered by a competitive context, but also how this supervision style may strengthen the positive effects of inclusive contexts but also mitigate the adverse effects of a competitive context on emotional engagement.

Regarding motivation for doctoral education, our results corroborate the model from Kahu (2013), which identifies motivation as a proximal psychological antecedent of academic engagement. These results may also be explained by self-determination theory (Reeve 2012; Ryan and Deci 2000),

considering that emotional engagement was predicted by higher personal development motivation (which may be considered an autonomous motivation) and lower professional motivation (which may be considered a controlled motivation). Interestingly, although doctoral education focuses on research practice and training, research motivation was not a significant predictor of emotional engagement.

Results regarding the influence of perceived relevance on emotional engagement are explained by Bowden, Tickle, and Naumann (2021), who considered that engagement was influenced by students' involvement, defined as perceived relevance. Furthermore, this result is supported by theories about emotions, which emphasise that emotional stimuli must be appraised as relevant or valuable to generate emotional responses (Frijda 2008; Pekrun and Linnenbrink-Garcia 2012).

Although, according to other authors, emotions may vary throughout the PhD journey (Morrison-Saunders et al. 2010), this study did not find a significant effect of the year of enrolment on emotional engagement. Receiving a scholarship or gender was also not a significant predictor of emotional engagement.

Overall, the results from this study follow the integrative model of nested contexts (McAlpine and Norton 2006), confirming that emotional engagement was predicted by factors and processes situated in the departmental/disciplinary context (academic context) and in the supervisor-supervisee context (supervision, motivation and perceived relevance attributed to the research project), and concluding that the supervisor-supervisee relationship mediated the relationship between academic context and emotional engagement. However, each of the predictors considered in the model may be influenced by other variables within those above and the institutional, societal and supra-societal contexts.

Some limitations of this study can be pointed out. Although the survey was sent to many universities and released using social media, the number of participants corresponded to 1% of the total number of PhD candidates registered in Portuguese universities in 2022 (FFMS 2023a), and nearly half were registered in one university. Furthermore, the survey was available in Portuguese only, which may have limited the participation of international students who do not speak Portuguese. There is still scarce national-level sociodemographic data about PhD candidates; however, there are some discrepancies between the characteristics of the participants and the general characteristics of the population of PhD candidates, namely regarding gender (69% of women in the sample and 53% in the population), the distribution between STEM and HASS areas (respectively 55% and 45% in the sample vs. 50% and 50% in the population) (DGEEC 2023b) or the percentage of international PhD candidates (20% in the sample and 36% in the general population of PhD candidates registered for the first time) (OCDE 2023). These limitations may have reduced the representativeness of the sample. Exploring more agile ways of collecting data for doctoral education research could be important without compromising ethical principles and data protection requirements.

Although this study explores the effects of the predictor variables on the independent variable, the interpretation of the data obtained should take into account that this effect reflects a relationship between the variables, which is not a linear cause-and-effect relationship (Abbad and Torres 2002), but may instead be a relation characterised by resource gain spirals in which there are positive reciprocal relationships between positively-oriented individual states (Hobfoll et al. 2018; Martínez et al. 2019). Further research could be conducted to explore other mediation and moderation effects, namely including perceived relevance and motivation variables (Igartua and Hayes 2021).

Emotional engagement could also be more deeply explored and potentially expanded, including other positive activating emotions. Furthermore, the inclusion of negative valence emotions could be considered given that negative emotions may also be activating (Pekrun and Linnenbrink-Garcia 2012), and current conceptualisations of engagement and disengagement do not explain the role of deactivating positive emotions and activating negative emotions.

Nevertheless, this study may have practical implications in the field of doctoral education. It draws attention to the need to choose research topics perceived as relevant by PhD candidates. It also

highlights the importance of developing supervisors' competencies and practices that nurture PhD candidates' autonomy and trust. This may require an investment in supervisors' training and the promotion of supervisors' working conditions that allow them to dedicate the necessary time and effort to the support of their supervisees. Furthermore, this study emphasises the relevance of promoting the integration of PhD candidates in a respectful, dynamic and supportive academic context. This study also draws attention to the importance of personal development which may be neglected by more performative approaches to the value of doctoral education. This may also have implications for doctoral students' motivations and expectations management. Moreover, the study adds to the knowledge about emotional engagement in doctoral education, which is still not sufficiently theorised, asserting doctoral education as a space of affective education (Burford 2017) which cares for the integrity of the PhD candidates (Best 2005) and assumes the promotion of positive experiences as an ethical imperative of the role of higher education institutions as employer organisations (Woods 2010).

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References

Abbad, Gardênia, and Cláudio Vaz Torres. 2002. "Stepwise and Hierarchical Multiple Regression in Organizational Psychology: Applications, Problems and Solutions." *Estudos de Psicologia* 7: 19–29. https://doi.org/10.1590/S1413-294X2002000300004.

Alves, Patrícia, Amélia Lopes, Ricardo Cruz-Correia, and Isabel Menezes. 2023. "The Value of Doctoral Education in the Intersection of the Multiple Purposes of Higher Education." *European Educational Research Journal. Advance Online Publication*, https://doi.org/10.1177/14749041231206197.

Alves, Patrícia, Amélia Lopes, Isabel Menezes, and Marta Kowalczuk-Walędziak. 2021. "The Research-Practice Nexus in Doctoral Education: The Voices of Social and Health Sciences PhD Candidates and Graduates." *Research in Post-Compulsory Education* 26 (3): 290–311. https://doi.org/10.1080/13596748.2021.1920260.

Best, Ron. 2005. "Education and Integrity: The Role of Affective Education." In *The Affective Dimension of Education: European Perspectives*, edited by I. Menezes, J. L. Coimbra, and B. P. Campos, 13–23. Porto: Fundação para a Ciência e a Tecnologia; Centro de Psicologia da Universidade do Porto.

Bowden, Jana Lay-Hwa, Leonie Tickle, and Kay Naumann. 2021. "The Four Pillars of Tertiary Student Engagement and Success: A Holistic Measurement Approach." *Studies in Higher Education* 46 (6): 1207–1224. https://doi.org/10.1080/03075079.2019.1672647.

Burford, James. 2017. "Conceptualising Doctoral Writing as an Affective-Political Practice." *International Journal of Doctoral Studies* 12: 17–32.

Cardoso, Sónia, Orlanda Tavares, and Cristina Sin. 2019. "Can you Judge a Book by its Cover? Industrial Doctorates in Portugal." *Higher Education, Skills and Work-Based Learning* 9 (3): 279–89. https://doi.org/10.1108/HESWBL-05-2018-0056.

Carvalho, Teresa, Sara Diogo, and Bruno Vilhena. 2022. "Invisible Researchers in the Knowledge Society: The Uberisation of Scientific Work in Portugal." *European Journal of Higher Education* 12 (4): 393–414. https://doi.org/10.1080/21568235.2022.2105371.

Castelló, Montserrat, Marta Pardo, Anna Sala-Bubaré, and Núria Suñe-Soler. 2017. "Why do Students Consider Dropping out of Doctoral Degrees? Institutional and Personal Factors." *Higher Education* 74 (6): 1053–1068. https://doi.org/10.1007/s10734-016-0106-9.

Cerdeira, Luísa, Belmiro Gil Cabrito, and Pedro Ribeiro Mucharreira. 2019. "Portuguese Higher Education Growth: Evolution of Postgraduation and Scientific Production." *EccoS - Revista Científica* 51: (e14974, out./dez.). https://doi.org/10.5585/eccos.n51.14974.

Coimbra, Joaquim Luis. 2005. "Subjective Perceptions of Uncertainty and Risk in Contemporary Societies: Affective-Educational Implications." In *The Affective Dimension of Education: European Perspectives*, edited by I. Menezes, J. L. Coimbra, and B. P. Campos, 3–12. Porto: Fundação para a Ciência e a Tecnologia; Centro de Psicologia da Universidade do Porto.

Cornér, Solveig, Kirsi Pyhältö, Jouni Peltonen, and Erika Löfström. 2021. "Interest, Burnout, and Drop-Out Intentions Among Finnish and Danish Humanities and Social Sciences PhD. Students." *International Journal of Doctoral Studies* 16: 593–609. https://doi.org/10.28945/4867.

Cotterall, Sara. 2013. "More Than Just a Brain: Emotions and the Doctoral Experience." *Higher Education Research & Development* 32 (2): 174–87. https://doi.org/10.1080/07294360.2012.680017.

Crome, E., L. Meyer, A. Bosanquet, and L. Hughes. 2019. "Improving Engagement in an Early Career Academic Setting: Can Existing Models Guide Early Career Academic Support Strategies?" *Higher Education Research and Development* 38 (4): 717–32. https://doi.org/10.1080/07294360.2019.1576597.

Devos, Christelle, Gentiane Boudrenghien, Nicolas Van der Linden, Assaad Azzi, Mariane Frenay, Benoit Galand, and Olivier Klein. 2017. "Doctoral Students' Experiences Leading to Completion or Attrition: A Matter of Sense, Progress and Distress." *European Journal of Psychology of Education* 32 (1): 61–77. https://doi.org/10.1007/s10212-016-0290-0.

DGEEC (Direção-Geral de Estatísticas da Educação e Ciência). 2023a. "Inscritos em mobilidade internacional de crédito: Incoming" (Dataset). Vagas e inscritos. Accessed 15 January 2023. https://www.dgeec.medu.pt/art/64ad21cb8e5ca5b1c8676270/64ad2dfe8e5ca5b1c867627e/652fb76fbd5c2b00958292b7/652fbaf4bd5c2b00958292c7.

DGEEC (Direção-Geral de Estatísticas da Educação e Ciência). 2023b. "Inscritos no ano letivo 2022/2023" (Dataset). Accessed 20 April 2024. https://www.dgeec.medu.pt/art/ensino-superior/estatisticas/vagas-e-inscritos/652fba6bbd5c2b00958292c4/lartigo-6576f80c5f39ee77721e9e66.

FCT (Fundação para a Ciência e a Tecnologia). n.d. *"Calls: Closed". Fundação para a Ciência e a Tecnologia*. Accessed January 20, 2024. https://www.fct.pt/en/concursos/?paged=1&tab=closed.

FFMS (Fundação Francisco Manuel dos Santos). 2023a. "Alunos matriculados no ensino superior: total e por nível de formação" (Dataset). PORDATA, estatísticas sobre Portugal e a Europa. Accessed 15 January 2023. https://www.pordata.pt/portugal/alunos+matriculados+no+ensino+superior+total+e+por+nivel+de+formacao-1023.

FFMS (Fundação Francisco Manuel dos Santos). 2023b. "Doutoramentos (ISCED 8) por 100 mil habitantes" (Dataset). PORDATA, estatísticas sobre Portugal e a Europa. Accessed 15 January 2023. https://www.pordata.pt/europa/doutoramentos+(isced+8)+por+100+mil+habitantes-2409.

Fredricks, Jennifer A., Phyllis C. Blumenfeld, and Alison H. Paris. 2004. "School Engagement: Potential of the Concept, State of the Evidence." *Review of Educational Research* 74 (1): 59–109. https://doi.org/10.3102/00346543074001059.

Frijda, Nico H. 2008. "The Psychologists' Point of View." In *Handbook of Emotions*, edited by Michael Lewis, Jeannette M. Haviland-Jones and Lisa Feldman Barrett, 68–87. New York, NY, US: The Guilford Press.

Guerin, Cally, Asangi Jayatilaka, and Damith Ranasinghe. 2015. "Why Start a Higher Degree by Research? An Exploratory Factor Analysis of Motivations to Undertake Doctoral Studies." *Higher Education Research & Development* 34 (1): 89–104. https://doi.org/10.1080/07294360.2014.934663.

Hascher, Tina. 2010. "Learning and Emotion: Perspectives for Theory and Research." *European Educational Research Journal* 9 (1): 13–28. https://doi.org/10.2304/eerj.2010.9.1.13.

Herrmann, Kim Jesper, and Gitte Wichmann-Hansen. 2017. "Validation of the Quality in PhD Processes Questionnaire." *Studies in Graduate and Postdoctoral Education* 8 (2): 189–204. https://doi.org/10.1108/SGPE-D-17-00017.

Hobfoll, Stevan E., Jonathon Halbesleben, Jean-Pierre Neveu, and Mina Westman. 2018. "Conservation of Resources in the Organizational Context: The Reality of Resources and Their Consequences." *Annual Review of Organizational Psychology and Organizational Behavior* 5 (1): 103–28. https://doi.org/10.1146/annurev-orgpsych-032117-104640.

Igartua, Juan-José, and Andrew F. Hayes. 2021. "Mediation, Moderation, and Conditional Process Analysis: Concepts, Computations, and Some Common Confusions." *The Spanish Journal of Psychology* e49), https://doi.org/10.1017/SJP.2021.46.

Kahu, Ella R. 2013. "Framing Student Engagement in Higher Education." *Studies in Higher Education* 38 (5): 758–73. https://doi.org/10.1080/03075079.2011.598505.

Kusurkar, Rashmi A., Stéphanie M. E. van der Burgt, Ulviye Isik, Marianne Mak-van der Vossen, Janneke Wilschut, Anouk Wouters, and Andries S. Koster. 2021. "Burnout and Engagement among PhD Students in Medicine: The BEeP Study." *Perspectives. on Medical Education* 10 (2): 110–7. https://doi.org/10.1007/s40037-020-00637-6.

Lindsay, S. 2015. "What Works for Doctoral Students in Completing Their Thesis?" *Teaching in Higher Education* 20 (2): 183–96. https://doi.org/10.1080/13562517.2014.974025.

Maguire, Rebecca, Arlene Egan, Philip Hyland, and Phil Maguire. 2017. "Engaging Students Emotionally: The Role of Emotional Intelligence in Predicting Cognitive and Affective Engagement in Higher Education." *Higher Education Research & Development* 36 (2): 343–57. https://doi.org/10.1080/07294360.2016.1185396.

Martínez, Isabel M., Carolyn M. Youssef-Morgan, Maria J. Chambel, and Alexandra Marques-Pinto. 2019. "Antecedents of Academic Performance of University Students: Academic Engagement and Psychological Capital Resources." *Educational Psychology* 39 (8): 1047–67. https://doi.org/10.1080/01443410.2019.1623382.

McAlpine, Lynn, and Judith Norton. 2006. "Reframing our Approach to Doctoral Programs: An Integrative Framework for Action and Research." *Higher Education Research & Development* 25 (1): 3–17. https://doi.org/10.1080/07294360500453012.

Mesquita, Batja, and Michael Boiger. 2014. "Emotions in Context: A Sociodynamic Model of Emotions." *Emotion Review* 6 (4): 298–302. https://doi.org/10.1177/1754073914534480.

Mesquita, Batja, Michael Boiger, and Jozefien De Leersnyder. 2016. "The Cultural Construction of Emotions." *Current Opinion in Psychology* 8: 31–36. https://doi.org/10.1016/j.copsyc.2015.09.015.

Morrison-Saunders, Angus, Susan A. Moore, Michael Hughes, and David. Newsome. 2010. "Coming to Terms with Research Practice - Riding the Emotional Rollercoaster of Doctoral Research Studies." In *The Routledge Doctoral Student's Companion: Getting to Grips with Research in Education and the Social Sciences*, edited by P. Thomson, and M. Walker, 206–8. New York: Routledge.

Nogueira, Ana Rita Santos, Ana Catarina Nunes Silva, and Nuno Conceição. 2019. "Adaptation to Portuguese of the Short Version of the Supervisory Relationship Questionnaire." *Análise Psicológica* 37 (4): 521–33. https://doi.org/10.14417/ap.1581.

OECD (Organisation for Economic Co-operation and Development). 2019. *OECD Review of Higher Education, Research and Innovation: Portugal*. Portugal: OECD Publishing, Paris. https://doi.org/10.1787/9789264308138-en.

OECD (Organisation for Economic Co-operation and Development). 2023. "OECD.Stat: Education and Training" (Dataset). Accessed 20 January 2024. https://stats.oecd.org/?_ga = 2.39653280.2044788255.1695632716-1674530551.1690476831#.

Okada, Ryo. 2023. "Effects of Perceived Autonomy Support on Academic Achievement and Motivation Among Higher Education Students: A Meta-Analysis." *Japanese Psychological Research* 65 (3): 230–42. https://doi.org/10.1111/jpr.12380.

Overall, Nickola C., Kelsey L. Deane, and Elizabeth R. Peterson. 2011. "Promoting Doctoral Students' Research Self-Efficacy: Combining Academic Guidance with Autonomy Support." *Higher Education Research & Development* 30 (6): 791–805. https://doi.org/10.1080/07294360.2010.535508.

Pekrun, Reinhard, and Lisa Linnenbrink-Garcia. 2012. "Academic Emotions and Student Engagement." In *In Handbook of Research on Student Engagement*, edited by Sandra L. Christenson, Amy L. Reschly, and Cathy Wylie, 259–82. Boston, MA: Springer US.

Pyhältö, Kirsi, Jouni Peltonen, Henrika Anttila, Liezel Liezel Frick, and Phillip de Jager. 2023. "Engaged and/or Burnt out? Finnish and South African Doctoral Students' Experiences." *Studies in Graduate and Postdoctoral Education* 14 (1): 1–18. https://doi.org/10.1108/SGPE-02-2021-0013.

Reeve, Johnmarshall. 2012. "A Self-Determination Theory Perspective on Student Engagement." In *Handbook of Research on Student Engagement*, edited by Sandra L. Christenson, Amy L. Reschly, and Cathy Wylie, 149–72. New York: Springer.

Rönkkönen, Sara, Lotta Tikkanen, Viivi Virtanen, and Kirsi. Pyhältö. 2023. "The Impact of Supervisor and Research Community Support on PhD Candidates' Research Engagement." *European Journal of Higher Education*, https://doi.org/10.1080/21568235.2023.2229565.

Ryan, Richard M., and Edward L. Deci. 2000. "Self-determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being." *American Psychologist* 55: 68–78.

Santos, João Marques, Hugo Horta, and Manuel Heitor. 2016. "Too Many PhDs? An Invalid Argument for Countries Developing Their Scientific and Academic Systems: The Case of Portugal." *Technological Forecasting and Social Change* 113: 352–62. https://doi.org/10.1016/j.techfore.2015.12.013.

Schaufeli, Wilmar B., Isabel M. Martínez, Alexandra Marques Pinto, Marisa Salanova, and Arnold B. Bakker. 2002. "Burnout and Engagement in University Students: A Cross-National Study." *Journal of Cross-Cultural Psychology* 33 (5): 464–81. https://doi.org/10.1177/0022022102033005003.

Selkrig, Mark, Catherine Manathunga, and Ron Keamy. 2021. "Research is … Making the Emotional Dimensions of Academics' Research Visible." *Australian Educational Researcher* 48 (4): 721–37. https://doi.org/10.1007/s13384-020-00412-w.

SPCE (Sociedade Portuguesa de Ciências da Educação). 2014. *Instrumento de regulação ético-deontológica. Carta ética [Instrument of ethical-deontological regulation. Ethical charter]*. Porto: SPCE. http://www.spce.org.pt/regulacaoeticodeontologia.html.
Stevens-Long, Judith, Steven A. Schapiro, and Charles McClintock. 2011. "Passionate Scholars: Transformative Learning in Doctoral Education." *Adult Education Quarterly* 62 (2): 180–98. https://doi.org/10.1177/0741713611402046.
Tikkanen, Lotta, Kirsi Pyhältö, Aleksandra Bujacz, and Juha Nieminen. 2021. "Study Engagement and Burnout of the PhD Candidates in Medicine: A Person-Centered Approach." *Frontiers in Psychology* 12), https://doi.org/10.3389/fpsyg.2021.727746.
Vekkaila, Jenna, Kirsi Pyhältö, and Kirsti Lonka. 2013a. "Experiences of Disengagement – A Study of Doctoral Students in the Behavioral Sciences." *International Journal of Doctoral Studies* 8: 61–81. https://doi.org/10.28945/1870.
Vekkaila, Jenna, Kirsi Pyhältö, and Kirsti Lonka. 2013b. "Focusing on Doctoral Students' Experiences of Engagement in Thesis Work." *Frontline Learning Research* 1 (2): 12–34. https://doi.org/10.14786/flr.v1i2.43.
Virtanen, Viivi, and Kirsi Pyhalto. 2012. "What Engages Doctoral Students in Biosciences in Doctoral Studies?" *Psychology (Savannah, Ga)* 3: 1231–1237. https://doi.org/10.4236/psych.2012.312A182.
Virtanen, Viivi, Juha Taina, and Kirsi. Pyhältö. 2017. "What Disengages Doctoral Students in the Biological and Environmental Sciences from Their Doctoral Studies?" *Studies in Continuing Education* 39 (1): 71–86. https://doi.org/10.1080/0158037X.2016.1250737.
Weise, Crista, Mariela Aguayo-González, and Montserrat Castelló. 2020. "Significant Events and the Role of Emotion Along Doctoral Researcher Personal Trajectories." *Educational Research* 62 (3): 304–23. https://doi.org/10.1080/00131881.2020.1794924.
Wong, Zi Yang, and Gregory Arief D. Liem. 2022. "Student Engagement: Current State of the Construct, Conceptual Refinement, and Future Research Directions." *Educational Psychology Review* 34 (1): 107–38. https://doi.org/10.1007/s10648-021-09628-3.
Woods, Charlotte. 2010. "Employee Wellbeing in the Higher Education Workplace: A Role for Emotion Scholarship." *Higher Education* 60 (2): 171–85. https://doi.org/10.1007/s10734-009-9293-y.

Appendix 1: Items included in the scales

Emotional engagement scale

(Indicate your degree of agreement with the following statements concerning your thoughts, feelings, emotions, and experiences related to your doctorate. Seven-point scale: 1 = strongly disagree; 7 = strongly agree).

- I am enthusiastic about my research
- My PhD work makes me feel fulfilled
- I feel happy when I start working on my research
- I feel that this PhD project is truly 'my' project

Perceptions about the academic context scale

(The following questions refer to your opinion about the research context in which you are conducting your PhD (e.g. research group, research centre, department). Please indicate how strongly you agree with the following statements. Seven-point scale: 1 = strongly disagree; 7 = strongly agree).

Inclusive context subscale

- I feel like I am part of a research community
- In this research community we present and discuss each other's research on a regular basis
- I feel respected as a researcher
- My PhD has been essentially a solitary process (Reversed)

Learning context subscale

- I developed relevant knowledge and competencies in interaction with my PhD colleagues
- Within the scope of my PhD I created friendship relationships with my PhD colleagues or other researchers

Competitive context subscale

- I feel that the researchers are harsh and negative rather than constructive when giving feedback on each other's work
- In this research community people seem to be very competitive

Supervision scale

(Indicate your level of agreement with the following statements concerning your relationship with your supervisor or supervision team and their supervision practices. Seven-point scale; 1 = strongly disagree; 7 = strongly agree).

Autonomy-focused supervision subscale

(My supervisor or supervising team …)

- Let me take control of my project
- Is/are flexible to accept changes in my PhD project
- Show me that she/he/they respect/s and value my work
- Is respectful of my viewpoints and ideas
- Is/are friendly, supports and reassure/s me when I am feeling down
- Listens to how I would like to do the things
- Makes me feel comfortable to openly discuss my concerns with he/she/they
- Encourage/s me to be open about my own ideas and any issues that concern me
- Make/s me feel that I will be able to successfully complete my research/thesis
- Express/es understanding and empathy when I experience difficulties
- Give/s me positive feedback on my performance
- Encourage/s me to work autonomously

Task-focused supervision

- Help/s me to plan and manage the different research tasks
- Give/s me guidance to find relevant literature and research materials
- Teach/es me the knowledge and competencies that I need to complete my research
- Seek/s information that will help me with my thesis
- Has/have availability to supervise me
- Respond/s to my queries or requests within a reasonable timeframe
- Sets clear expectations and goals that I have to achieve
- Provide/s me practical assistance when I need help with my research tasks
- Encourages me to reflect on my practice
- Ask/s me about my needs and expectations regarding supervision
- Challenge/s me to do more and/or better

Motivation for doctoral education scale

(Indicate the extent to which you agree that the reasons listed below contributed to your decision to enrol in a doctoral programme. Seven-point scale: 1 = strongly disagree; 7 = strongly agree).

Personal development motivation subscale

- Intellectual challenge
- To deepen my personal development
- To invent/create/discover new things
- To feel fulfilled
- To develop my knowledge and/or competencies

Research motivation subscale

- To contribute to the research field
- To know more about the topic that I am studying
- To do research
- To contribute to the improvement of society

Professional motivation subscale

- Demands of my profession
- Encouragement from my employer
- Career development
- Solve a problem or respond to a need identified in my professional practice
- To have a better salary

Prestige motivation subscale

- To show (to myself or to others) that I am capable
- Prestige of the doctoral degree

Perceived relevance scale

(Indicate your degree of agreement with the following statements concerning your thoughts, feelings, emotions, and experiences related to your doctorate. Seven-point scale: 1 = strongly disagree; 7 = strongly agree).

- My PhD work may contribute in some way to the betterment of society
- My PhD work will be a relevant contribution to the disciplinary/scientific area