



MOTIVATION IN DOCTORAL STUDENTS: DEVELOPMENT AND PSYCHOMETRIC VALIDATION OF THE EUROPEAN PORTUGUESE VERSION OF THE MOTIVATION FOR PHD STUDIES SCALE

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ABSTRACT

Aim/Purpose	The objective of this study was to assess the psychometric properties of the European Portuguese version of the Motivation for PhD Studies Scale (MPhD).
Background	The motivation of doctoral students has been identified as a factor influencing their enrolment in doctoral studies and its completion. Based on the Self-Determination Theory, the MPhD is a 15-item self-report measure that was recently developed with the aim of assessing the motivation for doctoral studies. MPhD assesses five types of regulation: intrinsic, integrated, identified, introjected, and external. However, this scale has not been validated for other cultures or languages, creating a gap attributable to the lack of validated and

Accepting Editor Katherine A. Quinn | Received: July 19, 2024 | Revised: November 21, 2024 |

Accepted: January 9, 2025.

Cite as: Cardoso, C., Canavarro, M. C., & Pereira, M. (2025). Motivation in doctoral students: development and psychometric validation of the European Portuguese version of the Motivation for PhD Studies Scale. *International Journal of Doctoral Studies*, 20, Article 2. <https://doi.org/10.28945/5436>

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	culturally adapted instruments tailored to doctoral students' specific characteristics and needs.
Methodology	A sample of 299 Portuguese doctoral students (80.6% female) completed a web-based questionnaire that collected sociodemographic and doctoral-related information, the European Portuguese version of the MPhD, and other relevant self-report questionnaires (e.g., Depression Anxiety and Stress Scale).
Contribution	Our findings support the use of the MPhD among Portuguese doctoral students. Since the motivation and experiences of Portuguese doctoral students are understudied, this validation will contribute to improving research with these students.
Findings	The results supported the original five-factor structure by type of regulation (CFI = .935; RMSEA = .075 [.063-.087], $p = .001$; SRMR = .0607). Positive associations were found between more autonomous types of regulation and positive outcomes (e.g., self-determination) and between more controlled types of regulation and negative outcomes (e.g., symptoms of anxiety and depression). The scale reliability was very satisfactory.
Recommendations for Practitioners	It is suggested that the MPhD be used in interventions and initiatives, as it promotes approaches tailored to the specificities of PhD students and is culturally adapted for the Portuguese population. Practitioners should take into consideration the different types of motivation of PhD students and their implications for their mental health and doctoral progress. It is important to help students with less favorable motivations by promoting more favorable forms of motivation and self-regulation.
Recommendations for Researchers	The use of the MPhD in research on doctoral students should be considered since it has been validated for the Portuguese population, presents solid evidence of reliability and validity, and considers doctoral students' cultural and academic characteristics. This validation facilitates understanding the specific aspects of doctoral students' motivation, allowing advances in current research. Further validation studies of the MPhD in other countries are also recommended.
Impact on Society	The validation of the MPhD will foster research, assessment, and intervention better adapted to the cultural and academic characteristics of doctoral students. This work in the context of the doctorate will help prevent and intervene in maladaptive forms of motivation, impacting a personal, academic, and institutional level.
Future Research	With the validation of this scale, research will be able to use this assessment tool and promote further studies on doctoral students. It could also develop further validations of this scale in other countries.
Keywords	doctoral students, motivation for PhD studies scale, PhD studies, psychometric properties, self-determination theory

INTRODUCTION

In Portugal, the number of students enrolled in doctoral studies has increased over time (Pordata, 2022a). However, fewer students complete their doctoral degrees than enrolled in a program (Pordata, 2022b). These delays and dropouts have various consequences at different levels, impacting stu-

dents, universities, and even society (De Clercq et al., 2021; Jaksztat et al., 2021), so studying the experiences of doctoral students is essential to prevent these outcomes. Despite this worrying data, in Portugal, there is little research devoted to doctoral students, especially about the role of motivation in their studies, despite its significant relevance in the contemporary scientific context (Pereira, 2021). This gap is an important concern, as it limits the ability to fully understand doctoral students' experiences and develop effective interventions and initiatives.

Internationally, in recent years, the motivation of doctoral students has gained greater emphasis in the study of PhD experiences. The literature has shown that motivation is related to deciding to enroll in doctoral studies (e.g., Hands, 2018; Mueller et al., 2015) and determining whether PhD students complete doctoral studies (Bair & Haworth, 2004; Howard et al., 2021). Intrinsic and extrinsic factors are related to the persistence, attrition, and dropout of PhD students (Ivankova & Stick, 2007; Lovitts, 2008).

Due to the variety of motivational reasons and factors associated with doctoral experiences, many authors have explored the multidimensionality of motivation (De Clercq et al., 2021; Litalien & Guay, 2015; Litalien et al., 2015). To analyze this multidimensionality based on a well-established theory, researchers have begun to evaluate doctoral students' motivation according to self-determination theory (SDT) (Deci & Ryan, 1985a, 2012). SDT suggests that motivation exists on a continuum of autonomy, with different types regulating an individual's behaviors (Deci & Ryan, 1985b, 2012). It identifies two main types of motivation: autonomous (consisting of intrinsic, integrated, and identified regulation) and controlled motivation (consisting of introjected and external regulation) (Deci & Ryan, 2012).

Based on this theory, the Motivation for PhD Studies Scale (MPhD) was developed (Litalien et al., 2015). To the best of our knowledge, MPhD is the only measure designed to assess the motivation of students for doctoral studies, and it considers the multidimensionality of the construct of motivation as well as the specificities of this academic context. However, this measure has not yet been validated among Portuguese PhD students. This gap highlights the need to adapt and validate an instrument with these characteristics for Portuguese PhD students, as it is important to use measures adapted to the characteristics of each culture to ensure the accuracy of research, findings, initiatives, and interventions (Weeks et al., 2007). Accordingly, the validation of a scale that assesses the motivation of doctoral students in the Portuguese context may promote a deeper and more complete understanding of their motivation for enrolling in a doctorate and its association with the PhD itself. This will be an asset, as there are few studies on doctoral students in Portugal. This may be particularly useful in research and clinical settings (i.e., interventions specifically designed for PhD students in university settings) and may also contribute to the development of effective initiatives that account for the multidimensionality of motivation and the specific characteristics of pursuing a doctoral degree, as well as initiatives that assist higher education institutions in preventing extensive delays or early dropouts.

On that premise, the current study aimed to analyze the psychometric properties of the European Portuguese version of the MPhD in a sample of Portuguese doctoral students.

LITERATURE REVIEW

Doctoral education is regarded as the pinnacle of academic achievement (De Clercq et al., 2021), playing a central role in today's scientific landscape and increasingly attracting young individuals who drive scientific progress. In Portugal, the enrollment of students in doctoral programs has increased over time (Pordata, 2022a). The reasons to pursue a PhD are diverse and include external invitations such as by the supervisor, interest in research, interest in an academic career, and reasons related to personal/professional development (Horta et al., 2023; Leijen et al., 2016; Leonard et al., 2005; Moreno & Kollanus, 2013). However, other data are less encouraging: a smaller number of students complete their doctoral studies than enrolled in a program (Pordata, 2022b), and there is evidence of delays in completing PhD programs and substantial academic dropout rates (Jaksztat et al., 2021;

Vassil & Solvak, 2012). In 2019, a report involving 311 European universities showed that 16% of universities reported a decrease in the PhD completion rate, and only 66% of PhD students completed their dissertation within six years of entering their PhD program (Hasgall et al., 2019). The literature documents several reasons for dropping out of or delaying doctoral studies. Specifically, PhD students reported reasons related to supervision (e.g., lack of support, poor relationship with their supervisor) and the institution, nonacademic reasons (e.g., work), reasons related to the doctoral program itself (e.g., satisfaction with the program), and personal factors (e.g., motivation, goal-directedness) (Bair & Haworth, 2004; Leijen et al., 2016). The impacts of PhD delay and dropout are also varied, with evidence indicating significant consequences for the individual (e.g., lost career opportunities), for the university (e.g., inefficient use of resources), and for society (e.g., lower innovation and scientific knowledge) (De Clercq et al., 2021; Jaksztat et al., 2021). Despite this worrying data, in Portugal, to the best of our knowledge, there is a significant gap in studies on the experiences of doctoral students. This lack of information limits our understanding of their journeys and hinders efforts to improve student well-being and prevent negative impacts on universities and society.

In the international literature, the motivation of doctoral students has gained greater emphasis in the study of PhD experiences. Studies have shown that motivation is related to the decision to enroll in doctoral studies (e.g., Hands, 2018; Mueller et al., 2015). This decision may be based on intrinsic motivation (e.g., enjoyment of studying, learning and researching, and intellectual challenge; personal fulfillment) (Hands, 2018; Leijen et al., 2016; Moreno & Kollanus, 2013; Mueller et al., 2015) or extrinsic motivation (e.g., employment opportunities, academic career) (Leijen et al., 2016; Moreno & Kollanus, 2013). Motivation has also been reported as an important factor in determining whether PhD students complete a doctoral degree and is associated with persistence, attrition, and dropout (Bair & Haworth, 2004; Howard et al., 2021). Similar to the motivational factors associated with the decision to enroll in doctoral studies, there are intrinsic (e.g., personal challenges) and extrinsic factors (e.g., monetary factors) related to the persistence, attrition, and dropout of PhD students (e.g., Ivankova & Stick, 2007; Lovitts, 2008).

Several empirical studies have corroborated motivational reasons related to doctoral completion and/or dropout, which depend on the motivational profile of students (De Clercq et al., 2021; Litalien et al., 2015). Due to the variety of motivational reasons, the current context of the doctorate (e.g., oversupply of PhD students) as well as the factors associated with doctoral experiences, many authors have explored the multidimensionality of motivation (e.g., De Clercq et al., 2021; Litalien & Guay, 2015; Litalien et al., 2015). To analyze this multidimensionality based on a well-established theory, researchers have begun to evaluate doctoral students' motivation according to self-determination theory (SDT) (Deci & Ryan, 1985a, 2012).

SDT is based on a continuum of autonomy that proposes that different types of motivation regulate an individual's behavior (Deci & Ryan, 1985b, 2012). According to this theory, there are two major types of motivation: autonomous (comprised of intrinsic, integrated, and identified regulation) and controlled motivation (composed of introjected and external regulation) (Deci & Ryan, 2012). In brief, intrinsic regulation represents a higher level of autonomy, where individuals perform an activity where they experience interest and satisfaction in the absence of a reward (Deci & Ryan, 1985a). Integrated regulation occurs when individuals perform an activity aligned with their personal needs, experiences, and values (Deci & Ryan, 2012). In turn, identified regulation occurs when there is a "conscious valuing of a behavioral goal or regulation" (Ryan & Deci, 2000, p. 72), so the action is accepted when it is personally important. Introjected regulation refers to performing an action to avoid anxiety or guilt or to improve feelings of value, ego, or pride (Ryan & Deci, 2000). External regulation has the lowest level of autonomy since the individual performs an activity to achieve a reward or avoid punishment (Deci & Ryan, 2012). Although some types of regulation have higher autonomy according to the continuum presented by SDT, they are still defined as extrinsic motivation since the true reason that the individual performs the activity is not the activity itself but the intended outcome

The reliability coefficients were generally acceptable (ranging between $\omega = .69$ and $\omega = .85$), although in the two samples studied, only identified regulation had values below the .70 threshold ($\omega = .69$ and $\omega = .60$; Litalien et al., 2015). Additionally, in general, the convergent validity of the MPhD was mainly in agreement with SDT: adjacent regulation types on the SDT continuum were positively associated, and more distant types were less strongly associated (Litalien et al., 2015; Ryan & Connell, 1989). Discriminant validity with several variables (e.g., test anxiety, satisfaction, and postdoctoral intention) also supported the SDT assumptions (Deci & Ryan, 2000; Litalien et al., 2015). Specifically, the results showed that different forms of motivation were associated with different consequences. More autonomous types of regulation were positively associated with positive outcomes (i.e., satisfaction, postdoc intentions, positive affect, performance) and negatively associated with negative outcomes (i.e., test anxiety, negative affect, dropout intentions, and thesis problems). In contrast, less autonomous types of regulation were positively associated with negative outcomes and negatively associated with positive outcomes (positive affect, satisfaction, and performance). Overall, results also showed that this structure was generalizable across doctoral students with different backgrounds (e.g., gender, age, type of program) (Litalien et al., 2015).

The MPhD has been used by a small number of studies and has demonstrated good internal consistency values (e.g., Litalien & Guay, 2015; Sverdlik & Hall, 2020). However, to the best of our knowledge, this scale has not been validated for use in different languages and cultures. This is a relevant gap in the research on doctoral students' motivation and their experiences during the PhD trajectory. Indeed, in addition to providing a new country/culture with a soundly designed measure, this validation also has the potential to enhance the cross-cultural comparability of doctoral student's motivation across cultures and scientific contexts. In addition, the validation of this scale for the Portuguese population could be an asset since there are not many empirical studies and evidence on doctoral students, and a specific scale for this population could encourage additional research.

METHODS

PARTICIPANTS

The sample included 299 Portuguese PhD students (80.6% female) with a mean age of 31.75 ($SD = 6.94$; range: 23-66 years). Most PhD students were single (41.8%), did not have children (84.9%), and had completed a master's degree (92.3%). Most participants were carrying out a PhD in a public institution (93.3%) and were studying social sciences (28.6%) or medical and health sciences (24%). A complete description of the participants' sociodemographic and doctoral-related characteristics is presented in Table 1.

Table 1. Sociodemographic and doctoral-related characteristics ($N = 299$)

	<i>N</i>	%
Gender		
Male	57	19.1
Female	241	80.6
Other	1	0.3
Marital status		
Single	125	41.8
Married	36	12.0
<i>De facto</i> union	83	27.8
In a relationship (without living together)	49	16.4
Divorced	5	1.7
Widowed	1	0.3

	<i>N</i>	%
Children		
Yes	45	15.1
No	254	84.9
Residence		
Rural	48	16.1
Urban	251	83.9
Education level		
Bachelor's Degree	7	2.3
Master's Degree	276	92.3
Doctoral Degree	11	3.7
Other	5	1.7
Monthly income		
≤ 704€	11	3.7
705€ - 1100€	79	26.4
1101€ - 1400€	174	58.2
≥ 1401€	26	8.7
No response	9	3.0
Type of institution		
Public	279	93.3
Private	20	6.7
PhD year		
1 st year	44	14.7
2 nd year	64	21.4
3 rd year	85	28.4
4 th year	55	18.4
5 th year	38	12.7
Other	13	4.3
Scientific field		
Exact Sciences	24	8.0
Natural Sciences	49	16.4
Engineering and Technology Sciences	31	10.4
Medical and Health Sciences	72	24
Agricultural Sciences	9	3.0
Social Sciences	86	28.6
Humanities	27	8.9
Other	1	0.3

PROCEDURES

After obtaining permission from the authors of the MPhD, two researchers independently translated the scale into European Portuguese. The translation was done word by word, item by item, and considering the cultural context of the items. The researchers analyzed and compared both translations and a consensual version was obtained. Next, a third person fluent in English and without knowledge of the scale proceeded to back-translate the scale and checked the lexical and semantic aspects of the items so that the content was the same in the original and the European Portuguese versions. Throughout this process, none of the items revealed any linguistic problems. Thus, a final version of the MPhD was obtained. This version was not pilot-tested before data collection.

Recruitment

The sample was collected through the dissemination of the study on social networks and through email contacts with several research centers in Portugal. For inclusion criteria, study participants had to be doctoral students in any scientific area at a university/research center in Portugal and have Portuguese nationality. Data were collected online through LimeSurvey® software (hosted on the webpage of the host institution) between August 2022 and June 2023. The first page of the survey contained information about the study (e.g., its objectives), the researchers (e.g., contact information), the roles of researchers and participants, the inclusion criteria, the voluntary nature of participation, the anonymity and confidentiality of data, and the informed consent form. The present study was approved by the Ethics and Deontology Committee of the host institution.

MEASURES

Participants were asked to complete a web-based survey that comprised sociodemographic and doctoral-related questionnaires, the European Portuguese version of the MPhD, and other self-report questionnaires that assessed relevant measures for evaluating criterion-related validity: self-determination, quality of life, depression, anxiety, and stress symptoms; self-efficacy; and work engagement. A summary of the measures used in the online survey is shown in Table 2. There were no missing values.

Table 2. Summary table of the measures that comprised the online survey

Measure	Questionnaire	No. of items	Subscales	Response scale
Sociodemographic and doctoral-related data	Sociodemographic and doctoral-related questionnaire	-	-	-
PhD students' motivation for doctoral studies	Motivation for PhD Studies Scale (MPhD) (Litalien et al., 2015)	15	Intrinsic Regulation, Integrated Regulation, Identified Regulation, Introjected Regulation and External Regulation	5-point scale
Self-determination	Self-Determination Scale (SDS) (Sheldon et al., 1996)	10	Awareness of Self and Perceived Choice	5-point scale
Quality of life	EUROHIS-QOL-8 (Power, 2003)	8	-	5-point scale
Depression, anxiety, and stress symptoms	Depression Anxiety and Stress Scale-21 (DASS-21) (Lovibond & Lovibond, 1995)	21	Depression, Anxiety, and Stress	4-point scale
Self-efficacy	General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995)	10	-	4-point scale
Work engagement	Utrecht Work Engagement Scale (UWES-17) (Schaufeli & Bakker, 2009)	17	Dedication, Vigor, and Absorption	7-point scale

Sociodemographic and doctoral-related data

The authors developed a self-report questionnaire to assess sociodemographic (e.g., gender, age) and doctoral-related data (e.g., institution, PhD year). Based on the original version of the MPhD (Litalien et al., 2015), the questionnaire also included information about the intention to do a postdoc

(*yes vs. no*), the intention to drop out of the PhD program (e.g., dropout probability [1 = *not at all likely*, 5 = *very likely*]; year and reasons for considering dropping out), and satisfaction with the doctoral program (one question, “Overall, how satisfied are you with your doctoral program?” answered on a 5-point Likert scale [1 = *very dissatisfied*, 5 = *very satisfied*]).

PhD students’ motivation for doctoral studies

PhD students’ motivation for doctoral studies was assessed by the European Portuguese version of the MPhD, which was developed in this study (Litalien et al., 2015). This self-report scale was designed to evaluate the type of regulation for doctoral studies based on SDT and assesses five regulation types: intrinsic, integrated, identified, introjected, and external. The MPhD is composed of 15 items (three for each type of regulation, e.g., “For the satisfaction I have in facing challenges in my studies”) scored on a 5-point scale (1 - *does not correspond at all*, 5 - *corresponds exactly*). The scale allows the computation of a score for each type of regulation and each type of motivation (i.e., autonomous and controlled).

Self-determination

Self-determination was assessed using the Self-Determination Scale (SDS) (Sheldon et al., 1996, and the Portuguese version by Silva et al., 2010). This scale assesses individual differences in self-determination and is composed of 10 items. Each item includes two sentences (e.g., “A – I always feel like I choose the things I do; B – I sometimes feel that it’s not really me choosing the things I do”). Items are answered on a 5-point response scale (1 – *only A feels true* / 5 – *only B feels true*). The SDS contains two subscales, each containing five items: Awareness of Self and Perceived Choice. The score is obtained from the sum of the items of each subscale, providing a score for each subscale (ranging between 5 and 25) and an overall SDS score (ranging between 10 and 50). Higher scores indicate higher levels of self-determination. In the present sample, Cronbach’s alpha for the Awareness of Self subscale was .74, the Perceived Choice subscale was .86, and the total scale was .82.

Quality of life

Quality of life was assessed by the EUROHIS-QOL-8 (Power, 2003, and Portuguese version by Pereira et al., 2011). This self-report instrument comprises eight items (e.g., “How would you rate your quality of life?”) that are answered on a 5-point response scale [1 – *not at all/very dissatisfied*, 5 – *completely/very satisfied*]. A standardized overall score ranging from 0 to 100 is computed, with higher values indicating a better perceived quality of life. In the present sample, the Cronbach’s alpha value was .85.

Depression, anxiety, and stress symptoms

The Portuguese version of the Depression Anxiety and Stress Scale-21 (DASS-21) (see Lovibond & Lovibond, 1995, and Portuguese version by Ribeiro et al., 2004) was used to assess anxiety, depression, and stress symptoms. This scale is composed of 21 items (e.g., “I found it hard to wind down”) that are rated on a 4-point response scale, ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). The DASS-21 has three subscales (Depression, Anxiety, and Stress), each with seven items, scored by the summing items scores to yield total subscale scores (ranging between 0 to 21). Higher scores denote more negative affective states. Cronbach’s alpha values in our sample were .86 for the Anxiety subscale, .91 for the Depression subscale, and .90 for the Stress subscale.

Self-efficacy

The General Self-Efficacy Scale (see Schwarzer & Jerusalem, 1995, and Portuguese adaptation by Schwarzer & Jerusalem, 1999) was used to assess self-efficacy. This scale consists of 10 items (e.g., “I can always manage to solve difficult problems if I try hard enough”) that are rated on a 4-point response scale (1 – *not at all true*, 4 – *exactly true*). The total score is computed by summing scores on all items and ranges between 10 and 40 points, with higher scores indicating greater perceived self-efficacy. In our sample, the Cronbach’s alpha was .89.

Work engagement

The Utrecht Work Engagement Scale (UWES-17) by Schaufeli and Bakker (2009) (Portuguese version by Teles et al., 2017) is a 17-item self-reported measure and was used to assess work engagement (e.g., “I find the work that I do full of meaning and purpose”). This scale assesses three dimensions: Dedication, Vigor, and Absorption. Items are rated on a 7-point response scale (0 – *never/6 – always/ every day*). In the present sample, Cronbach’s alpha values ranged between .83 (Absorption) and .93 (Dedication). The reliability of the total scale was .95.

STATISTICAL ANALYSIS

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS; version 27.0; IBM SPSS, Chicago, IL) and Analysis of Moment Structure (AMOS) software (version 27.0; IBM SPSS, Chicago, IL).

Descriptive statistics

Descriptive statistics were first calculated to analyze the sample’s sociodemographic and doctoral-related characteristics, as well as the distributional characteristics of the items. The distributional characteristics of items and domains were examined by calculating mean values (*M*) and standard deviations (*SD*), floor and ceiling effects, and skewness and kurtosis in the distributions of scores.

Confirmatory factorial analysis

Confirmatory factorial analysis (CFA) was used to examine the factorial structure proposed by the authors of the original version of the MPhD (Litalien et al., 2015). The following fit indices were considered (Hu & Bentler, 1999): the chi-square test (χ^2 , tests the adjustment between the hypothetical model and the empirical model, and should be nonsignificant, $p > .05$), $\chi^2/\text{degrees of freedom}$ (fit is considered good if < 2 ; acceptable if values range from 2 to 5), Comparative Fit Index (CFI; good adjustment if $> .95$), Tucker–Lewis Index (TLI $> .95$ indicates very good model fit), Root Mean Square Error of Approximation (RMSEA $< .06$), and Standardized Root Mean Square Residual (SRMR; good model adjustment if $< .08$).

Correlations and internal consistency

Pearson correlations (and point-biserial correlations, as appropriate) were computed to analyze the association between the MPhD scores with the following variables: intentions to do a postdoc, PhD dropout probability, satisfaction with the doctoral program, and other relevant measures (e.g., self-determination, quality of life, anxiety, depression, and stress symptoms). A variety of measures were used to assess the reliability and validity of the MPhD and to ensure a comprehensive evaluation. By including various measures, the aim was to capture the full scope of the constructs in question and provide robust evidence of the performance of the MPhD. This is especially important in a context where the area is not yet well-studied, as it allows us to gather more detailed information and insights into how different variables interact. Internal consistency reliability was estimated using Cronbach’s alpha and McDonald’s omega (ω).

RESULTS

DESCRIPTIVE STATISTICS

The distributional characteristics of scores on the 15 items are presented in Table 3. Floor and ceiling effects were detected for most items, as more than 15% of participants achieved the lowest or highest possible score (Terwee et al., 2007). Item sensitivity was assessed through the skewness (*Sk*) and kurtosis (*Ku*) coefficients, with most items demonstrating adequate values (within the range of ± 1.00).

Table 3. Descriptive statistics for items of the MPhD

Items	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Floor effect (%)	Ceiling effect (%)
1. For the satisfaction I feel when I surpass myself in my learning activities (e.g., work, presentations).	3.61	1.04	-0.58	-0.32	3.0	18.4
2. For the satisfaction I have in facing challenges in my studies.	3.47	1.12	-0.51	-0.51	5.7	17.4
3. For the pleasure I feel in accomplishing my study project (e.g., thesis).	3.77	1.15	-0.84	-0.10	5.4	29.4
4. Because doctoral studies are consistent with my values (e.g., curiosity, ambition, success).	3.62	1.13	-0.62	-0.49	4.3	22.7
5. Because my doctoral studies are a fundamental part of who I am and my identity.	2.63	1.32	0.31	-1.06	25.8	10.4
6. Because my doctoral studies meet my goals and my objectives in life.	3.24	1.35	-0.24	-1.17	13.4	21.7
7. Because I want to improve my skills in my field of study.	3.80	1.05	-0.71	-0.24	2.3	28.4
8. Because it's important for me to advance knowledge in my field of study.	3.76	1.14	-0.79	-0.21	4.7	29.4
9. Because I have the opportunity to take my first steps in research (e.g., publications, collaborations) while benefitting from supervision.	3.38	1.32	-0.38	-1.04	11.4	24.4
10. Because my supervisor would be disappointed or angry if I gave up.	1.97	1.20	1.12	0.24	48.5	5.7
11. Because I have made commitments that I must fulfil (e.g., with funding agencies, employers, collaborators, a research director).	3.40	1.38	-0.41	-1.07	13.4	27.8
12. Because I do not want to be perceived as a quitter.	2.87	1.53	0.11	-1.49	28.1	21.1
13. For the prestige associated with a PhD.	2.66	1.36	0.30	-1.15	26.1	12.4
14. To find a job with good working conditions.	3.19	1.40	-0.23	-1.22	17.1	22.1
15. To get a better paying job after graduation	3.31	1.44	-0.39	-1.22	17.7	26.1

CONSTRUCT VALIDITY

The first-order (five-factor structure) and higher-order (two-factor structure, i.e., autonomous and controlled motivations) models proposed by the original authors were also tested. The results of the CFA indicated that the original five-factor structure provided a good fit to the data: $\chi^2 = 213.43$, g.l. = 80, $p < .001$; $\chi^2 / \text{g.l.} = 2.67$, CFI = .935, TLI = .915, RMSEA = .075 [.063-.087], SRMR = .0607. However, the higher-order structure did not show a good fit to the data: $\chi^2 = 411.14$, g.l. = 85, $p < .001$, $\chi^2 / \text{g.l.} = 4.84$, CFI = .842, TLI = .805, RMSEA = .113 [.103-.125], SRMR = .248.

Figure 2 shows the structural model and factor loadings obtained for the European Portuguese version of the MPhD. Factor loadings of MPhD items for the model were all statistically significant ($p < .001$) and equal to or greater than .48.

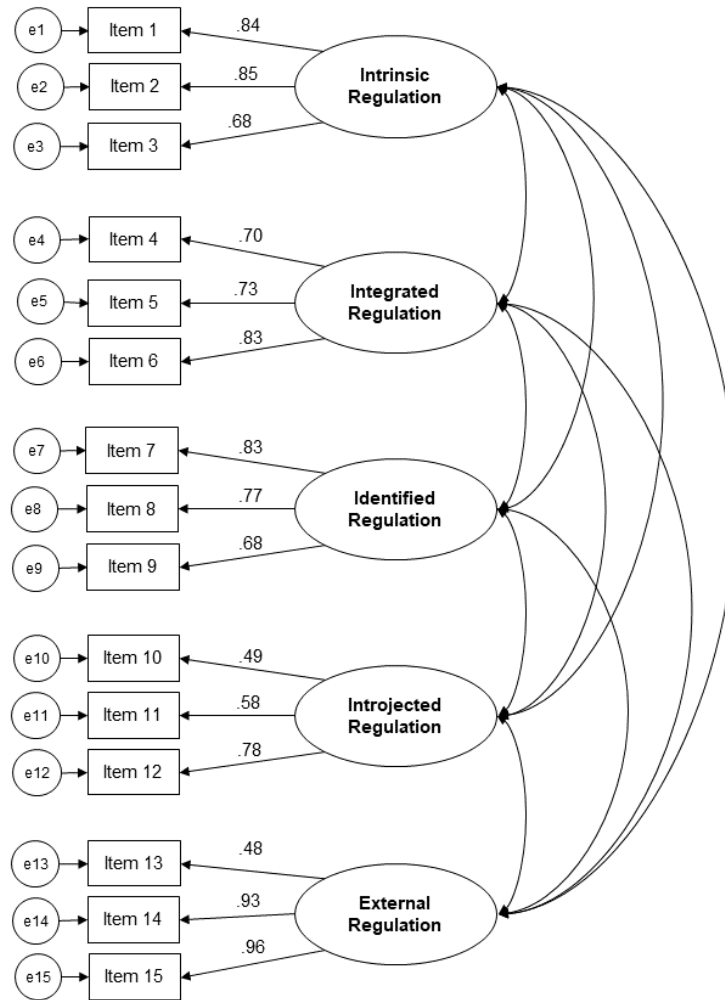


Figure 2. Structural model of the European Portuguese version of the MPhD

Correlations between the different types of regulation are presented in Table 4. Adjacent regulation types on the self-determination continuum were positively associated with each other, except for identified and introjected regulation ($r = -.03$), which were not significantly associated. The correlations ranged from $-.16$ (between intrinsic and introjected regulations) to $.68$ (between integrated and identified regulations).

Table 4. Scale correlations, reliabilities, and descriptive statistics of MPhD factors

Factors	1	2	3	4	5
1. Intrinsic regulation	-				
2. Integrated regulation	.52***	-			
3. Identified regulation	.59***	.68***	-		
4. Introjected regulation	-.16**	-.03	-.03	-	
5. External regulation	.14*	.39***	.26***	.23***	-
Scale reliability (α ; ω)	.82; .82	.79; .81	.79; .79	.65; .67	.82; .86
Scale <i>M</i> (<i>SD</i>)	3.62 (0.94)	3.16 (1.07)	3.65 (0.99)	2.75 (1.05)	3.05 (1.20)

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

CRITERION-RELATED VALIDITY

Regarding criterion-related validity, the correlations between the types of regulation of the MPhD and doctoral-related and psychological-related variables are presented in Table 5. The results indicated that the intention to do a postdoc was positively associated with intrinsic, integrated, and identified regulation ($r = .26$, $r = .37$, and $r = .31$, respectively), which indicated that doctoral students who had these types of regulation had more intentions to do a postdoc. The probability of PhD dropout was positively correlated with introjected regulation ($r = .19$) and negatively correlated with intrinsic, integrated, and identified regulation ($r = -.24$, $r = -.21$, and $r = -.17$, respectively). Specifically, doctoral students who presented more introjected regulation in their PhD studies were more likely to drop out than students with more autonomous types of regulation. Satisfaction with the doctoral program was positively correlated with the three most autonomous types of regulation (i.e., intrinsic, integrated, and identified) as well as with external regulation (significant correlations ranged from .14 to .37). Accordingly, students who had more of these types of regulation were more satisfied with their doctoral program.

Table 5. Descriptive statistics and correlations between the MPhD, doctoral-related, and psychological-related variables

	<i>M</i>	<i>SD</i>	Intrinsic regulation	Integrated regulation	Identified regulation	Introjected regulation	External regulation
Intentions to do a postdoc ^a	-	-	.26***	.37***	.31***	-.02	.06
PhD dropout probability	1.80	0.88	-.24***	-.21***	-.17**	.19**	-.03
Satisfaction with the doctoral program	3.27	1.28	.33***	.37***	.32***	-.11	.14*
Self-determination	35.42	7.46	.37***	.30***	.30***	-.36***	.01
Quality of life	27.96	5.44	.32***	.15*	.16**	-.38***	.03
Depressive symptoms	5.91	5.19	-.33***	-.20***	-.17**	.34***	.01
Anxious symptoms	3.63	4.18	-.11	-.01	.01	.26***	.10
Stress symptoms	7.63	5.12	-.13*	-.09	-.08	.27***	.11
Self-efficacy	29.65	4.60	.35***	.21***	.20***	-.18**	.06
Work engagement	3.49	1.19	.58***	.39***	.49***	-.26***	-.01

Note. ^a Intentions to do a postdoc (0 = no/don't know; 1 = yes)

* $p < .05$, ** $p < .01$, *** $p < .001$

Regarding psychological-related variables, the results showed that self-determination, quality of life, self-efficacy, and work engagement had the same pattern of correlations: they were positively associated with intrinsic, integrated and identified regulation (correlations ranged from .15 to .58) and negatively associated with introjected regulation (correlations ranged from -.18 to -.38). Doctoral students who reported more autonomous types of regulation also reported increased self-determination, quality of life, self-efficacy, and work engagement, in contrast to students who reported more introjected regulation. Depressive symptoms were positively correlated with introjected regulation ($r = .34$) and negatively correlated with intrinsic, integrated, and identified regulation (correlations ranged from -.17 to -.33), which indicated that doctoral students who had introjected regulation reported more depressive symptoms, in contrast to those who showed intrinsic, integrated, and identified regulation. Anxiety symptoms were positively correlated with introjected regulation ($r = .26$). In contrast, stress symptoms were positively correlated with introjected regulation ($r = .27$) and negatively correlated with intrinsic regulation ($r = -.13$). Accordingly, doctoral students who reported more introjected regulation also reported increased symptoms of anxiety and stress. In contrast, students who exhibited intrinsic regulation experienced fewer stress symptoms.

RELIABILITY

The internal consistency of the MPhD subscales varied between adequate and good to excellent in terms of both Cronbach's alpha ($\alpha = .79$ to $\alpha = .82$) and McDonald's omega ($\omega = .79$ to $\omega = .86$), except for introjected regulation, which had values slightly below .70 ($\alpha = .65$, $\omega = .67$; see Table 4).

DISCUSSION

The present study examines the psychometric properties of reliability and validity of the European Portuguese version of the MPhD in a sample of Portuguese doctoral students. To the best of our knowledge, this is the first study to test the psychometric performance of the MPhD in a different culture and context. Our main results corroborate the original five-factor structure according to the type of regulation and support the scale's validity and reliability, therefore supporting its use in the Portuguese doctoral population.

Overall, the distributional characteristics of the items were good. We found more ceiling effects than floor effects, which indicates that the scale items corresponded well or exactly to the reasons that doctoral students identified for continuing their doctoral studies. These results seem to suggest that doctoral students may have different reasons to remain in their studies, from the most autonomous to the most controlled types of regulation, corroborating the theoretical basis of SDT (Deci & Ryan, 1985b, 2012) and other studies reporting the multidimensionality of motivation among these students (e.g., De Clercq et al., 2021; Litalien & Guay, 2015; Litalien et al., 2015).

FACTOR STRUCTURE OF THE EUROPEAN PORTUGUESE VERSION OF THE MPhD

Our results showed that the original five-factor structure (intrinsic, integrated, identified, introjected, and external regulation) had a good fit with the data, supporting the original authors' structure and the assumptions of SDT. Indeed, one of the criticisms highlighted by SDT is that motivation is often analyzed as a dichotomous construct (Deci & Ryan, 2012), overlooking the ability of individuals to have various reasons for their actions (Ryan & Deci, 2000). According to this theory, analyzing human behavior in terms of the multidimensionality of motivation is essential (Deci & Ryan, 1985b, 2012). Despite proposing the presence of two major motivation groups (autonomous and controlled), SDT gives primacy to the different types of regulation (Deci & Ryan, 1985b, 2012), which seem well-depicted in the MPhD. The literature also supports the importance of distinct types of regulation since different types of regulation (within the same major motivation group, i.e., autonomous

or controlled motivation) have different consequences (e.g., Howard et al., 2021; Litalien et al., 2015; Van den Broeck et al., 2021).

In contrast to the findings of Litalien et al. (2015) that supported both five-factor and two-factor structures, our results did not support a good fit to the data of the two-factor structure (autonomous and controlled motivation). However, as mentioned above, even SDT places greater emphasis on the different types of regulation than on the two types of motivation, supporting the importance of the multidimensionality of motivation proposed by the theory (Deci & Ryan, 1985b, 2012). These findings allow us to conclude that, theoretically, the division between the five regulation types and the two major motivation groups is meaningful since it better organizes the continuum postulated by SDT. However, in research and practical contexts, it may not make as much sense to divide individuals according to the major motivation groups since, in these contexts, it is important to obtain as much information as possible, which may be facilitated by an analysis based on the different types of regulation. This is corroborated by Litalien et al. (2015), as these authors also considered the five-factor structure to be the most informative, preferring it over the higher-order structure (autonomous and controlled motivations) in regard to making an informed choice. The fact that the European-Portuguese version of the MPhD supports only a five-factor structure, corresponding to the types of regulation postulated by SDT (Deci & Ryan, 1985b, 2012), may not be seen as a limitation but an advantage, as it favors a model that defends the multidimensionality of motivation and provides detailed information about the motivations of doctoral students.

VALIDITY AND RELIABILITY OF THE EUROPEAN PORTUGUESE VERSION OF MPhD

CFA indicated that all items showed expected loadings according to the original version of the MPhD (Litalien et al., 2015). The positive associations between adjacent types of regulation on the self-determination continuum found in our study are mainly consistent with the simplex-like pattern proposed by SDT (Ryan & Connell, 1989) and have been corroborated by other studies (e.g., Chatzisarantis et al., 2003; Howard et al., 2017) and by the original study in which the MPhD was developed (Litalien et al., 2015). Consistent with the original study, we found that only identified and introjected regulations were not significantly correlated. This finding is not particularly unexpected because, theoretically, each of these types of regulation represents a different major type of motivation (autonomous vs. controlled) (Deci & Ryan, 1985b, 2012).

Due to this difference, these types of regulation present different characteristics, such as different levels of internalization of the activity's value autonomy, as well as a different impact of external contingencies and pressures (e.g., approval, avoidance of guilt) (Deci & Ryan, 1985a, 1985b, 2012). These differences could explain the nonsignificant correlation between identified and introjected regulation, as also noted by Litalien et al. (2015). Furthermore, it should be noted that in our study, external regulation was positively associated with the most autonomous types of regulation (identified, integrated, and intrinsic regulation). Considering the assumptions of SDT, this is an unexpected result since these regulations are at opposite poles of the autonomy continuum (Deci & Ryan, 1985a, 1985b, 2012), and accordingly, a negative association would be expected. However, this association pattern has been observed not only in the original study (Litalien et al., 2015) but also in other motivation scales administered to other samples (e.g., college students, elementary school students) (Gagné et al., 2015; Ryan & Connell, 1989; Vallerand et al., 1989), showing a common pattern in the validation of motivation scales and supporting the validity of our measure. In this study, and among PhD students, this may indicate that intrinsic and external regulation coexist. In other words, each PhD student could have both intrinsic reasons (e.g., enjoying science) and external reasons (e.g., the possibility of a better future) for pursuing doctoral studies, which supports the idea that individuals have the capacity to act for different reasons (Ryan & Deci, 2000).

In this study, the pattern of associations between the more autonomous and more controlled motivation types and the positive and negative outcomes was as expected. Similar associations between the

more autonomous types of motivation and other positive outcomes have been reported, such as satisfaction with studies, positive emotions (Turner, 2023; Vallerand et al., 1989), self-efficacy (Bayar, 2021; Sverdlik & Hall, 2020), proactivity, job effort (Gagné et al., 2015), positive health outcomes (Levesque et al., 2007), quality of life (Costa et al., 2018), and academic engagement (Stoeber et al., 2011). Consistent with these findings, the literature also supports the negative associations of autonomous types of motivation with negative outcomes, such as emotional exhaustion, turnover intentions (Gagné et al., 2015), depression, and illness (Chen et al., 2023). Regarding the less autonomous types of motivation (i.e., introjected and external regulation), our results indicate that introjected regulation has the most detrimental results, as it was negatively associated with almost all positive outcomes and positively associated with all negative outcomes. These results are in line with those reported in the original validation study of the MPhD (Litalien et al., 2015). They are not entirely surprising, as introjected regulation has often been associated with less adaptive and less healthy outcomes across different populations (e.g., Choi et al., 2022; Howard et al., 2021). In the context of doctoral studies, Sverdlik and Hall (2020) showed that this type of regulation is associated with less self-efficacy and satisfaction with the doctoral program as well as with more illness symptoms, depression, and stress.

In our study, external regulation was only significantly associated with satisfaction with the doctoral program. This lack of significant associations with other variables was also found in the original study (Litalien et al., 2015). These findings suggest that this type of regulation in doctoral students, who are characterized by the prestige associated with a PhD, the search for a job with good working conditions and obtaining a better-paying job, may have no significant effect on either the negative (e.g., stress symptoms) or positive (e.g., quality of life) outcomes that were assessed in the present study. Nonetheless, the positive association between external regulation and satisfaction with the doctoral program is unexpected. For example, in studies on other populations (e.g., lower academic degree students, employees), external regulation has been negatively or not significantly associated with positive outcomes (e.g., job satisfaction, well-being) (Howard et al., 2021; Van den Broeck et al., 2021). Among PhD students, in the original study, external regulation was negatively associated with satisfaction (Litalien et al., 2015). This difference in the direction of the association may be due to the different assessment measures used in the original study and in our study. Litalien et al. (2015) used a 4-item measure of doctoral students' satisfaction with studies that were not specific to the doctoral context (i.e., it was an adaptation of the French version of the Satisfaction with Life Scale), while we used a single item assessing the satisfaction with the doctoral program. The use of a single item may be seen as a limitation, which should be considered in the interpretation of this association.

Introjected regulation was the type of regulation with the lowest internal consistency values. Despite the scarcity of studies with the MPhD, the lower value of introjected regulation observed in our study was also found in a recent study with this measure (Shin et al., 2022). This lower reliability may be due to the sample characteristics, as our participants may not identify with the content of some items. This can be verified, for example, by the relevant floor effect of item 10 ("Because my supervisor would be disappointed or angry if I gave up"), as almost 50% did not agree with this statement. Furthermore, the content of item 10, which is part of introjected regulation, may not fully measure this type of regulation, thus influencing the reliability value. Specifically, this item is more directed toward external/other-related reasons, as it is about a potential behavior or response of the supervisor ("Because my supervisor would be disappointed or angry if I gave up").

Considering the theoretical definition of introjected regulation (Deci & Ryan, 1985b, 2012; Ryan & Deci, 2000), item 11 ["Because I have made commitments that I must fulfill (e.g., with funding agencies, employers, collaborators, a research director)] and item 12 ("Because I do not want to be perceived as a quitter") seem to best represent this definition, as they address a behavior under a self-worth contingency (i.e., to avoid a sense of failure). The fact that this dimension has only three items is also of note, as it is well-known that a reduced number of items may influence the reliability estimate. However, it is important to note that although it has the lowest reliability value, that value is

still acceptable. Concerning identified regulation, our results are considerably higher than those reported by Litalien et al. (2015). This discrepancy may also be due to differences in the sample characteristics between the original study and the present study (e.g., type of relationship with the supervisor, presence of funding), which may influence the students' responses to the specific items and, in turn, the reliability values.

LIMITATIONS OF THE STUDY

The present study is not without limitations. First, the sampling method may be viewed as a limitation, as the sample was self-selected (the doctoral students who answered the questionnaire may be more interested in this topic). Second, self-report questionnaires are also a limitation, as they may increase response bias (e.g., due to social desirability bias). However, it should be noted that self-report instruments may have some advantages when the main objective is to analyze intrapsychic factors, as people know themselves the best (Paulhus & Vazire, 2007). The sensitive nature of some items (i.e., considering quitting the PhD program and relationship with the supervisor(s)) may also have led to socially desirable responses. Although no common-method bias check was carried out, data collection was performed through an online survey, and anonymity was guaranteed, which may have minimized this type of response and bias. The representativeness of the sample may also be compromised due to some participant characteristics, such as gender (i.e., the high percentage of women) and scientific area distribution (i.e., the high percentage of doctoral students studying medical and health sciences and social sciences). Therefore, our inferences should be interpreted with caution and within the context of these characteristics. Finally, differences across genders were not computed, and given the cross-sectional design, temporal stability, and predictive validity analyses were not performed.

CONTRIBUTION OF THE STUDY

Despite these limitations, this study provides important contributions to the literature, as it is the first study to analyze the psychometric properties of a newly developed measure for assessing motivation for doctoral studies in a very understudied population with a different cultural and linguistic background (the original scale was only validated in French-Canadian PhD students). The MPhD is an instrument that is easy to administer, score, and interpret and has a solid theoretical basis. Indeed, it takes into consideration the multidimensionality of motivation, which allows us to assess motivation in a more detailed and specific way. Furthermore, the MPhD considers the idiosyncrasies and specific characteristics of the doctoral context (e.g., supervisors, funding) and is more appropriate than generic measures of motivation. Moreover, the availability of an instrument with this purpose and these characteristics can improve identification, assessment, and interventions with doctoral students. Accordingly, these findings have important implications for research and practice.

Regarding research, this validated scale can be used as a tool to assess and understand students' motivations to enroll in PhD studies and persist in this academic path. This validation will also facilitate research on Portuguese PhD students, including their needs and mental health, as this specific population has been consistently neglected in studies in higher education (Pereira, 2021). Additionally, to the best of our knowledge, there are no other validation studies of the MPhD in other countries. In addition to the original version of the MPhD (developed in the French-Canadian context), this validation study provides evidence supporting its use and, consequently, promotes further validation studies in other countries. Validating the MPhD for other populations is highly recommended, as it is important to adapt an instrument to the specificities of each culture (e.g., expressions, contextual relevance), making them more accurate, easy to understand, and culturally accessible (Weeks et al., 2007), as well as allowing advances in cross-cultural research.

Regarding practical implications, studying the motivation of doctoral students may promote awareness and knowledge about different types of motivation in these students. This could enhance understanding of their motivations and, therefore, promote approaches and initiatives (e.g., by the supervisor and research team) that consider the specific characteristics of these students. The validation of the MPhD can encourage initiatives that aim to identify students with less favorable motivations for

good mental health and for upholding their studies at an early stage. Also, these results can inform doctoral programs and universities to develop initiatives that promote more autonomous forms of motivation (e.g., greater autonomy in decision-making) and create supportive environments, healthy workplaces (with supervisors and peers), and appropriate mental health support programs. This is corroborated by Turner (2023), who recently suggested that the promotion of a shift in motivation from an external to an internal locus by the staff of doctoral programs can have a positive impact on the experiences of doctoral students, such as greater student satisfaction. This study could also promote the development of effective interventions that are tailored to PhD students, their academic context, and their needs. Our results suggest that these interventions may help doctoral students with unfavorable motivations for their studies (e.g., introjected regulation) and promote more favorable forms of motivation (e.g., intrinsic regulation). Thus, it will be possible to prevent and intervene for maladaptive forms of motivation at the personal level among these students (e.g., to improve quality of life and well-being), at the academic level (e.g., to reduce dropout intentions, improve academic productivity), by responding more effectively to the needs of doctoral students, and at the institutional level, as the completion of the cycles of study often assesses the formative efficiency of institutions.

CONCLUSION

The present study showed that the European Portuguese version of the MPhD corroborates the original five-factor structure (Litalien et al., 2015). This study achieved its objectives, showing that the MPhD is a reliable and valid instrument, as the original version (Litalien et al., 2015) supports its use in European Portuguese predoctoral and doctoral students. Supporting the assumptions of SDT, the underlying theory (Deci & Ryan, 1985a, 2012), and the findings of the original version of MPhD (Litalien et al., 2015), positive associations were found between more autonomous types of regulation and positive outcomes (e.g., satisfaction with the doctoral program, self-determination), as well as between more controlled types of regulation and negative outcomes (e.g., PhD dropout probability, depressive symptoms). These results are also novel in the Portuguese context. This study will foster the development of research, assessment, and interventions that are better suited to the cultural and academic characteristics of doctoral students. Our results will also influence the prevention and intervention strategies for doctoral students with maladaptive motivation, impacting them on personal, academic, and institutional levels.

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engaging and fulfilling.

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