




# How to improve academic well-being: an analysis of the leveraging factors based on the Italian case

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## Abstract

At first glance, for those who start out in it the academic environment may seem attractive, but they soon experience the difficulties inherent in this type of career. At the same time, the academic sector is crucial to the social, cultural, and economic development of any country. Given this important role, it is fundamental for the decision makers to guarantee the best return on investment made into this sector. The good health of workers has important implications for the quality of their lives since it affects their level of productivity at work, and it is especially relevant for research programmes, where most of the work is intellectual. In the present research, we have analysed the health of workers without tenure in the Italian academic environment, i.e. PhD students and short term contract researchers, in order to understand which factors have the most relevant impact on their state of health. 699 participants (398 females, 301 males) completed an online questionnaire that included both ad hoc Likert-scales and open-ended questions. Our results, elaborated through Structural Equation Modelling and Text Mining techniques, show how researchers experience high levels of anxiety both from the characteristics of the academic environment and from the career advancement system. Specifically, both job-related factors (i.e. perception of fairness, professional growth, and safety perception) and relational factors (i.e. relationships with supervisors and colleagues) predict the anxiety of non-tenured researchers. Furthermore, women researchers show a high level of anxiety compared with male researchers. Policy implications of our findings are provided.

**Keywords** Academic policy · Academic well-being · fairness · relationships

## 1 Introduction

Do you remember when you were a young undergraduate student, and you were fascinated by research conducted in the academic field that you studied during your course? Probably this experience has inspired a lot of students, all over the world, to embark on a PhD career. In this regard, between 2013 and 2017, the number of students graduating with a doctorate increased by approximately 8% across Organization for Economic Co-operating and Development (OECD) countries, reaching 276,800 students in 2017 (OECD 2019). The desire

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for knowledge and institutional support has led to increased participation rates in the PhD production process (Robotham 2008). But in the face of strong competition to enter academia, PhD students soon understand that the research world is not all the fun and games that they had expected. There are many obstacles in their way, starting from strong competition with their colleagues as well, insufficient resources to carry out their research, difficulties in reconciling their family obligations with their work needs - all elements that cause them to wonder 'Do I deserve this position, or am I not qualified to carry out this task?'. When they ask themselves this question, usually they are alone, without adequate support from their supervisor and colleagues, and they can start to experience a sense of anxiety which increases every day and which has a negative effect on their performance at work (Geraniou 2010; Sverdlik 2019). This sad image of the PhD student has been depicted in many reports from all over the world (The Economist 2012; Philips and Heywood-Roos 2015; Schillebeeckx et al. 2013) in which the mental health of non-tenured university researchers is closely examined. For instance, in a pioneering study, (Levecque et al. 2017) found that a sizeable group of PhD students in the Netherlands experienced psychological distress, or were at risk of having or developing a common psychiatric disorder. Most prevalent were feelings of unhappiness and depression, sleeping problems due to worries, inability to overcome difficulties, and inability to enjoy day-to-day activities. Low mental health among non-tenured researchers has a considerable negative impact for research institutions and teams (Lee et al. 2015), as it creates serious financial costs for the institution and has an adverse effect on the efficacy of the larger research teams to which the individual researchers belong (Goh et al. 2015, 2016, see for example). The mental health problems described in the literature affect the well-being of PhD students, and this condition has broader repercussions for their institutions and for academia as a whole (Satinsky et al. 2021). Furthermore, several studies of PhD students' careers indicate that the dropout levels range from 30 to 50 percent, depending on the scientific discipline and country (Stubb et al. 2012). High turnover among PhD makes the academic world less attractive for new potential candidates threatening the quality of academic research (Lievens and Highhouse 2003). In view of the negative consequences of low psychological well-being among non-tenured researchers, it is important to establish what the causes are, so that effective strategies can be developed to counteract this phenomenon. On the basis of existing literature, we can classify these causes into three interrelated areas: personal, work-related, and relational. Personal factors include individual (i.e. psychological/mental) processes that affect academic work; work-related factors include job features that can represent an obstacle (i.e. job demands) or a support (i.e. job resources) at work; relational factors included the relationships network within the work context. In the present research we set out to test a predictive model of anxiety among non-tenured researchers that included both work-related and relational factors, intended to offer to the academic industry effective policy guidance in order to deal appropriately with this issue. We decided to concentrate on these two kinds of factors because with adequate policy collective action they can be improved. For relationship factors we considered two elements that were already well-documented in previous literature on the subject of well-being in academia (i.e. relationship with one's supervisor and relationship with one's colleagues). As work-related factors we examined two features that previous literature has largely overlooked, namely perception of fairness and career development. We considered that in an academic context both the perception of fairness and career development can play a central role as job resources. Perception of fairness can be defined as an unbiased and equitable treatment in the organisation, for example, in relation to the allocation and distribution of resources, and to the decision-making processes or information sharing (Colquitt and Zipay 2015). Perception of equality at work

can make a significant contribution to employees' well-being (Masagão and Ferreira 2015). Career and professional development relates to how accessible the organisation makes its criteria and the opportunities on offer within it for growth. A number of studies have demonstrated that employees present lower levels of work-related stress when career opportunities and criteria are made clearly evident (Wilson et al. 2004; Xanthopoulou et al. 2007). In such a context as academia, where merit is prioritised, the perception of equality and correctness at work and the recognition that academia facilitates professional growth can be of great benefit to researchers' mental health. In addition, in view of the spread of COVID 19 across the world, we have examined the effect on anxiety levels of employees' perception of safety at work. We found that after the first phase of the pandemic and the imposition of lockdown (i.e. confinement to home) as an effective strategy to contain and counteract the spread of the virus, many laboratories all over the world rapidly became operative again. The perception of safety at work among researchers who were obliged to work on site in spite of the spread of COVID is a subject that merits investigation. As stated above, PhD students are more likely than the rest of the population to develop common emotional disorders such as anxiety and depression. For this reason, several studies published in recent years give warnings about the mental health of PhD students. Physiological anxiety is the emotion that one feels in the face of a real or imagined threat, and has the aim of preparing us to confront it: it is characterised by a state of psychological and physical tension, sometimes almost terror (Steimer 2002). Anxiety, on the other hand, is pathological when it significantly disturbs one's psychological functioning, bringing about a limitation of the individual's ability to adapt: it is characterised by a state of uncertainty about the future, with the prevalence of unpleasant feelings (Walker et al. 1990). Anxiety can affect the quality of one's sleep, one's eating habits, one's general behaviour, one's work, social functioning, and well-being. We have chosen to investigate the presence of anxiety traits among PhD students attributable to the effect that anxiety can have on people's work and their social functioning. In our case, the consequence is a negative effect on academic performance. To sum up: in the context of policy development to improve the quality and efficacy of research, the present study set out to test the effect of job-related factors (i.e. fairness perception, professional growth, and safety perception) and relational factors (i.e. relationships with supervisors and colleagues) on the anxiety level of non-tenured researchers. In the present research, we tried to take a step further in investigating the mental health of non-tenured researchers, by combining both ad hoc Likert questionnaires and open-ended questions. We believed, in fact, that hearing directly from researchers could represent a valuable enrichment in investigating their mental health, while also giving us an opportunity to investigate problematic areas that tend to be underestimated by current researchers in the field. These findings are then discussed to reveal their implications for policy makers.

## 2 Background and related works

Although they are not the focus of the present research, a wide literature has investigated personal factors having a greater impact on precarious researchers' mental health, focusing in particular on motivation and self-efficacy. Motivation to succeed is a salient predictor of achievement and persistence in doctoral studies (e.g. Bargar and Duncan 1982; Brown and Watson 2010; Hegarty 2011; Onwuegbuzie et al. 2014). For instance, McGee et al. (2016) showed that motivation predicted the intention of engineering in continuing their PhD studies, despite the daily difficulties they can encounter. Moving to self-efficacy refers

to an individual's perceived belief in having the resources necessary to achieve desired goals (Schunk and Pajares 2009). As applied to the academic context, doctoral self-efficacy can be defined as the individuals' confidence in performing tasks related to conducting efficient research (Forester et al. 2004). Research self-efficacy significantly predicts interest in research and the production of publications (Lambie and Vaccaro 2011), and lower levels of drop-out intentions (Litalien and Guay 2015). Doctoral students with lower levels of self-efficacy can engage in self-handicapping behaviors (i.e., sabotaging their chance of success (Jones and Berglas 1978) to avoid being perceived (or perceiving themselves) as incompetent (Schwinger and Stiensmeier 2011)). One of the most frequent self-handicapping behavior among PhD students is to find an excuse (e.g., a few times) to avoid participation in competitive grants. Moving to the work-related factors, in line with the job demands-resources theory (Bakker and Demerouti 2007, 2017, JD-R theory) we can find job demands and job resources. Job demands are "physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (cognitive and emotional) effort or skills and are therefore associated with certain physiological and/or psychological costs" (Bakker and Demerouti 2007). Job demands are not negative by definition; they become job stressors when meeting those demands requires a high effort that the person cannot adequately cope with. Job resources instead are "the physical, psychological, social, or organizational aspects of the job that are functional in achieving work goals; reduce job demands and the associated physiological and psychological costs; stimulate personal growth, learning, and development" (Bakker and Demerouti 2007). In the present research, we focused on three potential job resources in academia: fairness, professional growth, and safety perception at work. A large body of occupational research has shown that perception of fairness at work includes both a comparison with objective measures (e.g., comparable rates of pay and roles with the external job market and among coworkers with similar skills and experience) and subjective considerations (e.g., feeling that one's role and pay reflect the value of one's contribution in the workplace, (Cohen and Diamant 2019; Jawahar and Stone 2011; Till and Karren 2011)). Individuals who perceive more fairness at work are more likely to be satisfied at work, less stressed and less likely to look for alternative employment options (Erdogan et al. 2012). In the organizational context, great attention has also been devoted to career and professional growth which refers to the extent to which the organization clarifies and makes available criteria and opportunities for growth (Xanthopoulou et al. 2007). Evidence has shown that when workers perceive adequate opportunities for professional development, they feel less stressed at work with low levels of burnout (Bakker et al. 2003; Sashkin 1982; Lee RT 1996). Spreading of COVID19 has increased the attention to the importance of safety perception at work. During the last decades, governments of many countries across the world (e.g., Italy, Australia, United Kingdom) have established safety training as a legal requirement for organizations. Workers informed and trained about the risks at work can put in place all the strategies finalized to make their job safer. Crucially, a recent study conducted in Brasil by da Cunha et al. (2015) has shown that safety training of workers in food area was associated with less stress at work, confirming the importance for organizations to invest in training the workers about safety policy. Among relationship factors, low support at work from both supervisors and colleagues has long been found to affect levels of anxiety of PhD (De Lange et al. 2004; Vanroelen et al. 2008, e.g.). In a Finnish study of 383 PhD students, Stubb et al. (2011) found that 56% reported the academic community as a source of burden. According to Latona and Browne (2001), PhD would desire a relationship with their supervisor characterized by precise and timely feedback, frequent meetings that include open discussion about roles and responsibilities, a supportive and collegial relationship, and encouragement

to begin working on topics of PhD interest since the beginning of their academic pathway. Numerous empirical studies have found the good fit between supervisor and supervisee predicts positive doctoral students' emotions (Chiang 2003; Cotterall 2013; McAlpine and McKinnon 2013) and academic persistence (Ives and Rowley 2005; Leijen et al. 2016; Litalien and Guay 2015; Pauley et al. 1999) (see Sverdlik et al. (2018) for a review). The relationship with colleagues holds a critical position in academia comparable to that of supervisors. PhD students undergo a process of socialization by assuming the roles of both graduate students and professionals as they become members of the academic community (Golde 1998). Collaboration among researchers is deemed essential in a professional education model, as it optimizes the socialization of doctoral students (Bourner et al. 2001; Gardner 2010; Maxwell 2003; Usher 2002). According to Austin (2009), a successful academic model encompasses social support from colleagues, frequent and honest feedback, and an exchange of ideas that is both democratic and constructive (Shacham and Od-Cohen 2009).

### *Hypotheses*

Basing on the above-mentioned literature, we tested the following hypotheses:

- H1: Fairness perception (F) has a negative effect on Anxiety (AN).
- H2: Professional and personal Growth (G) has a negative effect on Anxiety (AN).
- H3: Safety perception at work (S) has a negative effect on Anxiety (AN).
- H4: Positive Relationship with Colleagues(CO) has a negative effect on Anxiety (AN).
- H5: Positive Relationship with Supervisors (SU) has a negative effect on Anxiety (AN).

Moreover, given that previous studies have shown a higher incidence of anxiety among females compared to males (Costa et al. 2001; Egloff and Schmukle 2004; Feingold 1994), we investigated whether analogous gender disparities existed in an academic setting (H6)

## **3 Material and methods**

### **3.1 Participants**

699 participants (398 females, 301 males, mean age = 29.60 years, SD = 4.90; range: 23-65 years) completed an online questionnaire. The survey was addressed to both PhD and researchers with a temporary contract with Italian Universities, given that both live in a non-tenured situation. Participants were recruited on a voluntary basis through social networks and institutional emails of Italian universities. We were able to have respondents from all Italian regions, by granting a representation of entire Italy. Before participating in the survey, all participants gave informed consent. No compensation was provided for participating in the study.

### **3.2 Procedure**

The first section of the questionnaire aimed to assess demographic characteristics (i.e., gender, academic position). Then, participants responded to an open-ended question "If you could change something in the world of academic research, what's the first thing you would

change?”. From this question we expected respondents to express the most critical elements of the academic career. Open questions are useful to catch the opinion of respondents, as they can answer touching topics they care most about, and let them describe their experience. After the open-ended question, we used ad-hoc scales to measure safety perception at work, fairness perception, professional growth, relationship with supervisors and with colleagues. In the last section of the questionnaire, we measured the participants' anxiety with State Trait Anxiety Inventory (Spielberger et al. 1983). Safety perception at work, professional growth, fairness perception, relationship with supervisor and with colleagues were assessed through the adaptation of the Italian Work Well-being questionnaire developed by the National Authority Against Corruption (ANAC 2013). Finally, participants were debriefed.

### 3.3 Measures

*Safety perception at work* was measured with 8 items adapted from the Italian Work Well-being questionnaire (ANAC 2013). Participants rated the extent to which they agreed with items such as “I have received appropriate information and training on the risks associated with my work activity and on prevention and protection measures”. Participants responded to these statements on a five-point scale from 1 (totally disagree) to 5 (totally agree). Fairness perception was measured with 3 items adapted from the Italian Work Well-being questionnaire (ANAC 2013). Participants rated the extent to which they agreed with items such as “I believe that the workload is distributed equally among the members of my working group”. Participants responded to these statements on a five-point scale from 1 (totally disagree) to 5 (totally agree). Personal and professional growth was measured with 4 items adapted from the Italian Work Well-being questionnaire (ANAC 2013). Participants rated the extent to which they agreed with items such as “My organization stimulates the development of skills and abilities”. Participants responded to these statements on a five-point scale from 1 (totally disagree) to 5 (totally agree). Relationships with supervisors and colleagues were measured with 13 items adapted from the Italian Work Well-being questionnaire (ANAC 2013), 8 items concerned about the supervisor and 5 items concerning the colleagues. Participants rated the extent to which they agreed with items such as “My supervisor is attentive to my needs”, “I feel part of a team”. Participants responded to these statements on a five-point scale from 1 (totally disagree) to 5 (totally agree). Anxiety was measured with the 20 items of the State-Trait Anxiety Inventory (Spielberger et al. 1983). The STAI-T was designed to measure a stable propensity to experience anxiety, and tendencies to perceive stressful situations as threatening. The trait scale consists of 20 statements (e.g. “I feel tense”) that require individuals to rate how they generally feel on a four-point scale from 1 = never to 4 = always.

## 4 Results

### 4.1 Descriptive statistics

Figure 1 shows the boxplots of the items of questionnaire's scales, from which it is possible to get interesting insights of the sample of respondents. It is interesting how among our predictors we observed that the median scores of fairness perception were around 3 on a 5-point Likert, with the median of the item “I think that my work-load is adequate to my retribution”

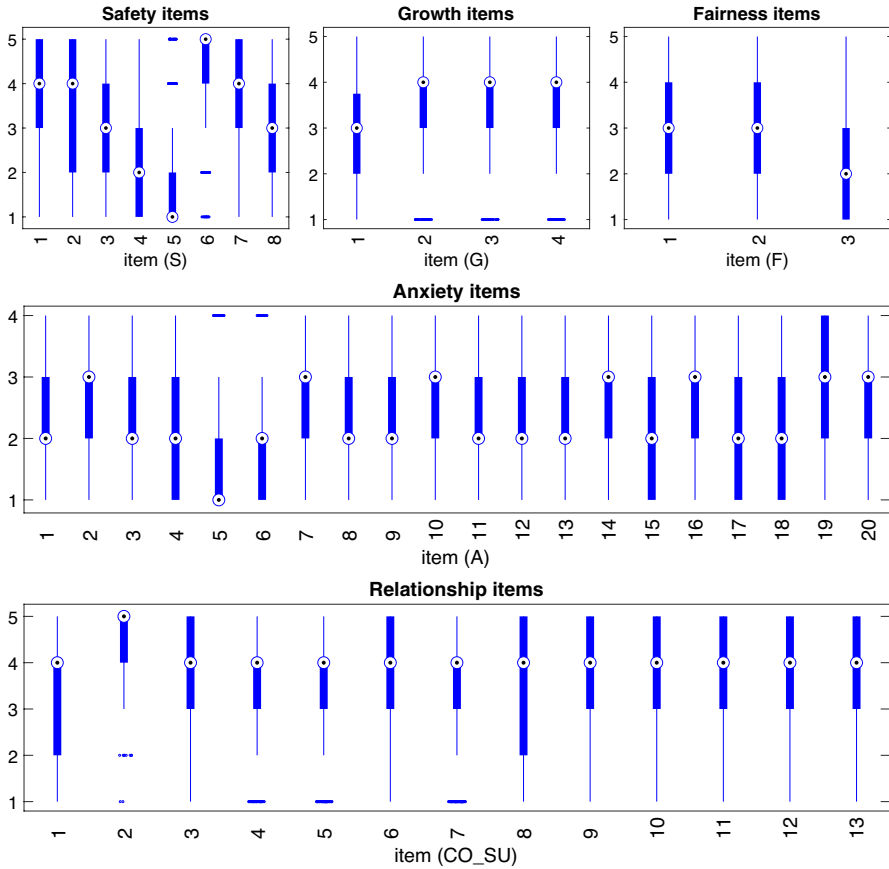


Fig. 1 Boxplots of the dataset of items by the 5 scales used in the questionnaire

that was very low (value = 2), by indicating how this topic is particularly critical in academia. Furthermore, from the boxplot emerged that participants were enough satisfied with growth and relationship with both supervisor and colleagues, given that for all these dimensions the median score was 4 on a 5-point Likert-scale. Among the predictors, the dimensions that showed the highest score was the safety perception at work (the items with a median score of 2 and 1 are reverse items) Crucially, the median scores of anxiety items were high and worrying, approximately 3 for all items on a 4-point scale (the item with a median below 3 are reverse items), indicating the presence of anxiety among our sample.

#### 4.2 Structural equation models

The concept of Structural Equation Modeling (SEM) is a linear model framework that is designed to model regression equations with latent variables. One of the distinguishing features of SEM is its ability to encompass both measurement and structural models. Specifically, the measurement model establishes a connection between observed and latent variables, while the structural model examines the relationships between endogenous variables (which can be either latent or observed) and exogenous variables (also either latent or

observed). Regression-based models are comprised of a single equation that is designed to elucidate one endogenous (dependent) variable, or alternatively, a multiequation model that examines a range of endogenous variables and their reciprocal relationships (Bollen 1989).

In our specification, we assume that there is only one endogenous latent variable (namely, anxiety) and eight exogenous latent variables. Therefore the measurement models for student  $i = 1, \dots, N$ , can be written as

$$\begin{aligned} Z_{il}^{(x)} &= \lambda_l^{(x)} \theta_i + \varepsilon_i, & \text{with } X_{il} = c & \text{ if } \gamma_{l,c-1}^{(x)} \leq Z_{il}^{(x)} \leq \gamma_{l,c}^{(x)} \\ Z_{ik}^{(y)} &= \lambda_k^{(y)} \eta_i + \varepsilon_i, & \text{with } Y_{ik} = c & \text{ if } \gamma_{k,c-1}^{(y)} \leq Z_{ik}^{(y)} \leq \gamma_{k,c}^{(y)} \end{aligned}$$

Here  $X_l$ , for  $l = 1, \dots, L$ , represent the observed categorical variables measuring the exogenous latent variables  $\theta_q$  for  $q = 1, \dots, Q$ ;  $Y_k$ , for  $k = 1, \dots, K$ , represent the observed categorical variables measuring the endogenous latent variable  $\eta$ ;  $Z_{il}^{(x)}$  and  $Z_{ik}^{(y)}$  are underlying variables linked to the observed indicators through a threshold model;  $\lambda_l^{(x)}$  and  $\lambda_k^{(y)}$  are the discrimination parameters;  $\gamma_l^{(x)}$  and  $\gamma_k^{(y)}$  are the vectors of the threshold parameters; finally,  $\varepsilon_i$  and  $\epsilon_i$  are normally distributed errors.

The structural equation model can be written as:

$$\eta_i = \beta' \theta_i + g' w_i + u_i$$

where  $\beta$  and  $g$  are vectors of regression coefficients,  $w_i$  is the vector of observed variables and  $u_i$  is a normally distributed error.

The structural component is represented in the path diagram provided in Figure 2.

### 4.3 Model summary of structural equation models (SEM)

To estimate the model, it was used the laavan library (Rosseeel 2012) in the language and environment for statistical computing R (R Core Team 2022). The evaluation was performed through the diagonally weighted least squares DWLS estimator. The number of model parameters is 226, while the number of observations is 699. A model for ordinal data has been fitted and the variables have been assumed to be orthogonal. Of course, the

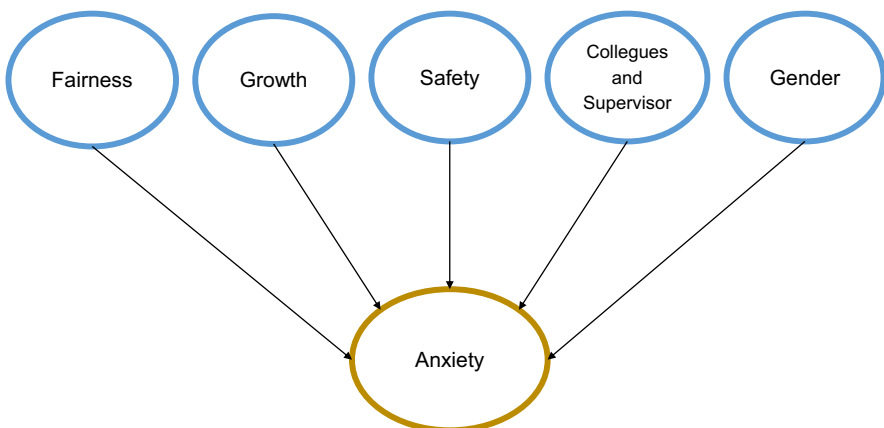


Fig. 2 Path diagram for the structural component in the proposed SEM



fit of the model would improve by eliminating this assumption. The good of fit indices used are RMSEA, CFI and TLI. In particular, RMSEA is an absolute fit index, in that it assesses how far a hypothesized model is from a perfect model, while CFI and TLI are incremental fit indices that compare the fit of a hypothesized model with that of a baseline model, that is a model with the worst fit (Xia and Yang 2019). In this case, RMSEA is equal to 0.235, CFI and TLI are equal to 0.841 (Table 1).

For the purpose of this study, SEM technique was used to examine the relation between the variables to determine the acceptance of the research hypotheses. First of all, it is important to state that all the items considered in the model explained the respective variables (see Tables 2, 3, 4, 5, 6). This study is composed of five independent variables, which are safety, growth, relationship, fairness and gender. In total, there are five hypotheses made to study the relationship of those independent variables with anxiety. It is shown in Table 1 that all hypothesis are supported.

#### 4.4 Textual analysis

Textual questions are interesting for leaving respondents free to express their opinion, but are more challenging than traditional structured questions, as they cannot be directly processed with quantitative methods. The analysis of these questions involved the usage of Text Mining Techniques. Text Mining is a toolset of techniques that allows to extract insight from textual data. Among the several techniques available, we used the ones belonging to the Bag of Words approach. In the specific case the single answers are considered as a bag of words, without order. The loss of the order and therefore the direct capability to extract the semantic meaning, enables the application of quantitative methods able to extract helpful insights from the processed data. Figure 3, is a preliminary analysis that shows the most frequently used words in the dataset of answers to the question about what the respondents would change in the academic world. The figure shows how “work”, “funds”, “phd”, “system”, “researchers”, “career” and “publications” (translated in English) are among the most used words. This figure provides insights into what many of the answers consider as the critical flaws of the Italian academic system: the current state of the academic career and resources for funding research.

On the same question, we performed further analysis, to extract what were the main discussed topics in the questions. To perform this analysis we performed a Latent Dirichlet Allocation (LDA) (Blei et al. 2003)). This methodology considers each document in the dataset as a mixture of topics. In particular, provided the number of  $k$  topics to be extracted, the method calculates the probability of each topic to be present in the dataset, the probability of each topic in each document, and the probability of each word to occur in each topic. After several trials we determined the best number of topics to be extracted is

**Table 1** Results of the SEM Regression for *Anxiety*

Regressor	Estimate	SE	z-value	$P(> z )$
Safety	-0.788	0.087	-13.526	0.000
Growth	-0.627	0.049	-12.925	0.000
Relationship	-0.440	0.032	-13.783	0.000
Fairness	-0.318	0.032	-10.071	0.000
Gender	0.199	0.059	3.366	0.001

**Table 2** Measurement model for the latent variable *Anxiety*: factor loading estimates. The question prompt the researchers to indicate how they generally feel

Id.	Item	Factor loading estimate
Factor: Anxiety		
A1	I feel pleasant	-0.916
A16	I am content	-0.915
A10	I am happy	-0.911
A3	I feel satisfied with myself	-0.738
A13	I feel secure	-0.681
A7	I am "calm, cool, and collected"	-0.667
A6	I feel rested	-0.558
A14	I make decisions easily	-0.538
A19	I am a steady person	-0.329
A9	I worry too much over something that really doesn't matter	0.533
A17	Some unimportant thought runs through my m.ind and bothers me	0.533
A4	I wish I could be as happy as others seem to be	0.601
A18	I take disappointments so keenly that I can't put them out of my mind	0.637
A11	I have disturbing thoughts	0.679
A20	I get in a state of tension or turmoil as I think over my recent concerns and interests	0.712
A12	I lack self-confidence	0.727
A8	I feel that difficulties are piling up so that I cannot overcome them	0.731
A5	I feel like a loser	0.765
A2	I feel nervous and restless	0.767
A15	I feel inadequate	0.817

All the items estimates are significant with  $p$ -value  $< 0.001$ . Items are sorted according to the factor loading estimate

4, as the results provided the best interpretability. In particular in this research we used the LDA implementation of library *quanteda* (Benoit et al. 2018) for R. Figure 4, shows the four wordcloud according to the 4 topics extracted through the LDA. Wordcloud is a useful data visualization tool in text mining to show results from textual data. The cloud of words indicates the several words present in the set, and their different size indicates the relevance of the word in the set according to some criteria. In the figure the wordclouds show the top 30 terms for the topic: bigger is their size, higher is the probability of that word to occur in the document for that topic. The results in the figure show some interesting insight of the most discussed topics by the respondents to our research. The following interpretation of topics have been integrated with a manual examination of comments presenting the topics terms:

- **Topic 1:** This topic has as most relevant terms: "researchers", "research", "funds", "phd", "projects". This topic focuses on the issue of funds for research and expresses the request of receiving more fundings to perform research and carry on researchers activities.

**Table 3** Measurement model for the latent variable *Safety*: factor loading estimates. The question prompt the respondents to indicate their agreement with the items

Id.	Item	Factor loading estimate
Factor: Safety		
S8	I feel discomfort for my daily work (intolerance, disinterest, usefulness feeling, lack of initiative, nervousness)	-0.914
S5	I am victim of harassment in term of words and behavior that threaten my dignity and that create a negative climate at work-place	-0.810
S4	I am victim of mobbing at work (e.g., extromission from decisional processes, social exclusion, extromission from information flow, unfair disparity of treatment at work, exaggerate control)	-0.721
S2	I have received adequate information and formation about hazards and risks related to my work and about measures of prevention and protection at work	0.433
S3	Ambient factors in my workplace (e.g. lighting, space, temperature, noise) are satisfying	0.435
S6	I have the possibility to take sufficient breaks at work	0.491
S1	My workplace is safe	0.575
S7	I can do my work with manageable rhythms	0.613

All the items estimates are significant with  $p$ -value < 0.001. Items are sorted according to the factor loading estimate

**Table 4** Measurement model for the latent variable *Growth*: factor loading estimates. The question prompt the respondents to indicate their agreement with the items

Id.	Item	Factor loading estimate
Factor: Growth		
G1	I think that in my organization the carrier is based only on merit	0.646
G4	The role in my organization is adequate to my professional profile	0.678
G2	My organization stimulate the development of competences and capabilities	0.746
G3	Until now I am satisfied of my professional path	0.943

All the items estimates are significant with  $p$ -value  $< 0.001$ . Items are sorted according to the factor loading estimate

**Table 5** Measurement model for the latent variable *Relationship*: factor loading estimates. The question prompt the respondents to indicate their agreement with the items

Id.	Item	Factor loading estimate
Factor: Relationship		
CO_SU2	I am available to help colleagues even if it is not part of my duties	0.402
CO_SU3	I am respected and treated with respect by colleagues	0.690
CO_SU4	In my group, anyone who has important information makes it available to everyone	0.708
CO_SU5	My unity pushes you to collaborate and work as a united team	0.776
CO_SU1	I feel part of a team	0.793
CO_SU11	My tutor can find an effective solution to problems at work	0.852
CO_SU12	My tutor treats me fairly	0.858
CO_SU9	My tutor recognizes when I do my job well	0.871
CO_SU13	I have a deep respect for my tutor	0.894
CO_SU6	My tutor helps me to understand how I can achieve my goals	0.920
CO_SU8	My tutor is attentive to my needs	0.926
CO_SU10	My tutor knows how to listen to me	0.926
CO_SU7	My tutor always manages to motivate me to give my best in my work	0.927

All the items estimates are significant with  $p$ -value  $< 0.001$ . Items are sorted according to the factor loading estimate

- **Topic 2:** This topic has as most relevant terms: “system”, “publications”, “change”, “evaluation”, “quality”, “work”, “bureaucracy”, “criteria”. This topic focuses on the desire of researchers to change the “evaluation system” of the research and publication activities in the Italian academic system.
- **Topic 3:** This topic has as most relevant terms: “work”, “contracts”, “research scholarship”, “wages”, “phd”. The relevant words of this topic indicate it focuses on the economic and contractual situations of currently employed researchers in the Italian academic system.

**Table 6** Measurement model for the latent variable *Anxiety*: factor loading estimates. The question prompt the respondents to indicate their agreement with the items

Id.	Item	Factor loading estimate
<b>Factor: Safety</b>		
F3	I think that my work-load is adequate to my retribution	0.478
F1	I think that work-loading is equally distributed among the member of my work-group	0.878
F2	I think that the responsibilities are equally distributed among the member of my work-group	0.967

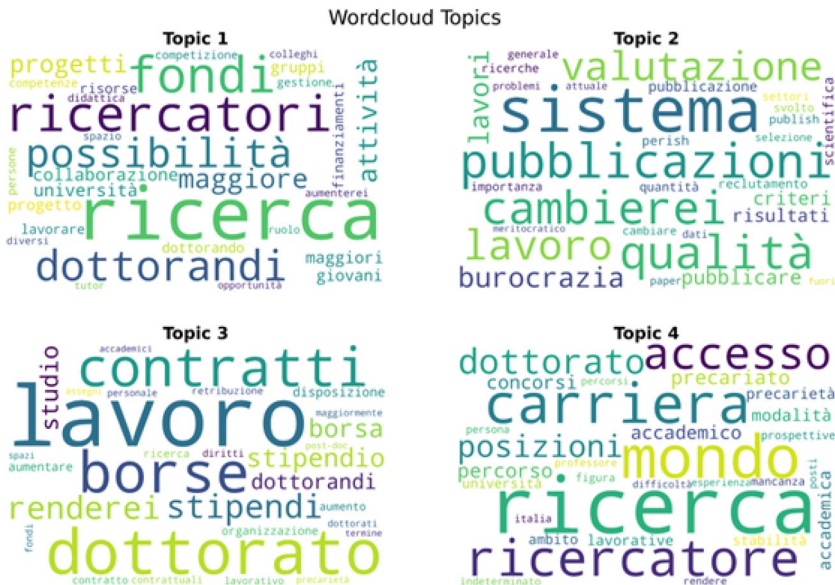
All the items estimates are significant with  $p$ -value < 0.001. Items are sorted according to the factor loading estimate



**Fig. 3** Top 20 term frequency for answers to question “If you could change something in the world of academic research, what’s the first thing you would change?”, excluding the word “ricerca” (research)

- **Topic 4:** This topic has as most relevant terms: “research”, “world”, “career”, “research”, “positions”, “non-tenured”. The relevant terms of this topic clearly indicates how this focuses on the difficulties to access the academic career and the characterization of the Italian academic system in the early stage of career of non-tenured work.

The results provided from the LDA and shown in Figure 4, provided helpful information about what are the expectations and the most relevant flaws of the academic system according to the participants of the questionnaire. The topic mainly discussed by the participants, touched on the most critical aspects of the Italian academic system, such as



**Fig. 4** Top 20 term frequency for answers to question “If you could change something in the world of academic research, what’s the first thing you would change?”, excluding the word “ricerca” (research)

the lack of funding to carry out research activities, the low wages and precariousness of PhD students and researchers in the early stage of career, and the evaluation system of researchers’ activities.

## 5 Discussion

The present research aimed to test a predictive model of anxiety of Italian non-tenured researchers, through both closed-ended questionnaires and open-ended questions. First, our **H1** that fairness perception has a negative effect on anxiety was supported. To the best of our knowledge, this is the first time that fairness perception is recognized as a predictor of anxiety among non-tenured researchers. This result is not surprising, given that studies in other organizational contexts have indicated that individuals who perceive more fairness at work are more likely to be satisfied at work, less stressed and less likely to dropout (Erdogan et al. 2012). The importance of fairness perception has been confirmed also by open-ended question, in fact; one topic was related to the evaluation system of the research and publication activities in the Italian academic system and another topic was about the difficulties to access the academic career and the characterization of the Italian academic system in the early stage of career of precarious work. Said in a nutshell, Italian non-tenured researchers seem available to make sacrifices at work, but they ask for guarantees about a meritocracy system with transparent policy about the start and the development of the career in next stages. In this regard, we can not affirm that in Italy the system is not meritocratic, but if the researchers that are the main actor of the system ask for a change in the evaluation system, the academia need to work on an efficient communication system about the policies of evaluation in Italy to make them more clear and transparent. Of course, we know that is not easy for academia to find an objective model of evaluation that

can overcome the *publish or perish* model that characterizes academia around the world, a system that risk to rewards the “significant result” finding and not the search for knowledge that should represent the drive of academia. In this regard, are surely appreciated the creation of Movements about the replicability and the transparency of science around the world. But these movements risk being ineffective, without a cultural change that involves the European institutions to find a system that awards good research and not only significant research, with implications for fairness perception. Second, another job resource that has had a negative effect on anxiety has been the perception of professional growth, confirming our **H2**. This result is particularly relevant in academia, where learning and professional growth represent the business core of work. Some topics that emerged in the open-ended question were related to professional growth: the problem of lack of funds for research, but also the problem of the economic and contractual situations of currently employed researchers in the Italian academic system. These aspects are, in fact, both essential in academia to grant researchers at an early stage the opportunity to perform their research without worrying about the necessity to find everyday funding and economic stability. It appears clear that the precariousness represents a sad plague of academia in Italy, with PhD and post-doc contracts that are temporary contact. This economic situation determines a negative spiral, where the non-tenured researchers are paid to accomplish their research but at the same time, they need to invest time and resources in finding new job opportunities given the absence of stability with the consequences that non-tenured researchers cannot dedicate completely on the research project they are working on, until they are not employed with a permanent contract. These aspects are in line with previous literature showing that a greater access to funding has further been found to correspond with higher levels of students’ overall satisfaction with their doctoral experience and lower attrition (Ali and Kohun 2006; De Valero 2001; Gururaj et al. 2010; Leijen et al. 2016). Third, results confirmed our **H3** that safety perception at work had a negative effect on anxiety. During the pandemic, the Italian government has given many guidelines to the students of primary and secondary school, with little attention devoted to the academic world, given that researchers and students of the university were considered more autonomous. Whether on one side this situation could be partially true, on the other side it has created a level of anxiety in researchers that were called to work in an emergency situation. Safety perception at work will be important also outside the pandemy, especially in some academic sectors considered more dangerous (e.g., research sector about biochemical risk). It is important for the department to communicate well about the risks and safety at work in order to make the non-tenured researchers feel they are not alone in dealing with dangers at work. Fourth, our results confirmed our **H4-5** that good relationships with both supervisors and colleagues had a negative effect on anxiety, by supporting the importance of the relationships as a crucial factor in promoting the mental well-being of non-tenured researchers. Relationships with supervisors and colleagues were highly interrelated, confirming the importance to develop an efficient model of socialization in academia that involve all stakeholders (Golde 1998; Weidman et al. 2001). In this regard it is important to put in place effective academic policies by promoting attention to personal needs by supervisors, but also a collaborative system where human resources can support each other in a positive model of socialization (Stubb et al. 2011). Making in field these strategies of socialization is difficult for academia, in fact, from one side researchers are highly invited to collaborate each other in particular to obtain national and European fundings that promote collaboration between different labs around the world, but at the same time, the competitive context of academia can represent an obstacle to this collaboration. A supportive model where the other is seen as a resource and not an enemy represents a challenging aim

for academia in Italy, and only a cultural change can help to promote a collaborative system within the own lab and among different labs. Investing in a collaborative system is essential to reduce anxiety among researchers and to promote their mental well-being with important practical implications for academia as a whole. In this regard, Stubb et al. (2011) found that among 669 Finnish doctoral students, those who perceived their scholarly community as integrative, empowering, and inspiring reported better overall well-being (e.g., lower anxiety, exhaustion, isolation) as well as greater interest in their studies and better engagement with their department. An ancillary result of the present research regarded the gender difference in anxiety, with higher levels of anxiety among female non-tenured researchers than male non-tenured researchers (H6). This result is in line with literature showing a greater level of anxiety among females rather than males (Costa et al. 2001; Feingold 1994), especially where anxiety is assessed with explicit measures as in the case of the present research (Egloff and Schmukle 2004). These gender differences deserve great attention from institutions in order to promote gender equality in academic research. We have not explored the reasons for these gender differences, we can speculate that it can be due to the difficulties to combine work needs with family needs, but also the difficulties to be recognized for females as scientists, a problem that mirrors gender stereotypes that are still present nowadays. Future studies are needed to investigate whether there are gender differences affecting academic well-being, considering that anxious traits are greater in females than in males. We would like to underline, however, that levels of anxiety are high also among males, by indicating that the anxiety goes beyond gender. It is possible that with implicit measures of anxiety, gender differences would be less accentuated. Future studies could verify this possibility.

## 6 Conclusion

Italian non-tenured researchers live stressful situations with high levels of anxiety. The combination of standard questionnaires and open-ended questions in our study provides useful insights for decision making institutions to arrange policies in order to reduce anxiety at work. The key policy implication of our findings is to put the researchers well being as a goal on the agenda of academic policies. From our research emerged the need to create a healthier workplace by working on the creation of positive and collaborative relationships with supervisors and colleagues, by communicating in a transparent way about the procedures of access and growth in academia, and by investing on safety perception but also on funding and salary. These policies are important for academic world given that high levels of anxiety among researchers can increase the degree of turnovers with an economic impact for research institutions and the functioning of the research team (see e.g. Lee et al. 2015; Goh et al. 2015, 2016). We wish to acknowledge the potential limitations of our results. The first pertains to the interpretation of our study findings. The present cross-sectional dataset is limited in its ability to establish causality. An alternative interpretation of the findings could suggest that non-tenured researchers who experience mental health issues may be more inclined to report negative evaluations of their environmental conditions. Nevertheless, previous research within the domain of occupational health has identified a considerable number of studies that examine causal links between organizational factors and the onset of mental health problems. This body of literature provides support for the notion that the work environment may be partially responsible for the prevalence of mental health problems observed in the current study. Furthermore, the study is subject to



limitations related to possible respondent auto-selection processes. Although the questionnaire was sent via institutional email, it is conceivable that non-tenured researchers who are living in problematic situations may be more motivated to complete the questionnaire. However, the large number of respondents and the concise cover story regarding the aim of the research help to mitigate this risk and give us confidence in the robustness of the results. Finally, another limitation is that we have not considered a control group. However, in the present research, we were not interested in having a comparison among non-tenured researchers and other professions, rather we were interested in testing a predictive model of anxiety which can allow identifying critical areas of intervention for institutions and university stakeholders. Our findings are in line with previous studies in the literature. Future studies may consider a gender comparison, as mentioned above, and a confrontation with a group of subjects unrelated to the academic world.

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## Declarations

**Conflict of interest** The authors have no relevant financial or non-financial interests to disclose.

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## References

- Ali, A., Kohun, F.: Dealing with isolation feelings in IS doctoral programs. *Int. J. doctoral stud.* **1**(1), 21–33 (2006). [10.28945/58](https://doi.org/10.28945/58)
- ANAC. Modelli per la realizzazione di indagini sul benessere organizzativo, sul grado di condivisione del sistema di valutazione e sulla valutazione del superiore gerarchico. Retrieved from <http://www.anticorruzione.it/portal/public/classic/home/RisultatoRicerca?id=ed0d622e0a77804266c291bc669a1d05> & (Accessed on 2022-11-14) (2013)
- Austin, A.E.: Cognitive apprenticeship theory and its implications for doctoral educational case example from a doctoral program in higher and adult education. *Int. J. Acad. Develop.* **14**(3), 173–183 (2009). <https://doi.org/10.1080/13601440903106494>
- Bakker, A., Demerouti, E.: The job demands-resources model: state of the art. *J. Manage. Psychol.* **22**(3), 309–328 (2007). <https://doi.org/10.1108/02683940710733115>
- Bakker, A., Demerouti, E., Schaufeli, W.: Dual processes at work in a call centre: an application of the job demands-resources model. *Eur. J. Work Org. Psychol.* **12**(4), 393–417 (2003). <https://doi.org/10.1080/13594320344000165>
- Bakker, A.B., Demerouti, E.: Job demands-resources theory: taking stock and looking forward. *J. Occupation. Health Psychol.* **22**(3), 273–285 (2017). <https://doi.org/10.1037/ocp0000056>


- Bargar, R.R., Duncan, J.K.: Cultivating creative endeavor in doctoral research. *J. Higher Educ.* **53**(1), 1–31 (1982). <https://doi.org/10.2307/1981536>
- Benoit, K., Watanabe, K., Wang, H., Nulty, P., Obeng, A., Müller, S., Matsuo, A.: *quanteda*: an R package for the quantitative analysis of textual data. *J. OpenSource Softw.* **3**, 774 (2018). <https://doi.org/10.21105/joss.00774>
- Blei, D.M., Ng, A.Y., Jordan, M.I.: Latent dirichlet allocation. *J. Mach. Learn. Res.*, **3**, 993–1022. <https://doi.org/10.5555/944919.944937> (2003)
- Bollen, K.A.: *Structural Equations with latent Variables*. John Wiley & Sons, Oxford, England (1989). <https://doi.org/10.1002/9781118619179>
- Bourner, T., Bowden, R., Laing, S.: Professional doctorates in England. *Stud. Higher Educ.* **26**(1), 65–83 (2001). <https://doi.org/10.1080/03075070124819>
- Brown, L., Watson, P.: Understanding the experiences of female doctoral students. *J. Further Higher Educ.* **34**(3), 385–404 (2010). <https://doi.org/10.1080/0309877X.2010.484056>
- Chiang, K.-H.: Learning experiences of doctoral students in UK universities. *Int. J. Sociol. Soc. Policy* (2003). <https://doi.org/10.1108/01443330310790444>
- Cohen, A., Diamant, A.: The role of justice perceptions in determining counterproductive work behaviors. *Int. J. Human Resource Manage.* **30**(20), 2901–2924 (2019). <https://doi.org/10.1080/09585192.2017.1340321>
- Colquitt, J.A., Zipay, K.P.: Justice, fairness, and employee reactions. *Ann. Rev. Org. Psychol. Org. Behav.* **2**(1), 75–99 (2015). <https://doi.org/10.1146/annurev-orgpsych-032414-111457>
- Costa, P.T., Jr., Terracciano, A., McCrae, R.R.: Gender differences in personality traits across cultures: robust and surprising findings. *J. Personal. Soc. Psychol.* **81**(2), 322 (2001). <https://doi.org/10.1037/0022-3514.81.2.322>
- Cotterall, S.: More than just a brain: Emotions and the doctoral experience. *Higher Educ. Res. Develop.* **32**(2), 174–187 (2013). <https://doi.org/10.1080/07294360.2012.680017>
- da Cunha, D.T., Cipullo, M.A.T., Stedefeldt, E., de Rosso, V.V.: Food safety knowledge and training participation are associated with lower stress and anxiety levels of Brazilian food handlers. *Food Control* **50**, 684–689 (2015). <https://doi.org/10.1016/j.foodcont.2014.10.012>
- De Lange, A., Taris, T., Kompier, M., Houtman, I., Bongers, P.: Work characteristics and psychological well-being. Testing normal, reversed and reciprocal relationships within the 4-wave SMASH study. *Work Stress* **18**(2), 149–166. <https://doi.org/10.1080/02678370412331270860> (2004)
- De Valero, Y.F.: Departmental factors affecting time-to-degree and completion rates of doctoral students at one land-grant research institution. *J. Higher Educ.* **72**(3), 341–367 (2001). <https://doi.org/10.2307/2649335>
- Egloff, B., Schmukle, S.C.: Gender differences in implicit and explicit anxiety measures. *Personal. Individ. Differ.* **36**(8), 1807–1815 (2004). [https://doi.org/10.1016/s0191-8869\(02\)00391-4](https://doi.org/10.1016/s0191-8869(02)00391-4)
- Erdogan, B., Bauer, T.N., Truxillo, D.M., Mansfield, L.R.: Whistle while you work: a review of the life satisfaction literature. *J. Manage.* **38**(4), 1038–1083 (2012). <https://doi.org/10.1177/0149206311429379>
- Feingold, A.: Gender differences in personality: a meta-analysis. *Psychol. Bull.* **116**(3), 429 (1994). <https://doi.org/10.1037/0033-2909.116.3.429>
- Forester, M., Kahn, J.H., Hesson-McInnis, M.S.: Factor structures of three measures of research self-efficacy. *J. Career Assess.* **12**(1), 3–16 (2004). <https://doi.org/10.1177/1069072703257719>
- Gardner, S.K.: Keeping up with the Joneses: socialization and culture in doctoral education at one striving institution. *J. Higher Educ.* **81**(6), 658–679 (2010). <https://doi.org/10.1353/jhe.2010.0013>
- Geraniou, E.: The transitional stages in the PhD degree in mathematics in terms of students' motivation. *Educ. Stud. Math.* **73**(3), 281–296 (2010). <https://doi.org/10.1007/s10649-009-9205-1>
- Goh, J., Pfeffer, J., Zenios, S.A.: The relationship between workplace stressors and mortality and health costs in the United States. *Manag. Sci.* **62**(2), 608–628 (2016). <https://doi.org/10.1287/mnsc.2014.2115>
- Goh, J., Pfeffer, J., Zenios, S.A., Rajpal, S.: Workplace stressors & health outcomes: Health policy for the workplace. *Behav. Sci. Policy* **1**(1), 43–52 (2015). <https://doi.org/10.1353/bsp.2015.0001>
- Golde, C.M.: Beginning graduate school: explaining first-year doctoral attrition *New Directions Higher Educ.* **101**, 55–64 (1998). <https://doi.org/10.1002/he.10105>
- Gururaj, S., Heilig, J.V., Somers, P.: Graduate student persistence: evidence from three decades. *J. Student Financial Aid* **40**(1), 31–46 (2010). <https://doi.org/10.55504/0884-9153.1030>
- Hegarty, N.: Adult learners as graduate students: underlying motivation in completing graduate programs. *J. Continuing Higher Educ.* **59**(3), 146–151 (2011). <https://doi.org/10.1080/07377363.2011.614883>
- Ives, G., Rowley, G.: Supervisor selection or allocation and continuity of supervision: Ph. D. students' progress and outcomes. *Studies Higher Educ.* **30**(5), 535–555 (2005). <https://doi.org/10.1080/0307507050249161>

- Jawahar, I., Stone, T.H.: Fairness perceptions and satisfaction with components of pay satisfaction. *J. Manage. Psychol.* (2011). <https://doi.org/10.1108/02683941111124836>
- Jones, E.E., Berglas, S.: Control of attributions about the self through self-handicapping strategies: The appeal of alcohol and the role of underachievement. *Personal. Soc. Psychol. Bull.* **4**(2), 200–206 (1978). <https://doi.org/10.1177/01461672780040020>
- Lambie, G.W., Vaccaro, N.: Doctoral counselor education students' levels of research self-efficacy, perceptions of the research training environment, and interest in research. *Counsel. Educ. Supervis.* **50**(4), 243–258 (2011). <https://doi.org/10.1002/j.1556-6978.2011.tb00122.x>
- Latona, K., Browne, M.: Factors associated with completion of research higher degrees. Higher Educ. Div. Depart. Educ. Train. Youth Affairs, Canberra, ACT (2001)
- Lee, Y.-N., Walsh, J.P., Wang, J.: Creativity in scientific teams: unpacking novelty and impact. *Res. Policy* **44**(3), 684–697 (2015). <https://doi.org/10.1016/j.respol.2014.10.007>
- Lee, R.T., A.B.: A meta-analytic examination of the correlates of the three dimensions of job burnout. *J. Appl. Psychol.* **81**(2), 123–133 (1996). <https://doi.org/10.1037/0021-9010.81.2.123>
- Leijen, A., Lepp, L., M., R.: Why did I drop out? Former students' recollections about their study process and factors related to leaving the doctoral studies. *Stud. Contin. Educ.* **38**(2), 129–144 (2016). <https://doi.org/10.1080/0158037X.2015.1055463>
- Levecque, K., Anseel, F., De Beuckelaer, A., Van der Heyden, J., Gisle, L.: Work organization and mental health problems in PhD students. *Res. Policy* **46**(4), 868–879 (2017). <https://doi.org/10.1016/j.respol.2017.02.008>
- Lievens, F., Highhouse, S.: The relation of instrumental and symbolic attributes to a company's attractiveness as an employer. *Person. Psychol.* **56**, 75–102 (2003). <https://doi.org/10.1111/j.1744-6570.2003.tb00144.x>
- Litalien, D., Guay, F.: Dropout intentions in PhD studies: a comprehensive model based on interpersonal relationships and motivational resources. *Contemp. Educ. Psychol.* **41**, 218–231 (2015). <https://doi.org/10.1016/j.cedpsych.2015.03.004>
- Masagão, V.D.C., Ferreira, M.C.: The impact of organizational justice on employee well-being: a study with retail workers. *Rev. Psicol., Organ. Trab.* [online] , **15**(1), 08-18 (2015). <https://doi.org/10.17652/rpot/2015.1.327>
- Maxwell, T.: From first to second generation professional doctorate. *Stud. Higher Educ.* **28** (2003). <https://doi.org/10.1080/03075070309292>
- McAlpine, L., McKinnon, M.: Supervision---the most variable of variables: student perspectives. *Stud. Contin. Educ.* **35**(3), 265–280 (2013). <https://doi.org/10.1080/0158037X.2012.746227>
- McGee, E.O., White, D.T., Jenkins, A.T., Houston, S., Bentley, L.C., Smith, W.J., Robinson, W.H.: Black engineering students' motivation for PhD attainment: passion plus purpose. *J. Multicultural Educ.* **10**, 167–193 (2016). <https://doi.org/10.1108/jme-01-2016-0007>
- OECD (2019). Education at a glance:organisation for economic co-operation and development. <https://doi.org/10.1787/cf3c1241-en>
- Onwuegbuzie, A., Rosli, R., Ingram, J., Frels, R.: A critical dialectical pluralistic examination of the lived experience of select women doctoral students. *Qualit. Rep.* **19**, 1–35 (2014). <https://doi.org/10.46743/2160-3715/2014.1283>
- Pauley, R., Cunningham, M., Toth, P.: Doctoral student attrition and retention: a study of a non-traditional Ed.D. Program. *J. College Student Retent. Res. Theory Pract.* **1**(3), 225–238 (1999). <https://doi.org/10.2190/RAWM-HXTB-M72D-1FFH>
- Philips, S., Heywood-Roos, S.: Job security for early career researchers is a significant factor in helping research make an impact. Retrieved from (2015). <http://blogs.lse.ac.uk/impactofsocialsciences/2015/06/30/earlycareer-paths-of-doctorate-holders-esf-pilot/> (Accessed: 2023-02-10)
- R Core Team, R: A language and environment for statistical computing [Computer software manual]. Vienna, Austria. Retrieved from <https://www.R-project.org/> (2022)
- Robotham, D.: 12). Stress among higher education students: towards a research agenda. *Higher Educ.* **56**, 735–746 (2008). <https://doi.org/10.1007/s10734-008-9137-1>
- Rosseel, Y.: lavaan: an R package for structural equation modeling. *J. Stat. Softw.* **48**(2), 1–36 (2012). <https://doi.org/10.18637/jss.v048.i02>
- Sashkin, M.: WORK REDESIGN JR Hackman and GR Oldham Reading, MA: Addison-Wesley, 1980, xxvii+ 330 pp. *Group and Organization Studies* **7**(1), 121–124 (1982). <https://doi.org/10.1177/105960118200700110>
- Satinsky, E., Kimura, T., Kiang, M., Abebe, R., Cunningham, S., Lee, H., Tsai, A.: Systematic review and meta-analysis of depression, anxiety, and suicidal ideation among Ph.D. students. *Sci. Rep.* **11**. <https://doi.org/10.1038/s41598-021-93687-7> (2021, 07)

- Schillebeeckx, M., Maricque, B., Lewis, C.: The missing piece to changing the university culture. *Nat. Biotechnol.* **31**, 938–941 (2013). <https://doi.org/10.1038/nbt.2706>
- Schunk, D.H., Pajares, F.: Self-efficacy theory. In: Wentzel KR, Wigfield A (eds) *Handbook of Motivation at School*, pp. 35–53 (2009). <https://doi.org/10.4324/9781315773384-9>
- Schwinger, M., Stiensmeier, J.: Prevention of self-handicapping—the protective function of mastery goals. *Learn. Individual Differ.* **21**. <https://doi.org/10.1016/j.lindif.2011.09.004> (2011, 12)
- Shacham, M., Od-Cohen, Y.: Rethinking PhD learning incorporating communities of practice. *Innov. Educ. Teach. Int.* **46**, 279–292 (2009). <https://doi.org/10.1080/14703290903069019>
- Speilberger, C.D., Gorsuch, R., Lushene, R., Vagg, P.R., Jacobs, G.A.: *Manual for the state-trait anxiety inventory [Computer software manual]*. Press, Palo Alto, CA (1983)
- Steimer, T.: The biology of fear- and anxiety-related behaviors. *Dialogues Clin. Neurosci.* **4**, 231–249 (2002). <https://doi.org/10.31887/DCNS.2002.4.3/tsteimer>
- Stubb, J., Pyhältö, K., Lonka, K.: Balancing between inspiration and exhaustion: PhD students' experienced socio-psychological well-being. *Stud. Contin. Educ.* **33**, 33–50 (2011). <https://doi.org/10.1080/0158037X.2010.515572>
- Stubb, J., Pyhältö, K., Lonka, K.: The Experienced meaning of working with a PhD thesis. *Scand. J. Educ. Res.* **56**, 439–456. <https://doi.org/10.1080/00313831.2011.599422> (2012, 08)
- Sverdlík, A.: *A comprehensive evaluation of the doctoral experience: exploring PhD students' socialization, motivation, and well-being [Computer software manual]*. McGill University, Canada (2019)
- Sverdlík, A., Hall, N.C., McAlpine, L., Hubbard, K.: The PhD experience: a review of the factors influencing doctoral students' completion, achievement, and well-being. *Int. J. Doctor. Stud.* **13**, 361–388 (2018). <https://doi.org/10.28945/4113>
- The Economist . The disposable academic. Retrieved from <http://www.economist.com/node/17723223?storyid=17723223> (Accessed on 2022-11-14) (2012)
- Till, R.E., Karren, R.: Organizational justice perceptions and pay level satisfaction. *J. Manage. Psychol.* **26**, 42–57 (2011). <https://doi.org/10.1108/02683941111099619>
- Usher, R.: A diversity of doctorates: Fitness for the knowledge economy? *Higher Educ. Res. Develop.* **21**, 143–153 (2002). <https://doi.org/10.1080/07294360220144060>
- Vanroelen, C., Levecque, K., Louckx, F.: (08). Psychosocial working conditions and self-reported health in a representative sample of wage-earners: a test of the different hypotheses of the Demand- Control-Support-Model. *Int. Arch. Occupat. Environ. Health* **82**, 329–42 (2008). <https://doi.org/10.1007/s00420-008-0340-2>
- Walker, H.K., Hall, W.D., Hurst, J.W.: *Clinical Methods: The History, Physical, and Laboratory Examinations*. Butterworths (1990)
- Weidman, J.C., Twale, D.J., Stein, E.L.: Socialization of graduate and professional students in higher education: a perilous passage? ASHE-ERIC higher education report. *Jossey-Bass Higher Adult Educ. Ser.* **28**(3), 719–719 (2001). <https://doi.org/10.1080/00221546.2003.11780868>
- Wilson, M.G., Dejoy, D.M., Vandenberg, R.J., Richardson, H.A., Mcgrath, A.L.: Work characteristics and employee health and well-being: test of a model of healthy work organization. *J. Occupat. Org. Psychol.* **77**(4), 565–588 (2004). <https://doi.org/10.1348/0963179042596522>
- Xanthopoulou, D., Bakker, A.B., Dollard, M.F., Demerouti, E., Schaufeli, W.B., Taris, T.W., Schreurs, P.J.: When do job demands particularly predict burnout? The moderating role of job resources. *J. Manage. Psychol.* (2007) <https://doi.org/10.1108/02683940710837714>
- Xia, Y., Yang, Y.: RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: the story they tell depends on the estimation methods. *Behav. Res. Methods* **51**(1). <https://doi.org/10.3758/s13428-018-1055-2> (2019)

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