

## A brief and sound assessment of the Big Five Personality Factors at work: The Revised Portuguese Big Five Mini-Markers

Nuno Rodrigues <sup>1,2</sup>, Teresa Silva <sup>1</sup> & Ricardo Nóbrega <sup>1</sup>

<sup>1</sup> Faculty of Arts and Humanities, Department of Psychology, University of Madeira, Funchal, Portugal

<sup>2</sup> University Research Centre in Psychology, Madeira Unit (CUIP-Uma), Funchal, Portugal

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**Abstract:** The *Big Five Mini-Markers* is a short inventory of the five factors of personality that demonstrates a high degree of psychometric robustness compared to alternative short forms. This paper revises the previous Portuguese version by focusing on the organizational context, using two independent occupational samples ( $n = 265$  and  $n = 212$ ). Furthermore, it addresses the main shortcoming of the previous version, i.e. the inclusion of only 31 personality items instead of the original English form's 40 items. Current research efforts have extended the Portuguese version to match the length of the original form and have provided supporting evidence for its validity and reliability. Moreover, the results regarding criteria-related validity showed that the Big Five, as assessed by the revised version (*Mini-Markers-P*, see Appendix), account for a significant portion of the variance in thriving at work and of its subdimensions of learning and vitality. The main implications for assessing personality in the workplace are discussed.

**Keywords:** *Personality; Five-factor model; Work thriving; Validity; Reliability; Factor structure.*

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Personality represents a critical psychological domain that shapes individuality and impacts multiple domains of life (i.e. academic, work, health and other social areas) across economies and cultural contexts (Stanek & Ones, 2023). It refers to a spectrum of dispositional attributes that translate into enduring individual differences in basic tendencies to think, feel and behave (Ones et al., 2005; Stanek & Ones, 2018), which play a significant role in driving human performance and well-being in achievement domains, including in the academic and organizational contexts (Anglim et al., 2020; Mammadov, 2022; Salgado et al., 2020). The five-factor model, or simply the Big Five, represents the most accepted and supported taxonomy across cultures (Bainbridge et al., 2022; Goldberg, 1992), for mapping and assessing the individual dispositions that form the meso level of the hierarchical structure of personality traits (see Stanek & Ones, 2018; 2023). It includes the factors of conscientiousness (i.e. achievement orientation, dependability, orderliness), emotional stability (i.e. calmness, self-confidence, psychological adjustment), extraversion (i.e. sociability, surgency, assertiveness), agreeableness (i.e. likeability, empathy, friendliness) and openness to experience (i.e. intellect, curiosity, unconventionality). Similarly, the Big Five represent the personality framework predominantly employed in the literature to theorize and empirically assess the role of individual basic tendencies in predicting distal individual outcomes that form one's life biography and personal growth (Bainbridge et al., 2022; McCrae & Suttin, 2018; Rodrigues et al., 2024).

In the workplace, which is the scope of this paper, substantial empirical evidence has mapped cognitive ability and personality, as operationalized by the five-factor model, among the most robust predictors of key work outcomes, such as job performance, satisfaction and well-being (Anglim et al., 2020; Salgado et al., 2020; Rodrigues & Rebelo, 2022, 2023; Wilmot & Ones, 2021). In addition to emerging as valid predictors of these criteria, meta-analytic research has shown that, depending on the focal job outcome, some of the Big Five generalize their validity across jobs and occupational groups. Specifically for performance criterion, conscientiousness is the personality factor that makes the stronger and non-redundant (with cognitive ability) contribution to predicting overall job performance across jobs and organizations (see Salgado et al., 2020; Wilmot & Ones, 2021). Findings regarding the validity of the other Big Five presented a more nuanced picture, as it depends on the type of occupation and the respective level of job complexity, indicating that conscientiousness should be paired with a measure of another Big Five, depending on the occupational group, to maximize validity (Wilmot & Ones, 2021). According to this logic, agreeableness should be considered alongside conscientiousness when selecting personnel for healthcare occupations because it has emerged as a relevant predictor of performance within this occupational group. Emotional stability holds that status for skilled, semi-skilled, and law enforcement occupations,

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<sup>1</sup> Correspondence address: Nuno Rodrigues, Departamento de Psicologia, Universidade da Madeira, Campus Universitário da Penteadá, 9020-105, Funchal. E-mail: [nuno.rodrigues002@gmail.com](mailto:nuno.rodrigues002@gmail.com)

extraversion for sales and management occupations, whereas openness predicts performance only in high complexity jobs, e.g. professionals' occupations. In addition to emerging as valid predictors of job performance, the big five represent important drivers of job satisfaction and well-being at work (Rodrigues & Rebelo, 2022; Salgado et al., 2020), with meta-analytic data supporting a prominent contribution of neuroticism, extraversion, and conscientiousness when global well-being (averaged psychological and subjective well-being measures) is taken as the focal criterion (see Anglim et al., 2020).

This body of research illustrates the recognized critically of the Big Five at work (Bainbridge et al., 2022; Rodrigues & Rebelo, 2023, Salgado et al., 2020) and justifies the efforts made in the development and validation of several Big Five instruments suitable for applied settings, including the *Big Five Mini-Markers*, or simply the *Mini-Markers* (Saucier, 1994). The current paper aims to contribute to the revision and improvement of the Portuguese version of this instrument, previously developed by Rodrigues and Rebelo (2024) in the context of higher education. The focus on this Big Five measure is the result of its acknowledged advantages in terms of brevity of administration and psychometric soundness (Saucier 1994; Thompson, 2008), as further developed in the next section.

To this end, two independent studies were conducted to fulfil the three main phases of validation of psychological measures, as recommended by the *Standards of Educational and Psychological Testing* (AERA, 2014). Thus, in the scope of the first phase (i.e. substantive validation phase) the content validity of this instrument for occupational settings was assessed, followed by the study of its psychometric properties in terms of its factorial structure and reliability (i.e. structural validation phase). Finally, empirical evidence was also gathered to examine its criteria-related validity (i.e. the external validation phase), using the construct of thriving at work as the focal criterion, which is defined as a psychological state that captures the joint experience of employee's learning and vitality at work (Spreitzer et al., 2005; Porath et al., 2012). Accordingly, to thrive and prosper workers must perceive an increase in their job knowledge acquisition and skill building to perform their job roles optimally, coupled with a sense of energy, enthusiasm and aliveness in the organization (Spreitzer et al., 2005; Porath et al., 2012). This work outcome has received a great deal of attention in recent literature due to the growing recognition of its role in sustaining optimal levels of employee performance and well-being (Goh et al., 2021; Rodrigues & Rodrigues, 2023). Accordingly, meta-analytic evidence shows that thriving employees achieve higher levels of task and creative performance, as well as of job satisfaction, commitment and subjective health, while tending to report lower levels of burnout and reduced intentions to leave the organization (see Kleine et al., 2019).

Recent research efforts have considered the personality traits, including the Big Five, as key personal antecedents of this construct (Goh et al., 2021; Liu et al., 2021), with preliminary evidence suggesting that conscientiousness represents a positive and meaningful predictor of this criterion (see Liu et al., 2021), yet the literature remains uninformative about the contributions of the remaining Big Five factors. Hence, in addition to revising the adequacy of the Portuguese version of the *Big Five Mini-Markers* (Saucier, 1994) for the occupational context, the current study intends to further contribute to literature by focusing on the contribution of the Big Five model for predicting thriving at work.

### **Psychometric strengths of the *Big Five Mini-Markers***

The original version of the *Mini-Markers* is a 40-item English's abbreviated form of Goldberg's (1992) 100-item *Trait Descriptive Adjectives* (TDA) measure of unipolar adjective markers, that assesses the phenotypic personality traits based on the five-factor model. This short version was developed under the premise that the Big Five factor structure can be consistently captured and reliably reproduced across samples, by a relatively small number of focal adjectives, carefully selected as trait markers, i.e. with the ability to describe and capture the prototypical trait characteristics of each personality factor within a given language lexicon (Goldberg, 1992; Saucier 1994; Thompson, 2008). By using adjectives instead of full item sentences, the *Big Five Mini-Markers* outperforms alternative and well-established Big Five instruments, like the *NEO Personality Inventory - Revised* (240-items, NEO-PI-R, Costa & McCrae, 1992, average approx. administration time of 45 minutes), the *NEO Five-Factor Inventory* (60-item NEO-FFI, Costa & McCrae, 1992, average administration time of 15 minutes), in maximizing the brevity of administration without losing psychometric adequacy (most subjects complete the *Mini-Markers* in 4-5 minutes). These advantages help to explain the widespread use of the *Mini-Markers* and other abbreviated measures of the Big Five, especially in occupational settings (see Ellen et al., 2022), where respondents' time and availability tend to be particularly limited.

However, as emphasized in the literature, these advantages may be coupled with relevant shortcomings, as brief personality instruments may suffer from reduced reliability and validity, due to content deficiency and attenuation effects, increasing Type I and Type II error rates, as happens with short measures for assessing other psychological constructs (Credé et al., 2012). Recently, a meta-analysis conducted by Ellen et al. (2022), focusing on the business research literature, assessed whether and to what

extent a set of five short versions of established measures of the Big Five, including the *Mini-Markers*, suffer from these limitations. The other four selected short forms included: a) the short 20-item version of the 50-item *International Personality Item Pool* (Goldberg et al., 2006), i.e. the *Mini-IPIP*, Donnellan et al. (2006); b) the short 10-item version of the 44-item of the *Big Five Inventory* (John et al., 1991), i.e. the *BFI-10*, Rammstedt and John (2007); c) the *Ten-Item Personality Inventory*, i.e. the *TIPI*, Gosling et al. (2003), based on the Goldberg (1992) and John et al. (1991) big five instruments; and d) the 30-item pairs *Brief Big-Five Bipolar Markers*, developed by Shafer (1999), based on the unipolar adjectives of Goldberg (1992) and related work.

The results reported by these authors depicted a rather promising picture for the *Mini-Markers*. Specifically, it was used in a greater number of primary studies compared to the remaining four short scales, and the corrected average validity estimates for the Big Five (as assessed by this instrument) were approximately the same as those reported in previous meta-analyses for the associations of existing and larger Big Five measures with meaningful work criteria, such as the performance dimensions of task and citizenship performance. For example, considering the factor of conscientiousness, the best predictor of personality, the estimate obtained with studies using the *Mini-Markers* for predicting task performance was of  $\rho = .24$  ( $k = 17$ ,  $N = 3,132$ ), which converges with the effect size of  $\rho = .20$  ( $k = 45$ ,  $N = 8,083$ ) reported in the Hurtz and Donovan (2000) meta-analysis. For citizenship performance, the correspondent validity estimate for conscientiousness, as measured by the *Mini-Markers*, was the same ( $\rho = .18$ ,  $k = 10$ ,  $N = 1,543$ ) as that in the Chiaburu et al. (2011) meta-analysis ( $\rho = .18$ ,  $k = 71$ ,  $N = 14,355$ ). Furthermore, the *Mini-Markers* showed internal consistency estimates comparable to the respective longer version, meeting or exceeding the  $\alpha = .80$  standard for all the five factors, except for openness to experience with a point estimate of  $\alpha = .77$ .

In summary, extant research suggests that, despite its brevity, the *Mini-Markers* preserves rather acceptable levels of psychometric soundness, in terms of sub-scale reliability, criterion-related validity (Ellen et al., 2022) and orthogonality (Saucier, 1994), justifying the efforts to further examining the appropriateness of its Portuguese version for other achievement contexts, such as organizational settings. As mentioned above, the initial Portuguese version of the *Big Five Mini-Markers* and the preliminary examination of its psychometric properties was carried out by Rodrigues e Rebelo (2024) in the academic context, with a sample of 673 university students. The results reported by the authors supported some of the aforementioned strengths for the Portuguese version, in terms of its factorial structure convergence, reliability and validity to predict academic performance. Specifically, the authors have provided evidence supporting its five-factor structure, the orthogonality of its five subscales and levels of internal consistency equivalent to those reported by Saucier (1994) with the original version, ranging from  $\alpha = .72$  for emotional stability to  $\alpha = .81$  for conscientiousness. In terms of criterion-related validity, the reported evidence was consistent with previous meta-analyses (Mammadov, 2022; Vedel, 2014) showing that conscientiousness and openness were valid predictors of the sampled students' performance, as measured by GPA.

Nevertheless, this first attempt to create a Portuguese version of the *Mini-Markers* has also revealed some limitations. First, it ended up composed by 31 adjectives from the initial set of 40, due to the exclusion of 9 translated adjectives that showed low component loadings or high cross-loadings, suggesting that they lack clarity in the Portuguese language or may have multiple meanings in the Portuguese cultural setting. Consequently, as acknowledged by Rodrigues e Rebelo (2024), there remains a need to identify alternative personality markers in the Portuguese language, to achieve the same length and equivalent content of the original *Mini-Markers* adjective set. Addressing these issues is paramount to avoid potential reduced reliability and threats to validity, due to attenuation effects and content deficiency resulting from a smaller number of items (Credé et al., 2012; Ellen et al., 2022). Second, the final set of 31 adjectives includes 2 items based on negations i.e. *Não intelectual*, and *Não criativo/a*, from the original items of *Unintellectual* and *Uncreative*. Despite their relatively typical use in English, these adjectives can create ambiguity and interpretation difficulties for speakers of other languages and contexts (Thompson, 2008), as in Portuguese, potentially leading to response errors. Third, despite the preliminary evidence supporting the psychometric viability of the Portuguese version of the *Mini-Markers* in academic settings (i.e. Rodrigues & Rebelo, 2024), parallel and complementary evidence regarding the assessment of its psychometric credentials in other relevant achievement domains (i.e. work, sports, health settings) is, according to our knowledge, virtually absent in the literature.

The current study aims to overcome these limitations by conducting two studies within the organizational domain with independent samples of Portuguese workers from various jobs and organizations. As noted, in order to adapt the Portuguese version of the *Mini-Markers* for occupational settings, the recommended practices of Standards of Educational and Psychological Testing (AERA, 2014) were followed. Since this instrument was not previously studied in the organizational context, the content validity of the Portuguese *Mini-Markers* was assessed for the occupational population (i.e. substantive

phase) and its psychometric properties, in terms of factor validity and reliability (i.e. structural phase), were also examined in both Study 1 and Study 2. Lastly, evidence respecting its criterion-related validity (i.e. external phase) was gathered in Study 2, using the construct of work thriving as the criterion variable, given the aforementioned relevance of this psychological state for individual performance and well-being (Goh et al., 2022; Rodrigues & Rodrigues, 2023; Spreitzer et al., 2005).

## STUDY I

### Method

As emphasized, the Portuguese *Big five Mini-Markers*, translated and adapted for the academic context by Rodrigues e Rebelo (2014), retained only 31 of the 40 adjectives (including 8 adjectives for each of the Big Five subscales) of the original English version. Consequently, this first study aims to extend the adjective set of the Portuguese version to reach the original measure length and to further adapt it for the organizational context. Thus, in a first phase, the content validity of the Portuguese *Mini-Markers* for the assessment of the employee population was evaluated through a focus group of four subject matter experts (SMEs), consisting of two personality researchers and two psychologists with experience in personality assessment. In addition to analysing the appropriateness of the 31-adjective set for this population, efforts were made to identify the missing nine personality markers and to maximize the degree to which each of the five subscales captures the conceptual content of the respective personality dimension.

As a result, for the extraversion subscale, the existing seven items of the Portuguese version were considered adequate and maintained, i.e. *Extrovertido/a* (*Extroverted*), *Calado/a* (*Quiet*), *Tímido/a* (*Shy*), *Reservado/a* (*Withdrawn*), *Falador/a* (*Talkative*), *Enérgico/a* (*Energetic*), *Desinibido/a* (*Bold*). For the missing marker of this subscale, the adjective *Sociável* (*Outgoing*) was proposed by the SMEs and included to reach the same size of the original subscale of 8 items. For neuroticism (or emotional stability, when operationalized from its positive pole), the five items of the Portuguese set were also kept i.e. *Nervoso/a* (*Fretful*), *Inseguro/a* (*Jealous*), *Instável* (*Moody*), *Ressentido/a* (*Touchy*), *Temperamental* (*Temperamental*). For the three missing adjectives, *Ansioso/a* (*Anxious*), *Tenso/a* (*Tense*) and *Stressado/a* (*Worried*) were suggested by the SMEs and included in the revised set. Regarding conscientiousness, the five pre-existing adjectives were considered appropriate, i.e. *Organizado/a* (*Organized*), *Desorganizado/a* (*Disorganized*), *Desleixado/a* (*Sloppy*), *Descuidado/a* (*Careless*), *Ineficiente* (*Inefficient*). For the set of three additional markers needed to complete this subscale, the SMEs proposed the inclusion of *Empenhado/a* (*Determined*) and *Esforçado/a* (*Hardworking*) with the purpose of tapping the dispositional elements of this factor regarding the individual tendency to show effort and persistence in achieving goals (Goldberg, 1992; Stanek & Ones, 2018, 2023). Furthermore, experts also recommended the inclusion of two additional adjectives in this subscale. i.e. *Responsável* (*Dependable*) and *Disciplinado/a* (*Disciplined*), in order to increase the subscale coverage of this factor theoretical domain, especially regarding the core elements of impulse control, responsibility and adherence to prescribed social norms, i.e. the tendency to be disciplined and responsible (Stanek & Ones, 2018, 2023). In order to add these four new items to the existing five without exceeding the subscale's limit of eight adjectives, the item *Desorganizado/a* (*Disorganized*) was suppressed, given the predominance of items reflecting order and tidiness in the original conscientiousness sub-scale, as outlined by previous researchers (see Mammadov, 2022). Regarding the agreeableness subscale, all the seven items of the Portuguese set were retained, i.e. *Desagradável* (*Rude*), *Indelicado/a* (*Harsh*), *Gentil* (*Kind*), *Insensível* (*Unsympathetic*), *Frio/a* (*Cold*), *Afetoso/a* (*Warm*), *Compreensivo/a* (*Sympathetic*). The item *Tolerante* (*Tolerant*) was proposed by the SMEs for this subscale where an adjective was missing. Finally, for the openness to experience subscale, a set of five adjectives from the Portuguese version were kept, consisting of the items *Criativo/a* (*Creative*), *Imaginativo/a* (*Imaginative*), *Intelectual* (*Intellectual*), *Filosófico/a* (*Philosophical*) and *Reflexivo/a* (*Deep*).

However, the experts strongly recommended the elimination of the remaining two items which are based on negations, i.e. *Não criativo/a* (*Uncreative*) and *Não intelectual* (*Unintellectual*), as they are more difficult to interpret and prone to originate rating errors, especially for workers with lower levels of education. Consequently, the items *Artístico/a* (*Artistic*) and *Original* (*Original*) were proposed as replacements, along with the adjective *Tradicional* (*Conventional*) to reach an 8-item a subscale and ensure an adequate coverage of the core characteristics of this factor, namely intellectance, aesthetic and unconventionality (see Stanek & Ones, 2018). In summary, after the qualitative assessment of SMEs, a total of nine new items were added and three items were replaced in the previous 31-item Portuguese *Mini-Markes* adjective set, reaching the intended revised set of 40 items, in line with the original version.

In a second step of the content validity assessment, an additional focus group composed by members of the focal population was conducted according to the adopted validation recommendations (AERA, 2014; Vogt et al., 2004). This focus group was composed of 6 workers from different occupations, including law

enforcement, management, sales, teaching, clerical and catering personnel, with an age range between 23 and 50 years. In terms of education and work experience, half of the participants had a high school (i.e. secondary) diploma, and the other half had a college degree, ranging from 3 to 26 years of work experience. The research team asked for their feedback on the ease of understanding of the *Mini-Markers* instructions, the response scale used, and the level of clarity and singularity of meaning of each adjective in the revised set. They began by assessing the ease of understanding of the instructions (which ask participants to indicate the extent to which each adjective describes themselves), as well as the suitability of the response scale, i.e. a seven-point Likert scale ranging from 1 = *Doesn't describe me at all* to 7 = *Totally describes me*. Overall, the instructions were considered clear and no major difficulties with the rating scale were reported. Participants were then instructed to indicate the meaning of each adjective, along with its level of clarity and familiarity. Consistent with the concerns of the SMEs, these workers reported that the adjectives based on negations, included in the first translation of the *Mini-Markers* (Rodrigues & Rebelo, 2024), i.e. *Não criativo/a (Uncreative)* and *Não intelectual (Unintellectual)* were confusing and difficult to rate, supporting the decision of eliminate them from the set. Moreover, some participants signalled the item *Frio/a (Cold)* as an adjective with a rather negative meaning, particularly in the work domain, for which the answers of the incumbents could potentially become evasive or significantly distorted. Faced with this observation, we decided to look for another item for the agreeableness subscale, finally replacing it with *Generoso/a (Generous)*, after considering the conceptual domain of this personality factor. All the remaining adjectives were considered familiar, non-ambiguous and seemed to be uniformly understood by these incumbents, suggesting the face validity of the final set of adjectives.

Therefore, this evaluation of the revised set of adjectives of the *Revised Portuguese Big Five Mini-Markers* conducted by personality experts and through consultation with members of the target population suggests that it captures the conceptual elements of the Big Five and seems to be adequately understood by incumbents from different jobs and organizations, supporting its content validity. The revised set of personality markers is presented in Table 1. For clarity, a translation of each adjective into English is also provided and the new items or replacements are shown in bold.

**Table 1.** Revised set of the Portuguese Personality Markers of each Big Five scale, after content validity assessment.

<b>Big Five sub-scale / Items Portuguese, English</b>		
<b>Extraversion</b>	<b>Emotional Stability</b>	<b>Conscientiousness</b>
Extrovertido/a, <i>Extroverted</i>	Nervoso/a, <i>Fretful</i>	Organizado/a, <i>Organized</i>
Calado/a, <i>Quiet</i>	Inseguro/a, <i>Jealous</i>	Desleixado/a, <i>Sloppy</i>
Tímido/a, <i>Shy</i>	Instável, <i>Moody</i>	Descuidado/a, <i>Careless</i>
Falador/a, <i>Talkative</i>	Ressentido/a, <i>Touchy</i>	Ineficiente, <i>Inefficient</i>
Reservado/a, <i>Withdrawn</i>	Temperamental, <i>Temperamental</i>	Empenhado/a, <i>Determined</i>
Enérgico/a, <i>Energetic</i>	<b>Ansioso/a, <i>Anxious</i></b>	<b>Esforçado/a, <i>Hardworking</i></b>
Desinibido/a, <i>Bold</i>	<b>Tenso/a, <i>Tense</i></b>	<b>Responsável, <i>Dependable</i></b>
<b>Sociável, <i>Outgoing</i></b>	<b>Stressado/a, <i>Worried</i></b>	<b>Disciplinado/a, <i>Disciplined</i></b>
<b>Openness</b>	<b>Agreeableness</b>	
Criativo/a, <i>Creative</i>	Desagradável, <i>Rude</i>	
Imaginativo/a, <i>Imaginative</i>	Indelicado/a, <i>Harsh</i>	
Intelectual, <i>Intellectual</i>	Gentil, <i>Kind</i>	
Filosófico/a, <i>Philosophical</i>	Insensível, <i>Unsympathetic</i>	
Reflexivo/a, <i>Deep</i>	Afetoso/a, <i>Warm</i>	
<b>Artístico/a, <i>Artistic</i></b>	Compreensivo/a, <i>Sympathetic</i>	
<b>Tradicional, <i>Conventional</i></b>	<b>Generoso/a, <i>Generous</i></b>	
<b>Original, <i>Original</i></b>	<b>Tolerante, <i>Tolerant</i></b>	

Note. New items and item replacements are shown in bold.

After completing the required procedures of the substantive phase, an occupational sample was collected to examine the empirical fidelity of these Big Five operationalizations (i.e. the structural phase), by assessing the latent-structure (i.e. its five-factor structure) and subscale reliability of this instrument. The sample characteristics and data collection procedure used are described below.

### Participants and procedure

A sample of 265 incumbents from different professional groups and organizations was collected through a cross-sectional design using a paper-and-pencil questionnaire to measure all variables under study (i.e. socio-demographic, relevant job-related data, and the Big Five). All incumbents agreed to participate in the survey under the conditions specified in the informed consent included in the first section of the questionnaire, after a brief explanation of the main research objectives. The anonymity and confidentiality of their answers and their exclusive use for research purposes were emphasized. It was also clarified that no incentives would be given for their participation, as well as their right to withdraw from the survey at any time without consequences. Prior to data collection, the research project, including this study and ongoing research developments, was reviewed and approved by the scientific committee of the psychology department of the university of Madeira, confirming its adherence to the ethical standards for research in psychology, the Helsinki Declaration of 1964 and its subsequent amendments, or comparable ethical standards.

Of the 265 incumbents sampled, 47.5% were female and 52.5% male, with an average age of 41.4 years ( $SD = 10.2$ ), ranging from 18 to 66 years. The majority of participants have completed upper secondary education (40.4%), followed by 34.7% with higher education, while 24.9% have basic education, specifically at the level of third cycle (15.5%), second cycle (8.3%) and first cycle (1.1%). They belong to different organizations and occupational groups, including management and administration (6.4%); sales and customer service (18.1%); health care (8.7%); clerical workers (8.8%); professionals (26.4%); i.e. teachers, accountants, lawyers, engineers, consultants; law enforcement and military (4.1%), i.e. police officers and soldiers; as well as skilled and semiskilled workers (27.5%), such as mechanics and plant assistants. Overall, 30.6% of the participants were employed in the public sector, 55.1% in the private sector, and 14.3% were self-employed, with an average of 13.2 years of global work experience ( $SD = 9.7$ ) and 11.2 years of organizational tenure ( $SD = 9.9$ ).

### Measures

**Sociodemographic and work-related data.** Incumbents were asked to provide sociodemographic and job-related data to characterize the sample. In addition to gender, age, and education, they also reported their current job, organizational tenure, total work experience and organizational sector.

**Big Five.** Personality factors were assessed using the Portuguese form of Saucier's (1994) 40-item *Mini-Markers* set, adapted by Rodrigues and Rebelo (2014). The revised 40-item set of *Mini-Markers* developed in the first phase of this study was used. Participants were instructed to rate the extent to which each adjective provided an accurate description of themselves, using a seven-point Likert scale ranging from 1 = *Doesn't describe me at all* to 7 = *Totally describes me*.

## RESULTS AND DISCUSSION

### Factor structure and reliability

Following the same analytical strategy used by Saucier (1994) in the development of the original *Mini-Markers* and by Rodrigues e Rebelo (2024) in its Portuguese adaptation, the factor structure of the revised *Mini-Markers* set was examined by principal component analysis with varimax rotation, using IBM SPSS (version 27) for Windows. As recommended by Tabachnik and Fidell (2019) and Pituch and Stevens (2015), the factorability of the data was first assessed by checking whether the Kaiser-Mayer-Olkin measure of sampling adequacy (KMO) was greater than 0.80 (Tabachnick et al., 2019) and whether Bartlett's sphericity test reached statistical significance. Accordingly, the KMO value was 0.83 and Bartlett's sphericity test was significant [ $\chi^2(780) = 4965.87, p < 0.001$ ], allowing the analysis to proceed. Next, the number of components to be extracted was determined by considering the theoretical framework of the *Mini-Markers*, which postulates the extraction of five components corresponding to the Big Five, along with the complementary empirical evidence of the scree test and a parallel analysis for the 95<sup>th</sup> percentile of 1000 random samples (Horn, 1965; O'Connor, 2000). Consistent with the conceptual criterion, empirical evidence suggested the retention of a five-component solution, explaining 50.40% of the total item variance, with the five components accounting for 21.13%, 9.78%, 7.31%, 6.92%, and 5.26% of the variance, respectively.

Still, contrary to our expectations, the results with the current sample indicate that a total of 13 items, two in the extraversion and openness subscales and three in the neuroticism, conscientiousness, and agreeableness subscales, did not show acceptable loadings on the expected component or showed cross-loadings of similar magnitude (Pituch & Stevens, 2015). Specifically, for the extraversion subscale, the item *Desinibido/a (Bold)* showed an equivalent cross-loading on the openness component, while the item

*Enérgico/a (Energetic)* showed a similar cross-loading on the conscientiousness component. With respect to emotional stability, the items *Ressentido/a (Touchy)* and *Instável (Moody)* showed equivalent negative cross-loadings on the agreeableness component, whereas the item *Temperamental (Temperamental)* loaded on its component, but with a magnitude below the acceptable standard (i.e. minimum of .40, Pituch & Stevens, 2015). For the openness subscale, the *Tradicional (Conventional)* and *Reflexivo/a (Deep)* items did not load adequately on any of the components. For the conscientiousness subscale, the items *Descuidado/a (Careless)* and *Desleixado/a (Sloppy)* showed high cross-loadings on openness and neuroticism, while the loading of the item *Ineficiente (Inefficient)* on the corresponding component did not reach at least .40 to be kept. Finally, for the agreeableness subscale, the items *Desagradável (Rude)*, *Indelicado/a (Harsh)* e *Insensível (Unsympathetic)* loaded on the expected component, but with magnitudes below this standard. Therefore, all these items were dropped from the solution and the analysis was repeated with the remaining 27 items (as presented in Table 2). A value of KMO = .82 was obtained, and Bartlett's test of sphericity [ $\chi^2$  (780) = 3082.32,  $p < .001$ ] was statistically significant, supporting the adequacy of the sample and the factorability of the data.

**Table 2.** Factor loadings from principal components analysis of the Portuguese *Mini-Markers* (with varimax rotation), with an organizational sample.

Item Portuguese, English	Openness	Agreeableness	Conscientiousness	E. Stability	Extraversion
Criativo/a, Creative	<b>.79</b>	.18	.15	.01	.10
Original, Original	<b>.74</b>	.17	.18	.09	.15
Imaginativo/a, Imaginative	<b>.73</b>	.09	.20	-.05	.16
Filosófico/a, Philosophical	<b>.66</b>	.02	-.07	-.14	.14
Artístico/a, Artistic	<b>.66</b>	.29	-.14	-.04	-.07
Intelectual, Intellectual	<b>.53</b>	.08	.28	.12	-.05
Tolerante, Tolerant	.14	<b>.72</b>	.13	.11	-.06
Afetuosos/a, Warm	.10	<b>.71</b>	.05	-.04	.22
Gentil, Kind	.17	<b>.70</b>	.20	.08	.17
Compreensivo/a, Sympathetic	.20	<b>.67</b>	.17	.13	-.11
Generoso/a, Generous	.11	<b>.66</b>	.11	-.13	.16
Responsável, Dependable	-.01	.18	<b>.80</b>	.08	.06
Organizado/a, Organized	.05	-.02	<b>.75</b>	-.02	-.07
Esforçado/a, Diligent	.15	.21	<b>.74</b>	.03	.20
Disciplinado/a, Disciplined	.18	.09	<b>.71</b>	.05	-.08
Empenhado/a, Determined	.11	.24	<b>.62</b>	-.03	.21
Stressado/a, Worried	-.09	.11	.01	<b>.85</b>	.04
Nervoso/a, Fretful	-.01	-.12	.02	<b>.83</b>	.14
Tenso/a, Tense	-.07	.20	-.01	<b>.79</b>	-.05
Ansioso/a, Anxious	.06	-.14	.01	<b>.78</b>	-.08
Inseguro/a, Jealous	.24	.34	.16	<b>.44</b>	-.06
Extrovertido/a, Extroverted	.20	.22	.02	-.12	<b>.74</b>
Falador/a, Talkative	.19	.20	.16	-.15	<b>.74</b>
Sociável, Outgoing	.18	.35	.17	.01	<b>.68</b>
Calado/a, Quiet	.20	.09	.27	-.07	<b>-.66</b>
Tímido/a, Shy	-.01	.25	-.06	-.16	<b>-.63</b>
Reservado/a, Withdrawn	-.39	-.21	-.31	-.04	<b>-.50</b>
Empirical eigenvalue	6.33	3.11	2.47	2.12	1.81
Random eigenvalue	1.64	1.54	1.47	1.40	1.35
% of variance explained	23.44	11.52	9.14	7.84	6.73
$\alpha$ Cronbach	.80	.79	.80	.82	.78

Notes.  $N = 265$ . E. Stability = Emotional Stability. Random eigenvalues were estimated by parallel analysis for the 95<sup>th</sup> percentile in 1000 random samples.

Using the same criteria for component retention, the results indicated that the items effectively reproduced the expected five-component solution, explaining 58.67% of the total variance, with the five components accounting for 23.44%, 11.52%, 9.14%, 7.84%, and 6.73%, respectively. Of these 27 items, with the exception of the item *Inseguro (Jealous)*, all of them showed loadings equal to or greater than .50 on the respective component, with relatively low cross-loadings. As shown in Table 2, the openness and extraversion subscales ended up with six items each, while the agreeableness, conscientiousness, and neuroticism subscales ended up with five items each.

Despite these shortcomings of the subscales, the reliability estimation showed rather acceptable values of Cronbach's alphas, all equal or very close to .80, being of .78 for extraversion, .79 for agreeableness, .80 for conscientiousness and openness, and of .82 for emotional stability (see Table 2). Nevertheless, 13 out of the 40 adjectives, which were dropped from the analysis, seem to represent inadequate personality markers in the Portuguese lexicon, at least when the respondents are workers with different levels of education, jobs and occupational domains. It is possible that some of these items may have generated ambiguity or interpretation difficulties (e.g. *Reflexivo/a, Tradicional, Temperamental, Ressentido/a, Desinibido/a*). In spite of the positive feedback on the revised set collected in the focus group with the six incumbents, a significant portion (approximately 65%) of the sampled employees have a secondary or basic education and thus may have experienced difficulties in interpretation and understanding the meaning of adjectives that were not detected by the focus group due to their higher educational level. Moreover, it cannot be excluded that some adjectives may have generated evasive response patterns due to their potentially negative meaning in the workplace (e.g. *Descuidado/a, Ineficiente, Instável, Insensível*).

Regardless, our goal of strengthening the Portuguese form of *Mini-Markers* to achieve the same number of items as the original version and maintain equivalent coverage of the Big Five theoretical content, which is key to the criterion-related validity of this instrument (Credé et al., 2012, Ellen et al., 2022, Saucier, 1994), was not fully accomplished, requiring a further revision of the *Mini-Markers* Portuguese adjective set.

## STUDY II

### Method

#### Content validity reassessment

For the reason mentioned above, a second study was developed that attempted to identify appropriate personality markers for the 13-item dropout of the revised *Mini-Markers* set used in Study I. To this end, two additional focus groups were used in a further revision, expansion, and subsequent content validity assessment of the set.

In the first step, the same group of SMEs from the first study was invited to participate in the task of identifying new potential markers for the *Mini-Markers* subscales, while ensuring a level of theoretical coverage equivalent to the original version. In a second step, a new focus group with eight members of the target population was used. To avoid potential shortcomings due to the underrepresentation of workers with lower levels of education, four pairs of workers were used, each representing one of the educational levels of the Portuguese system, namely two with a university degree, two with secondary education, two with basic education (one with a third cycle and the other with a second cycle) and two with primary education. Based on the underlying theoretical framework of this instrument (Goldberg, 1992; Saucier, 1994) and recent developments in personality research (Stanek & Ones, 2018, 2023), a number of new adjectives were suggested by the SMEs to reach eight adjectives for each of the five major subscales. For the emotional stability subscale, the SMEs suggested the addition of the items *Inquieto/a (Uneasy), Impaciente (Impatient),* and *Pessimista (Pessimistic)*, as a result of the dropping of the adjectives *Temperamental (Temperamental), Instável (Moody)* and *Ressentido/a (Touchy)*. These indications were made under the premise that these adjectives capture the core attributes of worry, emotional dysregulation, and maladjustment of the negative pole of emotional stability. For the extraversion subscale, the items *Comunicativo/a (Communicative)* and *Expressivo/a (Vivid)* were considered appropriate proposals after dropping the items *Desinibido/a (Bold)* and *Enérgico/a (Energetic)*, as they tap into core extraversion dispositional elements of interpersonal engagement and external stimulation seeking. With respect to the conscientiousness subscale, the dropped items *Descuidado/a (Careless)* and *Desleixado/a (Sloppy)* were replaced by *Desorganizado/a (Disorganized)* and *Prevenido/a (Cautious)* to preserve this factor's core elements of orderliness and planning, while *Ineficiente (Inefficient)* was replaced by *Cumpridor/a (Reliable)* to capture the core features of conscientiousness, i.e. the determination and goal attainment (Goldberg, 1992; Saucier, 1994; Stanek & Ones, 2018). In the openness subscale, SMEs proposed the replacement of the items *Reflexivo/a (Deep)* and *Tradicional (Conventional)*, due to their empirical

inadequacy, by *Engenhoso/a (Ingenious)* and *Explorador/a (Adventurous)*, which are close to the main openness traits of cognitive flexibility, curiosity and exploration. Finally, for agreeableness, SMEs proposed the replacement of the items *Desagradável (Rude)*, *Indelicado/a (Harsh)* and *Insensível (Unsympathetic)* due to their strongly negative social connotations and the need to minimize potential evasive response patterns. Accordingly, the items *Amável (Affectionate)*, *Acolhedor (Caring)* e *Bondoso (Compassionate)* were proposed and integrated, as they focus on the unique features of this personality factor, namely, the compassionate affiliation with others and empathetic concern for their well-being (Goldberg, 1992; Stanek & Ones, 2018).

In a second step of content validity assessment, this updated revised set of adjectives was presented and reviewed through a focus group with the eight members of the target population. These professionals confirmed the clarity of the *Mini-Markers* instructions and the usefulness of the correspondent rating scale. More importantly, most of the adjectives were well and consistently understood by all members, despite their different levels of education. Conversely, the items *Afetoso/a (Warm)* and *Filosófico/a (Philosophical)* generated an unexpectedly high level of ambiguity from workers with lower levels of education and were therefore eliminated from the updated set. Since the items *Meigo/a (Gentle)* and *Inovador/a (Innovative)* were included in the list of alternative items suggested by the SMEs for these subscales, they were added as eligible replacements. After the described adjective additions and modifications, the updated and final 40-item Portuguese *Mini-Markers* set (*Mini-Markers-P*) is shown in Table 3 (item updates are in bold).

**Table 3.** Updated Revised set of Portuguese personality markers for each Big Five scale of the *Mini-Markers*, following content validity reassessment (i.e. the *Mini-Markers-P*).

<b>Big Five sub-scale / Items Portuguese, English</b>		
<b>Extraversion</b>	<b>Emotional Stability</b>	<b>Conscientiousness</b>
Extrovertido/a, <i>Extroverted</i>	Nervoso/a, <i>Fretful</i>	Organizado/a, <i>Organized</i>
Calado/a, <i>Quiet</i>	Inseguro/a, <i>Jealous</i>	Empenhado/a, <i>Determined</i>
Tímido/a, <i>Shy</i>	Ansioso/a, <i>Anxious</i>	Esforçado/a, <i>Hardworking</i>
Falador/a, <i>Talkative</i>	Tenso/a, <i>Tense</i>	Responsável, <i>Dependable</i>
Reservado/a, <i>Withdrawn</i>	Stressado/a, <i>Worried</i>	Disciplinado/a, <i>Disciplined</i>
Sociável, <i>Outgoing</i>	<b>Inquieto/a, Uneasy</b>	<b>Desorganizado/a, Disorganized</b>
<b>Comunicativo/a, Communicative</b>	<b>Impaciente, Impatient</b>	<b>Cumpridor/a, Reliable</b>
<b>Expressivo/a, Vivid</b>	<b>Pessimista, Pessimistic</b>	<b>Prevenido/a, Cautious</b>
<b>Openness</b>	<b>Agreeableness</b>	
Criativo/a, <i>Creative</i>	Gentil, <i>Kind</i>	
Imaginativo/a, <i>Imaginative</i>	Compreensivo/a, <i>Sympathetic</i>	
Intelectual, <i>Intellectual</i>	Generoso/a, <i>Generous</i>	
Artístico/a, <i>Artistic</i>	Tolerante, <i>Tolerant</i>	
Original, <i>Original</i>	<b>Acolhedor/a, Caring</b>	
<b>Engenhoso/a, Ingenious</b>	<b>Bondoso/a, Compassionate</b>	
<b>Inovador/a, Innovative</b>	<b>Meigo/a, Gentle</b>	
<b>Explorador/a, Adventurous</b>	<b>Amável, Affectionate</b>	

Note. New items and item replacements are shown in bold.

### Participants and procedure

An additional independent sample of 212 incumbents from different jobs and organizations was collected to complete the remaining structural and external phases of the validation of this instrument (AERA, 2014). Data collection followed the same methodological approach as in Study I, i.e. a cross-sectional survey using paper and pencil questionnaires. All participants gave their informed consent, ensuring that their participation was voluntary and that they were not subject to any incentives. They were also informed of the possibility of withdrawing from the study at any time, and that all data provided would be collected and analysed under conditions of anonymity, confidentiality and exclusive use for research purposes. This second study, originally designed to cross-validate the *Mini-Markers*, was part of the same research project that included Study I and was previously approved by the Psychology Department of the respective university, in terms of its adherence to ethical standards of research in psychology.

Of the 212 incumbents, 40.1% were male and 59.9% were female, with an average age of 40.3 years ( $SD = 12.8$ ), ranging from 18 to 65 years. In terms of education, 41.5% of the participants have completed secondary education, 30.2% have basic education, 17.0% have completed the third cycle, 9.0% the second cycle and 4.2% the first cycle, while the remaining 28.3% have a university degree. The sampled

incumbents belong to different organizations and occupational groups, including management and administration (10.4%); sales and customer service (14.2%); health care (6.6%), i.e. doctors, nurses, and health technicians; clerical workers (7.5%); professionals (28.8%), i.e. teachers, consultants, lawyers, and engineers; skilled and semiskilled workers (30.7%), such as electricians, mechanics, construction workers, and operating assistants; and law enforcement and security personnel (1.9%). The percentage of participants working in the private sector was 49.5%, while 45.3% worked in the public sector and 5.2% were self-employed. Their organizational tenure was approximately 12.0 years ( $SD = 11.2$ ).

## Measures

**Big Five.** Personality factors were assessed with the revised 40-item Portuguese version of the *Mini-Markers* (*Mini-Markers-P*, see the Appendix), using the same instructions and response scale as the original version (i.e. a seven-point Likert scale, from 1 = *Doesn't describe me at all* to 7 = *Totally describes me*).

**Thriving at work.** This variable was measured using the Portuguese version of Porath et al.'s 10-item scale of thriving at work, adapted by Rodrigues and Rodrigues (2023), which assesses each of its encompassing dimensions of learning and vitality at work with five items. A sample item of the learning dimension is "I see myself continually improving" and of the vitality dimension is "I feel alive and vital". Incumbents provided their responses using a 7-point Likert scale ranging from 1 = *Strongly disagree* to 7 = *Strongly agree*. A principal components analysis conducted on the present sample data revealed the expected two-component solution, accounting for 64.42% of the total variance. After oblimin rotation, all items loaded clearly and strongly on their respective dimensions, with loadings ranging from .63 to .86 for the learning subdimension and from .67 to .90 for the vitality subdimension. A second-order principal component analysis using both dimensions as indicators showed that both learning and vitality loaded at .89 on the expected higher-order component of workplace thriving, which accounted for 78.72% of the total variance. Taken together, this evidence supports the hierarchical structure of this construct and allows for the use of its first-order dimensions of learning and vitality scores, as well as the total scale score, as a representation of the higher-order construct of work thriving. Cronbach's alphas for the learning and vitality dimensions were of .80 and .87, respectively, and of .85 for the total scale.

## RESULTS AND DISCUSSION

### Factor structure and reliability

The dimensionality of this second revision of the *Mini-Markers* set was assessed using the same analytical strategy as the previous sample, by submitting the revised set of adjectives to a principal components analysis with varimax rotation. The KMO value of 0.85 and the statistical significance of Bartlett's test of sphericity [ $\chi^2(780) = 4662.78, p < 0.001$ ] supported the appropriateness of the sample and the level of factorability of the data necessary to obtain reliable results (Tabachnik & Fidell, 2019; Pituch & Stevens, 2015). Regarding the number of components to retain, as expected, the scree test and a parallel analysis for the 95<sup>th</sup> percentile in 1000 samples (Horn, 1965; O'Connor, 2000) indicated that a five-component solution should be extracted, explaining 55.82% of the total variance. As can be seen in Table 4, all items clearly loaded in the expected component and low cross-loadings were obtained. In fact, all items of the subscales of neuroticism, openness and conscientiousness met the Saucier's (1994) strict criterion of item purity (p. 509), i.e. a personality factor pure adjective displays a loading in its subscale that, is at least, twice as high as the higher cross-loading. Even for the agreeableness and openness subscales, only two and three of the respective eight items did not meet this criterion, so that a total of 35 items/adjectives (88%) met Saucier's (1994) narrower definition of a personality marker.

Hence, the pattern of high item loadings, low cross-loadings, and relatively low mean inter-scale correlations, which reached .23 in this sample, supports the factor validity and orthogonality of this revised set. In addition, the replication of the principal component analyses using a random split of this sample into two smaller samples of  $N = 106$ , revealed a five-component solution in both, with all items loading adequately on the respective component, indicating cross-sample factor stability. Consistently, as shown in Table 4, all Big Five subscales had at least five items with component loadings greater than .60. These findings are consistent with previous research indicating that factors/components with four or more loadings above .60 in absolute value are stable across samples (Guadagnoli & Velicer, 1988; MacCallum et al., 1999) and can be effectively replicated with relatively small sample sizes ( $N \leq 100$ ).

**Table 4.** Factor loadings from principal component analysis of the Portuguese Revised *Mini-Markers-P* (with varimax rotation), with a second occupational sample.

Item Portuguese, English	E. Stability	Openness	Agreeableness	Conscientiousness	Extraversion
Stressado/a, Worried	<b>.84</b>	-.10	.02	.00	.00
Nervoso/a, Fretful	<b>.83</b>	-.16	.10	-.03	-.17
Ansioso/a, Anxious	<b>.80</b>	-.05	.07	.07	-.08
Inseguro/a, Jealous	<b>.74</b>	-.16	.17	-.17	-.13
Inquieto/a, Uneasy	<b>.74</b>	.12	-.08	.05	.19
Tenso/a, Tense	<b>.74</b>	-.09	.08	.06	-.17
Impaciente, Impatient	<b>.71</b>	.05	-.10	.06	.08
Pessimista, Pessimistic	<b>.60</b>	.00	-.12	-.01	.02
Criativo/a, Creative	-.04	<b>.83</b>	.23	-.04	.00
Engenhoso/a, Ingenious	-.05	<b>.79</b>	.10	.16	.03
Inovador, innovative	-.10	<b>.72</b>	.13	.11	.21
Imaginativo/a, Imaginative	-.04	<b>.68</b>	.17	.12	.10
Explorador/a, Adventurous	-.02	<b>.64</b>	.10	.18	.02
Artístico/a, Artistic	.15	<b>.63</b>	.30	-.11	.05
Intelectual, Intellectual	-.11	<b>.62</b>	.07	.19	.02
Original, Original	-.11	<b>.59</b>	.19	.25	.13
Amável, Affectionate	.05	.10	<b>.75</b>	.29	.13
Gentil, Kind	.03	.22	<b>.74</b>	.20	.09
Meigo/a, Gentle	.13	.23	<b>.69</b>	.12	-.05
Compreensivo/a, Sympathetic	-.05	.20	<b>.68</b>	.05	-.07
Acolhedor/a, Caring	.00	.24	<b>.65</b>	.23	.25
Bondoso/a, Compassionate	.15	.06	<b>.64</b>	.37	.10
Generoso/a, Generous	.01	.08	<b>.58</b>	.43	.08
Tolerante, Tolerant	-.19	.20	<b>.57</b>	.10	-.03
Responsável, Dependable	-.01	.07	.21	<b>.71</b>	.06
Organizado/a, Organized	.05	.19	.03	<b>.68</b>	.13
Esforçado/a, Diligent	.02	.07	.21	<b>.67</b>	.07
Desorganizado/a, Disorganized	.28	.17	.00	<b>-.65</b>	-.09
Cumpridor/a, Reliable	-.06	.20	.18	<b>.64</b>	.02
Disciplinado/a, Disciplined	.09	.17	.26	<b>.64</b>	-.11
Empenhado/a, Determined	.05	.17	.22	<b>.64</b>	.21
Prevenido/a, Cautious	.21	.23	.21	<b>.50</b>	-.10
Calado/a, Quiet	.14	.17	.02	-.13	<b>-.77</b>
Falador/a, Talkative	.20	.21	.06	.05	<b>.69</b>
Tímido/a, Shy	.33	.03	.14	.00	<b>-.68</b>
Comunicativo/a, Communicative	.00	.40	.20	.24	<b>.62</b>
Reservado/a, Withdrawn	.26	.19	.11	.12	<b>-.60</b>
Sociável, Outgoing	-.07	.34	.28	.12	<b>.59</b>
Extrovertido/a, Extroverted	.29	.30	.21	-.07	<b>.56</b>
Expressivo/a, Vivid	.10	.22	.15	.25	<b>.52</b>
Empirical eigenvalue	9.03	5.35	3.10	2.92	1.91
Random eigenvalue	1.94	1.82	1.74	1.67	1.60
% of variance explained	22.59	13.39	7.76	7.84	4.78
$\alpha$ Cronbach	.89	.86	.87	.83	.81

Notes.  $N = 212$ . E. Stability = Emotional Stability. First component items were previously inverted to represent Emotional Stability. Random eigenvalues were estimated by parallel analysis for the 95<sup>th</sup> percentile in 1000 random samples.

In terms of reliability, the Cronbach alphas for all the subscales reach at least .80 and exceed the respective estimates obtained in Study I, being equivalent or even superior to those reported by Saucier (1994) for the respective subscales of the original version (i.e. .83 vs .83 for conscientiousness, .81 vs .83 for extraversion, .87 vs .81 for agreeableness, .89 vs .78 for emotional stability, .86 vs .78 for openness). Further results concerning final item statistics and scale reliability are summarized in Table 5.

**Table 5.** Scale/Item descriptive and reliability statistics of the Revised Portuguese *Big Five Mini-Markers*.

<i>Scale/Item</i>	<i>M</i>	<i>DP</i>	<i>r<sub>t</sub></i>	<i>Alpha if item deleted</i>	<i>α</i>
<i>Estabilidade Emocional (Emotional Stability)</i>					.89
Stressado/a, <i>Worried</i>	4.18	1.83	.79	.87	
Nervoso/a, <i>Fretful</i>	4.05	1.82	.80	.87	
Ansioso/a, <i>Anxious</i>	4.45	1.69	.74	.88	
Inseguro/a, <i>Jealous</i>	3.60	1.62	.68	.88	
Inquieto/a, <i>Uneasy</i>	3.87	1.74	.62	.89	
Tenso/a, <i>Tense</i>	3.63	1.62	.66	.88	
Impaciente, <i>Impatient</i>	4.23	1.76	.59	.89	
Pessimista, <i>Pessimistic</i>	3.17	1.71	.52	.89	
<i>Intelecto/Abertura à Experiência (Intellect or Openness)</i>					.86
Criativo/a, <i>Creative</i>	4.91	1.37	.79	.82	
Engenhoso/a, <i>Ingenious</i>	4.58	1.50	.72	.83	
Inovador/a, <i>innovative</i>	4.79	1.39	.63	.84	
Imaginativo/a, <i>Imaginative</i>	5.17	1.30	.62	.84	
Explorador/a, <i>Adventurous</i>	4.52	1.46	.53	.85	
Artístico/a, <i>Artistic</i>	4.31	1.71	.58	.85	
Intelectual, <i>Intellectual</i>	4.78	1.28	.54	.85	
<i>Amabilidade (Agreeableness)</i>					.87
Amável, <i>Warm</i>	5.68	1.15	.73	.84	
Gentil, <i>Kind</i>	5.73	1.04	.71	.85	
Meigo/a, <i>Gentle</i>	5.38	1.23	.61	.86	
Compreensivo/a, <i>Sympathetic</i>	5.58	1.19	.58	.86	
Acolhedor/a, <i>Caring</i>	5.48	1.19	.66	.85	
Bondoso/a, <i>Compassionate</i>	5.70	1.14	.65	.85	
Generoso/a, <i>Generous</i>	5.77	1.10	.61	.86	
Tolerante, <i>Tolerant</i>	5.68	1.15	.47	.87	
<i>Conscienciosidade (Conscientiousness)</i>					.83
Responsável, <i>Dependable</i>	5.48	1.19	.60	.80	
Organizado/a, <i>Organized</i>	5.79	1.19	.60	.80	
Esforçado/a, <i>Diligent</i>	6.25	0.90	.64	.80	
Desorganizado/a, <i>Disorganized</i>	2.41	1.43	.57	.81	
Cumpridor/a, <i>Reliable</i>	5.70	1.09	.62	.80	
Disciplinado/a, <i>Disciplined</i>	5.94	1.04	.56	.81	
Empenhado/a, <i>Determined</i>	5.23	1.22	.45	.82	
Prevenido/a, <i>Cautious</i>	5.59	1.44	.47	.82	
<i>Extroversão (Extraversion)</i>					.81
Calado/a, <i>Quiet</i>	3.38	1.72	.61	.78	
Falador/a, <i>Talkative</i>	4.50	1.56	.51	.79	
Tímido/a, <i>Shy</i>	3.50	1.56	.46	.80	
Comunicativo/a, <i>Communicative</i>	5.39	1.26	.58	.78	
Reservado/a, <i>Withdrawn</i>	4.76	1.48	.39	.81	
Sociável, <i>Outgoing</i>	5.10	1.34	.46	.80	
Extrovertido/a, <i>Extroverted</i>	5.26	1.27	.64	.78	
Expressivo/a, <i>Vivid</i>	4.62	1.72	.59	.78	

Notes. *r<sub>t</sub>* = item-total correlation. The minimum and maximum values of all items were 1 and 7, respectively.

**Criterion-related validity**

Tables 6 and 7 summarize the main findings regarding the validity of the Big Five, as assessed by the Revised *Mini-Markers*, for predicting thriving at work and its subdimensions. As shown in Table 6, the obtained zero-order correlations showed positive relationships between the personality factors extraversion, conscientiousness, agreeableness, and openness and the criterion under study, i.e. work thriving. However, according to the further results of a multiple regression analysis, when the other personality factors are also included in the model, only conscientiousness emerges as a significant predictor of this criterion, explaining approximately 17% of its variance (see Table 7). Indeed, the correlation between conscientiousness and thriving obtained with the current sample, i.e.  $r = .40$  ( $p < .001$ ), is fully aligned with the respective meta-analytic effect size ( $\rho = .40$ ,  $k = 5$ ,  $N = 2,702$ ) for this relationship, as reported by Liu et al. (2021).

**Table 6.** Means, standard deviations and zero-order Pearson correlations

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender <sup>a</sup>			--											
2. Age	40.27	4.52	.09	--										
3. Education	4.00	2.00	.16*	-.27***	--									
4. Tenure	11.99	11.20	.08	-.71***	-.22**	--								
5. ES	4.10	1.31	-.17*	.11	.18*	.01	--							
6. EX	4.72	0.95	.09	.05	.05	.10	.10	--						
7. C	5.73	0.78	.06	.14*	.00	.06	.00	.23**	--					
8. A	5.58	0.84	.04	.10	-.05	.11	-.03	.25***	.53***	--				
9. OP	4.75	1.04	-	.02	.07	.08	.09	.30***	.34***	.47***	--			
10. Learning	5.74	1.09	.06	-.11	.14*	-.13	.00	.14*	.40***	.32**	.16*	--		
11. Vitality	4.71	1.32	-.08	-.12	.01	.05	.10	.17*	.28***	.19**	.23**	.38***	--	
11. Thriving	5.22	1.00	-.02	.02	.09	-.04	.07	.19*	.40***	.30***	.24**	.79**	.87***	--

Notes.  $N = 212$ .  $M$  = Mean,  $SD$  = Standard Deviation. <sup>a</sup>Male = 0, Female = 1, ES = Emotional stability, EX = Extraversion, C = Conscientiousness, A = Agreeableness, OP = Openness. \* $p < .10$ . \*\* $p < .05$ . \*\*\* $p < .01$ . \*\*\*\* $p < .001$ .

Similarly, all of the Big Five, with the exception of emotional stability, established positive and significant relationships with the learning and vitality subdimensions of thriving, as shown in Table 6. Of the demographic variables examined, only employee education level was significantly correlated with the learning subdimension. Yet, further results from hierarchical multiple regression analysis showed that, of this set, only conscientiousness and agreeableness yielded a significant contribution for predicting learning, in a model that explained 18% of its variance, when the effects of worker’s education were also considered. For vitality, the results have shown that solely conscientiousness and openness significantly predict this criterion, in a model that explains 9% of its variance.

**Table 7.** Multiple regression analyses examining the contribution of the Big Five, as assessed by the *Mini-Markers-P* in predicting thriving at work and its subdimensions.

Predictors	<i>R</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> <sub>adj</sub>	<i>F</i>	$\beta$	$\Delta R^2$
<i>Thriving at work</i>						
	.429***	.184	.168	11.69***		
Extraversion					.077	
Conscientiousness					.320***	
Agreeableness					.078	
Openness					.071	
<i>Learning</i>						
<i>Step 1</i>	.144**	.021	.016	4.44*		.021*
Education					.14*	
<i>Step 2</i>	.450***	.202	.183	11.74***		.182**
Extraversion					.032	
Conscientiousness					.315***	
Agreeableness					.180*	
Openness					.052	

**Table 7.** Continued.

Predictors	<i>R</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> <sub>adj</sub>	<i>F</i>	$\beta$	$\Delta R^2$
				<i>Vitality</i>		
	.327***	.107	.090	6.19***		
Extraversion					.084	
Conscientiousness					.224**	
Agreeableness					.078	
Openness					.140*	

Notes. *N* = 212. \**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

## GENERAL DISCUSSION

The current paper was developed with two main objectives, which were to strengthen the previous Portuguese version of the *Big Five Mini-Markers* (Rodrigues & Rebelo, 2014) and to contribute to its revision for implementation in the organizational domain, given the importance of the Big Five at work (Bainbridge et al., 2022; Salgado et al., 2020; Wilmot & Ones, 2021). To this end, two independent empirical studies have been conducted, providing some contributions to research and practice related to the brief, but effective, assessment of personality at work, as operationalized by the Big Five Factor Model (Stanek & Ones, 2028; 2023).

### Contributions to research and assessment of the Big Five at work

Study I focused on extending the existing Portuguese *Mini-Markers* set of adjectives, from 31 to 40, and further validating it for the professional setting. Indeed, the development of the first Portuguese version by Rodrigues and Rebelo (2024) with a sample of university students, left unanswered the question of whether the respective adjective set personality markers will be equally suitable from less educated workers. The results showed that 13 adjectives of the full and revised set, developed through the applied content validity procedures, showed psychometric inadequacy in capturing the prototypical characteristics of the Big Five, when a sample of workers with different levels of education was used. Despite the rather acceptable levels of reliability obtained for all the revised *Mini-Markers* subscales (in terms of internal consistency), the failure to reach the original size leads to a potential subscale conceptual content deficiency, which is a threat to the validity of this instrument (Credé et al., 2012; Ellen et al., 2022).

Study II addressed these limitations by developing an updated and complete 40-item set with 15 new items and item substitutions (the *Mini-Markers-P*), which ultimately demonstrated the virtues of the original Big Five *Mini-Markers*, i.e. a rather acceptable trade-off between maximizing brevity of administration while maintaining robust psychological properties in terms of factor validity and reliability (Ellen et al., 2022; Saucier, 1994). Thus, through the results of these two cumulative empirical studies, the Portuguese version of the *Mini-Markers* was strengthened and validated by the assessment of the Big Five at work. Besides reaching the same length of the original form and excluding the negation items, it allowed the identification and inclusion of 35 adjectives, from the final set of 40 items, that preserve factor purity in the strict terms of Saucier (1994) to be considered effective markers of the Big Five. Moreover, they appear to retain uniqueness of meaning and to be adequately understood (i.e. without major ambiguities) by the members of the target occupational population.

Accordingly, this paper contributes for the research and assessment of personality at the organizations by providing an updated version of the *Big Five Mini-Markers*, with its recognized merits of being easy and quick to administer (approximately 4-5minutes), while keeping psychometric robustness even in small samples (i.e. *N* = 100, Saucier, 1994). As Saucier (1994) has pointed out, these advantages come at the cost of sacrificing a broad sample of the Big Five's full theoretical bandwidth and relevant specific subsumed traits. Nonetheless, this sacrifice may not be as extreme in terms of reliability and criterion-related validity potential loss, as might arguably occur with alternative and even shorter measures of the Big Five, such as the 20-item *Mini-IPIP* (Donnellan et al., 2006) or the 10-item *TIPPI* (Gosling et al., 2003), to name a few. Thus, for research and application purposes, even in the case of the *Big Five Mini-Markers*, one should fully consider whether the theoretical coverage and bandwidth of the Big Five instrument chosen is sufficient to capture the specificity of the criterion to be predicted (Credé et al., 2012; Ellen et al., 2022). Accordingly, using the *Mini-Markers* instead of these very short Big Five scales may provide a reasonable balance in reducing administration time without largely compromising validity and reliability.

Moreover, our findings also help to examine the unexplored role of the Big Five, as assessed by the *Mini-Markers*, in promoting individual thriving at work (Goh et al., 2021; Spreitzer et al., 2005), converging with preliminary evidence supporting the central role of conscientiousness (see Liu et al., 2021). Still, they

also showed that agreeableness and openness may also contribute, albeit to a lesser extent, to fostering the core dimensions of this positive psychological state. Hence, screening job applicants, in the scope of personnel selection procedures, on the basis on their scores in conscientiousness, agreeableness and openness to experience, may contribute to build a workforce more predisposed to thrive at work and, consequently, capitalize on the benefits of this job outcome (see Goh et al., 2021; Kleine et al., 2019).

### Limitations and suggestions for future research

Despite these contributions, the current findings should be interpreted within the context of their limitations. First, the cross-validation of the Portuguese final version of the *Big Five Mini-Markers (Mini-Markers-P)* in terms of factorial validity and reliability was conducted in a suboptimal manner by splitting the Study II sample into two smaller samples. Future research on the cross-validation of this instrument with other occupational samples is needed before more definitive conclusions can be drawn about the positive prospects of this revised set of adjectives. Second, five items (i.e. *Bondoso/a* and *Generoso/a* from the agreeableness subscale, and *Comunicativo/a* and *Sociável* and *Extrovertido/a* from the extraversion subscale), despite showing clear and relatively strong loadings on the respective factor, did not meet Saucier's (1994) narrow criterion of factor purity to be considered effective personality markers. Thus, further evidence with other samples is needed to diagnose whether they are effectively failing to fulfil this role and, ultimately, if a suitable replacement may be needed. Related to this aspect, the psychometric robustness of *Mini-Markers-P* should be tested using confirmatory evidence and estimates of measurement equivalence and stability, across occupational groups and job complexity levels. Specifically, empirical research should test whether and to what extent the effects of the Big Five, namely conscientiousness, agreeableness and openness to experience, are contingent to the nature and complexity of the job. More complex jobs encompass higher task variety, role impact, and autonomy, requiring an expanded job knowledge and the need to make decisions under ambiguity and uncertainty (Martínez et al., 2025; Salgado, 2017), which will, arguably place stronger learning and vitality demands on incumbents. As such, seems worthwhile to explore in future research whether the effects of personality in nurturing work thriving may be larger in more complex jobs. Third, despite the pertinence of selecting work thriving as the focal criterion to study the criteria-related of the *Mini-Markers-P*, due to personality meaningful impact on job performance, satisfaction and well-being at work (Anglim et al., 2020; Pires et al., 2025; Wilmot & Ones, 2021), our evidence is totally uninformative as to whether this instrument holds the validity of the original English form for predicting these critical job outcomes. Future studies using these criteria are needed to achieve such a more complete understanding of the predictive validity of the *Mini-Markers-P* and its potential for high-stakes decisions (e.g. staffing and development) in human resource management at work.

In conclusion, the current empirical efforts support the psychometric robustness of this revised Portuguese version of the *Big Five Mini-Markers-P*, as a short and sound measure of the big five with utility for the organizational context, where the available time for personality assessment is often constrained.

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#### CRedit AUTHORSHIP CONTRIBUTION STATEMENT

**Nuno Rodrigues:** Conceptualization; Data Curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing - Original Draft; Writing - Review & Editing. **Teresa Silva:** Investigation; Methodology; Resources; Validation; Visualization; Writing - Review & Editing. **Ricardo Nóbrega:** Investigation; Methodology; Resources; Validation; Visualization; Writing - Review & Editing.

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**APPENDIX**

Versão Portuguesa Revista do *Big Five Mini-Markers* (*Mini-Markers-P*, Rodrigues, Silva & Nóbrega, 2026)

**Instruções:** Utilize os adjetivos seguintes para descrever-se a si próprio/a. Descreva-se como se vê no presente e não como gostaria de ser no futuro. Não existem respostas certas ou erradas, o importante é que indique o grau em que cada adjetivo descreve a sua forma de ser habitualmente. Por favor, responda de forma honesta e o mais precisa possível, usando a escala seguinte:

1	2	3	4	5	6	7
Não me descreve nada	Descreve-me muito pouco	Descreve-me pouco	Descreve-me moderadamente	Descreve-me muito	Descreve-me bastante	Descreve-me totalmente

1. Falador/a	1	2	3	4	5	6	7
2. Organizado/a	1	2	3	4	5	6	7
3. Imaginativo/a	1	2	3	4	5	6	7
4. Ansioso/a	1	2	3	4	5	6	7
5. Esforçado/a	1	2	3	4	5	6	7
6. Inseguro/a	1	2	3	4	5	6	7
7. Compreensivo/a	1	2	3	4	5	6	7
8. Responsável	1	2	3	4	5	6	7
9. Tolerante	1	2	3	4	5	6	7
10. Nervoso/a	1	2	3	4	5	6	7
11. Original	1	2	3	4	5	6	7
12. Tímido/a	1	2	3	4	5	6	7
13. Tenso/a	1	2	3	4	5	6	7
14. Extrovertido/a	1	2	3	4	5	6	7
15. Empenhado/a	1	2	3	4	5	6	7
16. Artístico/a	1	2	3	4	5	6	7
17. Sociável	1	2	3	4	5	6	7
18. Inovador/a	1	2	3	4	5	6	7
19. Stressado/a	1	2	3	4	5	6	7
20. Amável	1	2	3	4	5	6	7

21. Criativo/a	1	2	3	4	5	6	7
22. Gentil	1	2	3	4	5	6	7
23. Disciplinado/a	1	2	3	4	5	6	7
24. Meigo/a	1	2	3	4	5	6	7
25. Reservado/a	1	2	3	4	5	6	7
26. Cumpridor/a	1	2	3	4	5	6	7
27. Impaciente	1	2	3	4	5	6	7
28. Bondoso/a	1	2	3	4	5	6	7
29. Intelectual	1	2	3	4	5	6	7
30. Comunicativo/a	1	2	3	4	5	6	7
31. Inquieto/a	1	2	3	4	5	6	7
32. Acolhedor/a	1	2	3	4	5	6	7
33. Explorador/a	1	2	3	4	5	6	7
34. Desorganizado/a	1	2	3	4	5	6	7
35. Generoso/a	1	2	3	4	5	6	7
36. Engenhoso/a	1	2	3	4	5	6	7
37. Pessimista	1	2	3	4	5	6	7
38. Expressivo/a	1	2	3	4	5	6	7
39. Prevenido/a	1	2	3	4	5	6	7
40. Calado/a	1	2	3	4	5	6	7

**Cotação:**

Extroversão: 1, 12\*, 14, 17, 25\*, 30, 38, 40\*

Estabilidade Emocional: 4\*, 6\*, 10\*, 13\*, 19\*, 27\*, 31\*, 37\*

Conscienciosidade: 2, 5, 8, 15, 23, 26, 34\*, 39

Amabilidade: 7, 9, 20, 22, 24, 28, 32, 35

Abertura à Experiência: 3, 11, 16, 18, 21, 29, 33, 36

\*Estes itens devem ser invertidos antes do cálculo da pontuação global do respetivo fator. Caso se pretenda que a escala de estabilidade emocional expresse, alternativamente, o fator de neuroticismo, os itens respetivos não necessitam de ser invertidos.