



Psychometric analysis of the Innovative Behavior Scale in workers in Peru

Análisis psicométrico de la escala de comportamiento innovador en trabajadores de Perú

Sergio Dominguez-Lara^{1*}, Manuel Fernández-Arata¹,
Patricia Bárrig-Jó², Gustavo Calderón-De la Cruz³

¹Universidad de San Martín de Porres, Perú

²Pontificia Universidad Católica del Perú, Perú

³Universidad Peruana de Ciencias Aplicadas, Perú

Received March 12, 2024; accepted July 30, 2024

Available online February 6, 2025

Abstract

The aim of this study was to analyze the psychometric properties of the Innovative Behavior Scale (IBS) among 227 Peruvian workers (51.982% male), aged between 22 and 76 years ($M = 45.009$; $SD = 12.046$). Content validity was assessed through expert judgment regarding item clarity and relevance, while internal structure was examined using confirmatory factor analysis. Additionally, measurement invariance analysis was conducted across gender and job position, and reliability estimates were obtained for both direct scores (alpha coefficient) and the construct (omega coefficient). Results show the clarity and relevance of IBS items and a stronger empirical support for the unidimensional model, as well as acceptable levels of invariance across gender and job positions. Furthermore, reliability estimates were found to be satisfactory across all measures. In conclusion, the IBS demonstrates adequate psychometric properties.

JEL Code: C18, D91, 030

Keywords: innovative behavior; innovation; workers; psychometry; validity; reliability

*Corresponding author.

E-mail address: ssdominguezmpcs@gmail.com (S. Dominguez-Lara).

Peer Review under the responsibility of Universidad Nacional Autónoma de México.

<http://dx.doi.org/10.22201/fca.24488410e.2025.5508>

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Resumen

El objetivo fue analizar las propiedades psicométricas de la Escala de Comportamiento Innovador (IBS) en 227 trabajadores de nacionalidad peruana (51.982% hombres) entre 22 y 76 años ($M = 45.009$; $DE = 12.046$). En cuanto a la validez de contenido, la claridad y relevancia de los ítems fue analizada por jueces expertos, mientras que la estructura interna se evaluó mediante el análisis factorial confirmatorio. Por otro lado, se implementó un análisis de invarianza de medición según sexo y cargo, y se estimó la confiabilidad de las puntuaciones directas (coeficiente alfa) y del constructo (coeficiente omega). Los resultados indican que los ítems de la IBS son claros y relevantes, el modelo unidimensional tiene mayor respaldo empírico, y existe un grado aceptable de invarianza según el sexo y cargo laboral. Asimismo, la confiabilidad fue aceptable en todos los casos. Se concluye que la IBS tiene propiedades psicométricas adecuadas.

Código JEL: C18, D91, 030

Palabras clave: comportamiento innovador; innovación; trabajadores; psicometría; validez; confiabilidad

Introduction

Innovation is an essential process for business development. The competitiveness of companies reflects organizational innovation, which enables them to sustain themselves over time (Kanter, 1996; Vélez-Romero & Ortiz, 2016) and contribute to their development and success (Damanpour & Aravind, 2012; Shane & Venkataraman, 2000). Accordingly, employees require the support of colleagues or senior management within the organization for their innovative ideas to be approved and implemented, ultimately benefiting the organization. To this end, innovative behavior is recognized as one of the explanatory sources of innovation (Mielniczuk & Laguna, 2018).

Innovative behavior is understood as the ability of workers to recognize a problem, generate ideas for its resolution, and implement those ideas (Becuwe, 2021; Janssen, 2000; Scott & Bruce, 1994). Thus, innovative behavior involves two phases. The first is idea generation, in which problems are identified and solutions are developed to address them, and the second is idea implementation, which seeks to propose and defend the innovative product (De Spiegelaere et al., 2014). It should be noted that innovative behavior differs from creativity, as the latter focuses solely on the idea-generation phase of problem solving, rather than its application (Amabile, 1988; Purc & Laguna, 2019).

Innovative behavior is known to be influenced by the climate of innovation, the clearing system (Bos-Nehles & Veenendaal, 2019), engagement, job satisfaction, and organizational commitment (Alshami et al., 2023; Singh & Sarkar, 2012), and contributes to the process of well-being at work (Wang et al., 2022).

The innovation process encompasses specific employee behaviors, such as exploring new techniques or technologies, rethinking previous ideas about a product, and having colleagues who support the generation and application of ideas, as well as identifying sources of funding and resources necessary for implementation and establishing action plans (Janssen, 2000; Scott & Bruce, 1994). Although these aspects are interrelated, they can occur in any order, which is why innovative behavior is considered a dynamic and complex phenomenon that depends on context and work activities (Messmann & Mulder, 2012). Innovative behavior is assessed through the self-reports of people working in a company or institution (Hammond et al., 2019; Wang et al., 2022) or according to the reports of their supervisors (Guillén & Kunze, 2019; Scott & Bruce, 1994), both individually (Li et al., 2023) and in work groups (Mora-Esquivel & Solís, 2020; Reuvers et al., 2008).

In general, studies on innovation tend to focus on organizational areas where male personnel predominate (e.g., technology), limiting knowledge of women's innovative behavior in other areas of work (e.g., health) (Blake & Hanson, 2005; Nählinder et al., 2015). Furthermore, there is evidence that innovative behavior tends to be valued and encouraged more in men than in women (Luksyte et al., 2017; van Acker et al., 2018) and that the associations between leadership styles and innovative behavior differ according to the gender of the worker (Steyn & de Bruin, 2020a). Nevertheless, Tacsir and Pereira (2023) highlight that women's participation in the innovation process in Latin American organizations facilitates innovative behavior, thereby directly influencing productivity. Notwithstanding conflicting findings regarding innovation and gender, some studies have found no relevant differences in innovative behavior at work between men and women (Leong & Rasli, 2014; Luksyte et al., 2017; Salessi, 2021; Salessi & Omar, 2019). Therefore, given the lack of consensus on the role of gender in innovative behavior, Steyn and de Bruin (2020b) suggest using measures that are invariant to eliminate any bias when analyzing the factors associated with innovative behavior.

Innovation capacity among workers, which is crucial for the growth and development of companies (Mielniczuk & Laguna, 2020), has become a topic of academic research that involves both global and individual management within organizations, and is essential for continuous innovation and improvement (De Jong & Den Hartog, 2010).

Innovation, by its very nature, aims to improve the institution's existing situation and, as a result, achieve greater efficiency, profitability, productivity, and competitive advantage, while reducing expenditure on various business resources (time, money) and personal resources (human talent). To this end, innovation refers to the implementation of a new or significantly improved product or service, process, marketing method, or organizational method (Purc et al., 2015).

Within an organization, managers (bosses, executives) can express their support for innovation by taking actions such as listening to novel ideas, tolerating mistakes, recognizing innovative results and behaviors that encourage external social networks, and sharing their own resources to enable worker participation (Li et al., 2023). Recognition of organizational support is a crucial variable in the effective identification and management of human talent, as it fosters a sense of support among employees, enabling them to engage more effectively with leaders and exhibit innovative behavior (Choi et al., 2021).

In business praxis, it is necessary to provide employees with tools and technologies that enable them to access information, learn new things, share knowledge, connect with experts, and compare their thoughts with others. It is also necessary to take on new tasks as a challenge, acquire new knowledge, and apply it in practice, thereby fostering innovative behavior in the workplace (Purc et al., 2015).

Given the above, it is necessary to have an appropriate tool for assessing innovative behavior, and one of the best known is the Innovative Behavior Scale (IBS; Scott & Bruce, 1994), which was developed based on Kanter's (1996) proposal of the innovative process and found to have adequate reliability ($\alpha = .89$). In another study conducted on Taiwanese workers, favorable evidence of unidimensionality was obtained under confirmatory factor analysis and high reliability ($\alpha = .91$; Hsu et al., 2011). Additionally, the internal structure of IBS was analyzed among Polish workers, with a one-dimensional model and a two-dimensional model (idea generation and idea implementation) evaluated.

However, the one-dimensional structure with correlated residuals received the most empirical support, along with high reliability coefficients for internal consistency ($\alpha = .91$) and temporal stability ($r = .78$) (Purc & Laguna, 2019). Nevertheless, the reliability coefficient was not corrected for correlated residuals (Domínguez-Lara, 2016), which may have reduced the scores' reliability. In Brazil, Veloso et al. (2021) confirmed the scale's unidimensionality, with high factor loadings ($\lambda_{\text{range}} = .532-.806$) and adequate construct reliability ($\omega = .83$), although they eliminated one item (I am an innovative person). No studies validating the IBS were found in Peru or other Latin American countries.

On the other hand, some studies did not focus per se on the internal structure of the IBS but analyzed it in a complementary manner as part of an explanatory design that included more variables. For example, Carmeli and Spreitzer (2009) used the IBS with workers in Israel. They reported that the IBS items are configured as a unidimensional measure with high factor loadings (from .74 to .82) and good reliability ($\alpha = .92$). Moreover, Hsu and Chen (2017) showed that a three-variable model (one of which was innovative behavior measured one-dimensionally) studied in Taiwanese workers presents a better statistic fit than a global measure that encompasses all three variables together, which would support the idea that innovative behavior is an independent construct, that is, that it is possible to interpret its scores separately from other constructs. However, the measurement reliability was not reported in that study.

Other instruments assess innovative behavior, such as Innovative Work Behavior (De Jong & Den Hartog, 2010), which has several competing factor models (proposed structures of one to four factors) with similar fit indicators, which could make it difficult to use in a specific environment (Dahiya & Raghuvanshi, 2021), as it does not have a consolidated structure. A similar situation occurs with the instrument created by Kleysen and Street (2001), which, although brief (14 items), involved a procedure not recommended for psychometric analysis, such as varimax rotation (Lloret et al., 2014). In some cases, factorial complexity was shown, meaning that an item was influenced by more than one factor (Fleming & Merino, 2005). The instrument developed by Janssen (2000) is also available and considers innovative behavior as a multidimensional construct; however, the author did not test the instrument's structural hypothesis empirically (via factor analysis). Nevertheless, the scale appears to be unidimensional (Cevallos et al., 2018; Salessi, 2021).

Table 1
 Characteristics of other instruments that assess innovative behavior

Instrument	Suggested dimensions	Number of items	Psychometric evidence
Innovative Work Behaviour (De Jong & Den Hartog, 2010)	Idea generation, Idea exploration, Idea advocacy, and Idea implementation	Initial version with 17 items. Final version with 10 items.	Exploratory factor analysis revealed four factors, but confirmatory factor analysis examined four competing models with similar fit indices.
Multidimensional measure of individual innovative behavior (Kleysen & Street, 2001)	Opportunity for exploration, Generation, Formative research, Defense, Application	Initial version with 34 items. Final version with 14 items.	The first confirmatory factor analysis did not run satisfactorily, and the exploratory analysis suggested five dimensions.
Innovative Work Behavior (Janssen, 2000)	Generating ideas, Promoting ideas, Implementing ideas	9 items	The proposal was not subjected to empirical testing (factor analysis)

Therefore, the IBS has the potential to be used in an organizational setting due to its solid theoretical foundations, robust evidence of unidimensionality, adequate score reliability, and brevity, allowing it to be quickly applied in settings where evaluation time is often limited by the multiple tasks workers must perform.

In accordance with the above, the objective of this study was to analyze the internal structure of IBS among Peruvian workers, as well as the measurement invariance across gender and job position (supervisors and subordinates). The work is justified at a theoretical level because Scott and Bruce's (1994) proposal enabled exploration of the unidimensional nature of the construct, which was corroborated in other empirical studies, but with a different instrument (Cevallos et al., 2018; Salessi,

2021), and thus it is possible to study those factors that facilitate or hinder the development of innovative behaviors (Newman et al., 2020), as well as their consequences at the individual and organizational levels.

Furthermore, from a practical perspective, there is a need to analyze a Spanish version because no instrumental studies have been conducted in that language, to replicate the results obtained with the IBS in a new context and thereby consolidate the scale as a valid and reliable measure of innovative behavior. Consequently, it can be reliably used in academic research and in the applied field of innovative behavior (e.g., business) (Purc & Laguna, 2019). Furthermore, measurement invariance, which was not reported in the preliminary studies, was examined, enabling more robust comparative analyses.

The research hypotheses are as follows: the items are representative of the construct (hypothesis 1); a unidimensional internal structure predominates (hypothesis 2); the measurement of innovative behavior is equivalent across gender and position (hypothesis 3); and the instrument demonstrates adequate reliability (hypothesis 4).

This study is important because, from a practical point of view, fostering innovative behavior should not only include interventions in the initial stages or in any phase, such as exploration and idea generation, but also in later phases, such as information research, idea promotion, implementation, and application (Dahiya & Raghuvanshi, 2021). Likewise, organizational experts, human behavior scientists, and human talent managers should highlight the importance of innovative behavior and begin to evaluate it, as it can help employees and organizations promote it and better understand the practice of innovation.

Method

Participants

The sample size was determined using an approach that considers an anticipated effect size (factor loading) of .50, a statistic power of 80%, one latent variable (construct), six observable variables (items), and a probability level of 0.05. A minimum sample size of 200 participants is suggested (Soper, 2024).

A total of 227 Peruvian workers were evaluated, of whom 109 were women (48.018%), and 118 were men (51.982%), aged 22 to 76 ($M = 45.009$; $SD = 12.046$). Among the total, 110 were managers or supervisors (48.458%), and 117 were subordinates (51.542%), with an average length of service ranging from 1 to 43 years ($M = 9.650$; $SD = 8.019$). In terms of contract type, most were hired on permanent contracts (48.458%), followed by fixed-term contracts (20.264%). Regarding category, 45.375% worked on-site and 28.194% worked in a hybrid mode.

Instruments

Innovative Behavior Scale (IBS; Scott & Bruce, 1994). Consists of six items with response options on a five-point scale ranging from never (1) to very often (5).

Procedure

The translation followed a systematic process based on recommendations from the specialized literature (Hambleton, 2005; Muñiz et al., 2013). The initial phase consisted of obtaining authorization via email to translate the IBS into Spanish.

In the second phase, the back-translation procedure was used, consisting firstly of delivering the IBS—instructions, items, and response alternatives—to two psychologists specializing in the field of work, with five years of experience, of Peruvian nationality, whose native language was Spanish, and who had English as a second language, to translate it from English into Spanish. Then, two native English-speaking translation specialists translated it from Spanish into English. This resulted in two reasonably consistent versions, achieving a balance between psychological terms and everyday language in the final version used in this study.

The IBS was conducted using a Google Forms questionnaire, which was emailed to databases of workers in Lima. The link sent consisted of a primary section requesting their collaboration in the study through an informed consent form, which outlined the purpose of the research, the confidentiality of the information, the voluntary and anonymous participation of the worker, and the freedom to continue or stop participating at any time during the process if they deemed it appropriate. Additionally, the data would be used solely for research purposes, and participants would not receive any monetary benefit for their participation. The second section comprised the research questionnaire and their responses.

The evaluation was carried out in accordance with the guidelines of the Declaration of Helsinki (World Medical Association, 1964), the ethical code of the Peruvian Association of Psychologists (Spanish: Colegio de Psicólogos del Perú, 2018), and the Standards for Educational and Psychological Testing (American Educational Research Association et al., 2014).

Data analysis

Content-based validity evidence

Nine judges analyzed the clarity and relevance of the items, all of whom were psychologists with experience in the workplace and university teaching. In this procedure, Aiken's V methodology and its confidence intervals (CI; Penfield & Giacobbi, 2004) were applied. To this end, a lower confidence interval limit greater than .50 was considered appropriate (Merino & Livia, 2009).

Internal structure validity evidence

Preliminary analysis

The univariate normality of the items was analyzed at a descriptive level using the magnitude of asymmetry (< 2 ; Finney & DiStefano, 2006) and kurtosis (< 7 ; Finney & DiStefano, 2006), while for the multivariate analysis, Mardia's G2 coefficient (< 70 ; Domínguez-Lara *et al.*, 2022) was used.

Estimate

Confirmatory factor analysis was performed separately according to gender (men and women) and position (supervisors and subordinates), and a two-factor model (idea generation: items 1, 2, and 3; idea implementation: items 4, 5, and 6; Purc & Laguna, 2019) and a one-dimensional model were evaluated. The weighted least square mean and variance-adjusted estimation method and polychoric correlations were used.

Model fit was assessed according to general and specific criteria. In terms of general criteria, the magnitude of the most frequently used fit indices was considered, such as the CFI ($> .90$; McDonald & Ho, 2002), RMSEA ($< .08$; Browne & Cudeck, 1993), and WRMR (< 1 ; DiStefano *et al.*, 2018); and more specifically, factor loadings ($> .50$; Domínguez-Lara, 2018). On the other hand, convergent internal validity was assessed using the mean variance extracted per factor (MVE), and a value greater than .37 was considered (Moral-de la Rubia, 2019); and discriminant internal validity was supported if the interfactor correlations (ϕ) were less than .80 (Brown, 2015), and if the square of the interfactor correlation (ϕ^2) was less than the MVE.

Measurement invariance by gender and position

Measurement invariance was evaluated using a multiple-group factor analysis by gender and position. To this end, the equality restriction was specified for the internal structure (configural invariance), factor loadings (weak invariance), thresholds (strong invariance), and residuals (strict invariance) (Pendergast *et al.*, 2017). Then, compliance with different degrees of invariance was evaluated based on the variation in fit indices, i.e., if $\Delta CFI > .01$ and $\Delta RMSEA < .015$ (Chen, 2007), and if the change in χ^2 was not statistically significant ($p > .05$), it was considered favorable evidence of measurement invariance.

Reliability

The reliability of the scores was estimated using the α coefficient ($> .70$; Ponterotto & Charter, 2009) and that of the construct using the ω coefficient ($> .80$; Raykov & Hancock, 2005). In both cases, a correction procedure was implemented because the correlation between residuals was modeled (Dominguez-Lara, 2016; Dominguez-Lara & Merino-Soto, 2017). Nevertheless, in all cases, the coefficient was estimated at the point level, and the CI was obtained using the bias-corrected bootstrap method (Cheung, 2009).

Software

Regarding agreement among judges, a calculation module was used for Aiken's V and its CIs (Merino & Livia, 2009). For factor analyses (individual and multigroup) and reliability analyses, Mplus version 7.4 was used (Asparouhov & Muthén, 2006, 2021; Muthén & Muthén, 1998-2015).

Results

Content-based validity evidence

In general, the judges agree that the Spanish version of the IBS items is sufficiently clear and relevant to evaluate the construct (Table 2), although item 3 (statement) is considered less relevant than the others. Hypothesis 1 (the items are representative of the construct) was supported.

Table 2
 Validity of the Innovative Behavior Scale content

	Aiken's V	
	Clarity (CI 95%)	Relevance (CI 95%)
1. I am looking for new technologies, processes, techniques, or product ideas.	.925 (.823, .970)	.962 (.873, .989)
2. I propose creative ideas.	.962 (.873, .989)	.980 (.900, .996)
3. I promote and defend the innovative ideas of others.	.852 (.734, .923)	.628 (.495, .745)
4. I identify or obtain the necessary funds to implement new ideas.	.870 (.755, .936)	.813 (.690, .895)
5. I develop appropriate plans and schedules for implementing new ideas.	1.000 (.934, 1.000)	.833 (.713, .910)
6. I am innovative.	1.000 (.934, 1.000)	1.000 (.934, 1.000)

Note: CI = Confidence intervals

Internal structure validity evidence

The items show sufficient approximation to both univariate normality (Table 3) and multivariate normality ($G^2 = 13.422$).

Table 3
 Descriptive statistics for the Innovative Behavior Scale

	Descriptive			
	W	SD	g ₁	g ₂
Item 1	4.458	0.705	-1.149	0.819
Item 2	4.441	0.665	-0.782	-0.489
Item 3	4.493	0.634	-0.870	-0.282
Item 4	3.938	0.971	-0.665	-0.121
Item 5	4.026	0.882	-0.754	0.349
Item 6	4.269	0.737	-0.673	-0.177

Note: M= Mean; SD=Standard deviation; g₁= asymmetry; g₂= kurtosis

As for the two-dimensional model, although it showed an acceptable fit in men (CFI = .985; RMSEA = .120, 90% CI .060, .182; WRMR = 0.579), women (CFI = .982; RMSEA = .159, 90% CI .101, .221; WRMR = 0.639) and subordinates (CFI = .989; RMSEA = .116, 90% CI .052, .181; WRMR = 0.517), in the case of bosses, item 2 was removed because the first analysis was not performed properly (CFI = .974; RMSEA = .174, 90% CI .099, .259; WRMR = 0.536). Regarding factor parameters, all factor

loadings and VMEs were acceptable (Table 4), but the interfactor correlations were high, and the distinction between factors was not favorable in all cases ($\phi^2 > \text{MVE}$).

In the unidimensional model, the correlation between the residuals of items 4 and 5 was incorporated into all analyses, after which the fit improved substantially. For example, in the case of men after the first analysis (CFI = .967; RMSEA = .170, CI90% .118, .225; WRMR = 0.828), there was an improvement when incorporating the correlation between residuals (CFI = .984; RMSEA = .126, CI90% .068, .188; WRMR = 0.590). A similar picture was observed in women (CFI = .976; RMSEA = .170, CI90% .116, .229; WRMR = 0.744), whose fit improved after the additional parameter was implemented (CFI = .992; RMSEA = .108, CI90% .040, .174; WRMR = 0.500). A similar case was observed in the group of bosses (CFI = .954; RMSEA = .202, CI90% .151, .257; WRMR = 1.010), whose fit improved substantially (CFI = .994; RMSEA = .076, CI90% .000, .145; WRMR = 0.428), as did that of the subordinates (CFI = .983; RMSEA = .134, CI90% .078, .194; WRMR = 0.622), although in this case the improvement was not as noticeable (CFI = .988; RMSEA = .120, CI90% .058, .185; WRMR = 0.524). Finally, adequate convergent internal validity was observed ($\text{MVE} > .37$; Table 4). These results provide empirical support for hypothesis 2 (a unidimensional internal structure predominates).

Table 4
 Factor parameters of the IBS items

	Two oblique ^a factors				One-dimensional			
	M	W	B	S	M	W	B	S
Item 1	.822	.800	.863	.776	.812	.796	.848	.771
Item 2	.979	.879	-	.870	.957	.867	.971	.859
Item 3	.845	.877	.801	.896	.838	.868	.777	.886
Item 4	.773	.748	.685	.725	.649	.660	.625	.661
Item 5	.776	.807	.729	.763	.667	.720	.661	.710
Item 6	.822	.897	.833	.882	.796	.882	.807	.861
Φ	.831	.898	.781	.904				
ϕ^2	.691	.806	.610	.817				
MVE ₁	.783	.727	.693	.721	.630	.645	.624	.633
MVE ₂	.625	.672	.565	.629				

Note: M= Men; W= Women; B= Bosses; S= Subordinates; ^a: the idea generation factor is composed of items 1, 2, and 3, and the idea implementation factor is composed of items 4, 5, and 6; ϕ : interfactor correlation; MVE₁: mean variance extracted from the first factor; MVE₂: mean variance extracted from the second factor.

Measurement invariance according to gender and job position

The variation in the adjustment indices indicates that an acceptable degree of complete invariance was achieved across gender and job position (Table 5), which empirically supports hypothesis 3 (the measurement of innovative behavior is equivalent across gender and job position).

Table 5
 Measurement invariance by gender and position

	CFI	RMSEA	CI90%	WRMR	$\Delta\chi^2$	Δ CFI	Δ RMSEA
Invariance according to gender							
Configural	.989	.109	.064, .155	0.766			
Weak	.994	.071	.011, .116	0.814	2.738(5) ^{nm}	.005	-.038
Strong	.996	.047	.000, .088	0.863	5.583(11) ^{nm}	.002	-.024
Strict	.998	.030	.000, .074	0.911	3.437 (6) ^{nm}	.002	-.017
Invariance according to job position							
Configural	.992	.096	.047, .143	0.676			
Weak	.993	.077	.026, .121	0.827	7.089(5) ^{nm}	.002	-.019
Strong	.993	.062	.000, .100	0.918	9.045(11) ^{nm}	.000	-.015
Strict	.995	.048	.000, .086	0.984	4.497(6) ^{nm}	.002	-.014

Note: ^{nm}= Not significant

Reliability

Regarding reliability, high scores were obtained ($\alpha = .907$, 95% CI .881 - .923) and construct reliability ($\omega = .925$, 95% CI .903 - .938), although after correction due to the presence of correlated residuals, there was a decrease in the magnitude of the coefficients: not very significant in the ω coefficient ($\omega_{\text{corrected}} = .905$, 95% CI .878 - .924), but greater in the α coefficient ($\alpha_{\text{corrected}} = .703$, 95% CI .657 - .734). These findings indicate that hypothesis 4 (presents adequate reliability magnitudes) received empirical support.

Discussion

Measuring innovative behavior is a crucial activity in work environments, as it is essential to understand how this phenomenon manifests in the working population (Purc & Laguna, 2019). Few measurement instruments assess innovative behavior at work, among which the IBS, created by Scott and Bruce (1994),

stands out. It is a brief six-item measure that collects objective information about employee innovation. This fact is relevant because innovative behavior benefits individuals and organizations, as it is positively and directly related to well-being in the workplace (Wang et al., 2022) and stimulates enthusiasm for innovation in companies, thereby strengthening their innovative vitality.

Regarding psychometric findings, all hypotheses received empirical support. First, in terms of evidence of validity concerning the content of the items, it was found that all items showed favorable indicators of clarity, although five of the six items (except item 3) were considered relevant for measuring the construct. The item with the least favorable indicators (I promote and defend the innovative ideas of others) focuses on others' innovative ideas, whereas the other items focus on the respondent. This would indicate that, at least for experts, innovation is an individual-based process, and that its application focused on collective innovation (i.e., the perception of innovative behavior in others) would not be recommended.

Secondly, prior to the invariance analysis, the internal structure analysis was performed in each group (gender: men and women; hierarchy: bosses and subordinates). In general terms, it was observed that the one-dimensional structure is the one that receives the most support, that is, the dimensions called idea generation and idea implementation are not empirically distinguishable, and their independent interpretation would be redundant. In addition, the unidimensional version shows acceptable factor loadings across all groups, although item 4 (I identify or obtain the necessary funds to implement new ideas) had lower loadings. This is explained because the focus of the item is on external financing rather than on innovative ideas themselves, which would empirically distance the item from the core of innovation, which is personal and institutional, not economic.

This finding is consistent with reports by authors who conducted studies of the instrument in English (Carmeli & Spreitzer, 2009; Hsu & Chen, 2017) or Polish (Purc & Laguna, 2017), where the IBS is configured as a unidimensional measure. This situation provides cumulative evidence of the scale's internal structure across different cultural settings, lending consistency to the results.

Thirdly, measurement invariance analysis was conducted because there may be differences in the construct's representation between managers and subordinates, given that innovative behavior indicates a person's ability to recognize a problem, generate ideas for its resolution, and successfully implement them. A person's position may influence their problem-solving ability, as bosses are usually the ones who support innovation (Choi et al., 2021; Li et al., 2023). Regarding gender, the literature is inconsistent regarding the role of gender in innovative behavior (Blake & Hanson, 2005; Leong & Rasli, 2014; Luksyte et al., 2017; Nählinder et al., 2015; Salessi, 2021; Salessi & Omar, 2019; van Acker et al., 2018), so an analysis of invariance according to gender was implemented (Steyn & de Bruin, 2020b). It was found that this measure is invariant between men and women and between bosses and subordinates,

meaning that comparative studies can be conducted without concern for bias associated with the measure across groups (e.g., that bosses might interpret innovation differently than their subordinates).

Finally, in terms of reliability, the magnitudes of this statistic at the score and construct levels are encouraging for the scale's use in both applied and research settings. Although the association between residuals could affect unidimensionality, this is to be expected given the few items in the scale studied.

In terms of practical implications, the IBS obtained would be the first Spanish-language version and can be used reliably in academic and business-related research, especially in human resource development, as it is particularly suitable for studying a single dimension of innovative behavior. This fact could be particularly useful in online surveys and in extensive measurement sets that consume significant time for the employees or workers surveyed (Purc & Laguna, 2019). Thus, knowledge of employees' level of innovative behavior is valuable to employers, as it enables them to project cultural values that can encourage collective innovation (Barbosa, 2014). A democratic and collaborative vision is effective at stimulating innovation, and open communication, information exchange, autonomy, and participation in decision-making are important.

Additionally, organizations can establish other employee selection criteria and train them to develop skills that enhance innovative behavior (Mielniczuk & Laguna, 2020). Similarly, by gathering information from their employees, they can identify and retain supervisors who support innovation and provide them with training related to creative leadership skills (Li et al., 2023).

Although the study represents progress in innovative behavior, it has some limitations, including a small sample size, which may lead to difficulties in data distribution and could impact the research results. Online data collection may also have introduced bias into participants' responses.

The conclusion is that the IBS has a unidimensional structure with adequate reliability and is invariant across gender and the position of the person being evaluated. It is recommended to broaden the scope of research, given that workers' cultural environment can meaningfully influence employees' perceptions and attitudes (Choi et al., 2021). Likewise, given that it is not known whether innovative behavior is understood similarly across companies of different sizes and locations (Li et al., 2023), it would be interesting to conduct analyses in such contexts.

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