Multidimensional Assessment of Interoceptive Awareness (MAIA): validity and reliability for a Colombian community context

Evaluación Multidimensional de la conciencia Interoceptiva: validez y reproducibilidad en un contexto comunitario colombiano

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Abstract

Objective: This study aimed to examine the validity and reliability of the Multidimensional Assessment of Interoceptive Awareness (MAIA) in a Colombian community sample.
Methods: A cross-sectional study was conducted among 487 Colombian people. Participants completed an online survey that included the MAIA and International Fitness Scale (IFIS). Confirmatory factor analysis was conducted to verify the scale's internal structure, reliability analyses (Cronbach's alpha, McDonald's omega, Guttman's lambda 6, and Greatest Lower Bound) were performed at both the overall and factor levels, and test-retest reliability. Correlations with perceived physical condition indicators (as evidence of convergent validity) were also examined.
Results: Confirmatory factor analysis supported the dimensional structure of the scale, with adequate goodness-of-fit indices (CFI = .991; GFI = .990; NFI = .988; RMSEA = .070). Intercorrelations among the MAIA dimensions provided evidence of construct reliability, with high values above .80 for six of the eight factors, acceptable values around .50 for factor 2, and low values only for factor 3. Test-retest reliability was high (rho = .717, p < .001). Direct correlations were found between perceived physical condition and some dimensions of the MAIA, as evidence of convergent validity.
Conclusion: The MAIA demonstrated adequate evidence of internal structural validity, convergent and discriminant validity, and adequate reliability for measuring interoceptive awareness in a healthy Colombian population. The use of the MAIA to assess interoceptive awareness is recommended in future research as a tool for the prevention of mental and physical health conditions. Further studies are recommended to analyze its metric quality in other populations.

Keywords

Interoception; interoceptive awareness, self-perception, physical condition.

Resumen

Objetivo: El objetivo de este estudio fue examinar la validez y fiabilidad de la Evaluación Multidimensional de la Conciencia Interoceptiva (MAIA) en una muestra de la comunidad colombiana.
Métodos: Se realizó un estudio transversal entre 487 colombianos. Los participantes completaron una encuesta en línea que incluía la MAIA y la Escala Internacional de Aptitud Física (IFIS). Se realizó un análisis factorial confirmatorio para verificar la estructura interna de la escala, se llevaron a cabo análisis de fiabilidad (alfa de Cronbach, omega de McDonald, lambda 6 de Guttman y límite inferior máximo) tanto a nivel general como a nivel de factores, y se evaluó la fiabilidad test-retest. También se examinaron las correlaciones con los indicadores de condición física percibida (como evidencia de validez convergente).
Resultados: El análisis factorial confirmatorio respaldó la estructura dimensional de la escala, con índices de bondad de ajuste adecuados (CFI = 0,991; GFI = 0,990; NFI = 0,988; RMSEA = 0,070). Las intercorrelaciones entre las dimensiones de la MAIA proporcionaron evidencia de la fiabilidad del constructo, con valores altos por encima de 0,80 para seis de los ocho factores, valores aceptables en torno a 0,50 para el factor 2 y valores bajos solo para el factor 3. La fiabilidad test-retest fue alta (rho = 0,717, p < 0,001). Se encontraron correlaciones directas entre la condición física percibida y algunas dimensiones de la MAIA, como evidencia de validez convergente.
Conclusión: El MAIA demostró evidencia adecuada de validez estructural interna, validez convergente y discriminante, y fiabilidad adecuada para la medición.

Palabras clave

Interocepción; conciencia interoceptiva, autopercepción, condición física.

Introduction

Interoception is the capacity to perceive internal bodily signals, resulting from the neural integration of sensory information from the body's organs (Chen et al., 2021). Mechanisms underlying interoception depends on neural and endocrine systems. It plays an important role in brain-body interactions (Li., et al, 2025). A diminished interoceptive capacity has been related to different physical and mental conditions, such as suicidal thoughts, increased anxiety levels and alexithymia (Bonaz et al., 2021; Locatelli et al., 2023; Hielscher & Zopf, 2021;Trevisan et al., 2019). According to recent evidence interoception is related to both mental and physical health states; its assessment enables a deeper understanding of individuals' experiences of bodily sensations and responses, potentially facilitating the development of more effective coping strategies and self-regulation (Leão et al., 2025).

Self-regulation refers to the ability to modulate bodily sensations through the interpretation of interoceptive signals. This process involves perceiving, evaluating, and responding to internal states, thereby contributing to homeostatic balance (Bonaz et al., 2021). This balance can be better understood by recognizing that interoceptive and exteroceptive attentional processes must be adequately regulated to achieve appropriate emotional and behavioral responses to tasks; this attentional balance is becoming increasingly challenging due to the high volume of exteroceptive stimuli generated by modern technologies and lifestyles (Farb et al., 2013). One way to promote balance between internal and external focus is through physical activity; the body movement generates organic responses that enhance the perception of internal signals, thereby promoting greater interoceptive processing and improving homeostatic balance (Wallman-Jones et al., 2021; Wallman-Jones etal., 2022; Wallman-Jones, & Schmidt, 2022b).

Based on this framework, this study suggests that measuring interoceptive awareness, combined with physical fitness, could serve as indicators that provide more comprehensive information beyond proxies related to disease, reflecting the overall well-being of populations. This mind-body approach aligns with current trends in psychosomatic and integrative medicine, emphasizing the interconnectedness of physical and psychological health (Herbert & Pollatos, 2012; Quadt et al., 2018; Terasawa et al., 2021).

Various methods have been developed to measure interoceptive awareness. These methods can be categorized into three groups: 1) interoceptive accuracy, which includes objective measurements such as heartbeat count, 2) interoceptive sensibility, which relies on self-report measures questionnaires assessing individuals' perceived interoceptive states, and 3) interoceptive awareness, which integrates both accuracy and sensibility and is recognized as a metacognitive process (Garfinkel et al., 2015).

Instruments assessing interoceptive awareness and its underlying metacognitive processes could provide more comprehensive bodily information, encompassing not only bodily sensations but also self-regulation capacities, which are linked to better health outcomes. The scales most frequently used for this purpose are the Body Responsiveness Scale (BRS)(Alba Maldonado et al., 2021), the Scale of Body Connection (SBC)(Price et al., 2017), and the Multidimensional Assessment of Interoceptive Awareness (MAIA). For this study, the focus will be on the MAIA (Mehling et al., 2012).

MAIA began with an expert focus group that identified its core components. Items were subsequently created for each category, and a second focus group reviewed these items. A third focus group, composed of both patients and experts, then evaluated the items for comprehensibility. The finalized questionnaire was then administered, and factor analysis revealed an eight-factor structure with adequate fit indices. This structure demonstrated coherence with the conceptual framework of the scale and provide evidence of internal validity. Cronbach's alpha coefficients ranged from .66 to .82; however, factors 1, 2, and 3 did not exceed the commonly accepted threshold of .70. Correlations among the dimensions ranged from .09 to .60, with significant associations observed between these dimensions and measures of mindfulness, body awareness, anxiety, bodily dissociation, and emotion regulation (Mehling et al., 2018).

Several versions of the MAIA have been developed in addition to the original, including a short form and the MAIA-2. In the present study, the original version was selected because it has been previously validated in Latin American populations, as evidenced by its use in a Chilean sample(Valenzuela-Moguillansky & Reyes-Reyes, 2015) and its confirmed suitability in Colombian university populations. Addition-

ally, despite revisions introduced in the MAIA-2, the literature indicates that no substantial improvements have been observed; for instance, Machorrinho et al. reported persistent limitations in the No Distraction and No Concerns dimensions (Machorrinho et al., 2018).

The MAIA test has been applied in the Colombian context in studies conducted by Montoya-Hurtado et al. in university population (Montoya-Hurtado et al., 2023; Montoya-Hurtado et al 2023b). However, validation in non-university populations is still needed, encompassing a broader range of age groups, as the characteristics and needs of the general population may differ from those of university populations. Given that previous studies highlight the relevance of interoceptive awareness as a construct associated with mental and physical health, as well as overall health and well-being, and considering the lack of evidence regarding the psychometric properties of the MAIA in community samples, the present research is warranted. Accordingly, the objective of this study is to evaluate the validity and reliability of the MAIA in a healthy Colombian sample. Additionally, the present study also evaluates the perception of physical fitness with the International Fitness Scale (IFIS) (Ramírez Velez, et al. 2017) to examine its contribution to interoceptive awareness in terms of convergent validity, and to confirm the relationship between physical fitness and interoceptive awareness. The results of this study will allow, for the first time, an adapted tool with adequate psychometric properties for the measurement of interoception, which will allow health professionals to measure this construct within the framework of physical habilitation and rehabilitation processes in the Colombian community context.

Method

Design

This study was a quantitative, non-experimental and instrumental investigation. It is understood as a non-experimental study because variables were not manipulated and were measured in their natural state, and as an instrumental study because it sought to evaluate the metric properties (evidence of validity and reliability) of a scale, in this case the MAIA scale. . The study was approved by the research ethics committee of the nursing and rehabilitation faculty (record number 011, dated August 12, 2022).

Participants

A total of 487 Colombian adults aged 18 to 60 years (mean age = 38.46 ± 11.80) participated, including 184 men (37.78%) and 303 women (62.01%). Participants were recruited through a non-probabilistic sampling method. As inclusion criteria, participants had to be born and live in Colombia and be over 18 years of age. As exclusion criteria, participants should not have a clinically relevant diagnosis, at either the physical level (musculoskeletal, rheumatoid, or nervous disorders) or the psychological level (emotional, mood, or consciousness disorders), that could distort the assessment of their own interoception.. The sample size was deemed sufficient, as previous research indicates that with over 450 participants, the likelihood of accurately accepting theoretical models increases significantly, thereby reducing the risk of Type I errors (Morata-Ramírez et al., 2015). All participants provided electronic informed consent. The recruitment and eligibility processes are described in Figure 1.

Sampling

A convenience sampling method was used to recruit participants who met the predetermined inclusion criteria. The sample size was determined based on current literature recommendations. According to Lloret-Segura et al. (2014), when communalities are low, around 0.30, and the number of items per factor is 3, a minimum sample size of 400 cases is required, even 500 or more to obtain sufficiently precise estimates. Since certain dimensions of the scale include only three or four items and the communalities of the items have not been determined yet, the sample size was projected based on this criterion.

Additionally, a sample of 22 participants was obtained, based on an anticipated correlation of 80%, a confidence level of 95% and a statistical power of 80%, to perform a retest of the instrument 19 days later.

Figure 1. Flowchart of the recruitment process

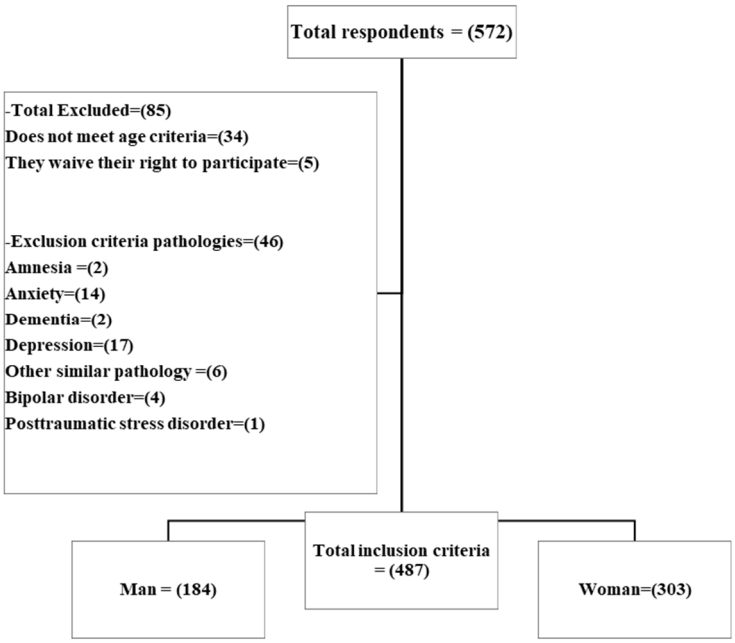

Table 1. Distribution of participants across educational levels

Education level	n	%
Basic	114	23.4
Thecnicall	95	19.4
Professional	171	35.1
Postgraduate	98	32.6
Not record	9	1.8

Instruments

A survey was conducted using Microsoft Forms, which included sociodemographic data and two instruments: the MAIA and the IFIS. Sociodemographic variables included sex, age, educational level, mental health diagnoses such as anxiety, depression, and schizophrenia, among others. The study's objectives were clearly outlined, and participants provided informed consent, allowing them to decide whether to participate in the study.

Multidimensional Assessment of Interoceptive Awareness

It is a questionnaire that assesses interoceptive awareness (Mehling et al., 2012a). It consists of 8 dimensions and 32 items. The first dimension, "Noticing," comprises four items and refers to the ability to recognize and be aware of neutral, pleasant, and unpleasant bodily sensations. The second, "Not distracting," includes three items and refers to the tendency to ignore or recognize bodily sensations of discomfort or pain. The third, "Not worrying," consists of three items and assesses the ability to maintain emotional balance despite experiencing discomfort or pain. The fourth dimension, "Attention regulation," includes seven items and refers to the ability to control or maintain attention on bodily sensations. "Emotional awareness" is the fifth dimension and includes five items related to the awareness of the connection between bodily sensations and emotional states. The sixth, "Self-regulation," comprises four items and explores the ability to release distress by directing attention to bodily sensations. The seventh, "Body listening," consists of three items and refers to the ability to actively listen to bodily sensations for information. Finally, the eighth, "Trusting," includes three items and represents trust in the body to manifest safely and reliably.

The scale employs a 5-point Likert response format, ranging from 0 (never) to 5 (always). It yields a total score reflecting overall bodily awareness, as well as scores for each dimension. Notably, items 5, 6, 7, 8, and 9 are reverse-scored within the dimensional assessment, and Cronbach's alpha coefficients ranged from .66 to .82 (Mehling et al., 2012a).

Perception of Physical Fitness: International Fitness Scale

To evaluate convergent validity, the IFIS (International Fitness Scale)(Ramírez Velez, et al. 2017) A questionnaire was used. This instrument consists of five items designed to measure individuals' perceptions of their physical fitness. Participants rate each item on a 5-point Likert scale (1 = very poor, 5 = very good), responding to questions such as "How would you rate your overall physical condition?". The dimensions evaluated by the IFIS include cardiorespiratory fitness, muscular strength, speed, and flexibility. This instrument has been previously validated in a Colombian sample, showing a Cronbach's alpha coefficient of 0.80. and excellent reliability scores (ICC range 0.90-0.96).

Data analysis

After creating the digital application, which incorporated informed consent outlining the study's purpose, rationale, activities, risks, and the voluntary nature of participation or withdrawal, demographic information was collected, and the MAIA was administered to the general sample. The instrument was distributed through institutional and researcher social media channels. For the sample with test-retest measures, the procedure was: initially they were contacted for their participation, the application form with consent was presented, and they began to fill it out (it was done in a room with adequate lighting, temperature and without interruptions), and 19 days later the new test was carried out with the same environmental conditions as the pretest.

Following data collection, the statistical analyses proceeded as planned. A confirmatory factor analysis was conducted to replicate the original eight-factor structure, providing evidence of the scale's internal validity (confirmatory factor analysis is a strategy for replicating a previous factor structure. If the goodness-of-fit indicators are favorable, this indicates that the theoretical structure is maintained with the empirical data, and allows us to affirm the evidence of validity from the internal structure). Simulations were performed using the R package Lavaan, with weighted least squares estimation applied to account for potential violations of multivariate normality (Rigo & Donolo, 2018) . Standardized latent variables and robust standard errors were used, aiming for fit indices above 0.95 and error indices below 0.08. To assess convergent and discriminant validity, Spearman correlation coefficients were calculated between the MAIA dimensions and perceived physical condition indicators, with the expectation of positive and significant correlations. Additionally, correlations among the instrument's factors were hypothesized to be significant but less than 0.90 to demonstrate relatedness without redundancy. Average variance extracted (AVE) values of 0.30 or higher for each factor were also evaluated, as evidence of convergent validity.

Reliability was evaluated through the calculation of Cronbach's alpha, McDonald's omega, Guttman's lambda 6, and the Greatest Lower Bound, both for the entire scale and at the factor level. Item deletion simulations were performed to determine each item's impact on internal consistency. Test-retest reliability was assessed via correlation coefficients (expected to be above 0.60), and independent samples t-tests were performed to demonstrate the stability of the measures at both measurement points. All statistical procedures were carried out with JASP version 0.18.3.

Results

All goodness-of-fit and error level indicators are adequate, supporting the alignment of participants' response patterns with the eight-factor model and thereby confirming the original factorial structure (Table 2).

Table 2. Goodness-of-fit indices of the eight-factor MAIA model in the Colombian population.

Indicator	Recommended value	Observed value
Comparative Fit Index (CFI)	> 0.95	0.991
Goodness-of-Fit Index (GFI)	> 0.95	0.990
Tucker–Lewis Index (TLI)	> 0.95	0.990
Non-Normed Fit Index (NNFI)	> 0.95	0.990
Normed Fit Index (NFI)	> 0.95	0.988
Relative Fit Index (RFI)	> 0.95	0.986
Incremental Fit Index (IFI)	> 0.95	0.991
RMSEA 90% CI (Lower bound)	< 0.08	0.066
RMSEA 90% CI (Upper bound)	< 0.08	0.074
Standardized Root Mean Square Residual (SRMR)	< 0.08	0.056

Note. CFI = Comparative Fit Index; GFI = Goodness-of-Fit Index; TLI = Tucker–Lewis Index; NNFI = Non-Normed Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; IFI = Incremental Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

Table 3. Factor loadings relating the factors to the MAIA items.

Factor	Indicator	Estimator	Standard error	Z score	P
Factor 1	1. When I am tense, I notice where the tension is located in my body.	0.686	0.027	24.972	< .001
	2. I become aware when I feel uncomfortable in my body.	0.834	0.021	39.327	< .001
	3. When I am comfortable, I notice it in specific parts of my body.	0.770	0.024	32.486	< .001
	4. I notice changes in my breathing, such as when it becomes slower or faster.	0.769	0.028	27.280	< .001
Factor 2	5. I only notice physical tension or discomfort when it becomes very severe.	0.558	0.074	7.584	< .001
	6. I am unaware of sensations of discomfort.	0.367	0.053	6.907	< .001
	7. When I experience pain or discomfort, I try to ignore it and continue with what I was doing.	0.826	0.101	8.138	< .001
Factor 3	8. When I feel physical pain, I get angry.	0.182	0.072	2.517	0.012
	9. If I feel any discomfort, I start to worry that something is wrong.	0.197	0.069	2.843	0.004
	10. I can experience an unpleasant physical sensation without worrying about it.	0.649	0.160	4.054	< .001
Factor 4	11. I can focus on my breathing without being distracted by my surroundings.	0.644	0.028	23.144	< .001
	12. I can be aware of my internal bodily sensations even when there is a lot going on around me.	0.786	0.019	40.575	< .001
	13. When I am conversing with someone, I can pay attention to my posture.	0.780	0.018	43.123	< .001
	14. I can redirect my focus back to my body if I am distracted.	0.855	0.014	61.554	< .001
	15. I can shift my attention from my thoughts to my bodily sensations.	0.859	0.013	65.448	< .001
	16. I can attend to my entire body, even when one part is experiencing pain or discomfort.	0.835	0.015	56.999	< .001
	17.I am able to consciously focus on my body as a whole.	0.842	0.015	57.533	< .001
Factor 5	18. I notice how my body changes when I am angry.	0.769	0.020	39.402	< .001
	19. When something goes wrong in my life, I can feel it in my body.	0.822	0.016	50.472	< .001
	20. I notice that my body feels different after a peaceful experience.	0.861	0.015	59.049	< .001
	21. I notice that I can breathe freely and easily when I feel comfortable.	0.815	0.023	36.005	< .001
	22. I notice how my body changes when I feel happy.	0.909	0.015	58.750	< .001
Factor 6	23. When I feel overwhelmed, I can find a peaceful place within myself.	0.783	0.018	44.640	< .001
	24. When I direct my attention to my body, I feel calm.	0.870	0.013	65.691	< .001
	25. I can use my breath to reduce tension	0.822	0.017	49.533	< .001
	26. When I am caught up in my thoughts, I can calm my mind by focusing on my body/breath.	0.889	0.011	77.926	< .001
Factor 7	27. I am attentive to the information my body sends about my emotional state.	0.933	0.013	72.374	< .001
	28. When I am upset, I take time to explore how my body feels.	0.816	0.016	52.471	< .001
	29. I listen to my body to guide my actions.	0.843	0.015	55.151	< .001
Factor 8	30. In my body, I feel at home.	0.907	0.010	89.124	< .001
	31. I feel that my body is a safe place.	0.925	0.009	102.828	< .001
	32. I trust my bodily sensations.	0.918	0.012	77.987	< .001

Note: Estimator = factor loading to the item; expected p-value < 0.05.

All factors were adequately loaded onto each item (loading > 0.30, p < 0.01), except for two items in factor 3, whose loadings remained statistically significant but had low extractability (Table 3). Meanwhile, the average variances extracted (factor 1 = 0.588; factor 2 = 0.376; factor 3 = 0.165; factor 4 = 0.645; factor 5 = 0.700; factor 6 = 0.709; factor 7 = 0.749; factor 8 = 0.840) indicate that seven of the eight factors had adequate extractions, and only factor 3 did not meet this criterion, suggesting a low explanatory power of that factor for the construct. Table 4 presents the correlations between the MAIA dimensions and the perceived physical state questionnaire.

Table 4. Correlations between the dimensions of the MAIA and self-reported measures of physical condition.

Variable		1. IFIS physical condition		2. IFIS cardiorespiratory fitness		3. IFIS muscular strength		4. IFIS speed/agility		5. IFIS flexibility	
Factor 1: Noticing	rho	0.149	***	0.083		0.124	**	0.082		0.096	*
	Value p	< .001		0.067		0.006		0.071		0.035	
Factor 2: Not-distracting	rho	-0.103	*	-0.104	*	-0.092	*	-0.101	*	-0.076	
	Value p	0.023		0.021		0.042		0.026		0.094	
Factor 3: Not Worrying.	rho	0.025		0.032		0.003		0.008		-0.014	
	Value p	0.587		0.485		0.956		0.867		0.759	
Factor 4: Attention regulation	rho	0.213	***	0.206	***	0.165	***	0.199	***	0.166	***
	Value p	< .001		< .001		< .001		< .001		< .001	
Factor 5: Emotional awareness	rho	0.216	***	0.153	***	0.129	**	0.146	**	0.168	***
	Value p	< .001		< .001		0.004		0.001		< .001	
Factor 6: Self-regulation.	rho	0.337	***	0.329	***	0.271	***	0.286	***	0.226	***
	Value p	< .001		< .001		< .001		< .001		< .001	
Factor 7: Body Listening	rho	0.215	***	0.210	***	0.156	***	0.202	***	0.146	**
	Value p	< .001		< .001		< .001		< .001		0.001	
Factor 8: Trusting.	rho	0.325	***	0.237	***	0.260	***	0.260	***	0.203	***
	Value p	< .001		< .001		< .001		< .001		< .001	
Total Score MAIA	rho	0.256	***	0.220	***	0.188	***	0.219	***	0.177	***
	Value p	< .001		< .001		< .001		< .001		< .001	

Note: * = p-value < 0.05; ** = p-value < 0.01; *** = p-value < 0.001.

Convergent validity was evident from positive associations between IFIS and the MAIA dimensions (Table 4), except for factor 3. Additionally, Table 5 shows the correlations between the dimensions of MAIA, indicating correlations between the dimensions (as evidence of validity from the internal structure), but these correlations do not exceed values of 0.90, which shows the independence of each dimension.

Table 5. Correlations between the dimensions of the MAIA.

Variable		Factor 1: Noticing	Factor 2: Not distracting	Factor 3:: Not Worrying.	Factor 4: Attention Regulation	Factor 5: Emotional awareness.	Factor 6: Self-regulation.	Factor 7: Body Listening.
Factor 1: Noticing	rho	—						
	Value p	—						
Factor 2: Not-distracting	rho	.022	—					
	Value p	.633	—					
Factor 3: Not Worrying.	rho	.064	.289 ***	—				
	Value p	.156	<.001	—				
Factor 4: Attention regulation	rho	.524 ***	.078	.190 ***	—			
	Value p	<.001	.085	<.001	—			
Factor 5: Emotional awareness	rho	.597 ***	.075	.124 **	.607 ***	—		
	Value p	<.001	.096	.006	<.001	—		
Factor 6: Self-regulation.	rho	.418 ***	.003	.131 **	.545 ***	.564 ***	—	
	Value p	<.001	.943	.004	<.001	<.001	—	
Factor 7: Body Listening	rho	.443 ***	.026	.149 ***	.507 ***	.504 ***	.714 ***	—
	Value p	<.001	.563	<.001	<.001	<.001	<.001	—
Factor 8: Trusting.	rho	.460 ***	-.010	.120 **	.499 ***	.572 ***	.679 ***	.640 ***
	Value p	<.001	.820	.008	<.001	<.001	<.001	<.001

Note: * = p-value < 0.05; ** = p-value < 0.01; *** = p-value < 0.001.

Overall reliability, examined by factor and through item removal simulations (Table 6), was high (>.80) for six factors, acceptable (~.50) for factor 2, and low for factor 3. Removing items consistently decreased reliability, and item-item correlations were generally above .30 (except for two items in factor 3). As Factor 3 exhibited a low variance explained and weak correlations with other dimensions, a confirmatory factor analysis was conducted, omitting Factor 3, to ascertain whether model fit indices would improve. However, these indices did not demonstrate a substantial enhancement (CFI = 0.994; ΔCFI = 0.003; TLI = 0.994; ΔTLI = 0.004, GFI = 0.993; ΔGFI = 0.003; RMSEA = 0.063; ΔRMSEA = 0.007). Furthermore, removing this factor would preclude the assessment of the capacity to maintain emotional equilibrium despite experiencing pain, thereby compromising the content validity of the scale.

Table 6. Inventory reliability coefficients.

	Dimension	McDonald ω	Cronbach α	Guttman λ6	GLB	Item-to-item correlation
	General	.940	.936	.960	.977	
	F1	.823	.821	.787	.828	.538
	F2	.588	.573	.488	.588	.313
	F3	.422	.336	.294	.447	.141
	F4	.911	.910	.908	.934	.591
	F5	.878	.875	.875	.921	.586
	F6	.890	.889	.862	.902	.668
	F7	.876	.873	.825	.876	.696
	F8	.916	.915	.883	.916	.782
			If the item is deleted			
	Item	McDonald ω	Cronbach α	Guttman λ6	GLB	Item-to-item correlation
F1	Item 1	.790	.786	.723	.790	.622
	Item 2	.724	.723	.637	.724	.760
	Item 3	.786	.780	.721	.786	.630
	Item 4	.808	.806	.747	.808	.573
F2	Item 5	.450	.450	.291	.450	.401
	Item 6	.587	.587	.418	.587	.311
	Item 7	.371	.371	.231	.371	.444
F3	Item 8	.003	.006	.003	.007	.302
	Item 9	.097	.097	.051	.097	.263
	Item 10	.543	.543	.373	.543	.031
F4	Item 11	.912	.912	.905	.933	.578
	Item 12	.900	.897	.892	.921	.718
	Item 13	.899	.898	.892	.924	.715
	Item 14	.890	.889	.880	.914	.795
	Item 15	.889	.888	.882	.918	.804
	Item 16	.895	.893	.887	.919	.756
	Item 17	.897	.895	.889	.920	.735
F5	Item 18	.857	.855	.851	.923	.683
	Item 19	.841	.840	.823	.897	.740
	Item 20	.832	.830	.812	.877	.787
	Item 21	.872	.868	.842	.881	.620
	Item 22	.859	.850	.829	.875	.702
F6	Item 23	.875	.874	.824	.875	.715
	Item 24	.855	.852	.800	.855	.772
	Item 25	.858	.858	.803	.858	.756
	Item 26	.847	.846	.789	.847	.786
F7	Item 27	.855	.855	.747	.855	.718
	Item 28	.818	.818	.694	.818	.759
	Item 29	.784	.785	.647	.785	.795
F8	Item 30	.887	.887	.797	.887	.818
	Item 31	.842	.842	.728	.842	.871
	Item 32	.901	.901	.822	.901	.798

Test-retest reliability was supported by a correlation of .717 (p < .001) between the two measurement time points. Furthermore, no significant differences were found between the two measures (t = -1.332; p = .197), suggesting adequate stability of the measure.

Discussion

This research aimed to identify evidence of validity and reliability of the (MAIA) for the Colombian sample, given the importance of interoception measurement in health. This importance is primarily due to recent evidence linking interoception with various mental and physical health conditions. Having psychometrically validated tools for its assessment will facilitate informed decision-making, supporting the development of comprehensive health interventions. The findings indicate that the scale preserves an eight-factor structure with high goodness-of-fit indicators and low measurement error, where all items are explained by the dimension to which they belong, providing evidence of the inventory's internal structure validity. Therefore, the MAIA can be considered a psychometrically sound instrument for assessing interoceptive awareness in Colombian community samples, supporting its use in both research and the design of health-related interventions.

Despite adequate global model fit, the Not Worrying factor showed weaker psychometric performance, suggesting that model-level fit may mask factor-specific limitations. The results indicate that seven factors explained sufficient variance, with the exception of Factor 3, Not Worrying shows weaker psychometric performance. The findings suggest that the eight-factor structure is supported by adequate fit indices and aligns with the results in the original validation by Mehling et al. (2012). Concerning reliability, the coefficients obtained in this study are similar to those reported by Mehling et al. (2012), who found strong values in five factors (Noticing, Not-Distracting, Attention Regulation, Emotional Awareness, Body Listening), whereas this study identified them in six (Noticing, Attention regulation, Emotional awareness, Self-regulation, Body listening, Trusting). Additionally, the third factor (Not Worrying) continued to fall below the expected threshold, consistent with the original study.

One plausible theoretical explanation is that Not Worrying (Factor 3) may show stronger psychometric performance in community samples that include individuals with health conditions associated with physical discomfort. The findings from Moretta et al. indicate that individuals with amyotrophic lateral sclerosis (ALS) who demonstrate greater awareness of internal bodily sensations tend to report lower levels of concern about physical discomfort. The study identified a moderate and statistically significant correlation, underscoring the relevance of Factor 3 in the assessment of interoceptive profiles among individuals with chronic physical conditions such as ALS (Moretta et al., 2022). In contrast, the study by Eggart et al. (Eggart et al., 2023) demonstrated through hierarchical regression analyses that higher scores on the Not Worrying (Factor 3) subscale predicted greater levels of mental fatigue at hospital discharge ($\beta = 0.26$, $p = 0.02$). In this context, factor 3 exhibits a dual role: while it may be beneficial by reflecting reduced preoccupation with bodily sensations, it could have adverse implications in individuals with major depressive disorder, as it appears to be associated with increased residual mental fatigue. However, our theoretical explanation about factor 3 merits further study in future research that considers the use of MAIA for interoceptive analysis. Therefore, future studies should examine the functioning of the Not Worrying subscale across different clinical and community populations, including testing measurement invariance and differential item functioning, to clarify whether its psychometric instability reflects contextual sensitivity rather than a structural weakness of the MAIA.

While removing Not Worrying (Factor 3) does not substantially alter the overall performance of the scale, it could potentially compromise the content validity of the MAIA. The third factor also remains below the anticipated threshold, as in the original studies, supporting its role within the general factor and reaffirming the distinctiveness of each factor for evaluating separate elements of interoception. This limitation might be addressed by considering the work of Chapman et al. (Chapman & Stewart, 2024), who developed the MAIA-2 that retains all eight factors but reduces the number of items in factors with a high item count, potentially offering a more balanced and comprehensive assessment of interoceptive awareness. This research showed that correlations among dimensions align with those reported by Mehling et al.2012, highlighting similar relationships with strong coefficients across five factors, whereas this validation in Colombian population identified them in six.

MAIA-2 have 38-item, which adds six questions, three in the "does not distract" dimension and three in the "not worrying" dimension. In its Portuguese translation, this version has exhibited low factor loadings on these two dimensions. Therefore, it is noteworthy that the original 32-item version may represent a parsimonious option to be the optimal number for effectively assessing interoceptive awareness (Machorrinho et al., 2018; Mehling et al., 2018). Additionally, the Brief MAIA-2, published in 2023 by

Rogowska in Poland, retains the original 8 dimensions but standardizes the number of items per dimension, resulting in a total of 24 items with 3 items for each dimension. This abbreviated scale demonstrates a solid factorial structure, with all dimensions achieving adequate factor loadings (Rogowska et al., 2023).

Correlation measures were predominantly positive among the dimensions, and consistent with the present study. Wallman-Jones & Schmidt (2022) suggest associations with the IFIS further support elements of convergent validity. This relationship can be explained by the fact that higher levels of physical activity tend to enhance interoceptive attention, as internal sensations during exercise reflect an individual's physical condition and may promote interoceptive awareness (Wallman-Jones et al., 2022). Some results are consistent with a correlation measure predominantly positive among the dimensions and between them and the International Fitness Scale (IFIS) questionnaire, although factor 3 (not worrying) showed low correlations. Reliability coefficients were very high (≥ .80) for six factors, with one factor showing acceptable levels and the third remaining low (DeVellis, 2016). Item removal analyses demonstrated that 30 of 32 items contributed to internal consistency. The test-retest reliability further supported the stability of the instrument. The findings of In addition to the findings reported by Wallman-Jones et al. 2022, and supported by the results of the present study, it is important to further investigate and incorporate interoception, physical activity, and their interaction as potential predictors of health in populations (Georgiou et al., 2015).

Regarding concurrent validity, Fiskum et al. conducted a study in Norway that correlated the MAIA with the Coop-WONCA, finding that physical fitness is associated with the "does not distract," "does not worry," and "emotional awareness" dimensions. This aligns with our findings, where overall physical awareness, as measured by the IFIS, is related to the total MAIA score, as well as specific dimensions such as tension regulation, emotional awareness, self-regulation, listening to the body, and trust (Fiskum et al., 2023).

About the structural aspects of the questionnaire, Valenzuela et al. reported that the Chilean version of the MAIA maintains the original questionnaire's structure, including its items and dimensions. However, they identified comprehension issues in specific elements, leading to a readaptation—specifically, reformulating questions 5 and 7 of the "does not distract" dimension (Valenzuela-Moguillansky & Reyes-Reyes, 2015). Their study found factor loadings below 0.30 for items 5 to 9, and above 0.60 for the remaining items, concluding that the Spanish adaptation of the MAIA was generally an adequate tool for assessing interoceptive awareness in the Chilean population and supporting its application in research related to psychological and physical well-being. Conversely, in the present study, where seven of the eight factors exhibited good loadings, only factor 3 had an extracted variance score of 0.165 (Valenzuela-Moguillansky & Reyes-Reyes, 2015).

Comparing our results with those of Montoya-Hurtado et al. 2023 in a Colombian university sample, we observed that the factor loadings in our study were generally higher, with most factors exceeding 0.70. Although factors 2 and 3 had somewhat lower loadings (0.58 and 0.44, respectively), the overall eight-factor structure was preserved. In contrast, Montoya-Hurtado et al. 2023 proposed removing the 'does not worry' factor due to lower factors loading on items 8 to 10 (O. Montoya-Hurtado et al., 2023). Overall, these findings support the conclusion that the MAIA possesses adequate validity, reliability, and internal consistency for application in the Colombian community context.

The key rationale for introducing interoception knowledge among the Colombian population relates to the country's mental health needs, as it has historically experienced periods of violence that impact individuals' overall well-being. Interoceptive awareness may be particularly relevant in contexts where stress-related conditions are prevalent (Idrobo et al., 2018; Tamayo-Agudelo & Bell, 2019). Future research in Colombia should evaluate the psychometric performance of the MAIA-2 and the Brief MAIA-2, including sex-stratified analyses, comparisons across educational access levels, and validation in clinical samples living with chronic conditions, to determine their applicability and measurement equivalence across diverse populations.

Despite the successful administration of the questionnaire to the full target sample, the study presents limitations that should be considered when interpreting the findings. First, the sample showed a marked gender imbalance, with underrepresentation of male participants, which may limit the generalizability

of factor-level estimates. Second, future studies should incorporate exclusion criteria for chronic conditions that may alter systemic sensitivity or somatosensory perception, as interoceptive profiles may be influenced by disease-related characteristics. Evidence from clinical applications of the MAIA, including studies in individuals with amyotrophic lateral sclerosis, suggests that interoceptive functioning may covary with neuropsychological, affective, and condition-specific factors, potentially confounding measurement in community samples. Third, the present study did not include discriminant validity testing through comparisons between community participants and clinical groups (e.g., chronic pain, fibromyalgia, endometriosis, or mental health conditions), nor between athletes and non-athletes. Such analyses may clarify whether the weaker performance of the Not Worrying subscale reflects contextual sensitivity rather than a structural limitation. Finally, comparisons by educational level, age, and other sociodemographic strata were not conducted, and should be incorporated in future work to strengthen evidence of measurement equivalence across diverse Colombian populations.

Conclusions

The results support that the MAIA exhibits sufficient reliability and validity, making it an effective instrument for assessing interoception among Colombian adults. Additionally, our study identified a link between interoceptive awareness and perceived physical fitness in a healthy Colombian sample aged 18 to 60 years. Given these outcomes, further research is warranted, especially focusing on factor 3 of the MAIA scale. As highlighted in studies from Portuguese, Chilean, and Colombian populations, it is important to be cautious when translating and applying this factor, whether by reformulating the questions or by verifying participant understanding. Such precautions will enhance the relevance and accuracy of future research.

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