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Psychometric Evaluation of the Primals Inventory (PI-99) in an Iranian Sample: Evidence for a semi-Hierarchical Structure of Primal World Beliefs

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Abstract

Primal world beliefs refer to fundamental assumptions individuals hold about the general nature and character of the world. Recently, Clifton et al. (2019) developed the Primals Inventory (PI-99) to assess such beliefs within a semi-hierarchical framework. The present study examined the psychometric properties of a Persian version of the PI-99 in an Iranian adult sample (*n* = 810; 59.9% female; mean age = 33.39 years, *SD* = 12.54). Using a split-half validation design, exploratory factor analysis (EFA) was conducted on one subsample, followed by confirmatory factor analysis (CFA) on the other independent subsample. EFA supported the extraction of 22 tertiary dimensions, largely consistent with the original conceptualization. CFA results indicated three higher-order dimensions (secondary beliefs: Safe, Enticing, and Alive), demonstrating acceptable model fit. More complex semi-hierarchical models, however, showed estimation or identification difficulties. Evidence for convergent validity was observed through theoretically consistent associations between primals, life satisfaction, and relevant subscales of the World Assumptions Scale. Internal consistency estimates were acceptable for most subscales (α/ω ≥ .70), although several primals showed marginal reliability. Overall, findings support the applicability of the PI-99's semi hierarchical structure in an Iranian context, while indicating areas where measurement refinement and further cross-cultural validation are warranted.

1. Introduction

It is a commonplace observation that *everybody sees the world in his or her own way*. Psychological theories have long hypothesized that human cognition and behavior are shaped by underlying beliefs and assumptions about life and reality (Clifton et al., 2019), also called world beliefs or worldviews (Koltko-Rivera, 2004). Despite growing recognition of the importance of world beliefs for psychological functioning, systematic efforts to comprehensively categorize and empirically delineate these beliefs have remained limited. Much prior research has focused on self-beliefs (Chen et al., 2016), and the few existing frameworks on world beliefs were primarily theoretically driven (Janoff-Bulman, 1989) and showed psychometric limitations (Kaler et al., 2008).

To address this gap, Clifton et al. (2019) systematically identified and classified a central subset of world beliefs, building on Janoff-Bulman's (1989) theory of world assumptions. They termed these primal world beliefs (primals) and defined them as basic assumptions about the world's fundamental character, such as whether it is beautiful or dangerous. According to Clifton et al. (2019), primals are (1) simple, expressed with one or two descriptors; (2) adjectival, capturing perceived nature rather than causes; (3) goal-relevant, reflecting qualities important to individual needs; (4) maximally general, extending to the world as a whole. Primals are theorized to be automatic and active, influencing attention, processing, and behavior, answering: "What is the nature of the world?"

1.1. Framework development and psychometric properties of the Primals Inventory

To taxonomize all primal world belief, Clifton et al. (2019) used a multi-method approach. They first analyzed historical and cultural texts, large-scale Twitter data, and language corpora to generate an initial pool of candidate beliefs. This preliminary set was subsequently refined through multiple rounds of expert review and focus group discussions, ultimately resulting in the identification of 25 candidate primals, each conceptualized as bipolar belief dimension.

Based on this conceptual framework, the authors then developed an initial pool of 234 items to evenly represent all candidate constructs and examined their factor structure in a large and diverse sample of Americans. The results supported a semi-hierarchical structure comprising 26 beliefs organized across three levels: one primary factor (Good world belief), three secondary factors (Safe, Enticing, and Alive world beliefs), and 22 tertiary factors. Subsequent psychometric analyses led to a refined 99-item instrument (PI-99). Across five additional studies, the factor structure consistently replicated, demonstrated discriminant associations with related constructs (e.g., Big Five personality traits, affective states, and life satisfaction), and showed high temporal stability over periods ranging from two weeks to nineteen months. These results would largely replicate in later studies (Ludwig et al., 2023; Perizonius et al., 2024).

The framework organized primals identical or closely related to previously studied world beliefs, especially Just world belief (Lerner, 1980) and Dangerous world belief (Perry et al, 2013), and extended by capturing additional dimensions, notably Enticing and its seven tertiary beliefs. This work renewed scholarly attention in worldview research and highlighted links between primals and psychological domains, including personality, well-being, psychosocial development, cultural variation, and political orientation (Clifton & Meindl, 2021; Hämpke et al., 2025; Lansford et al., 2025; Ludwig et al., 2023). Primals exhibit substantial temporal stability, functioning as enduring dispositions even amid adversity (Ludwig et al., 2023), suggesting they resemble personality traits and inform interventions for well-being and personality outcomes (Hämpke et al., 2024).

1.2. Cultural context and rationale for the present study

Given the theoretical emphasis on contextual and cultural influences in shaping world beliefs, intercultural research is important to the study of primal world beliefs. While several translations of the inventory exist, published validations have so far been limited to European contexts, including the German (Stahlmann et al., 2020) and Swedish (Perizonius et al., 2024) versions. Therefore, examining the psychometric properties of the PI-99 in an Iranian sample, where different religious worldviews, collective values, and historical experiences play a prominent role in meaning-making, provides an opportunity to evaluate the cross-cultural robustness of the model.

Aims of the study

The present study aims to examine the psychometric properties of the PI-99 in an Iranian population. Specifically, the study seeks to: (1) Examine the underlying factor structure of the PI-99 using Exploratory Factor Analysis (EFA) and assess the extent to which the structure reported in previous research can be reproduced in the current sample. (2) Test the factorial validity of the identified structure using Confirmatory Factor Analysis (CFA) and compare the fit of alternative measurement models. (3) Evaluate measurement invariance across gender, age groups, and other demographic subgroups with adequate sample sizes to determine the consistency of the factor structure across populations. (4) Evaluate the internal consistency of the PI-99. (5) Evaluate

convergent validity by examining the associations between the PI-99 subscales and related constructs, including life satisfaction and Janoff-Bulman's world assumptions.

2. Method

2.1. Participants and procedure

We collected data from 810 participants (59.9% female, mean age = 33.39, SD = 12.54; see Table 1). Participants' educational backgrounds included High school or lower (17.3%), associate degree (4.3%), bachelor's degree (35.1%), master's degree (31.6%), and doctoral degree (11.7%). In terms of marital status, participants were "single with no emotional/sexual partner" (40.5%), "single with an emotional/sexual partner" (16.9%), married (40.2%), and divorced (2.3%). Employment status was distributed as follows: students (33.2%), employed full-time (31.1%), employed part-time (16.7%), unemployed (11.5%), and retired (7.5%). Economic status was reported as less than 200$ to more than 500$. 47.2% reported psychological problems. Participants provided informed consent prior to participation and had to be at least 18 years old. Further details on the sampling procedure are provided in Supplementary Material T1.

Table 1
Demographic features of the participants (*N* = 1296).

Continuous Features		
	n/M	***%/SD***
Age (in years)	33.39	12.55
Gender		
Female	485	59.9
Male	325	40.1
Educational attainment		
High school or lower	140	17.3
Associate Degree	35	4.3
bachelor's degree	284	35.1
Master's degree	256	31.6
Doctoral degree	95	11.7
Occupational status		
Student	269	33.2
Full-time employee	252	31.1
Part-time worker	135	16.7
Unemployed	93	11.5
Retired	61	7.5
Marital status		
Married	326	40.2
Single (no emotional/sexual partner)	328	40.5
Single (with emotional/sexual partner)	137	16.9
Divorced	19	2.3
Economic status		
Below 200$	180	22.2
200$–300$	227	28.0
300$–400$	137	16.9
400$–500$	132	16.3
Above 50$	134	16.5
Psychological problem		
Yes	376	46.9
No	426	53.1
Note. Percentages are calculated based on *N* = 810. Minor rounding differences may result in totals not summing exactly to 100%.		

2.2. Measures

Primals Inventory (PI-99)

The Primals Inventory (PI-99; Clifton et al., 2019) contains 99 items designed to assess 26 theoretically proposed primals across three semi-hierarchical levels of granularity (primary, secondary, and tertiary beliefs). Specifically, 96 items measure 22 tertiary beliefs, with each scale containing 4–5 items. This item range is consistent with recommendations for balanced scale breadth and internal consistency in personality assessment (Clark & Watson, 1995). From these, 69 items plus two additional items form the three secondary beliefs: *Safe* (29 items), *Enticing* (28 items), and *Alive* (14 items). Furthermore, the primary belief, *Good*, is represented by another subset of 71 items, which incorporates one additional item. In the present analyses, we closely followed the exact structure identified by Clifton et al. (2019). Example items include: *"Whatever is happening around me often feels related to me or something I've done"* (Alive), *"No matter where we are or what the topic might be, the world is fascinating"* (Enticing), *"On the whole, the world is a safe place"* (Safe), and *"On the whole, the world is an uncomfortable and unpleasant place"* (Good; reverse-coded). Responses are recorded on a six-point scale ranging from 0 (strongly disagree) to 5 (strongly agree).

Satisfaction with Life Scale (SWLS)

The Satisfaction with Life Scale (SWLS; Diener et al., 1985; Persian version: Bayani et al, 2007) is a measure to assess an individual's global judgment of their life satisfaction. The scale consists of five positively worded items (e.g., "The conditions of my life are excellent"), which are rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Total scores range from 5 to 35, with higher scores indicating greater levels of life satisfaction. Internal consistency in the present sample was good (Cronbach's α = .85).

World Assumption Scale (WAS)

The World Assumptions Scale (WAS; Janoff-Bulman, 1989; Persian version: Hosseinzadeh Maleki & Kalani, 2024) is a 32-item self-report questionnaire designed to assess individuals' assumptions about the world. The scale comprises three major dimensions measured using eight subscales. The first dimension, *Benevolence of the World*, includes the subscales Benevolence of the Impersonal World and Benevolence of People. The second dimension, *Meaningfulness of the World*, consists of the subscales Justice, Controllability, and Randomness. The third dimension, *Self-Worth*, includes the subscales Self-Worth, Self-Controllability, and Luck. Each subscale is composed of four items. Responses are given on a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). In this study, Cronbach's alphas for Justice, Controllability, Randomness, and Benevolence of the Impersonal World subscales in the present study were 0.79, 0.82, 0.76, and 0.86, respectively.

2.3. Statistical analyses

Data were analyzed using IBM SPSS Statistics version 26 and Amos version 26. The factor structure of the Persian version of the PI-99 was examined via both EFA and CFA. The sample was randomly split into two subsamples of about equal size to ensure robust validation and minimize sample-specific bias. Prior to analyses, we confirmed that the two random subsamples did not differ significantly on any observed demographic variable, supporting the appropriateness of the split-half validation design. In the first sample, 40.2% were male and 59.8% were female. The average age was 33.27 with a standard deviation of 12.78. In the second sample, 40% were male and 60% were female. The average age was 33.52 with a standard deviation of 12.32. We initially considered the use of Exploratory Structural Equation Modelling (ESEM) to account for potential cross-loadings and factor correlations. However, given the computational complexity associated with modelling 99 items across 22 latent factors, the ESEM models failed to converge despite multiple specification attempts. Consequently, we adopted a split-half EFA/CFA approach with varimax rotation, which provided a robust and interpretable solution within our sample size constraints (Marsh et al., 2014). EFA with varimax rotation was conducted on the first subsample to uncover the underlying factor structure, enabling an unbiased exploration of latent constructs essential for scale development. Varimax rotation was selected to enhance interpretability of the factor structure; however, factor correlations were subsequently examined to evaluate higher-order relationships. Prior to conducting EFA, the suitability of the data was evaluated using the Kaiser–Meyer–Olkin (KMO) measure for sampling adequacy and Bartlett's test of sphericity to examine whether the correlation matrix was suitable for factor analysis. To determine the optimal number of factors to retain in the analysis, Kaiser's eigenvalue criterion, the scree plot, and parallel analyses were utilized. CFA was then performed to validate the EFA-derived structure, using the second subsample to enhance generalizability and avoid overfitting. Based on the suggestions of Hu and Bentler (1999), the fit was evaluated using the following fit indices: comparative fit index (CFI; good fit ≥ 0.90), root mean square error of approximation (RMSEA; good fit ≤ 0.08), and standardized root mean square residual (SRMR; good fit ≤ 0.08). Values close to these cutoffs were considered acceptable fit.

Subsequently, reliability was assessed via Cronbach's alpha and McDonald's omega to ensure that all scales were reliably measured. For the higher-order dimensions, McDonald's Omega Total was calculated by treating all items from the constituent tertiary primals as indicators of a single composite construct. This approach estimates the proportion of variance in the total composite score attributable to all common sources, providing a conservative reliability estimate for multidimensional scales. Finally, convergent validity was evaluated by examining the Pearson correlations between the inventory subscales and related constructs, such as life satisfaction and world assumptions.

3. Results

3.1. EFA for Persian PI-99

The first split-half sample was used for an EFA (*n* = 402, 60%female mean age = 33.52), which was conducted using PCA as the extraction method. Inspection of the initial eigenvalues and scree plot revealed 23 components with values greater than 1.0 (Kaiser's criterion), collectively accounting for 69.08% of the total variance. The Kaiser's criterion was interpreted cautiously given its tendency to over-extract factors. Since the 23rd component was defined by one item only, it was considered unreliable and lacking in interpretability (Fabrigar & Wegener, 2012) and was therefore excluded. Accordingly, 22 components were retained for rotation (Table 2). Following varimax rotation, these 22 factors explained 68.03% of the total variance, with the variance redistributed more evenly across factors (the largest rotated factor accounting for 7.09% of the variance).

Table 2
Eigenvalues and Extracted Variance from Exploratory Factor Analysis

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	20.341	21.188	21.188	6.804	7.088	7.088
2	7.709	8.030	29.218	4.683	4.878	11.966
3	4.615	4.808	34.026	3.739	3.894	15.860
4	3.201	3.335	37.361	3.469	3.613	19.473
5	2.657	2.768	40.128	3.460	3.604	23.077
6	2.613	2.721	42.850	3.338	3.477	26.555
7	2.286	2.381	45.231	3.191	3.324	29.878
8	2.207	2.299	47.530	2.965	3.088	32.967
9	1.984	2.067	49.597	2.963	3.087	36.054
10	1.859	1.936	51.534	2.950	3.073	39.127
11	1.660	1.729	53.263	2.932	3.054	42.181
12	1.567	1.632	54.895	2.695	2.807	44.988
13	1.525	1.588	56.483	2.623	2.732	47.721
14	1.461	1.522	58.005	2.618	2.727	50.448
15	1.391	1.449	59.453	2.597	2.706	53.154
16	1.316	1.371	60.824	2.541	2.647	55.801
17	1.284	1.338	62.162	2.377	2.476	58.277
18	1.212	1.262	63.424	2.360	2.459	60.735
19	1.174	1.223	64.647	2.011	2.094	62.830
20	1.124	1.171	65.818	1.886	1.965	64.794
21	1.103	1.149	66.967	1.852	1.930	66.724
22	1.023	1.066	68.033	1.257	1.309	68.033

Robustness Checks and Alternative Specifications

To evaluate the robustness of the retained 22-factor solution, we conducted supplementary analyses using alternative extraction and rotation methods. First, we examined Parallel Analysis (PA) with 1,000 permutations, which suggested retaining 10 factors. However, given known tendencies of PA to under-extract factors in complex, high-dimensional scales with correlated constructs (Auerswald & Moshagen, 2019), and considering that the 10-factor solution merged theoretically distinct primals, we retained the 22-factor solution based on theoretical coherence and interpretability. Second, we conducted EFAs using oblique rotations. While the overall structure remained similar, several factors were defined by only a single item with salient loadings, which is considered psychometrically unstable (Fabrigar & Wegener, 2012). An exploratory analysis using within an exploratory framework was conducted. The PCA with varimax rotation was retained as the primary solution for its balance of statistical stability and theoretical clarity.

3.2. CFA for Persian PI-99

The second split-half sample was used for a CFA) *n* = 408, 59.8% female, mean age = 33.27). To validate the structure found in the EFAs. Three models were tested using maximum likelihood estimation in AMOS: (a) a first-order model with 22 factors, (b) a first-order model using mean scores of these 22 tertiary beliefs and modelling the three secondary belief dimensions (Safe, Enticing, Alive), and (c) a second-order model using mean scores of the 22 tertiary beliefs and modelling the secondary belief dimensions as well as the higher-order factor "Good" (primary belief). The first-order model with 22 factors did not converge, and the second-order model produced improper solutions, likely due to high parameter-to-sample ratio and model complexity (Marsh et al., 2014). The second-order model produced improper solutions, suggesting over factoring or local identification issues. This suggests that modelling a single general factor at the item level may exceed the informational capacity of the data. The first-order CFA with 22 tertiary factors did not converge, likely due to the high parameter-to-sample ratio common in models with extensive item sets (Marsh et al., 2014). Using mean scores for tertiary beliefs to model secondary beliefs allowed convergence and produced acceptable fit indices (CFI = .906; IFI = .907; RMSEA = .078 see Table 3). Although the first-order CFA could not be estimated due to computational limitations, using mean scores for tertiary beliefs to model secondary factors provides an empirically defensible solution while preserving the theoretical structure of the PI-99. All factor loadings were statistically significant and within acceptable ranges. All factor loadings were statistically significant and theoretically coherent. Accordingly, this first-order model using facet mean scores was retained as the most empirically defensible representation, supporting three secondary dimensions underlying the 22 primary primal beliefs (Swami et al., 2019). Standardized and non-standardized path coefficients are presented in Table 4, with all tertiary beliefs significantly loading on their respective secondary factors ($p < .001$).

Table 3
Hypothetical model fit indices

Fit indices	Chi-Square	Chi-Square/df	RMSEA	SRMR	CFI	IFI	TLI	AIC
Second order model	409.583	3.471	0.078	0.066	0.906	0.907	0.878	515.583

Table 4
Standard coefficients and significant indices of factor loadings

Safe		b	β	SE	t	*P*
	Cooperative	**1.000**	**0.58**			
	Harmless	.943	0.583	.086	10.958	< 0.001
	Pleasurable	1.584	0.828	.132	11.984	< 0.001
	Progressing	.975	0.578	.102	9.569	< 0.001
	Regenerative	.929	0.682	.086	10.771	< 0.001
	Stable	.729	0.539	.074	9.856	< 0.001
	Just	.910	0.726	.082	11.093	< 0.001
Enticing	Abundant	1.000	0.595			< 0.001
	Beautiful	1.383	0.74	.118	11.678	< 0.001
	Interesting	1.256	0.677	.115	10.939	< 0.001
	Meaningful	1.102	0.596	.111	9.908	< 0.001
	Worth Exploring	.435	0.272	.086	5.074	< 0.001
	Funny	.260	0.183	.076	3.415	< 0.001
	Improvable	.797	0.618	.078	10.270	< 0.001
Alive	Intentional	1.000	0.766			< 0.001
	Needs Me	.916	0.782	.065	14.026	< 0.001
	Interactive	.298	0.31	.049	6.032	< 0.001
	Just	.231	0.647	.019	12.075	< 0.001

3.3. Intercorrelations among primal world belief subscales

Pearson correlation coefficients were calculated based on subscale mean scores to examine the intercorrelations among the 22 tertiary belief dimensions. These manifest correlations provide an initial overview of the nomological network among primals; however, we acknowledge that latent factor correlations estimated within a structural equation modelling framework would offer a more refined account of construct-level relationships. Examination of the intercorrelation matrix among the 22 primal belief subscales revealed a pattern supportive of the proposed second-order factor structure. Subscales belonging to the same higher-order dimension generally exhibited stronger within-factor correlations. For instance, within the Safe dimension, Just correlated strongly with Pleasurable (r=.58) and Harmless with Cooperative (r=.51). Similarly, within the Enticing dimension, Beautiful showed a strong association with Interesting (r=.55). Pleasurable was correctly associated with the Safe dimension, as noted above. Within the Alive dimension, Needs Me was highly correlated with Intentional (r=.60). In contrast, weaker or non-significant correlations were observed between many subscales across different higher-order factors, such as between Interactive and Harmless (r=-0.029), supporting discriminant validity. Notably, meaningful cross-factor correlations, such as between Beautiful (Enticing) and Pleasurable (Safe) (r=.60) and between Just (Safe) and Intentional (Alive) (r=.63), indicate that the three higher-order dimensions are interrelated, collectively forming a coherent nomological network (see Table 5). These intercorrelations were consistent with the English PI-99's performance (Clifton et al., 2019).

Table 5
Intercorrelations Among the 22 Primal World Beliefs Subscales (N = 810)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Abundant	1												
2. Acceptable	-0.059	1											
3. Beautiful	.510**	-0.069	1										
4. Changing	0.094	− .131**	0.048	1									
5. Cooperative	.394**	0.012	.437**	− .135**	1								
6. Funny	0.073	-0.029	.246**	.156**	0.071	1							
7. Harmless	.378**	0.019	.498**	− .187**	.512**	.128**	1						
8. Hierarchical	.101*	− .209**	0.079	-0.043	-0.044	0.003	-0.017	1					
9. Improvable	.365**	− .301**	.514**	0.008	.314**	.254**	.388**	.236**	1				
10. Intentional	.328**	-0.001	.386**	0.031	.233**	0.053	.214**	.211**	.321**	1			
11. Interactive	0.041	0.019	0.095	.111*	− .101*	0.068	-0.029	.165**	.103*	.386**	1		
12. Interconnected	.189**	-0.039	.299**	.209**	0.052	.114*	0.055	0.049	.270**	.549**	.370**	1	
13. Interesting	.422**	-0.063	.453**	0.071	.430**	0.078	.270**	0.028	.338**	.385**	-0.037	.247**	1
14. Just	.417**	-0.067	.552**	0.031	.358**	.201**	.358**	.208**	.489**	.626**	.327**	.388**	.418**
15. Meaningful	.306**	− .164**	.296**	-0.07	.387**	-0.039	.240**	.098*	.317**	.431**	0.036	.170**	.547**
16, Needs Me	.324**	-0.07	.422**	0.085	.255**	.098*	.196**	.165**	.408**	.597**	.283**	.449**	.438**
17. Pleasurable	.449**	− .150**	.601**	-0.025	.437**	.211**	.483**	.190**	.517**	.397**	0.052	.195**	.559**
18. Progressing	.305**	-0.023	.382**	-0.089	.426**	.138**	.495**	0.053	.389**	.223**	-0.012	0.072	.362**
19. Regenerative	.367**	-0.038	.446**	-0.037	.416**	.098*	.420**	0.06	.384**	.320**	-0.038	.151**	.484**
20. Stable	.314**	0.015	.347**	− .118*	.425**	0.058	.367**	-0.023	.233**	.185**	− .189**	0.004	.469**
21.Understandable	.353**	-0.057	.382**	-0.07	.408**	.113*	.396**	0.086	.380**	.218**	0.059	0.061	.319**
22.Worth Exploring	.141**	-0.05	.207**	.181**	.098*	.235**	.153**	-0.025	.249**	0.076	0.042	.214**	.186**

****p < 0.01, *p < 0.05**

3.4. Convergent Validity of Persian PI-99

Pearson correlation coefficients are presented. The pattern of correlations provides strong evidence for the convergent validity of the PI-99 (Table 6). As theoretically expected, subscales reflecting positive World Assumptions demonstrated significant and moderate-to-strong positive correlations with established measures of adaptive constructs, including Life Satisfaction and the Benevolence, Justice, and Controllability subscales of the World Assumptions Scale. For instance, the 'Pleasurable' subscale showed the strongest association with the Benevolence scale (r=.714), and the 'Just' subscale correlated most strongly with the Justice scale (r=.694). These substantial correlations indicate that the new measure effectively captures related constructs within the expected nomological network.

Table 6
Correlation of Primals Inventories with life satisfaction and World Assumptions

Abundant	**LS**	**Justice**	**Randomness**	**Benevolence**	**Controllability**
	.358**	**.340****	**.342****	**.471****	**.252****
Acceptable	− .040	− .085	.016	− .073	− .147**
Beautiful	.408**	.446**	.296**	.636**	.299**
Changing	− .038	.022	− .048	.051	.123*
Cooperative	.341**	.263**	.393**	.442**	.152**
Funny	.178**	.244**	− .058	.280**	.165**
Harmless	.342**	.339**	.235**	.513**	.211**
Hierarchical	.053	.226**	.030	.112*	.227**
Improvable	.298**	.410**	.280**	.481**	.388**
Intentional	.275**	.441**	.404**	.455**	.326**
Interactive	.030	.263**	.081	.126*	.229**
Interconnected	.169**	.313**	.184**	.289**	.332**
Interesting	.367**	.243**	.448**	.446**	.180**
Just	.410**	.694**	.393**	.629**	.499**
Meaningful	.181**	.211**	.420**	.377**	.157**
Needs Me	.316**	.433**	.398**	.480**	.383**
Pleasurable	.487**	.489**	.389**	.714**	.390**
Progressing	.357**	.294**	.209**	.481**	.195**
Regenerative	.427**	.369**	.269**	.573**	.286**
Stable	.351**	.287**	.285**	.411**	.132**
Understandable	.300**	.395**	.234**	.468**	.310**
Worth Exploring	.158**	.123*	− .013	.196**	.109*
Safe	.528**	.512**	.420**	.729**	.349**
Enticing	.462**	.473**	.406**	.685**	.366**
Alive	.295**	.511**	.409**	.500**	.418**
< 0.05 p * <0.01 p **					

3.5. Internal Consistency and Reliability of Persian PI-99

The majority of subscales demonstrated acceptable to good internal consistency (α and ω ≥ 0.70). However, four subscales (Changing, Hierarchical, Understandable, and Regenerative) showed marginal reliability estimates (α = 0.68–0.70; ω for Understandable = 0.62), which may warrant caution in interpretation or suggest item refinement in future studies (Table 7).

Table 7
Internal consistency and reliability of Alpha and Omega

Abundant	Alpha	Omega
	0.70	**0.71**
Acceptable	0.71	0.73
Beautiful	0.73	0.77
Changing	0.69	0.70
Cooperative	0.80	0.83
Funny	0.73	0.75
Harmless	0.71	0.71
Hierarchical	0.68	0.72
Improvable	0.77	0.79
Intentional	0.79	0.78
Interactive	0.74	0.76
Interconnected	0.77	0.79
Interesting	0.81	0.85
Just	0.81	0.82
Meaningful	0.76	0.78
Needs Me	0.87	0.87
Pleasurable	0.81	0.79
Progressing	0.85	0.83
Regenerative	0.74	0.68
Stable	0.70	0.76
Understandable	0.70	0.62
Worth Exploring	0.72	0.76
Safe	0.85	0.85
Enticing	0.72	0.72
Alive	0.71	0.78

4. Discussion

The present study examined the psychometric properties of the Persian version of PI-99 in an Iranian sample. The findings supported the replicability of the 22 tertiary primals proposed by Clifton et al. (2019), and for a higher-order organization characterized by three broader dimensions (Safe, Enticing, and Alive). Along with these results, several methodological and cultural considerations were also considered that enable the interpretation of these findings and direct priorities for future research.

4.1. Exploratory structure and methodological considerations

The results obtained in the exploratory phase led to a clear 22-component solution that corresponded to the tertiary primals proposed in the original model. The initial eigenvalue criterion suggested the existence of 23 components, but it seemed methodologically justified to exclude a single-item component in order to be consistent with established guidelines in factor analysis (Fabrigar & Wegener, 2012). The retained 22-component structure explained a substantial proportion of the total variance, indicating a coherent and interpretable dimensional organization. It should be noted that the exploratory analyses were based on principal component analysis (PCA), not on common factor extraction methods. PCA focuses on variance decomposition and does not involve the explicit estimation of latent common factors. Although PCA is widely used in large-scale questionnaire research and often produces stable and interpretable solutions, future studies could benefit from replicating these findings using common factor approaches. Methods such as principal axis factorization or maximum likelihood extraction may be particularly informative (Fabrigar & Wegener, 2012). Using varimax rotation makes the results more interpretable, but the assumption of orthogonality of the components must be maintained. Given that primals are theoretically expected to correlate (Clifton et al., 2019), oblique rotations may provide a more theoretically consistent representation of the latent structure (Brown, 2015). Conducting such analyses will help clarify whether the observed components reflect correlated latent factors.

Moreover, the present findings suggest that the tertiary primals can be generalized across cultures, and also highlight areas that may be sensitive to methodological choices and cultural context. Similar patterns were reported in the German version. Most of the tertiary primals were confirmed, although there were some deviations in the factor structure (Stahlmann et al., 2021). These evidences do not indicate definitive cross-cultural robustness, but rather contribute to emerging literature on cross-cultural relevance (Rothenberg et al, 2025; Perizonius et al, 2024).

4.2. Semi Hierarchical structure and confirmatory analyses

Confirmatory factor analysis supported a semi-hierarchical structure of primal beliefs. The first-order model, using mean scores of the tertiary beliefs and modelling the three secondary beliefs Safe, Enticing, and Alive, exhibited good to excellent fit indices and strong theoretical coherence. In contrast, the first-order 22-factor model did not converge, and the second-order model aiming to replicate the primary belief Good showed improper solutions. Such issues may be related to over-parameterization and identification difficulties in highly complex hierarchical models that require very large samples. These findings suggest that attempting to model complex, higher-order structures at the individual item level is often impractical and prone to convergence failures. Instead, a semi-hierarchical approach using parceled mean scores offers a much more workable and clear picture of these multidimensional belief systems. This practical strategy for managing model complexity aligns well with established methodological recommendations (Marsh et al., 2014).

4.3. Nomological network and validity evidence

The 22 primal subscales showed stronger correlations within their respective higher-order dimensions than between them, indicating convergent and discriminant validity (Clifton et al., 2019; Kline, 2015). Stronger correlations among primals within the same theoretical domain (such as Beautiful with Pleasurable, or Just with Intentional) suggest that primal beliefs operate as an integrated worldview system rather than a set of isolated assumptions (Janoff-Bulman, 1989; Koltko-Rivera, 2004). The pattern of moderate to strong relations between positive primals and life satisfaction and adaptive world assumptions (benevolence, justice, and controllability) supported the convergent validity. In contrast, correlations with the Randomness subscale tended to be weak, in accordance with theoretical expectations, that fundamental beliefs are more related to value-based and meaning-based worldviews than to perceptions of the stochasticity. These findings replicate earlier evidence connecting primal beliefs with well-being and allied psychological constructs (Clifton et al., 2019; Stahlmann et al., 2020).

4.4. Reliability and culturally sensitive subscales

Most PI-99 subscales demonstrated acceptable to good internal consistency based on both Cronbach's alpha and McDonald's omega, supporting the reliability of the Persian version. However, marginal reliability was observed for several subscales (particularly Changing, Hierarchical, and Understandable). These results may reflect cultural nuances in how abstract or relational assumptions about the world are conceptualized in the Iranian context (Markus & Kitayama, 1991). For instance, ideas of hierarchy may simultaneously invoke familial, religious, or social meanings, whereas understandability may be construed in terms of fate, ambiguity, or existential meaning rather than cognitive predictability alone. The limited number of items within each subscale may have restricted the reliability. Future studies could benefit from revising or expanding these subscales to strengthen internal consistency.

4.5. Measurement invariance

Measurement invariance across gender and age groups could not be tested due to model non-convergence, likely caused by model complexity, small subgroup sizes, and item functioning differences (Vandenberg & Lance, 2000). Future studies could use subscale-level testing, theory-driven parceling, or alternative methods like alignment optimization or Bayesian SEM to handle complex models (Asparouhov & Muthén, 2014).

4.6. Theoretical and practical implications

This study provides the first comprehensive psychometric evaluation of the PI-99 in an Iranian sample and contributes to the growing literature on primal world beliefs. The results provide initial evidence supporting the replicability of the 22 tertiary primals beliefs and the second-order semi-hierarchical structure. At the same time, the findings identify subscales and modeling steps that may be culturally sensitive or methodologically challenging. In our CFAs, the first-order model with 22 primary factors did not converge, and the second-order model with one general factor ("Good") produced improper solutions. Future research should further examine the validity of the semi-hierarchical structure using advanced statistical methods, such as clustering strategies. Practically, the Persian version of the PI-99 seems suitable for research applications in examining broad worldviews and their relationship to well-being. Considering that certain subscales may require refinement for applied use.

4.7. Limitations and future directions

Several limitations should be acknowledged. First, the use of PCA with orthogonal rotation limits conclusions about latent factor structure. Second, challenges in fitting highly complex semi-hierarchical models limit the assessment of first- and third-order structures and measurement invariance. Third, research should replicate these findings using common-factor extraction methods, oblique rotations, and alternative SEM approaches, as well as explore culturally informed revisions of selected primals.

4.8. Conclusion

In sum, the Persian version of the PI-99 shows promising psychometric performance in an Iranian sample and provides preliminary evidence in support of the cross-cultural generalizability of primal world beliefs. At the same time, methodological limitations and culturally sensitive subscales points to clear directions for refinement and replication in future research. In the meantime, this Iranian version of the PI-99 can be used as a valid and reliable measure of primal world beliefs in Persian contexts.

Declarations

Ethics statement

The present study was approved by the Institutional Review Board of Kharazmi University and conducted in accordance with the Declaration of Helsinki (2013 revision).

Conflict of interest:

None to declare

Informed Consent:

Informed consent was obtained from all participants prior to their participation.

Funding:

None to declare.

Author Contribution

M.A. designed the study. S.M.F., D.A., and Z.T. collected the data. M.A. and M.B. conducted the statistical analyses and wrote the main manuscript text. J.H., A.B.W., and J.D.W.C. contributed to the conceptual framework of primal world beliefs and provided critical revisions to the manuscript. All authors reviewed and approved the final manuscript.

Data Availability

The data are available from the first author upon reasonable request.

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