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Totem and Animism Beliefs in Athletes: Scale Development and Examination of Psychometric Properties

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Abstract

Background: Competitive sport is characterized by uncertainty and performance pressure, which may prompt athletes to engage in belief-related behaviors such as rituals, symbolic object use, and superstitious practices. Although these behaviors are often described as superstitions, they may also be examined through interpretive frameworks derived from anthropological concepts such as totemism and animism. This study aimed to develop and validate the Totem and Animism Scale in Sport (TASS; see Supplementary File 1), a multidimensional measurement tool designed to assess belief-related dimensions associated with athletes' rituals, symbolic object attachment, and supernatural or animistic attributions in competitive sport contexts.

Methods: The study included 637 actively competing athletes, comprising 325 males and 312 females, with a mean age of 24.2 years. The sample included 270 athletes competing at the international (elite) level and 367 at the national level. Participants were randomly divided into two independent subsamples. Item reduction was conducted through expert panel evaluation and item-total correlation analysis. Exploratory factor analysis (EFA) using principal axis factoring (PAF) with Promax rotation was conducted on the first subsample to examine the latent factor structure. The resulting 18-item model was subsequently evaluated through confirmatory factor analysis (CFA) on the second subsample.

Results: EFA supported a four-factor structure consisting of ritualism, supernaturalism, totemism, and superstition, accounting for 66.12% of the total variance. CFA indicated acceptable-to-good model fit ($\chi^2/df = 2.057$,

RMSEA = 0.059, CFI = 0.958, NNFI = 0.946, GFI = 0.922). Internal consistency was high, with an overall Cronbach's alpha of 0.932, and composite reliability (CR) values ranged from 0.702 to 0.890 across the four factors.

Conclusion: The TASS appears to show acceptable initial psychometric evidence for assessing belief-related dimensions among athletes. By distinguishing ritualism, supernaturalism, totemism, and superstition as related but separate constructs, the scale may serve as a useful tool for sport psychology research in competitive contexts.

Keywords:

Totemism; Animism; Sport psychology; Scale development; Psychometrics; Ritualism; Superstition

Introduction

Competitive sport is characterized by high levels of uncertainty, pressure, and limited controllability. Even when athletes are physically prepared and tactically competent, performance outcomes may still be shaped by factors such as injury, environmental conditions, referee decisions, and opponent behavior. Under such conditions, athletes may turn to psychological strategies that help them regulate anxiety, maintain focus, and preserve a sense of control. Previous research has shown that superstitious and ritualized behaviors are more likely to emerge in situations marked by uncertainty, high personal significance, and limited objective control [9,23,30]. In sport settings, these behaviors have been described as practices that may help athletes cope with competitive pressure and sustain perceived control in demanding performance contexts [33,34].

Belief-related practices in sport, however, are not limited to isolated superstitious acts. Athletes may also attribute symbolic meaning to objects, routines, places, environmental cues, or perceived external forces. From an anthropological perspective, such tendencies may be approached through concepts such as totemism, animism, ritualism, and superstition. Totemism refers to the attribution of symbolic or protective significance to particular objects, animals, symbols, or group-related signs, whereas animism refers to the attribution of agency, intentionality, or influence to non-human, environmental, spiritual, or transcendent forces [11,32]. Ritualism involves structured and repetitive behaviors performed before or during competition, often to regulate arousal, attention, or perceived control [7,33]. Superstition refers to non-empirically supported cause-and-effect beliefs in which specific actions, objects, or conditions are associated with desired outcomes

[5,14,30]. Although these constructs may overlap in practice, they are not conceptually interchangeable. Moreover, sport-related belief systems and behavioral tendencies may also be shaped by broader psychosocial and cultural dynamics within competitive environments [37]. In the present study, they are used as interpretive and operational categories for understanding athletes' belief-related tendencies rather than as claims about deep evolutionary or universal psychological origins.

A growing body of sport psychology research has examined superstitions, rituals, and related coping practices among athletes. Existing studies suggest that such behaviors are common across different sports, competitive levels, and cultural settings, although their frequency, form, and meaning may vary according to sport type, cultural background, gender, and competitive experience [34]. More recent research also indicates that ritualized behaviors may support self-regulation and performance-related readiness under pressure [33]. Nevertheless, much of the available literature and most existing measurement tools focus primarily on superstition or pre-performance ritual. Consequently, broader belief-related dimensions, such as athletes' attachment to meaningful objects or their attribution of influence to environmental, spiritual, or supernatural forces, have received comparatively limited empirical attention.

This limitation is important because belief-related behaviors in sport may reflect more than routine habits or generalized superstitions. Athletes may attach protective meaning to an object, interpret environmental signs as favorable or unfavorable, or repeat specific routines because these practices are perceived to support psychological readiness. Although such tendencies may intersect with superstition and ritual, they may also represent distinguishable belief-related dimensions that are not fully captured by existing instruments. A multidimensional assessment approach is therefore needed to differentiate among repetitive behavioral practices, symbolic object attachment, perceived external agency, and irrational causal expectations within sport contexts. Similar multidimensional conceptualizations and psychometric modeling approaches have been used in previous sport psychology scale validation studies [1,2].

Cultural context is also central to the study of belief-related behaviors in sport. Beliefs concerning luck, protection, fate, spiritual influence, and the "evil eye" are embedded in many societies and may shape how athletes interpret uncertainty and performance-related events. Turkey provides a

relevant context for examining these issues because modern competitive sport coexists with culturally rooted beliefs about protection, destiny, symbolic objects, and supernatural influence. Investigating such beliefs in a Turkish athlete sample may therefore contribute to a more culturally grounded understanding of how athletes interpret and manage uncertainty in sport.

Despite the relevance of these constructs, there is currently a lack of validated multidimensional instruments designed to assess totemism, supernaturalism, ritualism, and superstition as related yet distinct belief dimensions in athletes. Existing scales provide valuable insight into superstitious practices and ritualized behaviors, but they do not comprehensively address the broader range of belief-related dimensions that may shape athletes' interpretations of performance situations. Addressing this gap may contribute both to measurement in sport psychology and to a more context-sensitive understanding of athletes' belief-related coping tendencies. A conceptual representation of the proposed four-dimensional structure is presented in Figure 1.

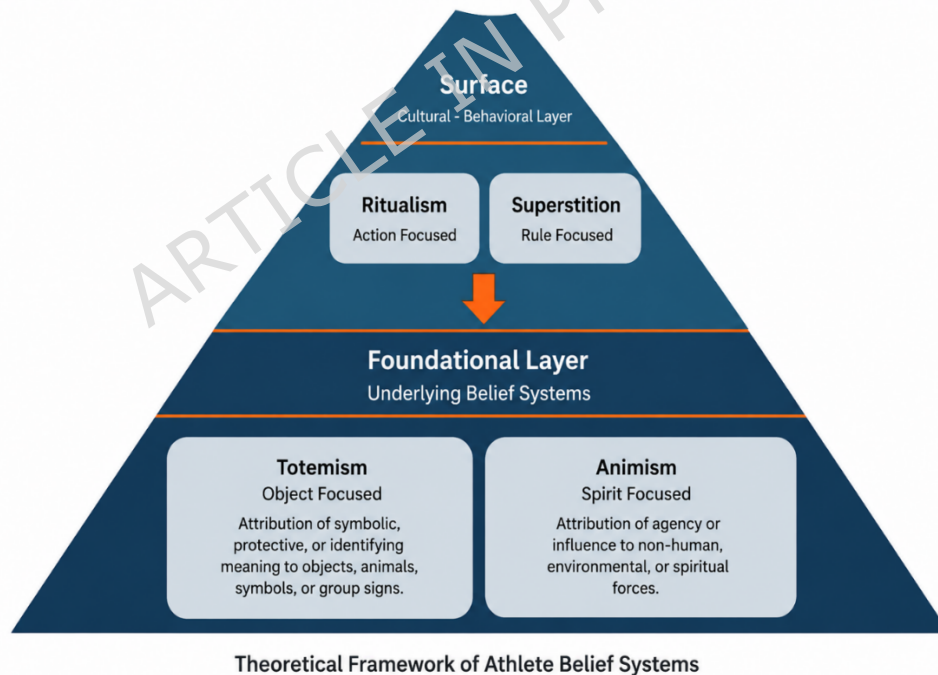


Figure 1. Four Dimensions of Belief-Related Behaviors in Sport

Therefore, the aim of the present study was to develop and validate the Totem and Animism Scale in Sport (TASS), a multidimensional instrument designed to assess belief-related dimensions in athletes. The proposed

structure includes four dimensions: totemism, supernaturalism, ritualism, and superstition. By examining the psychometric properties of this scale, the study seeks to provide a theoretically grounded and culturally sensitive tool for investigating belief-related tendencies associated with objects, routines, symbolic meanings, and perceived external influences in competitive sport contexts.

Methods

Participants

The study involved a total of 637 actively competing athletes (325 males, 312 females; Mean age= 24.2 years). Detailed demographic characteristics are presented in Table 1. Participants were recruited using a convenience sampling method through sports clubs, athletes affiliated with various national federations, and national team training camps across Turkey.

Data were collected between January 2025 and May 2025 using both online and paper-based questionnaires. Approximately 1,053 athletes were invited to participate in the study. A total of 660 responses were received (response rate: 62.7%). Data screening was conducted to identify incomplete, inconsistent, or potentially problematic responses before the final sample was determined. Following data screening procedures, including missing data checks and Mahalanobis distance-based outlier detection, 23 cases were excluded due to incomplete or inconsistent responses, resulting in a final sample of 637 participants.

Inclusion criteria required participants to be actively competing athletes aged 18 years or older with at least one year of competitive experience. Participation was voluntary, and all participants provided informed consent prior to data collection. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Development of Instruments

The Totem and Animism Scale in Sport (TASS) was developed by the authors to assess athletes' belief-related tendencies associated with totemism, animism, and superstition in sport contexts. The development of the scale followed a systematic, multistage process in line with established scale development principles. The final English version of the scale is

provided as Supplementary File 1. The process of developing the scale consisted of four stages:

Stage 1: Item Generation and Pre-screening.

An initial pool of items was generated based on a comprehensive review of the literature on sport-related superstitions, as well as anthropological discussions of totemism and animism. Foundational theoretical perspectives, including those of Freud, Tylor, and Malinowski, were used as conceptual references to inform the development of items. These perspectives were not treated as direct explanatory models but rather as interpretive frameworks guiding the identification of belief-related patterns.

During this process, theoretical insights derived from these sources were adapted to contemporary sport contexts, focusing on observable behaviors and self-reported beliefs such as ritualistic practices, attachment to symbolic objects, and attributions of performance outcomes to external or non-material influences. Initially, approximately 100 items were generated. These items were carefully reviewed by the researchers to eliminate redundancies, ambiguities, and conceptually overlapping statements. Following this internal pre-screening process, the item pool was reduced to 45 items for further evaluation.

Stage 2: Expert Evaluation and Content Validity.

The initial pool of 45 items was evaluated by a panel of 10 experts to establish content validity. The expert panel consisted predominantly of specialists in Sport Sciences, along with experts in Psychology and Philosophy of Religion, ensuring a multidisciplinary evaluation of the construct. Content validity ratios (CVRs) were calculated using Lawshe's method. The obtained CVR values were interpreted based on the criteria proposed by Ayre and Scally [3]. Items that did not meet the minimum CVR threshold were removed, while those requiring minor revisions were refined based on expert feedback. Following this evaluation process, 11 items were eliminated, resulting in a 34-item version of the scale for further analysis.

Stage 3: Preliminary Application and Item Analysis.

Before the main analyses were conducted, a pilot study involving 50 athletes from the target population was carried out to evaluate the clarity and comprehensibility of the items. Following this, the 34-item form was administered to the main study sample ($N = 637$). In addition to assessing face validity, item-total correlation analysis was conducted to evaluate the

discriminative power of the items. Most items demonstrated strong item-total correlations above the .30 threshold. One item (Item 13), which exhibited a correlation coefficient of 0.272, was removed based on established psychometric criteria suggesting a minimum threshold of .30 for item retention. Consequently, the 33-item version was retained for the exploratory factor analysis stage.

Stage 4: Exploratory Factor Analysis (EFA).

To examine the latent structure of the scale, an EFA was performed on the first subsample (n=333). Principal Axis Factoring (PAF) was used as the extraction method with Promax rotation. PAF was preferred over principal component analysis because it focuses on identifying the underlying latent structure rather than mere data reduction [8]. The choice of Promax rotation was based on the theoretical expectation that the dimensions of ritualism, supernaturalism, totemism, and superstition would be conceptually related. Items were evaluated based on factor loadings higher than .40 and the requirement for clear differentiation across factors. This analysis resulted in a refined model consisting of 18 items distributed across four factors.

Procedure

Data were gathered via both online and paper-based questionnaires, with participation being entirely voluntary. All participants provided informed consent before taking part in the study. The Totem and Animism Scale in Sport (TASS) was administered as a 5-point Likert-type scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The mean scores were evaluated via equal intervals: 1.00–1.80 (very low), 1.81–2.60 (low), 2.61–3.40 (moderate), 3.41–4.20 (high), and 4.21–5.00 (very high).

Data Analysis

All statistical analyses were performed using SPSS version 27.0 and AMOS version 24.0. Before proceeding with the primary analyses, the normality of the dataset was evaluated by examining skewness and kurtosis values for all items [26]. All skewness values fell within ± 1.5 and all kurtosis values fell within ± 2.0 , as recommended by Hair et al. [15], indicating that the data met the assumptions for parametric analyses. Multivariate outliers were screened using Mahalanobis distance values ($p < .001$), and extreme cases were removed prior to the main analyses.

Item Analysis:

To assess item discrimination, independent samples t-tests were performed by comparing the upper 27% and lower 27% of participants based on total scale scores. Additionally, item-total correlations were analyzed, and

items with correlation coefficients lower than .30 were considered for elimination.

Exploratory Factor Analysis (EFA):

Exploratory factor analysis (EFA) was performed on the first subsample ($n = 333$) to evaluate the construct validity of the scale. To determine the appropriateness of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were utilized. Principal Axis Factoring (PAF) was employed as the extraction method because it focuses on identifying underlying latent structures rather than mere data reduction. Promax rotation (oblique rotation) was applied because the four factors—ritualism, supernaturalism, totemism, and superstition—were expected to be conceptually related rather than orthogonal. Similar psychometric procedures have recently been employed in sport-specific scale development studies [36]. Factors with eigenvalues exceeding 1.0 were retained, and items with factor loadings below .40 or with cross-loadings (difference $< .20$ between factors) were excluded from the analysis.

Confirmatory Factor Analysis (CFA):

The factor structure derived from the exploratory factor analysis (EFA) was validated through confirmatory factor analysis (CFA) on the second independent subsample ($n = 304$) using maximum likelihood (ML) estimation. To assess model fit, various fit indices were utilized, including χ^2/df , RMSEA, CFI, NNFI, NFI, and GFI.

Reliability and validity:

To assess internal consistency, Cronbach's alpha coefficients were utilized. Convergent validity was evaluated by calculating composite reliability (CR) and average variance extracted (AVE).

Table 1. Demographic profile of the participants

Variables	Groups	n	%
Gender	Male	325	51.0
	Female	312	49.0
Competitive Level	International (Elite)	270	42.4
	National	367	57.6
Age Groups	18-22	195	30.6
	23-27	256	40.2
	28+	186	29.2

Sport Type	Team Sports	346	54.3
	Individual Sports	291	45.7
Team Sports	Football	86	13.5
	Volleyball	78	12.2
	Handball	72	11.3
	Basketball	56	8.8
	Rugby	54	8.5
	Wrestling	84	13.2
Individual Sports	Badminton	82	12.9
	Boxing	56	8.8
	Shooting	32	5.0
	Tennis	21	3.3
	Swimming	16	2.5

Table 1 highlights the demographic breakdown of the 637 athletes involved in the study. Among them, 51.0% were male (n=325), and 49.0% were female (n=312). In terms of competition level, 42.4% of the athletes competed at the international (elite) level (n=270), whereas 57.6% participated at the national level (n=367). Analysis of the participants' age groups revealed that 30.6% were aged between 18 and 22 years (n=195), 40.2% were between 23 and 27 years (n=256), and 29.2% were 28 years or older (n=186). With respect to the type of sport, 54.3% of the participants engaged in team sports (n=346), whereas 45.7% participated in individual sports (n=291). Within the team sports category, 13.5% were involved in football (n=86), 12.2% in volleyball (n=78), 11.3% in handball (n=72), 8.8% in basketball (n=56), and 8.5% in rugby (n=54). For individual sports, 13.2% were engaged in wrestling (n=84), 12.9% in badminton (n=82), 8.8% in boxing (n=56), 5.0% in shooting (n=32), 3.3% in tennis (n=21), and 2.5% in swimming (n=16).

Results

Table 2. Item discrimination analysis results (lower 27% - upper 27%)

Item	t value	p	Lower Group Mean (n=172)	Upper Group Mean (n=172)
I1	-10.965	< .001	2.29	4.11
I2	-12.921	< .001	1.81	3.90
I3	-10.088	< .001	2.09	3.92
I4	-10.955	< .001	1.87	3.80

I5	-12.201	< .001	2.19	4.54
I6	-14.343	< .001	1.66	3.87
I7	-12.088	< .001	1.20	3.25
I8	-12.071	< .001	1.64	3.70
I9	-15.995	< .001	1.62	3.97
I10	-16.423	< .001	1.26	3.56
I11	-17.339	< .001	1.67	4.22
I12	-17.273	< .001	1.54	4.09
I13	-3.990	< .001	3.74	4.41
I14	-7.255	< .001	2.82	4.23
I15	-8.359	< .001	2.24	3.75
I16	-9.481	< .001	1.66	3.41
I17	-17.117	< .001	1.43	3.96
I18	-16.111	< .001	1.44	3.90
I19	-19.893	< .001	1.33	4.02
I20	-16.575	< .001	1.32	3.84
I21	-13.690	< .001	1.34	3.58
I22	-19.792	< .001	1.31	3.99
I23	-11.349	< .001	1.17	3.02
I24	-14.406	< .001	1.07	3.19
I25	-12.804	< .001	1.18	3.20*
I26	-12.595	< .001	1.43	3.55
I27	-14.967	< .001	1.41	3.79
I28	-12.512	< .001	1.98	4.12
I29	-11.963	< .001	1.83	3.89
I30	-10.440	< .001	1.74	3.74
I31	-13.086	< .001	1.84	4.07
I32	-11.019	< .001	1.70	3.74*
I33	-13.076	< .001	1.58	3.80
I34	-12.611	< .001	1.34	3.48

Note: N = 637. $p < .001$. Comparison of the upper 27% (n = 172) and lower 27% (n = 172) groups.

Independent samples t-test results indicated significant differences between the lower and upper 27% groups (n = 172 per group) for all items. As shown in Table 2, the t-values ranged from -3.99 to -19.89, with all results being statistically significant ($p < .001$). These findings confirm that the TASS items possess high discriminative power, effectively distinguishing between participants with low and high belief-related tendencies in sport.

Table 3. Results of Item-Total Correlation Analysis and Internal Consistency for the Preliminary 34-Item Scale

Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Decision
1.	0.515	0.958	Accept
2.	0.656	0.957	Accept
3.	0.552	0.958	Accept
4.	0.564	0.958	Accept

5.	0.536	0.958	Accept
6.	0.596	0.958	Accept
7.	0.652	0.957	Accept
8.	0.671	0.957	Accept
9.	0.689	0.957	Accept
10.	0.688	0.957	Accept
11.	0.649	0.957	Accept
12.	0.718	0.957	Accept
13.	0.272	0.960	Remove
14.	0.522	0.958	Accept
15.	0.420	0.959	Accept
16.	0.495	0.958	Accept
17.	0.786	0.956	Accept
18.	0.685	0.957	Accept
19.	0.863	0.956	Accept
20.	0.763	0.957	Accept
21.	0.806	0.956	Accept
22.	0.761	0.957	Accept
23.	0.612	0.958	Accept
24.	0.677	0.957	Accept
25.	0.536	0.958	Accept*
26.	0.625	0.957	Accept
27.	0.666	0.957	Accept
28.	0.559	0.958	Accept
29.	0.702	0.957	Accept
30.	0.561	0.958	Accept
31.	0.582	0.958	Accept
32.	0.741	0.957	Accept*
33.	0.727	0.957	Accept
34.	0.718	0.957	Accept

In the preliminary item analysis, the corrected item-total correlation values for the 34 items ranged from .272 to .863 (Table 3). Item 13 ($r = .272$) was found to be below the recommended .30 threshold and was therefore excluded from the scale [15]. The remaining 33 items demonstrated acceptable internal consistency and were retained for further analysis. Subsequently, these items were subjected to Exploratory Factor Analysis (EFA) to examine the underlying factor structure. During the EFA process, additional items were removed based on factor loading and cross-loading criteria, resulting in the final 18-item scale.

Psychometric Properties of the Scale

The psychometric properties of the scale were evaluated through a multi-step process. First, Exploratory Factor Analysis (EFA) using Principal Axis Factoring (PAF) with Promax rotation was conducted to examine the underlying factor structure. Subsequently, Confirmatory Factor Analysis (CFA) was performed to test the fit of the proposed four-factor model. Finally, internal consistency reliability was assessed using Cronbach's alpha coefficients.

Exploratory Factor Analysis

Table 4. KMO and Bartlett's Test Results for the TASS (Final 18-item version)

Statistical Measure	Value
Kaiser–Meyer–Olkin (KMO) Sample Adequacy Value	0.934
Bartlett's Sphericity Test - Approximate Chi-Square (χ^2)	3236.014
Degrees of Freedom (df)	153
Significance Level (p)	<.001

Note: The EFA and CFA results were based on the final 18-item structure. During the iterative EFA process, items with low factor loadings (< .40) or high cross-loadings (difference < .20) were removed to obtain the most robust and theoretically coherent model.

As shown in Table 4, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.934, which is considered excellent [15]. Bartlett's test of sphericity was statistically significant ($\chi^2 = 3236.014$, $df = 153$, $p < .001$), confirming that the data were suitable for factor analysis. Exploratory Factor Analysis (EFA) was subsequently conducted using Principal Axis Factoring (PAF) as the extraction method and Promax as the oblique rotation method. Factors with eigenvalues exceeding 1.0 were retained. Items with factor loadings below .40 or cross-loadings with a difference of less than .20 were iteratively excluded to ensure a clean factor structure.

Table 5. Exploratory Factor Analysis Results for the Final 18-Item TASS

	Items	λ	TVE %
F1 Ritualism	I9 I believe that the rituals I perform during competitions increase my luck	0.780	
	I11 Using a specific item consistently during a match gives me confidence	0.767	
	I12 Some items that I believe bring me luck are always with me during the competition	0.722	
	I2 I attach special meaning to certain objects or symbols during competitions.	0.689	
	I8 During the competition, I respect nature and believe that nature helps me.	0.638	
	I17 During the competition, I feel stronger by creating a specific totem or using a symbol.	0.615	
	I10 During a match, I assign meaning to different objects or symbols to protect myself from the negative energy of opposing players.	0.592	
F2 Supernaturalism	I19 During the match, I believe that a certain supernatural being helps me achieve success.	0.833	
	I20 I feel I need the help of a specific supernatural being to succeed during the competition	0.818	
	I18 I believe that a specific supernatural being protects or guides me during the competition.	0.778	66.12 %
	I21 I believe that my rule-breaking behavior during the competition could be punished by a divine power.	0.687	
	I34 I believe that visiting sacred places before competitions will have a positive effect on my performance	0.603	
F3	I23 During the competition, a specific animal symbol inspires me	0.770	

	I7	I believe that items worn or used by someone else during the competition bring me luck	0.656
	I25	A specific totem or symbol during a competition could have a negative effect on me*	0.645
F4 Superstition	I31	I believe that when I perform well in competitions, others will cast an evil eye on my performance	0.726
	I32	I think that if what I experienced before competitions where I failed in the past were to happen again, I would fail again*	0.667
	I30	I have lucky or unlucky jersey numbers in competitions	0.656

Note: Results are based on the final 18-item structure derived from Exploratory Factor Analysis (EFA) conducted using Principal Axis Factoring (PAF) with Promax rotation. Only factor loadings greater than .40 are presented. Items with cross-loadings (difference < .20) were removed during the analysis. Total explained variance (TVE) is 66.12%. * indicates reverse-coded items. n = 333 (Subsample 1).

As shown in Table 5, the results of the Exploratory Factor Analysis (EFA) supported a four-factor structure. These four factors collectively explained 66.12% of the total variance, exceeding the commonly accepted threshold in social sciences. Promax rotation was preferred to obtain a theoretically meaningful and interpretable factor structure, as the factors were expected to be conceptually related. Interfactor correlations were found to be moderate to high, supporting the use of an oblique rotation method. The pattern matrix obtained after rotation was used to interpret the factor structure. All analyses were conducted using SPSS 27.0. The four factors identified are conceptualized as follows:

First Factor (F1): Ritualism

This dimension includes behaviors related to pre-performance and in-competition rituals, the attribution of meaning to specific objects, and the use of symbolic items. From an anthropological perspective, Malinowski suggested that rituals may emerge in contexts characterized by uncertainty and risk, providing individuals with a sense of psychological comfort and perceived control [25]. In sport settings, such ritualized behaviors are often interpreted as strategies that may help athletes regulate anxiety and maintain focus during performance.

Second Factor (F2): Supernaturalism

This dimension involves beliefs related to transcendental forces, divine assistance, and the significance of visiting sacred sites before competitions. Conceptually, these tendencies align with what Tylor [32] described from an anthropological perspective as animistic attributions, where individuals may perceive external or non-human agency in environmental or spiritual forces [30]. Within the context of sports, this factor represents athletes' potential

reliance on perceived supernatural support or protection as a way to interpret and manage the inherent unpredictability of competitive performance.

Third Factor (F3): Totemism

This dimension focuses on the symbolic attribution of meaning to animal figures, the perceived influence of objects associated with others, and the perceived positive or negative effects of specific totems. Drawing on Durkheim's [11] conceptualization, totemism can be understood as the use of symbolic anchors that represent identity and collective significance [9]. In sport settings, such symbols or totems may serve as psychological anchors, potentially enhancing an athlete's sense of belonging and providing a source of motivation or perceived protection during competition.

Fourth Factor (F4): Superstition

This dimension addresses non-empirical beliefs, such as the attribution of luck or misfortune to specific jersey numbers and the expectation that past failures may recur under similar conditions. From a psychological perspective, such superstitious tendencies are often interpreted as coping mechanisms used to manage performance anxiety and a desire for control in high-pressure situations [12]. Within this framework, athletes may resort to superstitious practices and repetitive patterns as a way to navigate uncertainty and stabilize their mental state during competition.

Confirmatory Factor Analysis

Table 6: Results of the Confirmatory Factor Analysis for the TASS (Final 18-item version)

Factors/Items	β	t value	CR	AVE	R ²
Factor 1					
I believe that the rituals I perform during competitions increase my luck	0.750				0.562
Using a specific item consistently during the competition gives me confidence	0.705	13.794			0.497
Some items that I believe bring me luck during competitions are always with me	0.738	12.852			0.544
I attach special meaning to certain objects or symbols during competitions.	0.708	11.984	0.889	0.534	0.501
During the competition, I respect nature and believe that nature helps me.	0.636	12.154			0.404
During the competition, I feel stronger by creating a specific totem or using a symbol.	0.829	14.337			0.687
During a match, I assign meaning to different objects or symbols to protect myself from the negative energy of opposing players.	0.735	12.814			0.541
Factor 2					
During the match, I believe that a certain supernatural being helps me achieve success.	0.926				0.857
I need the help of a specific supernatural being to be successful during the competition	0.835	20.457			0.697
I believe that a specific supernatural being protects or guides me during the competition.	0.862	21.871	0.890	0.624	0.743
I believe that my rule-breaking behavior during the competition could be punished by a divine power.	0.645	12.993			0.416
I believe that visiting sacred places before competitions will have a positive effect on my performance	0.636	12.88			0.405

Factor 3					
During the competition, a specific animal symbol inspires me	0.728				0.405
I believe that items worn or used by someone else during the competition bring me luck	0.762	11.099	0.780	0.542	0.53
A specific totem or symbol during a match could have a negative effect on me*	0.718	10.481			0.581
Factor 4					
When I am successful in competitions, I believe that others will cast an evil eye on my performance	0.632				0.4
I think that if what happened before my past unsuccessful competitions happens again, I will fail again*	0.675	8.896	0.702	0.441	0.455
I have lucky or unlucky jersey numbers in competitions	0.683	8.964			0.467

*= Reversely coded items.

Note: All factor loadings were statistically significant ($p < .001$). CR: Composite Reliability; AVE: Average Variance Extracted. For Factor 4, while AVE (.441) is below the .50 threshold, it is considered acceptable because the CR (.702) is above .60 [11].

As presented in Table 6, the standardized factor loading ranged from .632 to .926, and all were statistically significant ($p < .001$), indicating satisfactory indicator reliability. Composite reliability (CR) values for the four factors ranged between .702 and .890, exceeding the recommended .70 threshold [15]. The average variance extracted (AVE) values were above the acceptable .50 level for three factors, while the AVE for the fourth factor (Superstition) was .441. Although this value falls slightly below the recommended threshold, convergent validity is still considered acceptable given that the CR for this factor exceeds .60, in line with the criteria suggested by Fornell and Larcker [12]. Overall, these findings provide support for the reliability and convergent validity of the proposed four-factor structure.

Table 7. Discriminant Validity Results According to the Fornell-Larcker Criterion

Factors	F1	F2	F3	F4
F1 Ritualism	0.731	0.495	0.611	0.565
F2 Supernaturalism	0.495	0.790	0.453	0.453
F3 Totemism	0.611	0.453	0.736	0.497
F4 Superstition	0.565	0.453	0.497	0.664

As presented in Table 7, the square root of the AVE for each construct exceeded its correlations with the other constructs, supporting discriminant validity according to the Fornell-Larcker criterion. The inter-factor correlations ranged from .453 to .611, indicating that the four dimensions were related yet empirically distinguishable. These findings suggest that ritualism, supernaturalism, totemism, and superstition represent conceptually associated but separate constructs within the TASS

framework. However, because discriminant validity was evaluated only through the Fornell-Larcker criterion, the findings should be interpreted as providing supportive rather than conclusive evidence of discriminant validity.

Table 8. Internal consistency coefficients for the TASS subdimensions

TASS Sub-Dimensions	Internal Consistency Coefficient	Evaluation
Factor 1	0.893	Good
Factor 2	0.891	Good
Factor 3	0.753	Acceptable
Factor 4	0.703	Acceptable
Scale Total	0.932	Excellent

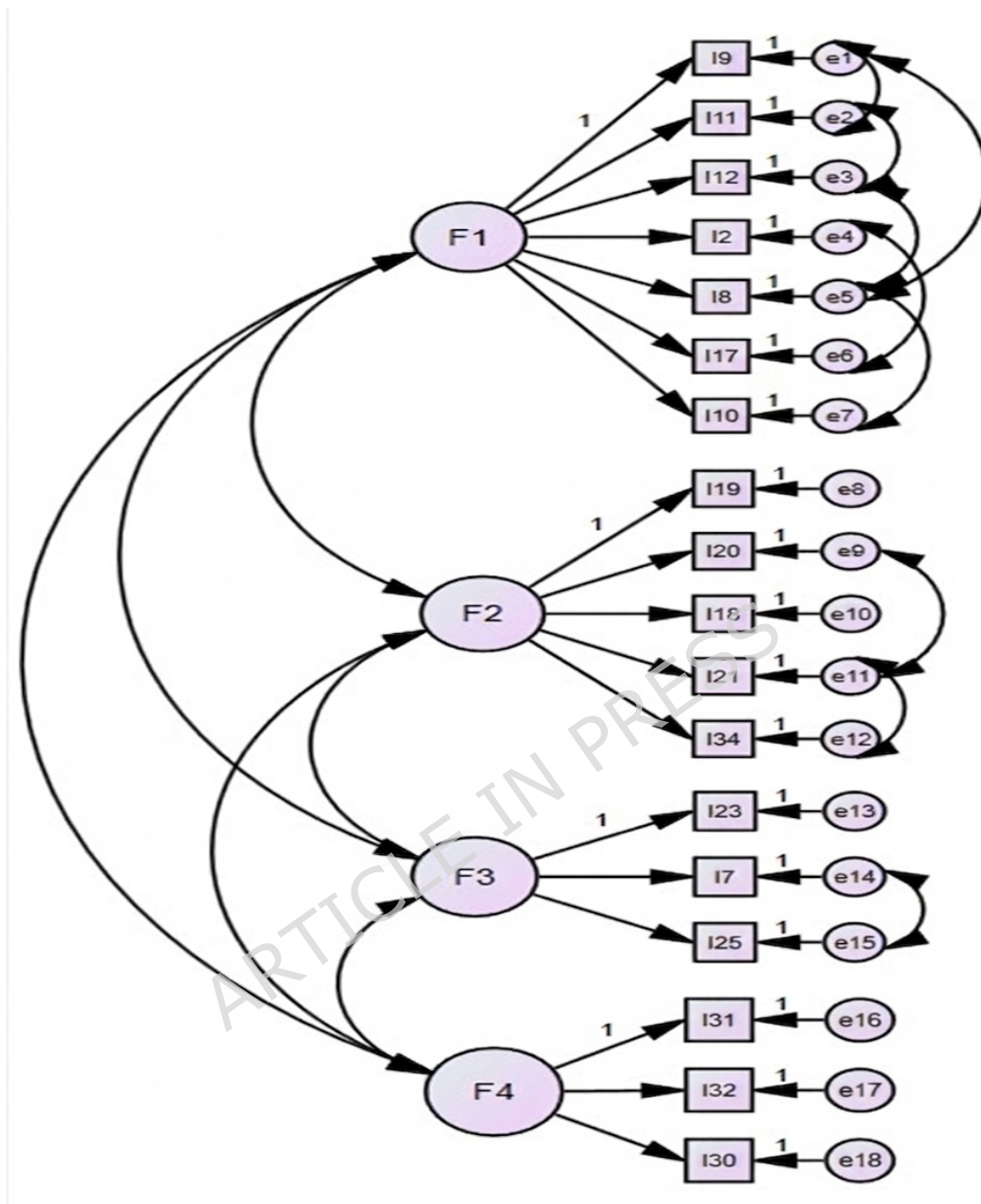
As shown in Table 8, the TASS demonstrated satisfactory internal consistency. The total scale showed excellent reliability ($\alpha = .932$). At the subdimension level, Factor 1 ($\alpha = .893$) and Factor 2 ($\alpha = .891$) showed good reliability, whereas Factor 3 ($\alpha = .753$) and Factor 4 ($\alpha = .703$) showed acceptable reliability [10,31].

Table 9: Fit Indices from Confirmatory Factor Analysis for the Totem and Animism Scale in Sport

Fit Measure	Value	Fit
χ^2	246.804	-
df	120	-
χ^2/df	2.057	Acceptable Fit
RMSEA	0.059	Acceptable Fit
NFI	0.922	Acceptable Fit
NNFI	0.946	Good Fit
CFI	0.958	Good Fit
GFI	0.922	Acceptable Fit
AGFI	0.889	Acceptable Fit

Note. χ^2/df = chi-square/degrees of freedom ratio; RMSEA = root mean square error of approximation; NFI = normed fit index; NNFI = non-normed fit index; CFI = comparative fit index; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index. Fit thresholds were interpreted according to Hu and Bentler [18].

As shown in Table 9, the confirmatory factor analysis results indicated that the proposed four-factor structure demonstrated acceptable to good model fit. The χ^2/df ratio (2.057) and RMSEA (.059) fell within acceptable ranges, while the CFI (.958) and NNFI (.946) suggested good fit. In addition, the NFI (.922), GFI (.922), and AGFI (.889) supported an overall acceptable level of model fit. Taken together, these findings provide support for the adequacy of the proposed measurement model [15,18,19,20,29].



Chi-Square = 246.804, **df** = 120, **P value** = 0.00000, **RMSEA** = 0.059

Figure 2. Standardized solution for the confirmatory factor analysis of the final 18-item TASS

Note: Figure 2 presents the standardized solution for the final four-factor CFA model. Correlated error terms within Factor 1 were retained only when supported by theoretical proximity and modification index diagnostics, consistent with recommendations in CFA research [6,15,21,24,29].

Discussion and Conclusion

Overview of Findings

The primary aim of this study was to develop and evaluate the psychometric properties of the Totem and Animism Scale in Sport (TASS), a multidimensional instrument designed to assess belief-related tendencies among athletes. The findings provide initial psychometric support for a four-factor structure comprising ritualism, supernaturalism, totemism, and superstition, which collectively accounted for 66.12% of the total variance. Confirmatory factor analysis indicated acceptable-to-good model fit, and internal consistency coefficients ranged from acceptable to excellent across subdimensions. These results are discussed in relation to the existing literature on belief-related behaviors in sport, the conceptual rationale underlying the scale dimensions, and the methodological constraints of the present study.

Theoretical Positioning of the Four Dimensions

The four-factor structure of the TASS is consistent with a multidimensional conceptualization of belief-related behaviors in competitive sport. Rather than treating athletes' rituals, symbolic attachments, supernatural attributions, and superstitious beliefs as equivalent or interchangeable expressions of a single underlying tendency, the present findings suggest that these may represent empirically distinguishable, though interrelated, patterns of cognition and behavior.

Ritualism (Factor 1) encompasses structured and repetitive behaviors performed in relation to competition, including the use of symbolic objects and the attribution of protective meaning to specific items. This dimension is conceptually consistent with Cotterill's [7] account of pre-performance routines as behavioral strategies that may help athletes regulate attention and manage uncertainty prior to performance. Similarly, Schippers and Van Lange [30] demonstrated that ritualized behaviors in elite football players were associated with perceived psychological benefits, particularly in high-stakes situations. The items loading on this factor in the present study reflect athletes' tendency to organize their pre- and in-competition experience through meaningful behavioral patterns, which may serve a psychological regulation function rather than implying literal causal efficacy. Although some ritualistic behaviors may involve symbolic objects or totemic elements, the Ritualism factor primarily reflects repetitive behavioral regulation

strategies, whereas Totemism reflects symbolic attachment and meaning attribution.

Supernaturalism (Factor 2) reflects beliefs involving transcendental or divine agency, including perceived support from supernatural beings and the significance of visiting sacred sites. In sport psychology, such beliefs have been discussed as externally oriented coping strategies that may help athletes reinterpret uncertainty and reduce subjective threat appraisals [17,34]. Anthropological concepts such as animism, as originally described by Tylor [32], are employed here strictly as interpretive frameworks to characterize the pattern of attributing agency to non-human forces, not as claims about universal cognitive evolution or deep psychological origins. The emergence of this factor as a distinct dimension from ritualism supports a conceptual distinction between behavioral regulation strategies and attribution-based belief tendencies.

Totemism (Factor 3) involves the perceived influence of symbolic objects, animal motifs, and totemic signs on performance outcomes. Drawing on Durkheim's [11] sociological account, the concept of totemism is used here to describe the attachment of protective or identity-related meaning to symbolic anchors rather than to invoke claims about universal or evolutionarily fixed belief structures. In applied terms, such symbolic attachments may function similarly to what Hamerman and Morewedge [16] described as reliance on lucky charms: the perceived connection between an object and an outcome may provide psychological comfort and reinforce a sense of agency without implying literal causal relations.

Superstition (Factor 4) captures non-empirically grounded cause-and-effect beliefs, including concerns about jersey numbers and the expectation that prior failure conditions may predict future failure. These tendencies align with the broader literature on superstitious behavior in sport [5,34] and may reflect cognitive patterns associated with outcome uncertainty and performance anxiety. It is important to note that the present study does not treat these beliefs as pathological or as indicators of irrational thinking; rather, consistent with Damisch et al. [9], superstitious beliefs may operate as functional coping responses in competitive settings.

Psychometric Evaluation and Comparison with Existing Instruments

The TASS was designed to extend beyond the scope of existing instruments that focus primarily on superstitious behavior or pre-

performance ritual. Scales such as the Superstitious Belief and Behavior Scale [5] and the Superstition in Sport Questionnaire [34] address important aspects of athletes' belief-related tendencies; however, they do not systematically differentiate among symbolic object attachment, supernatural attribution, ritualized behavior, and superstitious causal reasoning as distinct constructs. The multidimensional structure of the TASS may therefore offer additional measurement coverage for belief-related dimensions that are not fully captured by unidimensional or more narrowly focused instruments.

From a psychometric standpoint, the composite reliability (CR) values for all four factors exceeded the recommended .70 threshold, and the overall Cronbach's alpha of .932 indicated excellent internal consistency. The average variance extracted (AVE) for Factor 4 (Superstition; AVE = .441) fell slightly below the conventional .50 threshold. Although this value is marginal, the corresponding CR of .702 suggests that convergent validity for this factor remains acceptable under the criteria proposed by Fornell and Larcker [12]. This finding is noteworthy because the superstition dimension involves relatively heterogeneous beliefs—including luck attributions, failure expectations, and jersey number preferences—which may inherently limit the proportion of variance explained by the underlying factor. Future refinement of this subscale, including the addition of items more specifically targeting causal superstitious cognitions, may improve its AVE.

Discriminant validity was assessed using the Fornell-Larcker criterion, and the square root of the AVE for each factor exceeded its interfactor correlations, providing initial support for the empirical distinctiveness of the four dimensions. Nevertheless, the moderate-to-high interfactor correlations—consistent with the theoretical expectation that these dimensions are related aspects of a broader belief-related tendency—suggest that future studies should evaluate discriminant validity using more stringent procedures, such as the Heterotrait-Monotrait (HTMT) ratio [35] particularly for the ritualism and totemism factors, which showed a correlation of .611.

Cultural Context and the Evil Eye

The superstition factor included an item referencing the evil eye, a culturally embedded concern reflecting the perceived negative influence of others' envy on one's performance. This belief is prevalent in Turkish and broader Mediterranean and Middle Eastern cultural contexts [18] and is consistent with the general pattern of externally oriented causal attribution

that characterizes the superstition dimension. The prominence of this motif in the present sample underscores the importance of cultural context in shaping how athletes interpret uncertainty. At the same time, the extent to which this item functions equivalently across athletes from different cultural backgrounds remains to be established; future cross-cultural studies should examine whether the evil eye item and culturally specific items demonstrate comparable factor loadings and item properties in other samples.

Practical Implications

The TASS may offer practitioners and researchers a tool for systematically describing athletes' belief-related profiles across four distinguishable dimensions. Sport psychologists may use the scale to identify the extent to which an athlete relies on ritualized behavioral strategies, symbolic attachments, supernatural attributions, or superstitious causal reasoning. Such information could inform individualized psychological support, particularly in identifying whether an athlete's belief-related behaviors are primarily behavioral and regulation-focused (ritualism, totemism) or more cognitively and attribution-focused (supernaturalism, superstition). However, it is important to note that the present study provides only initial psychometric evidence, and the TASS should not be used for clinical or applied decision-making without further validation, including evidence from convergent and criterion validity studies.

Limitations

Several limitations should be acknowledged. First, the sample was drawn exclusively from Turkey, which limits the generalizability of the findings to other cultural contexts. Belief-related behaviors in sport are likely shaped by cultural norms, religious orientations, and social practices that vary across countries and regions. Cross-cultural replication is therefore necessary before the TASS structure can be considered generalizable. In addition, the use of convenience sampling may have introduced selection bias and limited the representativeness of the sample.

Second, concurrent validity with established instruments was not examined in this study. Although the scale's conceptual scope differs from existing superstition and ritual measures, the absence of convergent and discriminant validity evidence relative to external criteria remains a limitation. Future research should examine correlations between TASS scores and related constructs, including sport-specific superstition scales,

anxiety measures, and coping inventories. Although the Superstition factor demonstrated acceptable composite reliability, its AVE value remained slightly below the recommended threshold, suggesting that further refinement of this dimension may be beneficial.

Third, test-retest reliability was not assessed, which means the temporal stability of the TASS scores is currently unknown. Longitudinal data are needed to determine whether athletes' belief-related tendencies remain stable over time or change in response to performance outcomes, injury, or career transitions.

Fourth, measurement invariance across groups was not formally tested in the present study. The sample included male and female athletes, individual and team sport participants, and elite and national-level competitors. Before group comparisons on TASS scores can be meaningfully interpreted, invariance testing across these groups should be conducted.

Fifth, the cross-sectional design precludes causal inference. The present data do not allow conclusions about whether belief-related tendencies predict or influence performance outcomes, nor do they establish the direction of any association between the measured dimensions and psychological outcomes.

Finally, details regarding missing data management, randomization of subsamples, and outlier handling, while attended to during the screening process, should be reported more comprehensively in future publications to support replicability.

Conclusion

This study describes the development and initial psychometric evaluation of the Totem and Animism Scale in Sport (TASS), a four-factor instrument designed to assess belief-related dimensions among competitive athletes. The findings support a multidimensional structure comprising ritualism, supernaturalism, totemism, and superstition, with acceptable-to-good model fit and satisfactory reliability indicators across subdimensions. By differentiating among these constructs, the TASS extends beyond existing instruments that focus primarily on superstition or pre-performance ritual, offering a more comprehensive assessment framework for belief-related tendencies in sport.

It is important to emphasize that the present study provides initial, exploratory psychometric evidence. The constructs of totemism, animism, and supernaturalism are employed as interpretive categories to describe coherent patterns in athletes' self-reported beliefs and behaviors; they do not constitute empirical claims about evolutionary origins, universal cognitive architectures, or cross-cultural equivalence. The scale's applicability across diverse cultural and competitive contexts remains to be established through future research.

The TASS may contribute to sport psychology research by providing a tool for examining how athletes attribute meaning, agency, and causal influence to objects, routines, and perceived external forces in competitive contexts. Future studies should address concurrent and criterion validity, test-retest reliability, measurement invariance, and cross-cultural generalizability to further establish the scale's utility as a research instrument.

Ethics approval and consent to participate

The study was approved by the Gumushane University Non-Interventional Clinical Research Ethics Committee (File Number: E-95674917-108.99-310239). Informed consent was obtained from all individual participants included in the study.

Consent for publication

No individual or indemnifiable data is being published as part of this manuscript.

Availability of Data and Materials

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

Author's Contributions:

Conceptualization, M.U.T., M.O.S. and Mi.K.; methodology, M.U.T. and Mu.K.; formal analysis, M.U.T. and Mu.K.; investigation, M.U.T., Mu.K., Mi.K., E.T., O.K. and M.O.S.; data curation, M.U.T., Mu.K. and E.T.; resources, O.K., Mi.K. and M.O.S.; writing—original draft preparation, M.U.T.; writing—review and editing, M.U.T., M.O.S. and Mi.K.; supervision,

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