



Validity and Reliability Study of Coach Evaluation Scale (CES)

Sevim Handan YILMAZ¹, Ekrem Levent İLHAN², Yunus Emre YARAYAN³, Muhammet Cihat ÇİFTÇİ⁴

¹ Bartın Üniversitesi, Spor Bilimleri Fakültesi, Beden Eğitimi ve Spor

² Gazi Üniversitesi, Spor Bilimleri Fakültesi, Beden Eğitimi ve Spor Eğitimi

³ Siirt Üniversitesi, Beden Eğitimi ve Spor Yüksekokulu, Beden Eğitimi ve Spor Eğitimi

⁴ Ankara Yıldırım Beyazıt Üniversitesi, Spor Bilimleri Fakültesi, Spor Yöneticiliği

Abstract

This study aimed to develop and validate the Coach Evaluation Scale (CES) as a reliable and valid measurement tool for evaluating coaches from a holistic perspective. The study was conducted in two stages. In the first stage, Exploratory Factor Analysis (EFA) was conducted with 301 athletes, revealing a single-factor structure explaining 66.82 % of the total variance. Item-total correlations exceeded 0.60, and Cronbach's Alpha internal consistency coefficient was determined as 0.97, indicating high reliability. In the second stage, Confirmatory Factor Analysis (CFA) was conducted with 256 athletes to confirm the factor structure. Fit indices showed an acceptable model fit ($\chi^2/df = 2.81$, RMSEA = 0.084, SRMR = 0.034, CFI = 0.93, TLI = 0.92). Additionally, the Average Variance Extracted (AVE) value was 0.64 and the Reliability (CR) value was 0.97, confirming the validity and reliability of the scale. The findings demonstrate that the CES is a psychometrically sound tool for evaluating coaches from a comprehensive perspective. Future research should explore its applicability across different sport disciplines and cultural contexts and its potential use as a self-assessment tool for coaches.

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Antrenör Değerlendirme Ölçeği Geçerlilik ve Güvenilirlik Çalışması (ADÖ)

Öz

Bu çalışma, antrenör bütünsel bir bakış açısıyla değerlendirmek için güvenilir ve geçerli bir ölçüm aracı olarak Antrenör Değerlendirme Ölçeği'ni (CES) geliştirmek ve geçerliliğini doğrulamak amacıyla yapılmıştır. Çalışma iki aşamada gerçekleştirilmiştir. İlk aşamada, 301 sporcu ile Keşifsel Faktör Analizi (EFA) yapılmış ve toplam varyansın %66,82 'ini açıklayan tek faktörlü bir yapı ortaya çıkmıştır. Madde-toplam korelasyonları 0,60'ı aştı ve Cronbach's Alpha iç tutarlılık katsayısı 0,97 olarak belirlenmiştir. Bu yüksek güvenilirliği göstermektedir. İkinci aşamada, faktör yapısını doğrulamak için 256 sporcu ile Doğrulayıcı Faktör Analizi (CFA) yapıldı. Uyum indeksleri, kabul edilebilir bir model uyumu gösterdi ($\chi^2/df = 2,81$, RMSEA = 0,084, SRMR = 0,034, CFI = 0,93, TLI = 0,92). Ek olarak, Ortalama Çıkarılan Varyans (AVE) değeri 0,64 ve Güvenilirlik (CR) değeri 0,97 idi, bu da ölçeğin geçerliliğini ve güvenilirliğini doğruladı. Bulgular, CES'in antrenörleri kapsamlı bir perspektiften değerlendirmek için psikometrik olarak sağlam bir araç olduğunu göstermektedir. Gelecekteki araştırmalar, farklı spor disiplinleri ve kültürel bağlamlarda uygulanabilirliğini ve koçlar için bir öz değerlendirme aracı olarak potansiyel kullanımını araştırmalıdır.

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Sorumlu Yazar: Sevim Handan YILMAZ

E-mail: hyilmaz@bartin.edu.tr

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INTRODUCTION

Coaches are one of the most crucial components in enabling athletes to achieve high-level performance. Stated that the sports environment fundamentally consists of three primary relationship patterns: the coach, the athlete, and the training environment. Regardless of how talented an athlete or a team may be, they inevitably require professional guidance and technical and tactical development. The key figure in this process is the coach (Mallett and Côté, 2006).

Coaches guide athletes by blending theoretical knowledge with practical experience, support their development, train them for competitions, and simultaneously serve as their leaders (Baláková and Musálek, 2012). In this context, an ideal coach is expected to possess expertise in their field, stay updated on new developments, apply their knowledge effectively, be open to growth, serve as a role model, demonstrate exemplary behavior, act honestly towards their athletes (Başar, 1996), be self-critical when necessary, acknowledge mistakes, uphold the rights of their athletes, fairly reward their performance, and motivate them (Doğan, 2004). Additionally, an ideal coach is expected to closely monitor their athletes, engage with them on a personal level, be aware of their lives outside of sports, maintain relationships based on respect and care, refrain from being accusatory in case of failure, and take responsibility when necessary (Çeyiz, 2007).

All these parameters directly influence the athletes' professional careers, performance, psychological well-being, and motivation levels, contributing to their development and success (Bezci, 2016). The interaction between an athlete and a coach significantly impacts both the athlete's psychological state and performance (Cranmer and Myers, 2015). Athletes have reported that when their expectations regarding leadership, communication, and ethical behavior from their coaches are met, their performance improves. Conversely, when coaches fail to meet these expectations, negative outcomes arise, and athletes feel emotionally harmed (Jowett and Cockerill, 2003; Bekiari and Sympas, 2015; West, 2016). Moreover, athletes have stated that the harmony between them and their coaches not only affects their sports success and motor skill development but also has a significantly positive influence on their social and ethical behaviors (Cairney et al., 2018; Canlı, Taşkın and Kurt, 2021). Observing inadequacies in a coach can lead to a lack of self-confidence, anxiety, dissatisfaction, failure, and even complete withdrawal from sports (Konter, 2004). Based on this, it can be asserted that raising competent coaches is essential for developing both physically and mentally well-prepared athletes and achieving success in sports. In this regard, when examining coach training programs in our country, it is evident that the process is carried out through two approaches: the coaching education departments of universities and the fundamental coaching training courses conducted by the Ministry of Youth and Sports (Sunay and İmamoğlu, 1996).

Coaches trained through these programs are expected to possess certain qualities such as "sports-related knowledge, general culture, pedagogical competency, and appropriate personality and character traits" (Amorose and Horn, 2011). Within this scope, according to Articles 2, 30, and 31 of Law No. 3289 on the Organization and Duties of the General Directorate of Sports, and the Coaching Education Regulation published in the Official

Gazette on August 16, 2002 (No. 24848), the "Regulation on the Working Procedures and Principles of Coaches" outlines their responsibilities. These responsibilities include ensuring the technical and tactical development of athletes, preparing them for sports activities, maximizing their potential by following relevant publications, participating in related training programs, collaborating with other institutions for the development of their athletes, and monitoring their motivational levels.

For coaches to fulfill these expectations, it is crucial that they make the best use of the training programs they receive, continuously develop themselves, and stay updated with new advancements (Kasap, 2006). Another critical factor is that coaches should be aware of their strengths and weaknesses and take action to improve their deficiencies. To ensure objective evaluation, it is highly significant that this assessment is conducted from the perspective of athletes, as they have the opportunity to observe their coaches closely. At this point, there is a need for a reliable source of information through which athletes can evaluate their coaches. A review of national and international literature reveals that existing coach evaluation scales are unidimensional, focusing on coach-athlete relationships, assessment of coaching behaviors (Côté et al., 1999; Filiz and Demirhan, 2016; Carlsson and Lundqvist 2016) and leadership behaviors (Chelladurai and Saleh, 1980; Toros and Tiryaki, 2006; Yapar and İnce, 2014; Filiz and Demirhan, 2017; Unutmaz and Gençer, 2017). There was a need for a scale that included many different parameters such as communication, leadership and behavior.

No comprehensive scale assessing coaches from a broad perspective has been identified, highlighting the necessity of a measurement tool that fully evaluates coaches. The evaluation in question refers to athletes assessing not only their coaches' technical and tactical knowledge but also their ability to consider athletes' needs, create new opportunities, provide guidance, and remain open to continuous improvement. Based on this need, the purpose of this study is to develop a valid and reliable measurement tool that enables athletes to evaluate their coaches while also allowing coaches to assess themselves. It is thought that coaches will make self-evaluation and interpretation based on the scale results. It is believed that this research will be valuable in achieving a holistic evaluation of coaches.

MATERIALS AND METHODS

Research Design

This study was designed within the scope of scale development and validation, utilizing a cross-sectional survey design to assess the psychometric properties of the scale. An attempt was made to achieve easily accessible sampling. Team athletes over the age of 18 were recruited for the study. The cross-sectional survey design allows for the collection of data from a specific group of participants at a single point in time, facilitating the validity and reliability analyses of the scale (Creswell, 2014).

Research Group

Data were collected online. The research announcement was made on social media platforms, and the link was shared, and participants who wanted to take part were included. In this study, two different sample groups were utilized to evaluate the psychometric properties of the scale.

In the first phase, Exploratory Factor Analysis (EFA) and reliability analyses were conducted to identify the factor structure of the scale and test its internal consistency. A total of 301 individuals voluntarily participated in this phase, consisting of 171 males and 130 females. The mean age of male participants was $\bar{X} = 25.87 \pm 5.33$, while the mean age of female participants was $\bar{X} = 25.81 \pm 5.41$.

In the second phase, Confirmatory Factor Analysis (CFA) was performed to validate the identified factor structure of the scale. A total of 256 individuals voluntarily participated in this phase, comprising 145 males and 111 females. The mean age of male participants was $\bar{X} = 25.73 \pm 5.36$, and the mean age of female participants was $\bar{X} = 25.99 \pm 5.52$.

Ensuring an adequate sample size for EFA and CFA is a crucial criterion in scale development studies (Tabachnick and Fidell, 2019). A commonly accepted approach for factor analysis suggests having at least 5 to 10 participants per item (Costello and Osborne, 2005). In this context, EFA was carried out with 301 presenters and CFA was carried out with 256 participants. In this study, the inclusion of a total of 557 participants meets the recommended criteria for scale development and is considered to provide sufficient statistical power for the analyses.

Compliance with Ethical Standards

This study was approved by the Bartın University Ethics Committee (Ethics Committee Approval No: 2021-SBB-0150, Date: 07.04.2021). Informed consent was obtained from all participants, and the research was conducted in accordance with ethical principles. In this study, data collection via Google Forms surveys began on June 7, 2024, and was completed on September 16, 2024. Before filling out the survey, participants were informed about the study, and their voluntary consent was obtained.

Collection Instruments

In this study, the Coach Evaluation Scale (CES) was developed, and as a result of the validity and reliability analyses, a single-factor structure consisting of 23 items was obtained. The scale was designed using a 5-point Likert-type format, with response options ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree". The minimum possible score on the scale is 23, while the maximum is 115. Higher scores indicate that athletes evaluate their coaches as more competent and positive.

Data Collection Process

The data collection process in this study was conducted using a combination of online and face-to-face methods. To reach participants, an email invitation was initially sent, and responses were collected via Google Forms. Participants of the study were individuals over the age of 18. During the data collection phase, all participants were informed about the study and their verbal consent for voluntary participation was obtained. Additionally, to enhance the inclusivity of the data collection process, face-to-face administration was also conducted. During the face-to-face data collection process, participants were informed about the purpose of the study, and no time constraints were imposed while they completed the questionnaire.

A preliminary data screening was performed to identify missing or erroneous responses. In the first phase of the study, four participants were excluded from the analysis due to incomplete data forms. Therefore, the first phase analysis was conducted with 301 athletes. In the second phase of the study, two participants were found not to have answered some of the items and were excluded from the analysis, leaving 256 athletes. The two-phase data collection process was completed with a total of 557 participants.

Procedure

Item pool development:

To develop the Coach Evaluation Scale (CES) trial form, a detailed review of national and international studies on athletes was conducted (Chelladurai and Saleh, 1980; Côté et al., 1999; Filiz and Demirhan, 2016; Toros and Tiryaki, 2006). Based on these studies, a total of 25 items were initially identified and included in the item pool.

Expert review:

To ensure that the scale items comprehensively covered the intended construct, were clearly understandable, and were appropriate for the target sample, a trial form was prepared and sent via email to three coaches and four academic experts in the field. To ensure that the scale items comprehensively covered the targeted construct, were clearly understandable, and were appropriate for the target sample, a pilot form was developed and emailed to three coaches, three death assessment experts in the field, and one sports science academic.

Pilot study:

Before assessing the psychometric properties of the scale, a pilot study was conducted to evaluate item clarity, applicability, and potential sources of error. Pilot studies are recommended in scale development to test the comprehensibility of items, conduct preliminary analyses, and refine the scale before its main implementation (Boateng et al., 2018; DeVellis, 2017). In this context, a pilot sample of 21 participants with similar characteristics to the main study group was selected to assess the preliminary version of the Coach Evaluation Scale (CES). Participants provided feedback on the clarity of the scale, item content, and administration time. Based on the pilot study findings, two items with low clarity were revised, and one overly general or overlapping item was removed from the scale. As a result, a final version consisting of 23 items was created and proceeded to the main study implementation.

Data analysis and interpretation:

The data analysis process in this study was carried out in two phases. In the first phase, Exploratory Factor Analysis (EFA) and reliability analyses were conducted using SPSS 26.0. Initially, missing and outlier data analysis was performed, and data from 16 participants were excluded, resulting in analyses being conducted with 301 participants. To determine the construct validity of the scale, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity were applied. Factor loadings were examined, item-total correlations were

evaluated, and items with low discriminative power were removed from the scale. The Cronbach's Alpha coefficient was calculated to assess the internal consistency of the scale.

In the second phase, Confirmatory Factor Analysis (CFA) and validity tests were conducted using AMOS 24.0. Similar to the first phase, missing and outlier data analysis was performed, leading to the exclusion of eight participants, with the final analysis being conducted on 256 participants. CFA was applied to confirm the factor structure of the scale, and the model fit was assessed using χ^2/df , CFI, TLI, IFI, RMSEA, and SRMR fit indices. Additionally, to provide evidence for the convergent and discriminant validity of the scale, the Average Variance Extracted (AVE) and Composite Reliability (CR) values were calculated.

RESULTS

Phase 1

Table 1: Exploratory factor analysis, item-total test correlations, KMO test results

Items	Factor 1	Item-Total Test Correlations	Total Explained Variance (%)	KMO
18. My coach prepares his/her athlete for the competition in the best way.	.896	.883	66,828	KMO=.974; $\chi^2=6964,309$; $sd=253$; $p=.000^*$
21. My coach is sensitive to the needs of his/her athlete.	.878	.863		
5. My coach follows the development and psychological needs of his/her athlete.	.874	.860		
17. My coach sets realistic and competitive goals for the athlete.	.871	.855		
7. My coach knows the potential of his/her athlete and makes efforts to increase it.	.867	.851		
15. My coach guides his/her athlete to reach his/her goals.	.860	.843		
16. My coach constantly motivates his/her athlete.	.853	.833		
3. My coach develops effective training programs.	.852	.835		
6. My coach treats the athlete fairly.	.842	.821		
11. My coach has a high level of tactical knowledge.	.840	.821		
9. My coach honors his/her athlete at every opportunity.	.831	.813		
1. My coach has a high level of technical knowledge.	.828	.807		
23. My coach is a principled coach who adheres to the rules.	.826	.805		
12. My coach appreciates his/her athlete's effort even if he/she loses the competition.	.823	.801		
13. My coach takes his/her athlete's suggestions and evaluations into consideration.	.809	.790		
22. My coach looks after the interests of his/her athlete and defends his/her rights.	.803	.780		
19. My coach has in-depth knowledge about his/her athlete.	.800	.782		
4. My coach is a coach who values his/her athlete.	.797	.773		
20. My coach tries different strategies, methods and techniques in training.	.771	.750		
2. My coach respects his/her athlete's decisions.	.754	.729		
14. My coach prepares and applies a special training program for the athlete.	.747	.727		
8. My coach constantly strives for self-improvement.	.699	.676		
10. My coach works in cooperation with other professional groups (sports physician, sports psychologist, masseur, etc.).	.627	.605		

*Significant at $p < .001$ level.

In Table 1, the Kaiser-Meyer-Olkin (KMO) value was found to be 0.974, and Bartlett's Test of Sphericity produced a significant result ($\chi^2 = 6964.380$, $df = 253$, $p < .001$), confirming that the dataset was highly suitable for factor analysis. The factor analysis results indicated that the

scale exhibited a single-factor structure, explaining 66.828% of the total variance. The scree plot used in the Exploratory Factor Analysis (EFA) is presented in Figure 1.

The factor loadings ranged between 0.627 and 0.896, with all items loading onto a single factor. Among the items with the highest factor loadings were "My coach prepares the athlete for competition in the best possible way" (0.896) and "My coach is sensitive to the needs of the athlete" (0.878). These findings indicate that the scale effectively measures key elements related to coaching performance.

Additionally, item-total test correlations were generally above 0.60, further supporting the internal consistency and reliability of the scale. In accordance with the relevant literature, item-total correlations should be above 0.30 to be considered adequate for reliability (Nunnally and Bernstein, 1994). Following this stage, the Cronbach's alpha (α) internal consistency coefficient was calculated, and the results of this analysis are presented in Table 2.

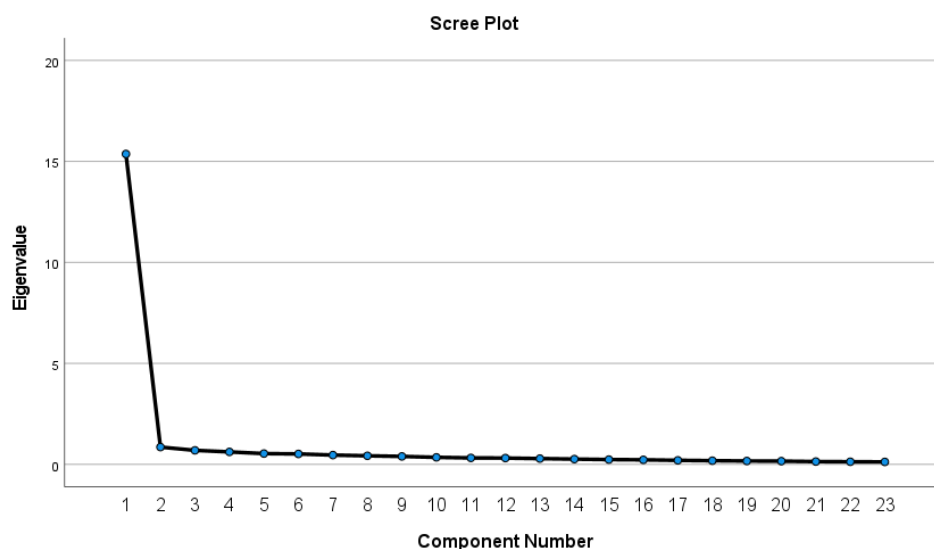


Figure 1. Scree plot of the exploratory factor analysis (EFA) results

Table 2. Internal consistency coefficients for the scale's sub-dimensions

Dimension	Cronbach Alpha (α)
Coach Evaluation	,97

In Table 2, the Cronbach's Alpha internal consistency coefficient was found to be 0.97. Considering that the recommended reliability threshold for measurement instruments in the relevant literature is 0.70 (Tezbaşaran, 1996), it can be concluded that both the sub-dimensions and the overall internal consistency coefficients of the scale are highly reliable. Following this stage, the study proceeded to the second phase to confirm the identified structure, and the results are presented in the subsequent section.

Phase 2

Confirmatory Factor Analysis (CFA):

A confirmatory study was conducted on a different sample group to validate the structure and reliability of the scale. The values obtained from the Confirmatory Factor Analysis (CFA) are presented. Additionally, to provide evidence for the convergent and discriminant validity of the scale, the Average Variance Extracted (AVE) and Composite Reliability (CR) values were also calculated.

Table 3. Fit indices and construct reliability values for confirmatory factor analysis

<i>Fit Index Values</i>									<i>Construct Reliability</i>		
χ^2	df	p	χ^2/df	RMSEA	SRMR	CFI	IFI	TLI	Scale	AVE	CR
641,6799	228	0,001	2,81	0,084	0,034	0,93	0,93	0,92	CES	,64	,97

According to the Confirmatory Factor Analysis (CFA) results in Table 4, the fit indices indicate that the model demonstrates an overall acceptable fit. The Chi-square/degrees of freedom ratio (χ^2/df) was calculated as 2.81, which falls within the recommended threshold of <3 , confirming an acceptable model fit (Kline, 2015). The RMSEA value was found to be 0.084, placing it within the 0.05–0.08 range, indicating an acceptable fit (Browne and Cudeck, 1993). However, for ideal fit, values below 0.06 are recommended (Hu and Bentler, 1999). The SRMR value was 0.034, which is close to the <0.05 threshold, demonstrating good model fit (Hu and Bentler, 1999). Additionally, the CFI (0.93), IFI (0.93), and TLI (0.92) values exceed the ≥ 0.90 threshold recommended in the literature, supporting the model's good fit (Bentler, 1990; Hu and Bentler, 1999).

In terms of construct reliability, the Average Variance Extracted (AVE) value was calculated as 0.64, exceeding the 0.50 threshold suggested in the literature. This indicates that the variance explained by the factor loadings is greater than the error variance (Fornell and Larcker, 1981). Additionally, the Composite Reliability (CR) value was found to be 0.97, far exceeding the 0.70 threshold suggested in the literature, demonstrating that the scale has high reliability. These findings support that the measurement model used in the study is generally valid and reliable. Consequently, the model meets general fit criteria, confirming that the scale is a valid and reliable measurement tool. This indicates that the scale is appropriate for its intended purpose and that its factor structure is sufficiently supported. The path diagram of the CFA analysis is presented in Figure 2.

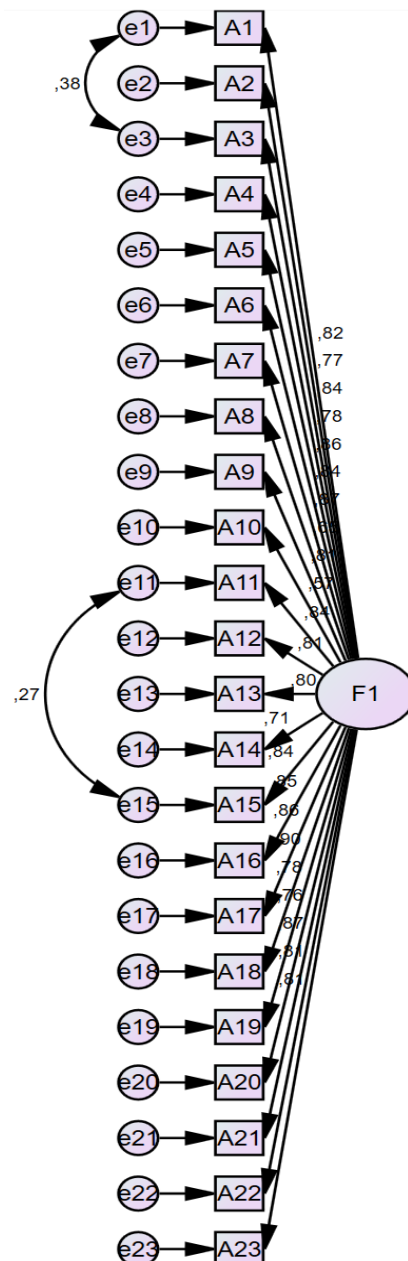


Figure 2: Path Diagram (This figure illustrates the path diagram obtained from the Confirmatory Factor Analysis (CFA), visually representing the relationships between the observed variables and the latent factor structure of the scale).

DISCUSSION

It is undeniable that coaches play a pivotal role in the success of athletes and teams (Amorose and Horn, 2011). Fundamentally, the sports environment is built upon the relationship between the athlete and the coach, a dynamic interaction that requires careful attention. Consequently, a holistic approach, rather than a single-dimensional perspective, is necessary to evaluate this process (Mallett and Côté, 2006). However, a review of the relevant literature reveals that most measurement tools assessing the coach-athlete interaction adopt a single-dimensional approach. In this sense, a measurement tool covering concepts such as behavior, communication and leadership was needed. Studies have primarily examined leadership

skills, communication abilities, and behavioral characteristics in isolation (Amorose, 2007; Baker, Yardley and Côté, 2003; Chelladurai and Saleh, 1980; Côté et al., 1999; Yapar and İnce, 2014; Filiz and Demirhan, 2016; Filiz and Demirhan, 2017; Unutmaz and Gençer, 2017; Gillet et al., 2010; Martin et al., 1999; Mondello and Janelle, 2001; Toros and Tiryaki, 2006).

A review of the existing literature did not identify a measurement tool in Türkiye that comprehensively evaluates all key parameters of coaching. Coaches can do this through their own interpretation and self-assessment based on the scale's score. Based on this gap, the present study aimed to develop a scale that enables athletes to evaluate their coaches, while also allowing coaches to assess themselves. This coach evaluation is not only based on technical and tactical knowledge but also incorporates aspects such as attention to athletes' needs, creating new opportunities, providing guidance, and maintaining an open attitude toward continuous improvement. The Coach Evaluation Scale (CES) was developed to reliably and validly measure these parameters. It is expected that this scale will introduce a new dimension to the evaluation of coaches in the sports environment. Additionally, as a comprehensive and up-to-date measurement tool, it has the potential to make a significant contribution to the sports science literature. The scale development process was carefully followed, and the findings are summarized below.

In the first phase of the study, factor analysis results indicated that the scale had a single-factor structure, explaining 66.828% of the total variance. Factor loadings ranged from 0.627 to 0.896, with all items loading onto a single factor. Item-total correlations were generally above 0.60, further supporting the internal consistency and reliability of the scale. The Cronbach's Alpha internal consistency coefficient was found to be 0.97, indicating high reliability. Following this phase, the study proceeded to the second phase, where a validation study was conducted with a different sample group. The fit indices indicated that the model demonstrated an acceptable overall fit, with a Chi-square/degrees of freedom ratio (χ^2/df) of 2.81. The construct reliability value (AVE) was 0.64, and the Composite Reliability (CR) value was 0.97, confirming that the scale was both valid and reliable. These results suggest that the scale is suitable for its intended purpose and that its factor structure is well-supported. In conclusion, the Coach Evaluation Scale (CES) 23-item form has been demonstrated to be a valid and reliable tool for assessing coaches in a single-factor structure. The measurement tools in the literature only measure parameters such as leadership and coaching behavior, but this measurement tool deals with many different parameters such as communication, behavior and leadership behavior within a single dimension.

CONCLUSION

The Coach Evaluation Scale (CES), developed in this study, is a valid and reliable measurement tool that allows athletes to evaluate their coaches holistically. This single-factor structure, identified through exploratory factor analysis, explained 66.83% of the total variance, and all items loaded highly on this factor (0.627–0.896). Cronbach's alpha coefficient of 0.97 indicates high internal consistency. Confirmatory factor analysis also demonstrated the reliability of the model. While this single-factor structure differs from multidimensional scales (e.g., LSS, CBAS), it is theoretically meaningful because it allows

for a holistic assessment of the coaching process, in line with the purpose of the study, and contributes to the literature. The Coach Evaluation Scale (CES) developed in this study provides athletes with a comprehensive tool to assess their coaches' technical, tactical, and psychosocial competencies in a valid and reliable manner. Future research could investigate how the scale performs across different sports disciplines, cultural groups, and long-term studies to further strengthen its scientific and practical validity. Additionally, the potential use of the scale for self-assessment by coaches could be explored as an area for future research.

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