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Adaptation and validation in Spanish of the Group Environment Questionnaire (GEQ) with professional football players

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Abstract

Background: This investigation presents two studies with the goal of adapting and validating a short version of the Group Environment Questionnaire in the Spanish sport context with professional players. **Method:** Study 1 used a sample of 377 male soccer players aged between 18 and 39 years (M = 24.51, SD = 3.73), in a preliminary study using exploratory factor analysis. Study 2 used a sample of 604 professional male and female athletes, ages between 15 and 38 years (M = 24.34, SD = 4.03). The data analyzed were collected at three moments of the season. For each measurement, we developed seven first- and second-order structures that were analyzed with confirmatory factor analysis. **Results:** Study 1 indicated appropriate factorial validity (> .60) and internal consistency (> .70), with only Item 3 presenting a low factor loading (.11), so its drafting was modified in the next study. Study 2 revealed that the Spanish version of the GEQ has high levels of internal consistency (> .70) and acceptable fit index values in its original four first-order factor structure in all three measurements (χ^2/df = 4.39, CFI = .95, IFI = .95, RMSEA = .07, SRMR = .04, AIC = 271.09). Discriminant validity (from r = .45 to r = .72) and concurrent validity (from r = .21 to r = .60) also presented appropriate values. Lastly, we conducted analysis of invariance, confirming that the models established in the different measurements were invariant. **Conclusions:** The short 12-item adaptation of the GEQ to Spanish is a valid and reliable instrument to measure team cohesion in professional male and female soccer players.

Keywords: group cohesion, psychometric properties, questionnaire, group environment, high-performance sport.

Resumen

Adaptación y validación al español del Group Environment Questionnaire (GEQ) con jugadores profesionales de fútbol. **Antecedentes:** esta investigación presenta dos estudios cuyo objetivo era adaptar y validar al contexto deportivo español una versión corta del Group Environment Questionnaire con jugadores profesionales. **Método:** el Estudio 1 contó con 377 jugadores de fútbol de género masculino con edades entre 18 y 39 años (M = 24.51; DT = 3.73), con los que se realizó un estudio preliminar mediante un análisis factorial exploratorio. El Estudio 2 contó con 604 deportistas masculinos y femeninos profesionales con edades entre 15 y 38 años (M = 24.34; DT = 4.03). Los datos analizados fueron recogidos en tres momentos de la temporada. Se desarrollaron siete estructuras de primer y segundo orden que fueron sometidas a un análisis factorial confirmatorio. **Resultados:** el Estudio 1 indica una validez factorial (>.60) y consistencia interna adecuada (>.70) del instrumento, donde únicamente el ítem 3 presentó una saturación baja (.11) y se modificó su redacción para el estudio 2. El Estudio 2 revela que la versión española del GEQ demuestra alta consistencia interna (>.70) e índices aceptables en su estructura factorial original con cuatro factores de primer orden en las tres medidas (χ^2/df = 4.39; *CFI* = .95; *IFI* = .95; *RMSEA* = .07; *SRMR* = .04; *AIC* = 271.09). Además, la validez discriminante (desde r = .45 a r = .72) y concurrente (desde r = .21 a r = .60) demostraron valores adecuados. Finalmente se realizó un análisis de la invarianza que demostró que los modelos eran invariantes en las diferentes medidas. **Conclusiones:** la adaptación corta de 12 ítems del GEQ al español es un instrumento válido y fiable para medir la cohesión de equipo en jugadores y jugadoras profesionales de fútbol.

Palabras clave: cohesión de grupo, propiedades psicométricas, cuestionario, ambiente de grupo, alto rendimiento deportivo.

Cohesion has been defined as "a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" (Carron, Brawley, & Widmeyer, 1998, p. 213). This construct has been extensively used for the past few years as a theoretical reference framework (Carron & Eys, 2012). The conceptual model developed by Carron (1982), revolves around two main points: group integration—which refers to the degree to which the team acts as a whole—and attraction to the group—which refers to how the group satisfies one's personal needs and goals. Likewise, Carron and Eys (2012) defend the idea that each team member develops a perception reflecting the degree to which the group members work together to achieve common goals—task cohesion—and a perception reflecting the degree to which team members empathize with each other and enjoy group fellowship—social cohesion (Carron, Widmeyer, & Brawley, 1985; Carron et al., 1998). Therefore, based on the players' appraisals,

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four different manifestations are identified: group integration-task (GI-T), group integration-social (GI-S), individual attraction to the group-task (ATG-T), and individual attraction to the group-social (ATG-S).

This effort to establish a consistent theoretical framework of group cohesion is related to the elaboration of different measurement instruments, seeking a scale with sufficient reliability and validity (see Lane, 2014; Sireci & Faulkner-Bond, 2014) to appraise levels of team cohesion. In accordance with Dion (2000), the most solid and relevant instrument is the Group Environment Questionnaire, designed by Carron et al. (1985). This questionnaire is made up of 18 items distributed in the four scales of its conceptual model (GI-T, GI-S, ATG-T, and ATG-S).

In spite of the fact that this instrument was extensively developed in different settings, there are still some critiques that question its validity (Carless & De Paola, 2000; Sullivan, Short, & Cramer, 2002). The main aspects that have been debated derive from the factor structure proposed by Carron et al. (1985), the four first-order factor model, because the results support social-task distinctions but not the group integration-individual attraction to the group distinctions. Different validations performed in sport (Carless & De Paola, 2000; Heuzé & Fontayne, 2002; Iturbide, Elosua, & Yanes, 2010; Li & Harmer, 1996; Schutz, Eom, Smoll, & Smith, 1994; Sullivan et al., 2002) did not show an appropriate factor structure consistent with the proposal of Carron et al. Some studies suggested the presence of two factors (social cohesion-task cohesion) (Iturbide et al., 2010; Sullivan et al., 2002), three factors (social cohesion, task cohesion and individual attraction to the group) (Carless & De Paola) or one second-order factor (global cohesion) (Nascimento Junior, Vieira, Rosado, & Serpa, 2012; Schutz et al., 1994) as a solution, because confirmatory factor analysis of the items indicated that the original model examined was not a good fit to the data. In spite of this, Carron and Brawley (2000) clarified two basic premises: (a) there are different dimensions of cohesion and (b) each context may demand one dimension more strongly than others (and some dimensions may not even be present). Therefore, the instrument must be adapted to each target area or group (Brawley & Carron, 2003).

Another focus of attention is that the values of internal consistency in the original version of Carron et al. (1985) (ATG-S = .64, ATG-T =.75, GI-S =.76, and GI-T = .70) and subsequent validations, such as Spanish version (Iturbide et al., 2010) (ATG-S = .73, ATG-T =.77, GI-S =.61, and GI-T = .67), were slightly below the recommendations in some of their dimensions (Nunnally & Bernstein, 1994). These values was confirmed in different studies employing this instrument, like Heuzé, Raimbault, and Fontayne (2006) (ATG-S = .44, ATG-T = .79; GI-T = .68, and GI-S = .68), Sullivan et al. (2002) (ATG-S = .56, ATG-T = .94, GI-S =.54, and GI-T = .35) and Schutz et al. (1994) (ATG-S = .60, ATG-T =.65, GI-S = .64, and GI-T = .64).

In the same vein, some investigations that have reviewed the psychometric properties of the GEQ also found problems with discriminant validity, because the correlations between factors were excessively high (correlations ranged from r = .71 to r = .91) (Li & Harmer, 1996; Ntoumanis & Aggelonidis, 2004) .

Due to these limitations with regard to the factor analysis and internal consistency, some authors had to reduce the number of items of the questionnaire to obtain appropriate values. In this sense, Carless and De Paola (2000) reviewed the instrument for work groups, reducing it to 10 items to measure global cohesion, and Nascimento Junior et al. (2012) reduced the instrument to 16 items. Similarly, Heuzé and Fontayne (2002) decided to modify and adapt the drafting of various items in order to obtain a valid and reliable instrument.

The comments of the authors of the GEQ (Carron & Brawley, 2000), in which they justify that the refining of a scale, including its reliability and validity, is an ongoing process, should be taken into account. Consequently, Eys, Carron, Bray, and Brawley (2007) changed the negative items to positive items, showing that the internal consistency of the GEQ improved ostensibly.

Another methodological improvement carried out in the studies of Ntoumanis and Aggelonidis (2004) and Leeson and Fletcher (2005) is the verification that the values of internal consistency remained constant over time in the same sample, which was an important contribution that had not been made till then. GEC validity and reliability confirmation in different measurements over time grants more strength to the instrument assessment. Frequently, the difficulty of measuring at different time intervals can hinder this confirmation. In fact, Buton, Fontayne, Heuzé, Bosselut, and Raimbault (2007) created a short version with 8 items to measure cohesion with repeated measures within a certain time interval.

Likewise, the work of Ntoumanis and Aggelonidis (2004), with samples of both genders, resolved the possible gender differences of the psychometric properties of the GEQ. These authors conducted the invariance by gender and they did not find any differences between men and women in the confirmatory factorial analysis. In spite of this, as the authors comment, gender differences should be viewed with caution and must be replicated.

Lastly, the differences in the factor structure of the GEQ at different levels of competences (i.e., between amateur and professional players) has never been analyzed. Moreover, most of the studies in the literature have examined training, amateur, or semi-professional athletes (Heuzé & Fontayne, 2002; Iturbide et al., 2010; Schutz et al., 1994; Sullivan et al., 2002). It would therefore be important to examine whether the GEQ can be used with professional players in the sport sphere, because this could be useful for coaches and sport psychologists who wish to measure their teams' cohesion.

Therefore, it is important to note that the current Spanish version (Iturbide et al., 2010) did not show the original factorial structure (two dimensions instead of four) and its internal consistency values were low (α <.70). Moreover, that Spanish version did not deal with limitations and improvements of the instrument conducted up to now, such as changing the negative items to positive items (Eys et al., 2007), and this instrument had to be adapted to the study participants, whereas their participants were very heterogeneous in sports, age, and categories without conducting any analysis of invariance.

In light of some limitations of the instrument, this investigation presents two studies with the goal of adapting and validating a short version of the Group Environment Questionnaire in the Spanish sport context with professional players. The main goal of Study 1 was to attempt to preliminarily consolidate the factor structure proposed by Carron et al. (1985) using the questionnaire validated by García-Calvo (2006) with semi-professional players. Thus, we attempted to test that the factorial structure found with players in training ages did not suffer any changes with amateur participants. The goal of Study 2 was to validate the short version in Spanish of the GEQ in professional players of both genders. In light of the limitations of the validation carried out in Spanish by Iturbide et al.

(2010), assessments were made with respect to its factor structure, internal consistency values, discriminant validity, concurrent validity, gender invariance, and the constancy of the validity of the measurement at three different points in time. For this purpose, different models were tested according to the recommendations of Li and Harmer (1996) and Ntoumanis and Aggelonidis (2004).

Methods

Participants

The research sample of Study 1 comprised 377 male soccer players, aged between 18 and 39 years (M = 24.51, SD = 3.73). The participants belonged to 20 semi-professional teams that played in Group XIV of the National League of the Third Division. To select participants, we used intentional sampling, in which all the teams of the competition participated in the study.

The sample of Study 2 was made up of male and female soccer players who belonged to 31 professional teams. The participants played in national Spanish competitions, specifically the Women's 1st Division and the Men's 2nd B Division. We also used intentional sampling to select the participants: 13 female teams and 18 male teams agreed to participate. At Time 1, there were 375 male players and 229 female players, aged between 15 and 38 years (M = 24.34, SD = 4.03). At Time 2, there were 333 male players and 232 female players, aged between 15 and 37 years (M = 24.01, SD = 4.84). At Time 3, there were 343 male players and 230 female players, aged between 15 and 38 years (M = 24.27, SD = 4.92).

Instruments

Cohesion. To assess cohesion, we used a Spanish adaptation of the GEQ (Carron et al., 1985) developed by García-Calvo (2006). This instrument has 12 positive items, grouped into four factors (GI-T, GI-S, ATG-T, and ATG-S). Agreement with items is rated on a 9-point Likert scale, ranging from *strongly disagree* (1) to *strongly agree* (9).

Collective efficacy. To confirm concurrent validity, we introduced collective efficacy because it is one of the group variables that has been more closely associated with group cohesion (Heuzé et al., 2006; Kozub & McDonnell, 2000; Leo et al., 2010; Spink, 1990). To assess collective efficacy, we used the instrument designed by Leo, Sánchez-Miguel, Sánchez-Oliva, Amado, and García-Calvo (2011). This instrument starts with a stem phrase (i.e., "Our team's confidence in our capability to…") and has a total of 26 items that refer to some offensive (i.e., keeping ball possession in the face of rival pressure) and defensive soccer situations (i.e., "…to defend set piece ball situations"), which are grouped into a single factor. Responses were rated on a 5-point scale ranging from *bad* (1) to *excellent* (5).

Procedure

Study 1 consisted of a preliminary study of the instrument using a cross-sectional design. A single measurement was performed in the first third of the season to ensure that the teams had competed in various official matches and there was enough time to form the group and create social bonds between players to be able to assess cohesion (Carrron & Eys, 2012). Study 2 used a longitudinal design with three measurement periods (pre-season, mid-season, and end of season), with the aim of corroborating the validity of the instrument to assess cohesion in different measures over time (Ntoumanis & Aggelonidis, 2004).

Data collection followed the same protocol in Study 1 and Study 2 to ensure that it was similar for all the participants involved in both investigations. Studies received ethical approval from the University. All participants were treated according to American Psychological Association ethics guidelines regarding consent, confidentiality, and anonymity of responses. We developed a protocol to ensure that data collection would be similar for all the participants involved in the investigation. First, club officials (i.e., coaches and psychological services) were contacted to request their supervision of the investigation and their consent. We also informed the athletes that their participation was voluntary and their responses would be treated confidentially. We provided a letter to the parents of minor athletes, informing them of the goals and requesting their consent for their children to participate in the study. Assessments were conducted in the changing room without the presence of the coach, in an appropriate climate that allowed the players to concentrate without any distractions. The questionnaires required approximately 10 minutes to complete. The main investigator was present while the subjects completed the questionnaires.

Data analysis

In the Study 1, the psychometric properties of the GEQ were analyzed with SPSS 19.0 statistical software. We carried out exploratory factor analysis, descriptive statistics, normality, and internal consistency using Cronbach's alpha for each factor. Furthermore, in the Study 2, we analyzed the psychometric properties of the GEQ through confirmatory factor analysis following the recommendations of Merenda (2007) to validate instruments (Ríos & Wells, 2014). Lastly, we analyzed discriminant and concurrent validity of the instrument, and we confirmed factorial invariance as a function of players' gender. All the analyses were conducted with the SPSS 19.0 and AMOS 6.0 statistical software.

Results

Study 1

Psychometric properties of the GEQ

First, we calculated the value of the Kaiser-Meyer-Olkin sample adequacy measurement (KMO), obtaining an appropriate value (.86) according to Kaiser (1974). Bartlett's sphericity test was also significant (p<.01), indicating the adequacy of the data.

Second, we examined the distribution patterns and the underlying components of the 12 items through exploratory factor analyses, using the maximum likelihood estimation method (ML: Lawley & Maxwell, 1971). Consequently, an oblimin orthogonal rotation (Mulaik, 1972) was applied to facilitate the interpretation of the components (Ferrando & Anguiano-Carrasco, 2010).

All the items obtained factor loadings higher than .60 (from .61 to .84), indicating a factor structure made up of 4 factors. Note that Item 3 obtained a factor loading of .11, which was considered inappropriate, therefore we decided to remove this item. We obtained Eigenvalues higher than 1 in each of the factors (the four factors exceeded Kaiser's criterion) and the scree plot slope

became gentle for these four factors. Skewness and kurtosis values of the data varied from -1.31 to 2.43, and total explained variance was 66.07% with the sum of the four factors.

In addition, the data have acceptable values of internal consistency (ATG-T = .77; GI-S = .76; GI-T = .74) (Nunnally & Bernstein, 1994). Only in the case of ATG-S was there a lower internal consistency (α = .58), perhaps influenced by the elimination of Item 3.

Regarding Item 3, we think that this item may be distorted due to the type of participants used in this investigation, because high-level teams usually place more emphasis on task cohesion than on social cohesion (Carron & Brawley, 2000). In fact, this item states "some of my best friends are on this team." Accordingly, it is difficult for semi-professional players, whose social circle is very rooted in their past, to identify this figure of the "best friend" within their sport group. The fact that the original translation was made with young players may have influenced the factor analysis to produce these results, because at sport initiation ages, the forming of a social group is under development. Accordingly, in Study 1 we decided to remove this item, and in Study 2 we decided to rewrite this item to "I have good friends on this team" (Table 1).

Study 2

Confirmatory factor analysis

In Study 2, we tested seven first-order and second-order structures proposed by Li and Harmer (1996) and Ntoumanis and Aggelonidis (2004) to confirm the best factor structure. Specifically, first, we analyzed four first-order models: a first-order one-factor model of Global Cohesion (M1), a cohesion model with two first-order factors representing Attraction and Integration (M2), a cohesion model with two first-order factors representing Task and Social aspects (M3), and a Cohesion model with four first-order factors (M4), which was hypothesized by Carron et al. (1985).

Next, we tested three second-order models: a cohesion model of 4 subscales with one second-order factor (Global Cohesion: M5), a cohesion model with two second-order factors (Attraction and Integration: M6), and a cohesion model with a different set of two second-order factors (Social and Task: M7).

To assess factorial validity, we carried out various confirmatory factor analyses, using the maximum likelihood estimation method with the bootstrapping procedure, which ensured that the results of the estimations were robust, and therefore not affected by the lack of multivariate normality (Byrne, 2001). We used the following fit indices to assess the fit of the data to the models (Jöreskog & Sörbom, 1996): Chi-Square/degrees of freedom (χ^2/*df*), comparative fit index (CFI), incremental fit index (IFI), root mean square error of approximation (RMSEA), standardized root mean residual (SRMR), and Akaike's information criterion (AIC).

The different fit indices of the models are shown in Table 2. These models were developed from the data taken at the beginning of the season. The models with data from the middle and the end of the season showed similar values (not shown in the manuscript to simplify and reduce the results). The models with second-order factors—M5, M6, M7—all present appropriate fit index values. In addition, we note that the first-order structure established by Carron et al. (1985) for their instrument is the only established model that presents optimum fit index values. In the comparison of the models, this presents the best fit index values, and it also has the lowest AIC value, indicating that it is the best model (Jöreskog & Sörbom, 1996). Regarding the discriminant capacity of the items of each factor, the values had an appropriate correlation range (from r = .45 to r = .72) and, therefore, the discriminant capacity of the instrument is appropriate (see Ntoumanis & Aggelonidis, 2004). However, the first-order models (M1, M2, and M3) do not present sufficiently good fit index values (Hu & Bentler, 1999).

Descriptive statistics, normality, internal consistency, temporal stability, and concurrent validity

Table 3 presents the descriptive statistics values of cohesion factors at the three measurements, where the means are observed to be above the central values. The means show a tendency to

Table 1
Group Environment Questionnaire (Spanish and English version)

1. Me gusta participar en actividades extra deportivas con los demás jugadores del equipo (cenas, excursiones…) [I like to participate in activities aside from sports with the other team athletes (meals, excursions…)]
2. Estoy contento con mi aportación al juego del equipo [I am pleased with my contribution to the team's game]
3. Tengo buenos amigos en este equipo [I have good friends on this team]
4. En este equipo puedo rendir al máximo de mis posibilidades [I can do my best on this team]
5. Las compañeras del equipo son uno de los grupos sociales más importantes a los que pertenezco [My teammates make up one of the most important social groups I belong to]
6. Me gusta el estilo de juego que tiene este equipo [I like the way this team plays]
7. A los miembros del equipo les gusta salir de fiesta juntos [The team members like to go out (parties, etc.) together]
8. Los miembros del equipo unen sus esfuerzos para conseguir los objetivos durante los entrenamientos y los partidos [The team members unite their efforts to achieve the goals during trainings and matches]
9. A los jugadores de este equipo les gustaría juntarse algunas veces cuando finalice la temporada [The players of this team sometimes like to get together after the season is over]
10. Todos los jugadores asumen la responsabilidad ante un mal resultado del equipo [All the players take responsibility for a poor team result]
11. A los miembros de nuestro equipo les gustaría juntarse en otras situaciones que no fueran los entrenamientos y los partidos [The members of our team like to get together in situations other than trainings and matches]
12. Si existe algún problema durante los entrenamientos todos los jugadores se unen para poder superarlo [If there is any problem during the training sessions, all the players get together to overcome it]

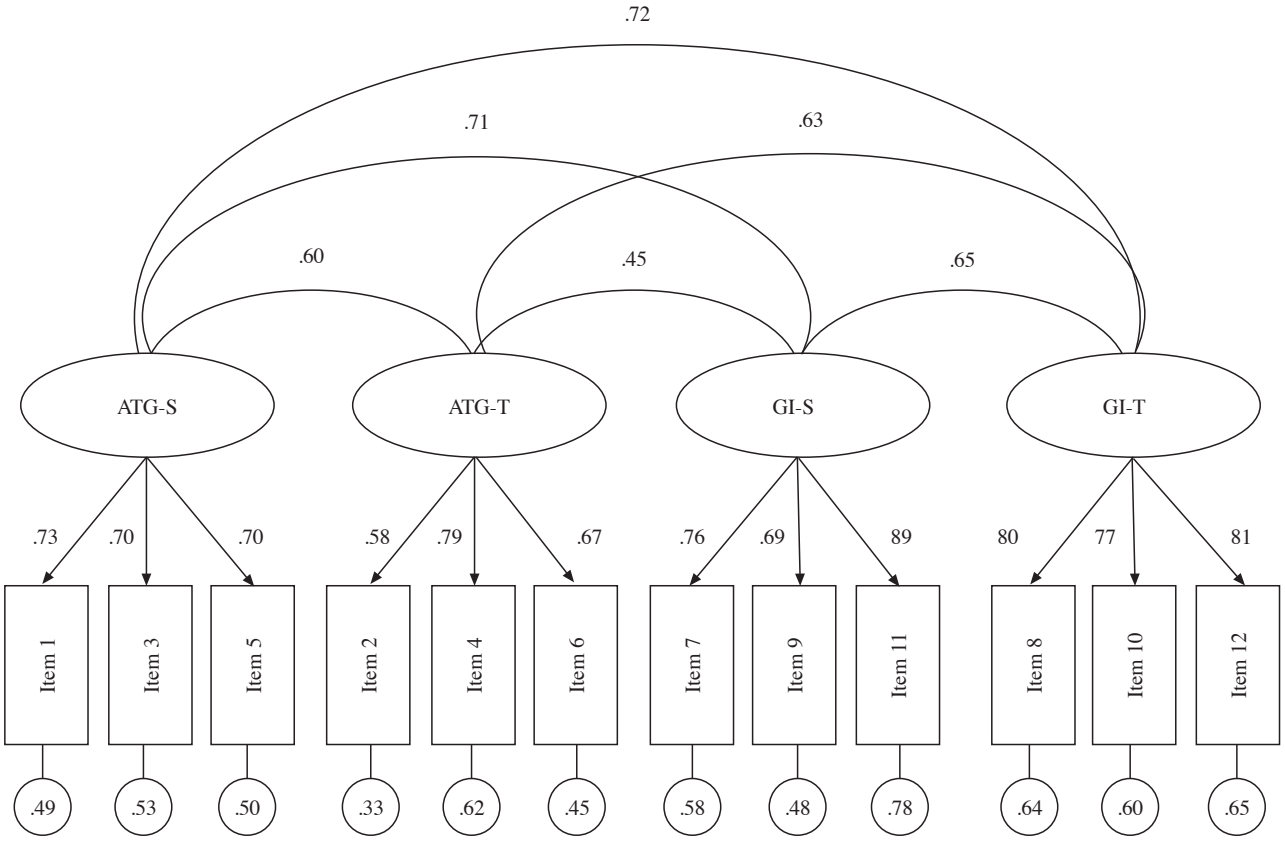

Figure 1. *A first-order four factor model*

Table 2
Values of fit indexes of the models of GEQ

Model and scale	χ^2/df	CFI	IFI	RMSEA	SRMR	AIC
Model 1 (one first-order factor, Global Cohesion)	15.36	.76	.70	.16	.08	877.88
Model 2 (two first-order factors, GI and ATG)	10.86	.84	.84	.13	.07	625.47
Model 3 (two first-order factors, Task and Social)	14.38	.78	.78	.15	.08	812.23
Model 4 (four first-order factors)	4.39	.95	.95	.07	.04	271.09
Model 5 (one second-order factor, Global Cohesion)	4.58	.95	.95	.08	.04	284.94
Model 6 (two second-order factors, GI and ATG)	4.63	.95	.95	.08	.04	285.12
Model 7 (two second-order factors, Task and Social)	4.35	.95	.95	.07	.04	271.19

decrease slightly as the end of the season approaches. Table 3 also shows skewness and kurtosis values of the data (from -1.31 to 2.43), as well as values of internal consistency in the four cohesion factors at all three measurements, which exceed .70 (Nunnally & Bernstein, 1994). Therefore, we can confirm that factor structure and internal consistency are constant over time.

As indicated above, we introduced collective efficacy to confirm concurrent validity. Accordingly, all the factors of group cohesion showed positive high correlations with collective efficacy at all three time periods.

Analysis of factor invariance

We analyzed the invariance of the factor structure as a function of participants' gender, using multigroup analysis. For this purpose, we used a sample from the measurement taken at the beginning of the season, made up of 375 male players and 229 female players.

By means of this technique, we could confirm that the designed instrument functions similarly for each group. That is, this analysis allows us to confirm that the psychometric properties of the instrument do not vary for either gender. Thus, the possible differences between the unconstrained model (Model 1) and the nested models (invariance models) can be tested. Table 4 shows the fit indices of the three compared models in the analysis of invariance by gender, where significant differences in chi square were found between the unconstrained model and two of the invariance models. In spite of this, according to Cheung and Rensvold (2002), when the CFI values are lower than .01, the instrument can be considered invariant, which was the result in our analysis. Therefore, the values found in CFI in the unconstrained

Table 3
Descriptive statistics, normality, internal consistency, and concurrent validity

	M	SD	Skewness	Kurtosis	α	CE
T1 Group Integration-Task	7.33	1.34	-.99	.95	.79	.40**
T1 Group Integration-Social	7.22	1.45	-.83	.52	.73	.21**
T1 Individual Attraction to Group-Task	7.66	1.23	-1.31	2.43	.73	.38**
T1 Individual Attraction to Group-Social	6.82	1.52	-.65	.18	.71	.27**
T2 Group Integration-Task	6.84	1.71	-.72	-.18	.85	.53**
T2 Group Integration-Social	6.65	1.82	-.73	-.15	.84	.32**
T2 Individual Attraction to Group-Task	7.75	1.62	-.75	.17	.72	.44**
T2 Individual Attraction to Group-Social	7.11	1.64	-1.10	1.05	.78	.41**
T3 Group Integration-Task	6.67	1.83	-.83	.06	.87	.60**
T3 Group Integration-Social	6.68	1.87	-.74	-.10	.88	.30**
T3 Individual Attraction to Group-Task	6.48	1.92	-.78	-.07	.80	.50**
T3 Individual Attraction to Group-Social	6.97	1.77	-.96	.32	.80	.43**

Note: T1 = Initial measurement, T2 = Mid-season measurement, T3 = final measurement; CE = Collective efficacy
* $p<.05$; ** $p<.01$

Table 4
Analysis of invariance by gender (beginning of season)

	χ^2/df	$\Delta\chi^2$	Δdf	p	CFI	IFI	RMSEA	SRMR
Model 1 Configural Invariance	3.43	–	–	–	.92	.92	.06	.04
Model 2 Metric Invariance	3.37	21.44	8	.01	.92	.92	.06	.05
Model 3 Strong Invariance	3.26	20.97	10	.02	.92	.92	.06	.05
Model 4 Strict Invariance	3.09	17.45	12	.13	.92	.92	.06	.05

model and in the different invariance models indicate that the GEQ does not vary as a function of gender (invariance models at mid- and end-season showed similar values which did not show herein to simplify the results).

Discussion

The goal of the present study was to examine the psychometric properties of the short version in Spanish of the GEQ with a sample of professional soccer players of both genders. The data analyzed and the results of the three measurements performed throughout the season were very similar, leading to some inferences about the psychometric properties of this version of the GEQ and about the temporal invariance and consistency of its validity and reliability. Accordingly, the results indicated that the scale has appropriate factor structure, internal consistency, and concurrent validity, and is also invariant as a function of the athletes' gender and over time. Therefore, the Spanish short version of the GEQ is a valid and reliable scale for the analysis of team cohesion. Furthermore, it has addressed the limitations of the previous measure in Spanish, which was adapted to participants under research in the performance domain and it facilitates its administration at different times over a year.

The aim of Study 1 was to preliminarily consolidate the factor structure proposed by Carron et al. (1985) by means of the questionnaire validated by García-Calvo (2006) with semi-professional players. In general, the instrument presented appropriate factor structure, with three items making up each one of the cohesion factors. The values of internal consistency were also appropriate (Nunnally & Bernstein, 1994), and only Item 3 presented a low factor loading in the factor analysis, and this decreased the internal consistency of ATG-S. This result may be due to the fact that the validation of the instrument by García-Calvo (2006) was carried out with young players, and this item, which is related to social aspects, may not be relevant in professional players because high-level teams grant more importance to aspects of task cohesion (Carron & Brawley, 2012). As there already is a version for players in training (Youth Sport Environment Questionnaire; Eys, Loughead, Bray, & Carron, 2009), we decided to change this item to be more oriented toward high performance.

The goal of Study 2 was to validate the short version in Spanish of the GEQ in professional players of both genders, in view of the limitations of the validation carried out in Spanish by Iturbide et al. (2010). This validation did not show the original factorial structure and its internal consistency values were low. Moreover, this scale did not consider limitations and improvements of the instrument developed so far (Eys et al., 2007). For this purpose, different models were tested according to the recommendations of Li and Harmer (1996) and Ntoumanis and Aggelonidis (2004). Within the analyzed factor structures, the model with the best fit indices was made up of the four first-order factors (M4) proposed by the original authors (Carron et al., 1985). Moreover, these results were similar in all three measurements carried out, which does not agree with the results of the validation in Spanish by Iturbide et al. (2010). However, we note that the adaptations of the GEQ to other languages, such as Portuguese (Nascimento Junior et al., 2012) and French (Heuzé & Fontayne, 2002), with some modifications, also presented this factor structure with appropriate indexes.

In addition, taking the AIC as reference, this model (M4) obtained the lowest score and, therefore, it presented the best fit. This coincides with the results obtained by Li and Harmer (1996). However, the work of Ntoumanis and Aggelonidis (2004), in spite of the fact that the different models had appropriate indexes, the AIC values did not coincide with this factor structure (four first-order factors, M4).

Another aspect to take into account is that in our model, the correlation indexes among factors were appropriate, so our instrument can be considered to have discriminant validity. Nevertheless, in the study by Li and Harmer (1996), the correlation values between the factors were high, because its discriminant capacity was not very appropriate. A similar finding was reported in the work of Ntoumanis and Aggelonidis (2004) because the correlations between factors were very high. Therefore, our data with high performance players guarantee an appropriate discriminate validity to distinguish instruments´ factors.

In the same vein, the values of internal consistency of each one of the factors at the initial, intermediate, and final measurements were higher (α>.70) (Nunnally & Bernstein, 1994). These results are coherent with the Portuguese, (Nascimento Junior et al., 2012), French (Heuzé & Fontayne, 2002), and Greek (Ntoumanis & Aggelonidis, 2004) versions of the GEQ, and they ostensibly improve the values presented in the original scale (Carron et al., 1985) and in the previous Spanish version (Iturbide et al., 2010).

One of the essential aspects indicated by Leeson and Fletcher (2005) and Ntoumanis and Aggelonidis (2004) was the need for this instrument to present permanent temporal validity. Accordingly, the values of internal consistency were appropriate and were constant at the beginning, in the middle, and at the end of the season. This is an important contribution because until now, this aspect was lacking in the adaptation to Spanish. Therefore, this 12-item version of the GEQ is valid, reliable, and constant over time. Previously, Buton et al. (2007) adapted this questionnaire with 8 items to facilitate its repeated administration to players, so a reduction of items seems to be a good decision, as the instrument is constant over time with regard to its validity.

Regarding the analysis of concurrent validity, we note that the four factors of cohesion present a significant correlation with collective efficacy, as previously established in numerous studies (Heuzé et al., 2006; Leo et al., 2010). In fact, both the model of cohesion of Carron (Carron & Eys, 2012) and the model of collective efficacy of Beauchamp (2007), have ratified the close relationship between collective efficacy and cohesion. Thus, we can state that the instrument presents appropriate concurrent validity in all the measurements.

Lastly, the adaptation of the GEQ was invariant by gender at the beginning, in the middle, and at the end of the season. Although significant differences in chi square were found between the unconstrained model and two of the invariance models, we note that the values of CFI were lower than .01. Therefore, in accordance with Cheung and Rensvold (2002), the instrument is invariant and can be used correctly in either gender (Byrne, 2001).

Conclusions, limitations, and future lines of research

Ultimately, the results indicate that the short version of the GEQ adapted to Spanish presents appropriate fit index values in the expected model (M4), with four first-order factors—GI-T, GI-S, ATG-T, and ATG-S (Carron & Brawley, 2000; Carron et al., 1985). It also presents optimal values of internal consistency, appropriate concurrent validity, and is invariant by gender at different moments over a certain time interval. Therefore, the short 12-item adaptation of the GEQ to Spanish is a valid and reliable instrument to measure team cohesion in professional male and female soccer players. No doubt, this instrument not only contributes a series of improvements with regard to the limitations of the validation in Spanish carried out by Iturbide et al. (2010), but this short version also facilitates its use in the professional sphere and its administration at different moments over a year.

From a practical perspective, the results imply that coaches and sports psychologists could use this instrument to measure each one of the dimensions of group cohesion in high-performance athletes, because the players can clearly differentiate the subscales (Hu & Bentler, 1999). In spite of this, more tests on the questionnaire are needed with athletes of different sports, because these psychometric tests were carried out with soccer players. Another limitation of the validation is that the participants were professionals, so it would be interesting to calculate the invariance with amateur groups. Future research should examine its psychometric properties (Lane, 2014; Padilla & Benítez, 2014; Ríos & Wells, 2014; Sireci & Faulkner-Bond, 2014) in different sports and with different populations, taking into account the recommendations of Carron and Brawley (2000). It would also be interesting to use this short scale in other cultures and languages to ensure a standard measuring instrument for the professional sphere (Buton et al., 2007).

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