

THE COACH-ATHLETE RELATIONSHIP: PSYCHOMETRIC PROPERTIES OF THE SPANISH VERSION OF THE CART-Q

LA RELACIÓN ENTRENADOR-DEPORTISTA: PROPIEDADES PSICOMÉTRICAS DE LA ADAPTACIÓN AL CASTELLANO DEL CART-Q

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ABSTRACT

The aims of the present study were to adapt the Coach-Sport Relationship Questionnaire (CART-Q) into Spanish and to examine its construct validity. The sample was made of 162 sports(wo)men (43.2% women), players of different sports, and whose ages were between 16 and 59 years old ($M = 26.41$, $SD = 8.98$). A confirmatory factorial analysis revealed a trifactorial structure. Indexes of goodness-of-fit (GFI: .951; CFI: .890; TLI: .952) and error (RMSEA: .078; RMR: .067) were adequate. Regarding gender and level differences, professional sportswomen felt significantly closer to their coaches than the rest of the participants. Results support the use of the instrument in the context of Spanish-speaking sport relationships. Gender and level differences need to be taken into account for the improvement of athletes' relational satisfaction.

KEYWORDS: test validity, test adaptation, coach-athlete relationship, sport dyad, gender differences

RESUMEN

Los objetivos del presente estudio fueron adaptar al castellano y examinar la validez de constructo del Cuestionario de Relación Entrenador-Deportista (CART-Q). Compusieron la muestra 162 deportistas (43.2% mujeres), especialistas de varias modalidades, con edades comprendidas entre los 16 y los 59 años ($M = 26.41$, $d.t. = 8.98$). Se llevó a cabo un análisis factorial confirmatorio que reveló una estructura trifactorial, con adecuados índices de bondad de ajuste (GFI: .951, CFI: .890, TLI: .952) y error (RMSEA: .078, RMR: .067). En cuanto a las diferencias de género y nivel, se observó una interacción: las mujeres profesionales se mostraron significativamente más cercanas con sus entrenadores que el resto de participantes. Los resultados apoyan el uso del instrumento en el contexto de las relaciones deportivas hispanoparlantes. Se sugiere que se tengan en cuenta las diferencias de género y nivel encontradas para mejorar la satisfacción de deportistas.

PALABRAS CLAVE: validez, adaptación de test, relación entrenador-deportista, diada deportiva, diferencias de género.

1. INTRODUCTION

Athletes establish different and specific relationships with their environment and the one they have with their coach is special (Lafrenière et al., 2008). Both coach's and athlete's emotions are in continuous interaction (Balaguer et al., 2012), so studying their relationship is crucial to know the factors associated with performance (Jowett, 2007; Jowett & Cockerill, 2003). However, the scarcity of studies that take into account the role of the coach in the quality and success of a sport experience is surprising (Pulido et al., 2015). Logically, the proliferation of such studies depends on the existence of valid and reliable instruments.

The Coach-Athlete Relationship Questionnaire (CART-Q), developed by Jowett and Ntoumanis (2004), is one of the most widely used instruments internationally to assess such relationship. This questionnaire addresses the coach-athlete relationship as an interdependence demanded by both parties, which is formed in the coaching process and creates a psychological climate in which goals are shared in a constructive and satisfying way. In its original version, the content and quality of the relationship are evaluated by means of the conceptual model of the 3 C's (e.g., Jowett, 2007, 2009a): Closeness—feeling emotionally close to the other person—, Commitment—perspectives shared by both individuals, as a result of a good communication channel— and Complementarity—cooperative interactions of the dyad—. However, and despite its necessity, the research and use of this instrument in Spanish-speaking athletes in a reliable way is not possible because there is no validated adaptation of it.

The quality of coach-athlete relationships is not invariable, it may weaken or vary, and its stabilization involves time, effort and energy from both parties

(Vigáiro et al., 2020). Several researchers agree that communication is one of the key factors in establishing a good coach-athlete relationship (e.g., Kristiansen et al., 2012), an aspect linked to the concept of Closeness used by Jowett et al. (e.g., Jowett & Ntoumanis, 2004; Yang & Jowett, 2010; Yang & Jowett, 2012). The way women describe their relationship with their coach is qualitatively different from that of men. They are able to describe Closeness with more complete and relational schemas (LaVoi, 2007) and may even feel more empathic toward their coaches than men (Sevdalis & Raab, 2014).

1.1. FACTORIAL STRUCTURE OF THE CART-Q

The CART-Q has been validated in several countries and languages, but there are inconclusive results regarding its dimensional structure. On the one hand, Jowett and Ntoumanis (2004) in their initial study opted for a second-order model in which the three mentioned factors would be subsumed in higher order -'Coach-Athlete Relationship' factor- with a Cronbach's alpha reliability of 0.93. This same structure was proposed in a preliminary study conducted with Greek athletes (Jowett & Ntoumanis, 2003), in a later one with Belgian sample (Balduck & Jowett, 2010), and in another one with a Brazilian sample in Portuguese language (Vieira et al., 2015).

In the examination of the psychometric properties of the questionnaire in Chinese, the authors (Yang & Jowett, 2010) posed the 3 Cs model as interrelated dimensions, given the high correlations between the 'closeness' and 'commitment' dimensions. Based on it, although a first-order structure might be appropriate, a higher-order structure was concluded, being the one that could explain in a more parsimonious way the covariances that occurred between dimensions in the first-order structure.

Jowett et al. (2012) investigated the properties of the CART-Q in seven countries with the aim of examining the invariance of the questionnaire measure simultaneously. In addition to athletes from the United Kingdom, China, Belgium, Greece, the United States, and Sweden, in this study Spanish athletes also participated. In this case, the results showed a first-order structure as the most appropriate model, but a second-order structure was not tested, even though this had been suggested by the authors in the initial factorial study (Yang & Jowett, 2010).

As Jowett et al. (2012) point out, both factor structures are equally valid in the research that has been carried out with this instrument. However, according to what was found in previous research, the three factors were highly correlated with each other, which is why models have also been tested in different countries that make it possible to conceive the construct in different ways (Balduck & Jowett, 2010; Jowett & Ntoumanis, 2003, 2004; Yang & Jowett, 2010). That is, models with a unitary structure have been found in which a single general factor would explain the high correlations of the factors discovered so far, but also some other models exist with a two-dimensional structure that combines the subscales of commitment and closeness in one dimension and complementarity in another.

Therefore, hitherto there is not a clear consensus about the factor structure of the CART-Q. For this reason, it would be necessary to evaluate the dimensions of the questionnaire in a Spanish-speaking sample in order to find out which structure best suits these athletes.

1.2. GENDER DIFFERENCES IN THE COACH-ATHLETE RELATIONSHIP

Different studies have observed that the relationships between cohesion and performance differ between male and female teams (e.g., Carron et al., 2002). Baumeister and Sommer (1997) argued that men are more concerned with issues of lower intimacy (power or status) than women, for whom this seems to have more weight than a cohesive and inclusive environment (Eys et al., 2015).

Regarding studies using the CART-Q, Jowett and Nezlek (2012) found that a British sample of women perceived greater similarity between their responses and those of their coaches. In other words, not only did they feel more engaged, closer and complemented by their coach, but they also thought that the coach felt the same way about them (Jowett & Nezlek, 2012).

All of this leads to believe that there might be differences in how people of different genders conceive the coach-athlete relationship construct, and more clearly in the Closeness dimension of the CART-Q. However, this aspect has not been empirically tested yet. Based on this relationship, it would be expected that the aforementioned gender difference would be observed in the Spanish adaptation of the instrument as evidence of its construct validity, namely, higher scores in the Closeness dimension would be expected in women as compared to men.

1.3. SPORT LEVEL DIFFERENCES IN THE COACH-ATHLETE RELATIONSHIP

The sport (competition) level is another variable that has been studied in the field of the coach-athlete relationship. In this line, differences have been found in the relationship with the coach between people with different levels of sport or competition. Jowett et al. (2005) found that, as the sport level increases, closer relationships are needed, since there are higher risks (i.e., burnout or injuries) than those that appear at lower levels. This association between closeness and sport level has also been corroborated by subsequent studies (e.g., Jowett & Nezlek, 2012; Sandstrom et al., 2016).

This evidence suggests that sport level could be a modulating variable in the coach-athlete relationship. Specifically, in light of the studies analyzed, it is expected that athletes belonging to a higher level (i.e., elite), show a greater tendency to establish closer relationships with their coaches than athletes with lower performance levels (i.e., amateur).

2. OBJECTIVES

The present study has a triple objective: (1) to adapt the CART-Q instrument (Jowett & Ntoumanis, 2004) to Spanish for athletes' (direct) version/perspective,

(2) to analyze its internal structure by means of a confirmatory factor analysis, complemented with an internal consistency analysis, and (3) to examine the differences in athletes' gender and sports level in their perception of their relationship with the coach, as indicators of convergent validity of the instrument.

3. METHOD

3.1. PARTICIPANTS

The sample consisted of a total of 162 Spanish athletes: 70 women (43.2%) and 92 men (56.8%), all of them trained by men. Participants ranged in age from 16 to 59 years ($M = 26.41$, $SD = 8.98$). They played a variety of sports, both individual (athletics, fencing, and swimming) and group (volleyball, soccer, handball, basketball, and field hockey). Three levels of sport performance were distinguished: amateur ($n = 81$; 50.3%), semi-professional ($n = 29$; 17.4%), or professional ($n = 52$; 32.3%). The type of relationship they had with their coach could be: exclusively sporting ($n = 129$; 81.1%), previous friendship ($n = 19$; 11.9%), partner ($n = 1$; 0.6%), family ($n = 1$; 0.6%), or friendship derived from training ($n = 9$; 5.7%); the duration of the relationship with the current coach ranged from 0.17 to 18 years ($M = 2.48$, $SD = 2.46$).

3.2. INSTRUMENTS

Coach-Athlete Relationship Questionnaire (CART-Q; Jowett & Ntoumanis, 2004). It assesses the quality and content of the relationship. It consists of 11 items through which the athlete reports how s/he feels about her/his coach (e.g., "I trust my coach"). The questionnaire, with a Likert scale response format, presents seven options between 1 (*totally disagree*) and 7 (*totally agree*). The higher the score on each of the dimensions, the higher the quality of the relationship perceived by the respondent. The reliability of this questionnaire in the original version (Jowett & Ntoumanis, 2004) is high ($\alpha = .90$).

3.3. PROCEDURE

First, the original CART-Q questionnaire was translated into Spanish using the back-translation method described in the scientific literature (e.g., Hambleton, 1996). Once both versions (Spanish and back-translated English) were obtained, they were compared with each other and the differences in the original and back-translated English versions were analyzed. Then, the necessary changes were introduced in the Spanish version to make the items more understandable (e.g., using the verb '*apreciar*' instead of '*gustar*' to translate the verb 'to like' in item 3).

Participation was voluntary and confidentiality and anonymity were assured by means of an informed consent. Two formats were provided for data collection: on paper or by e-mail. In both cases the athletes received precise instructions and possible doubts were answered. Participants spent approximately ten minutes.

3.4. DATA ANALYSIS

A descriptive analysis was performed by calculating the mean and standard deviation of all items, as well as variance, skewness and kurtosis in order to know how the sample was distributed; Kolmogorov-Smirnov index was calculated, proving that the sample distributions did not conform to normality. In addition, a confirmatory factor analysis (CFA) was carried out, testing the original model proposed, as well as other alternative models that appear in the literature on this subject. Furthermore, comparisons were carried out between the scores of men and women in the different factors, as well as between the scores of elite and amateur athletes using the non-parametric Mann Whitney U test. For all comparisons, a 95% confidence interval was established ($\alpha \leq 0.05$). All the analyses were performed with AMOS (Arbuckle, 1997) and SPSS 22.0.

4. RESULTS

Firstly, descriptive statistics of the items of the adapted questionnaire were calculated. They are shown in Table 1.

Table 1. Descriptive statistics of the items of the Spanish adapted questionnaire

Items	Min	Max	Mean	SD	Variance	skewness	kurtosis	K-S
1. Soy cercano/a con mi entrenador/a	1	7	5.440	1.392	1.938	-0.779	0.009	.223
2. Estoy comprometido/a con mi entrenador/a	1	7	5.940	1.260	1.599	-1.507	2.575	.236
3. Aprecio a mi entrenador/a	1	7	5.950	1.390	1.923	-1.495	1.776	.261
4. Cuando entreno con mi entrenador/a, estoy a gusto	2	7	5.910	1.370	1.873	-1.361	1.062	.274
5. Confío en mi entrenador/a	1	7	5.900	1.380	1.903	-1.488	1.892	.257
6. Pienso que mi carrera deportiva es prometedora con mi entrenador/a	1	7	5.080	1.610	2.584	-0.659	-0.356	.198
7. Respondo a los esfuerzos de mi entrenador/a cuando me entrena	2	7	6.110	0.930	0.870	-1.155	-1.904	.231
8. Respeto a mi entrenador/a	4	7	6.540	0.773	0.598	-1.676	2.128	.404
9. Aprecio los sacrificios que hace mi entrenador/a para mejorar mi rendimiento	2	7	6.200	1.002	1.004	-1.681	3.122	.280
10. Cuando entreno con mi entrenador/a, estoy dispuesto/a a dar lo mejor de mí mismo/a	2	7	6.260	0.994	0.988	-1.617	3.327	.309
11. Adopto una actitud amistosa cuando entreno con mi entrenador/a	2	7	5.800	1.305	1.704	-1.143	-0.789	.260

Secondly, confirmatory factor analyses (CFA) were performed to confirm the structure of the CART-Q in Spanish, testing both a first-order three-factor model (M3-1st) and a second-order three-factor model (M3-2nd). Although the emphasis is placed on the three-dimensional model proposed by the authors, other models are also tested in a complementary manner to facilitate comparison: i.e., a one-factor model (M1) and a two-factor model (M2) that

combines the subscales of commitment and closeness (emotional dimensions) in one dimension and complementarity (behavioral dimension) in another one.

The evaluation of the fit of a model is a relative process rather than a process based on absolute criteria; therefore, it is more appropriate to jointly evaluate different types of measures to assess the acceptability of a model (Morales-Sánchez et al., 2009). The RMSEA and SRMR error indices are considered acceptable when their values are less than 0.08 (Hair et al., 2007). Goodness-of-fit indices must show a value greater than 0.90 to be considered as an indication of good fit (Hoyle, 1995). None of the fit indices analyzed was adequate for all models (see Table 2). Therefore, it cannot be stated that the factor structure underlying the data of the present study coincides with the three-dimensional proposal of the authors of the original instrument but neither with a unidimensional or two-dimensional structure.

Table 2. Comparison of the Goodness-of-fit Indices of the Different Models of the CART-Q

Model	χ^2 (df)	χ^2/df	RMR	GFI	TLI	CFI	RMSEA	AIC
M1	220.77 (44)***	5.017	.118	.787	.743	.794	.158	264.77
M2	213.88 (43)***	4.974	.117	.797	.746	.801	.157	259.88
M3-1 st	210.04 (41)***	5.123	.117	.800	.736	.803	.160	260.04
M3-2 nd	156.80 (39)***	4.020	.099	.855	.807	.863	.137	210.80

Note. M1 = One-factor model, M2 = Two-factor Model first order, M3-1st = Three-factor Model first order, M3-2nd = Three-factor model second order.

*** $p < .001$

However, a careful inspection revealed that items 7 and 10 had very low factor weights (below .45); thus, confirmatory analyses were carried out by deleting them. The fit indices in this case showed a marked improvement (see Table 3), with either of the two three-factor models proving adequate.

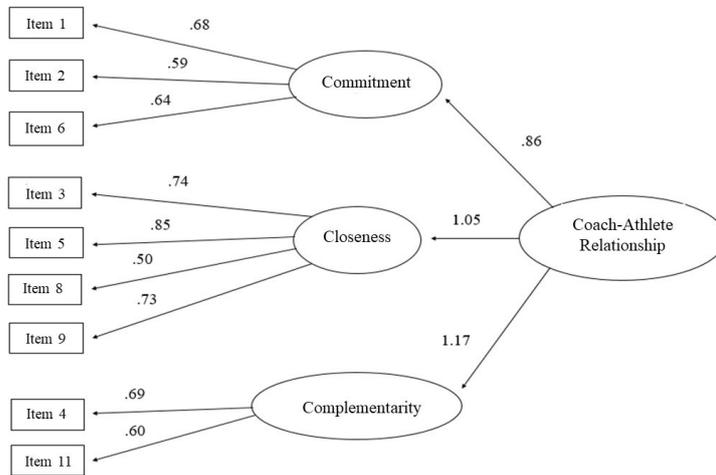
Table 3. Goodness-of-fit Indices of the Different Models after the Elimination of Items 7 and 10

Model	χ^2 (df)	p	χ^2/df	RMR	GFI	AGFI	TLI	CFI	RMSEA	AIC	NFI
M1	43.99 (21)	.002	2.095	.068	.944	.879	.946	.968	.082	91.99	.942
M2	113.44 (26)	.000	4.363	.102	.859	.876	.833	.879	.145	151.4	.935
M3-1 st	39.48 (20)	.006	1.974	.067	.951	.890	.952	.973	.078	89.48	.948
M3-2 nd	39.48 (20)	.006	1.974	.067	.951	.890	.952	.973	.078	89.48	.948

Note. M1 = One-factor model, M2 = Two-factor Model first order, M3-1st = Three-factor Model first order, M3-2nd = Three-factor model second order.

In this case, the second-order model (M3-2nd) is preferable, obtaining an optimal internal consistency index (Cronbach's alpha = .90) for the total scale. For each dimension, internal consistency was acceptable, with Cronbach's alphas of $\alpha = .67$; $\alpha = .79$, and $\alpha = .64$, for commitment, closeness and complementarity, respectively. The factor weights of the three-factor structure can be seen in Figure 1.

Figure 1. Factorial structure of the Spanish version of the CART-Q



Thirdly, as for analyses of gender and level, a multifactorial multivariate analysis of variance was performed; significant differences were observed. A main effect of sport level was observed, $F(1, 132) = 17.466$, as well as an interaction effect between gender and sport level, $F(1, 132) = 3.000$, applicable to all dimensions ($p < .05$) except for Complementarity.

Examining carefully differences in the CART-Q, in the Commitment dimension, in addition to the main effect of sport level, $F(1, 132) = 15.349$ —professionals have a lower level of commitment—, an interaction between gender and sport level can be observed, $F(1, 132) = 6.748$, with men obtaining higher scores than women in the amateur category, and women obtaining higher scores than men in the professional category. However, gender differences within each professional level are small (see Table 4 for a comparison of means and effect sizes).

Table 4. Average Rank Difference between Men and Women by Sport Level

Subscale	Level	Gender	Mean	SD	Mann-Whitney's U	p	η^2
Commitment	Amateur	Men (n = 35)	5.971	0.769	617.500	.070	.039
		Women (n = 46)	5.551	1.078			
	Professional	Men (n = 34)	4.716	1.237	218.000	.089	.055
		Women (n = 18)	5.927	1.053			
Closeness	Amateur	Men (n = 35)	6.529	0.510	761.000	.666	.002
		Women (n = 46)	6.440	0.713			
	Professional	Men (n = 34)	5.309	1.133	176.500	.012	.119
		Women (n = 18)	6.056	0.901			
Complementarity	Amateur	Men (n = 35)	6.342	0.650	755.500	.621	.003
		Women (n = 46)	6.370	0.791			
	Professional	Men (n = 34)	4.735	1.304	223.000	.107	.049
		Women (n = 18)	5.389	1.195			

Regarding the Closeness dimension, there is a significant main effect of gender, $F(1, 132) = 4.700$, in addition to the significant main effect of sport level, $F(1, 132) = 27.911$, although there is an interaction between gender and sport level, $F(1, 132) = 7.561$, with men obtaining higher scores than women in the amateur category, and women obtaining higher scores than men in the professional category, with a moderate gender difference in the case of the professional level ($\eta^2 = .119$).

Finally, and in relation to the Complementarity dimension, there is a main effect of sport level, $F(1, 132) = 51.936$, and there is no significant interaction. Namely, amateurs score higher than professionals, but there is no gender

difference, neither globally nor by sport level ($\eta^2 = .003$ in the amateur category and $\eta^2 = .049$ in the professional category).

5. DISCUSSION AND CONCLUSIONS

The objectives of this study were threefold: to adapt the CART-Q to Spanish, to examine its factorial structure, and to test possible gender or sport level differences in the subscale scores. Regarding the first objective, the questionnaire was successfully adapted following the guidelines for international test adaptations (Hambleton, 1996). Secondly, the analysis of its psychometric properties indicated that the factorial structure is congruent with that indicated by Jowett and Ntoumanis (2004), conceiving the CART-Q with a second-order trifactorial structure. According to Balduck and Jowett (2010), Jowett (2009a, 2009b), Rhind and Jowett (2010), Yang and Jowett (2010) and Yang and Jowett (2012), CART-Q factor analysis provides support to the existence of a higher order factor since this structure would explain the construct in a more parsimonious way. In all studies the correlation between the factors is high, which supports the theory that the evaluation of the coach-athlete relationship involves understanding it as an interactive process in which the emotions, thoughts and behaviors of the dyad have a high correspondence, both intrapersonally and interpersonally (Jowett, 2003; Jowett & Ntoumanis, 2004).

However, in Spanish it has not been possible to conceive the CART-Q with the same items as in other versions. In this case, it is suggested that items 7 and 10 be eliminated because they had too low factor weights (Cattell, 1988). This may be due to the fact that the translation of these items brings inherent difficulties. Specifically, item 7 (When I am coached by my coach, I am responsive to his/her efforts) was adapted as "*Respondo a los esfuerzos de mi entrenador/a cuando me entrena*"; in this case, the phrase may be understood literally, that is, based only on training, whereas in English it could have a connotation of continuity referring to the whole process and not only to the action of coaching. Item 10 (When I am coached by my coach, I am ready to do my best) was adapted as "*Cuando entreno con mi entrenador/a, estoy dispuesto/a a dar lo mejor de mí misma*". The choice of the adjective "*dispuesto*" may have introduced a different volitional nuance than the Anglophone adjective "ready" that makes the item function differently. This same question about the differences between the two languages is also striking in items 4 (When I am coached by my coach, I feel at ease/*Cuando entreno con mi entrenador/a, estoy a gusto*) and 11 (When I am coached by my coach, I adopt a friendly stance/*Adopto una actitud amistosa cuando entreno con mi entrenador/a*), both belonging to the Complementarity dimension, which could be included, in a theoretical sense, in the Closeness dimension. With a semantic argumentation, both items have a connotation of reciprocity, oriented to cooperation and not that much to the emotional processes of the relationship. Something similar occurs with item 1 (I am close to my coach), which does not belong to the closeness dimension, but to the commitment dimension; this would contradict what was expected at a theoretical level and that would explain the factor weight in the latter dimension.

Furthermore, the results on the internal consistency of the adaptation scores were optimal. Our data coincided with the indices shown by Jowett and Ntoumanis (2004) for the initial validation study of the CART-Q in English. However, it should be noted that, when this analysis is performed in terms of each of the dimensions of the CART-Q, the internal consistency is lower than that provided by the original authors, whom reported values of $\alpha = .82$ (commitment); $\alpha = .89$ (closeness), and $\alpha = .89$ (complementarity).

Thirdly, another aim was to analyze the existence of differences according to gender and sport level. Our results corroborated that women tend to score higher in the dimensions related to emotional aspects (Commitment and Closeness), although this is only true if they are professionals. Authors in this field had found gender differences (Jowett & Nezelek, 2012; Sandstrom et al., 2016) but the finding that these differences are moderated by sport level introduces a novel question that had not been explored so far. The gender difference could be because the vast majority of amateur coaches are men, and the personal characteristics of the coach also influence the relationship (Sandstrom et al., 2016). In addition, professional men might feel less committed and close to their coach due to the assiduity with which sports teams change coaches. They might think that the coach will not be with them for a long period and, according to Jowett and Nezelek (2012) since they are less likely to maintain close relationships with their coaches, they would not reach as high a level of commitment compared to that of women. These differences are what give value to the three-dimensional factor structure, since they point to a conception of the relationship as a construct involving different processes that cannot be considered only from the global perspective.

6. LIMITATIONS OF THE STUDY AND FUTURE DIRECTIONS

This study has not been conducted without limitations; not having a notably large sample size would be the most notable one. It could be considered to examine the psychometric properties of the instrument with a larger and more heterogeneous sample that would even allow for the analysis of differences in the scores depending on the sport practiced or, at least, on its individual or group nature. In this line, Rhind et al., (2012) found that athletes participating in individual sports were more satisfied with their relationship with their coach, which may be due to the fact that relationships become, in this case, closer, more committed and more complementary.

Another suggestion would be to adapt and validate the instrument in its meta-perspective and to do so in the context of sports dyads, associating the perception of both members. Likewise, future studies would benefit from the introduction in the analysis of the professional level and gender of both members and not only of the athlete, as well as other variables such as the duration of the relationship or the possible changes that have occurred in this regard. In this way, possible differences according to the composition of the dyads could be analyzed.

All in all, this study has a number of practical implications. The CART-Q is a good instrument to measure the quality of coach-athlete relationships

internationally, making it a useful tool for evaluation and intervention in psychological aspects of performance. The existence of a validated adaptation will facilitate the study and allow its use with Spanish-speaking athletes.

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