ORIGINAL

VALIDATION OF AN INSTRUMENT OF PROFESSIONAL DEVELOPMENT IN INFANT PHYSICAL EDUCATION

VALIDACIÓN DE UN INSTRUMENTO DE DESARROLLO PROFESIONAL EN EDUCACIÓN FÍSICA INFANTIL

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ABSTRACT

The objective is to build and design a questionnaire that assesses the professional development of Early Childhood Education teachers in their connection with Physical Education. Their psychometric properties have been studied with a sample of 526 teachers through the statistical program SPSS v.23 and AMOS. Reliability analysis, exploratory factor analysis, item correlation with total score and confirmatory factor analysis were carried out. The consistency of the instrument has been high (α = 0.836). In addition, there is an adequate item correlation with total score, and the presence of seven factors in the exploratory factor analysis. The confirmatory factor analysis showed an adequate adjustment to the model data of the questionnaire ($\chi2$ / gl = 1.635, GFI = 0.929, CFI = 0.963, RMSEA = 0.039) This questionnaire is a reliable and valid instrument and its use is suggested in future researches.

KEYWORDS: Physical Education; Infant Education; teachers; professional development; validation.

RESUMEN

El objetivo consiste en construir y diseñar un cuestionario que evalúa el desarrollo profesional de los docentes de Educación Infantil en su vinculación con la Educación Física. Se han estudiado sus propiedades psicométricas con una muestra de 526 docentes mediante el programa estadístico SPSS v.23 y AMOS. Se llevaron a cabo análisis de confiabilidad, análisis factorial exploratorio, correlación ítem con puntaje total y análisis factorial confirmatorio. La consistencia del instrumento ha sido elevada (α = 0,836). Además, hay una adecuada correlación ítem con puntaje total, y la presencia de siete factores en el análisis factorial exploratorio. El análisis factorial confirmatorio mostró un adecuado ajuste a los datos del modelo del cuestionario ($\chi2$ /gl = 1,635; GFI=0,929; CFI=0,963; RMSEA=0,039). Los resultados sugieren que este cuestionario es un instrumento fiable y válido y se recomienda su uso en futuras investigaciones.

PALABRAS CLAVE: Educación Física Infantil, Educación Infantil, docentes, desarrollo profesional, validación.

INTRODUCTION

Motricity, in its systematic form of Physical Education (Gil-Madrona, Contreras-Jordán, Gómez-Villora and Gómez-Barreto, 2008), presents a great importance in the global development of the infant in the eary years of life. According to Piaget and Ox (1969), through it, there is the formation of personality and the modes of conduct conformed by the domains: affective, social, cognitive and psychomotor (Gil-Madrona, Contreras, & Gómez-Barreto, 2008). In relation to this, several authors refer to the benefits of motor development in early childhood, both long and short term (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008) on the personality and skills of the child in the above Domains (Ward, 2010).

Through Infant Physical Education, motor development is promoted, facilitating and strengthening the maturation related to body control (maintenance of posture, wide movements and locomotor, more precise movements that allow the modifications of actions) and the process of representation of the body and the space-temporal coordinates where the action is carried out (Delgado and Montes, 2017).

The pedagogical value of Infant Physical Education is also of particular relevance since it promotes healthy and active life through the development of basic motor movements (Carson et al., 2015; Giles et al., 2017) and, in addition, due to the connection between the cognitive capacities of child and the motor activity since both capacities progress simultaneously. In fact, Physical Education is the means by which mental functions can be favoured (Davis et al., 2011) such as Creativity (Lupu, 2010), which makes it the most suitable means of promoting and fostering the development, evolution and acquisition of Learning in early childhood education, improving academic achievement (Shore et al., 2008). Otones and López-Pastor (2014), through a motor program applied to the second cycle of early childhood education, demonstrated that Physical Education in early childhood education fosters motivation, student attendance, active participation and the promotion of values. Emotions are also promoted through Physical Education because of the great interest that their activities generate in early childhood education. That is why it not only propitiates motor development, but the child expresses himself and communicates what he feels becoming socially more skilful (Gutiérrez, Fontenla, Cons, Rodríguez, & Pazos, 2017; Pons & Arufe, 2016).

Therefore, the stage of early childhood education is perfect for the promotion of specific competencies in the child, which will mark their personality and their subsequent development both personally and academically (Silva, Neves, & Moreira, 2016).

The promotion of this benefits depends on the teachers and educators' work. In effect, we must talk about the importance of the role of the Infant Education teachers in relation to their professional development and their link with Physical Education owing to the fact that they play an essential role in its development. Furthermore, they are the main responsible for the practices that are carried out in physical education in this stage. For this reason, teachers

require of knowledges about the content and methodologies of Physical Education.

So, we must mention the necessity of a questionnaire that assesses teachers' professional development in this educative stage in relation to Physical Education. Although there are some questionnaires that asses this topic, the have some limitations.

One of them is the questionnaire carried out by Sanz, Alonso, Valdemoros and Ponce de Leon (2013) whose aim is to evaluate teachers' professional development in the stage of Infant Education in relation to education for health. This questionnaire is focused on healthy habits, so this does not take into account some important aspects such as social, emotional and cognitive development. On the other hand, the factorial analysis highlights that internal reliability is quite low due to the fact that some factors are around 0,6. So, according to Gonzalez (2014) consistency' value should be above 0,7.

Another instrument is questionnaire for Infant Education teachers, elaborated by Latorre (2007). It is composed of 10 items that make reference to training, contextual and personal perspective. However, other important aspects such as social recognition and contextual perception are not included. Although reliability is acceptable, it would be preferable that internal value be above 0,8.

In the same line, the questionnaire for the analysis of Motricity in Infant Education elaborated by Moreno et al. (2004) also makes no reference to the social recognition received by teachers and children educators about their teaching activity around the Physical Education of children in the Early Childhood Education stage, although their reliability in this case is good (α = 0.870) according to the literature (Huh, Delorme, & Reid, 2006).

Any instrument has been summited to Confirmatory Analysis. On the contrary, the analysis has only focused on the underlying relationships without taking into account a prior model of these mentioned relationships.

So, the objective is to build and validate an assessment's instrument of   Infant teachers' professional development in relation to Physical Education, including some factors such as social recognition and external perception of Physical Education. These aforementioned factors have not been taken into account previously.

METHOD

PARTICIPANTS

In this study, 526 active teachers from the city of Albacete have participated in this study. Of this total sample, 118 subjects have taken part in the exploratory phase. After this, a sample of 408 has been taken in this final phase.

In the exploratory phase, there are 14 men and 104 women whose ages range from 25 to 65 years old. On the other hand, in the final phase the sample was composed of 408 participants whose ages also range from 25 to 65 years old. According to gender, there are 372 women and 35 men. The heterogeneous distribution is due to high feminization existing in Infant Education teachers. In its majority, participants develop their activity in state centres. On the contrary, the sample that works in private and concerted centres is inferior.

The selection criterion was the access to the sample by putting in contact with educative centres and the availability of teacher to participate in this study.

INSTRUMENT

The instrument used is "questionnaire for the assessment of teachers 'professional development in relation to Physical Education" (QPD-IPE). It is an ad hoc questionnaire designed by experts in Education (especially experts in Physical Education in the stages of Early Childhood and Primary Education). In its initial phase, the instrument was composed of 30 items measured by a Likert scale of 5 points (1 = nothing, 5= a lot). It has been organized in 5 blocks of dimensions or categories: professional development, work perception, personal perspective, internal and external perception of Infant Physical Education and contextual perspective. After summing this to a double process of depuration (expert judgment and exploratory factor analysis), finally the instrument was composed of the instrument was composed of 24 items (having eliminated six items from the initial questionnaire), distributed in 7 blocks of content or dimensions:

1. Training and professional development: initial and permanent teacher training in relation to Infant Physical Education and mastery of the contents.

2. Formative values of Physical Education: contribution of this field to the different skills in the 0-6 year stage.

3. Personal Perspective: level of motivation of teachers and educators towards the teaching of Physical Education in this stage.

4. Perception of Infant Physical Education (External): material resources and curricular elements that condition teachers in Infant Physical Education.

5. Perception of Physical Education (Internal): importance given to Physical Education in the 0-6 years stage by teachers.

6. Contextual perspective: value given to Infant Physical Education by families, fellow teachers and educators.

7. Social recognition: consideration of the students and families on the activity of the teacher of Early Childhood Education around the Physical Education.

PROCESS

The design and validation of the QPD-IPE carried out in several phases: Exploratory phase. The starting point for the construction of the QPD-IPE was an analysis of the literature on professional development of the teacher of Early Childhood Education, with special emphasis on Physical Education. The QPD-IPE was subjected to a double depuration process to ensure its content validity and its applicability:

- Judgment of experts: a group of five experts in Children's Physical Education from different Spanish universities was presented who pointed out some modifications in the writing of the items that did not affect the structure of the instrument.

- Pilot study. An EFA was performed and the reliability of the instrument was verified to guarantee the construct validity. For this, we had a first sample of participants (N = 118), which were subsequently discarded for the application of the modified questionnaire in the final phase of the study.

Final phase. After eliminating some items that affected the validity of the instrument, the final version was composed of 24 items. This version was applied to N = 408 participants. The data obtained were subjected to CFA and the composite reliability and the average variance extracted were studied, to guarantee the construct validity of the fine questionnaire.

DATA ANALYSIS

The data was analysed with IBM SPSS 23.0 (Statistical Package for Social Sciences) and the AMOS 23 program. Before starting the analysis, the data were prepared for its statistical treatment through the recoding of items formulated in negative (item 18) and the imputation of the lost values. Given that they are randomly lost values, MAR (Missing at Random) predictable from the observed components of other variables (Lang & Little, 2016), the multiple imputation method was used, by calculating the regression estimates multiple linear In addition, cases were eliminated of teachers whose questionnaires presented more than 25% of answers without answering.

RESULTS

EXPLORATORY FACTORIAL ANALYSIS OF INITIAL QPD-IPE

An EFA was carried out by the method of factoring main axes and varimax rotation on the results of the original version of the instrument. The results of Bartlett's sphericity test ($\chi2435 = 1495.613$; p> 0.001) and the Kaiser-Meyer-Olkin test (KMO = 0.718) made it possible to rule out that the correlations between items constituted an identity matrix. Likewise, the value of the determinant of the correlations was taken into account (D = 7,619), indicating low intercorrelations between variables. The degree of deviation of the normal distribution scores was analyzed by examining asymmetry and kurtosis. The initial structure extracted from the EFA offered, initially, a solution in 9 factors which explains 57.34% of the variance. After analysing the factorial weight of the items in each factor, items with weights lower than 0.4 were observed, which therefore have a low explanatory power of the dimension that are part of what they were eliminated (items 4A, 4E, 9, 11 , 18 and 22). With this, a solution was obtained in 7 factors which explained 59.12% of the total variance. Table 1 shows the items of the instrument distributed in the six dimensions extracted from the EFA, together with their reliability, with the total reliability of the scale α = 0.836. This structure was taken as the basis for the CFA.

Table 1. Results from EFA with rotation to seven factors: Dimensions and items

Dimensión	Ítems	A
Formative value of IFE	I4B. I consider classes of PE in IE important because they contribute to integration of children from diverse cultures.	0,783
	I4D. I consider classes of PE in IE important because they contribute to the acquisition of healthy habits.	
	I4G. I consider classes of PE in IE important because they contribute to the acquisition of habits and rules.	
	I4F. I consider the classes of PE in IE important because contribute to socialization	
	I4C. I consider classes of PE in IE important because they contribute to emotional expression and emotional education.	
contextual perspective	I23. IPE is socially considered as an activity of less importance by teachers.	0,950
	I24. IPE is considered as an activity of less importance by families	
	I12. My perception about teaching activity in IPE has improved in comparison to I started to work	
Training and professional development	I7. I read publications regarding PE for children from 0 to 6 years old.	0,721
	I6. I receive specific training of IPE (courses, conferences,etc.)	
	I5. The Inital training that I received at the university or vocational training was enough to work PE in my nursery or school.	
	I8. I have a good mastery of contents of PI for children from 0 to 6 years old.	
Personal perspective	I13. I feel motivated and excited when I teach IPE.	0,813
	I15. I wish to teach other fields of curriculum apart from PE	
	I14. I like teaching PE to all groups of students of my centre	
	I3. I like teaching PE lessons to all my pupils	
External perpection of IFE	I20. I elaborated an anual programme of PE. Elaboro una programación anual de EFI.	
	I19. I have enough means and materias and they are in good condition to teach	0,747
	I21.I develop and follow the planned programming	
Social recognition	I16. I obtain recognition to my teaching activity by students	0,769
	I10. The level of children´ motivation is high in IPE lessons	
	I17. I obtain recognition to my teaching activity by families.	
Internal perception of IFE.	I1. Value given to IPE in the period from 0 to 3 years old	0,733
	I2. Value given to IPE in the period from 0 to 3 years old.	

Note: Physical Education (PE), Infant Education (IE), Infant Physical Education (EFI)

DESCRIPTIONS OF ITEMS OF INITIAL QPD-IPE

Table 2 shows the indexes of central tendency and distribution that compose the evaluation of the final instrument, after its application to a sample of 408 subjects. According to the values obtained, the asymmetry of the items was negative but did not exceed the value -1 in most cases. For more than 70% of the items, the asymmetry occurred in absolute values lower than 0.7, which meant absence of significant deviations from the normal distribution. With respect to kurtosis, only one element exceeded the limits of the interval [-2, 2]. With regard to multivariate kurtosis, the Mardia coefficient obtained a value of 125,735, which was compatible with the multinormality of the set of variables observed when being below p * (p + 2), where p is the number of variables.

Table 2. Items' descriptive estadistics .

Ítems	N	M	DT	Asimmetry	Kurtosis
I1	408	4,22	0,837	-0,714	0,465
I2	408	4,35	0,738	-1,018	0,994
I3	408	3,95	0,866	-0,896	0,671
I4B	408	4,15	0,815	-0,688	0,003
I4C	408	4,39	0,705	-0,799	0,992
I4D	408	4,34	0,749	-0,655	0,454
I4F	408	4,54	0,678	-1,004	1,525
I4G	408	4,60	0,626	-0,734	1,951
I5	408	2,87	0,801	0,080	-0,703
I6	408	3,05	0,892	-0,199	-0,868
I7	408	3,10	0,856	-0,225	-0,809
I8	408	3,57	0,899	-0,447	0,186
I10	408	4,10	0,886	-0,524	0,647
I12	408	3,17	0,803	-.315	-0,586
I13	408	3,85	0,632	-0,555	0,535
I14	408	3,38	0,971	-0,353	-0,620
I15	408	3,87	0,983	-0,697	0,180
I16	408	4,05	0,928	-0,704	0,576
I17	408	3,57	0,809	-0,439	-0,295
I19	408	3,24	0,927	-0,116	-0,467
I20	408	3,46	0,858	-0,563	-0,251
I21	408	3.76	0,927	-0,596	0,064
I23	408	3,01	1,041	-0,234	-0,450
I24	408	3,10	1,059	0,.238	-0,489

CONFIRMATORY FACTORIAL ANALYSIS

To confirm the construct reliability of instrument, a CFA was carried out using a maximum likelihood method. However, initially a unifactorial model was employed, proposing the null hypothesis which is the existence of only one factor in which all the items are saturated. Rejecting this model due to the lack of goodness of fit involves that this model is valid to continuo exploring any model with more factors. In the second model, the seven factors were included. Each element loaded only on one latent variable, the covariates and the error terms did not correlate.
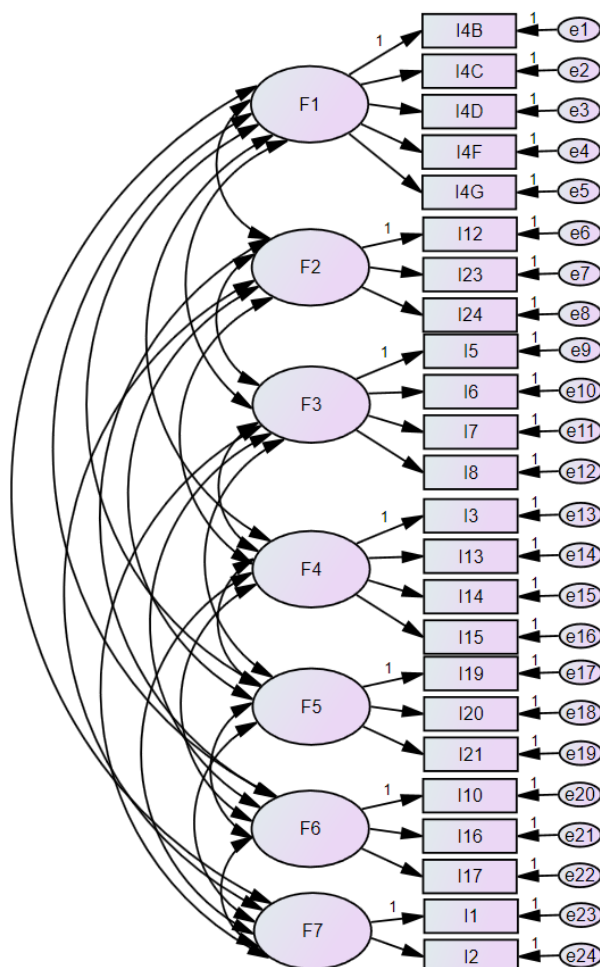
Figure 1. Model's factorial structure

Figure 1 shows the structure of the final model (seven factors). Taking into account the modification indexes, the importance of the parameters associated with the covariance between the individual factors was evaluated, and the adequacy of the models was analysed based on the goodness of fit indexes; Specifically, the relationship between χ^2 and degrees of freedom, the comparative adjustment index (CFI), the goodness of fit index (GFI), the residual root mean square (RMR) adjustment and the mean square error of approximation (RMSEA). The standardized correlations between factors and between variables and factors were also studied to confirm, on the one hand, the construct validity of the instrument and, on the other hand, the discriminant validity of the instrument, taking into account whether the correlation between the latent variables, attenuated by the measurement error (+/- 2 times the measurement error), was smaller than the base unit.

FACTORIAL STRUCTURE

The results presented in Table 3 indicated the lack of adjustment of the unifactorial model, allowing to reject the unidimensionality of the scale and to propose the existence of differentiated measures for different factors. Following the criteria proposed by several authors (Marsh, Hau, & Wen, 2004, Ntoumanis, 2001), the goodness of fit was greater for the final model in seven factors. In this model, the relationship between χ2 and its degrees of freedom was 1.635, a value that did not exceed the limit of 3, indicating a good fit between the proposed model and the observed data. The comparative adjustment index (CFI) exceeded the level of 0.900, a value considered acceptable, as well as the goodness of fit index (GFI), which exceeded 0.900 in the final model (GFI = 0.929), compared to a poor adjustment observed in the unifactorial model (GFI = 0.621). The RMR value remained below 0.050 only in the case of the final model, which also indicated a better adjustment of this. Finally, a mean square error of approximation (RMSEA) below 0.080 was considered acceptable, and those closer to 0.050 were considered optimal. According to these indices, the seven factor model provided the best fit.

Table 3. Indexes of goodness fit of model

Model	χ^2/gl.	CFI	GFI	RMR	RMSEA (CI 90%)
Unifactorial	12,529	0,336	0,621	0,129	0,160 (0,155-0,165)
Seven factors	1,635	0,963	0,929	0,042	0,039 (0,032-0,046)

Note: CFI = Comparative Fit Index; GFI = Goodness of Fit Index; RMR = Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation

Table 4. Factorial loads for model with seven factors, including correlations among error terms

Items	Load	R^2
Formative value of IPE		
I4B. I consider classes of PE in IE important because they contribute to integration of children from diverse cultures	0,611	0,416
I4D. I consider classes of PE in IE important because they contribute to the acquisition of healthy habits.	0,633	0,336
I4G. I consider classes of PE in IE important because they contribute to the acquisition of habits and rules	0,590	0,228
I4F. I consider the clases of PE in IE important because contribute to socialization	0,709	0,255
I4C. I consider classes of PE in IE important because they contribute to emotional expression and emotional education.	0,720	0,239
Contextual perspective		
I23. IPE is socially considered as an activity of less importance by teachers	0,939	0,128
I24. IPE is socially considered as an activity of less importance by teachers	0,943	0,124
I12. My perception about teaching activity in IPE has improved in comparison to I started to work	0,906	0,216
Trainning and professional development		
I7. I read publications regarding PE for children from 0 to 6 years old	0,624	0,515
I6. . I receive specific training of IPE (courses, conferences…)	0,627	0,559
I5.. The Inital training that I received at the university or vocational training was enough to work PE in my nursery or school	0,588	0,491
I8. I have a good mastery of contents of PE for children from 0 to 6 years old	0,678	0,435
Personal perspective		
I13. I feel motivated and excited when I teach IPE	0,840	0,254
I15. I wish to teach other fields of curriculum apart from PE	0,671	0,529
I14. I like teaching PE to all groups of students of my centre	0,620	0,542
I3. I like teaching PE lessons to all my pupils	0,804	0,265
External perception of IPE		
I20. I elaborate an annual programming of PE	0,705	0,561
I19. I have enough means and materials and they are in good condition to teach IPE	0,666	0,585
I21. I develop and follow the planned programming	0,752	0,372
Social recognition		
I16. I obtain recognition to my teaching activity by students	0,859	0,225
I10. The level of children´ motivation is high in IPE lessons	0,847	0,221
I17. I obtain recognition to my teaching activity by families	0,528	0,433
Internal perception of IPE		
I1. Value given to IPE in the period from 0 to 3 years old	0,604	0,444
I2. Value given to IPE in the period from 3 to 6 years old	0,966	0,037

Note: R2 = Explained percentage of variance

Note: Physical Education (PE), Infant Education (IE), Infant Physical Education (IPE)

Correlation matrix among factors is presented in table 5. The values range between 0,007 (negative correlation between contextual perspective and personal perspective) and 0,733 (correlation between contextual perspective and training and professional development. Low correlations among factors rejected the possibility that two factors would be the same dimension. This supported discriminant validity such as contextual perspective and personal

perception (r = -0,007) and internal perception of Physical Education and contextual perception (r = -0,024).

Table 5. Matrix correlation among factors

	FVIPE	CP	TPD	PP	SR	EPIPE	IPIPE
FVIPE							
CP	-0,015						
TPD	0.162	0,733					
PP	0,226	-0,007	0,530				
SR	0,088	0,058	0,524	0,412			
EPIPE	0,281	-0.022	0,332	0,529	0,460		
IPIPE	0,328	-0,108	0,148	0,222	0,130	0,129	

Note: Formative value IPE (FVIPE), Contextual perspective (CP) Training and Professional Development (TPD), Personal Perspective (PP), Social Recognition (SR), External Perception of Infant Physical Education (EPIPE), Internal Perception of Infant Physical Education (IPIPE)

RELIABILITY

Reliability of instrument, presented in Table 6, was estimated through Index of Composite Reliability index which allowed analysing all the constructs involved in the scale, and Average Variance Extracted (AVE) as a measure of convergent validity. With regard to the decree in which indicators measure the construct in a precise way, the values obtained was, generally, acceptable. However, it is to highlight that the value of "Contextual Perspective" was excellent and insufficient in the case of "Social Recognition".

Table 6. Subscales of Cronbach's alpha

Factors	Number of items	IFC	AVE
Formative values of IPE	5	0,593	0,429
Contextual perspective	3	0,847	0,864
Training and profesional development	4	0,452	0,397
Personal perspective	4	0,579	0,547
Social recognition	3	0,498	0,502
External perception of IPE	3	0,664	0,578
Internal perception of IPE	2	0,732	0,649

DISCUSION

The main aim of this research was the design and validation of QPC-IPE through an initial EFA with a sample of 118 participants in the pilot study. After this, CFA was applied in a final sample composed of 408 teachers and infant educators. In general lines, results evidence that this is an adequate instrument to assess Infant teachers 'professional development in relation to Physical Education.

The exploratory factorial structure extracted seven dimensions, which explained 59.12% of the total variance: formative value of the IPE, contextual perspective, training and professional development, personal perspective, internal perception of the IPE, external perspective of the IPE and recognition Social. This factorial structure was subsequently confirmed, guaranteeing adequate validity and reliability in all dimensions, with special relevance in the contextual perspective dimension.

Regarding the formative value dimensions of the IPE and internal perception it should be noted that its importance to evaluate the contribution of EFI to the global development of the child and the value given to the IPE by the teacher, respectively, has become evident in previous investigations such as Latorre (2007), Moreno et al. (2004) and Sanz-Arazuri et al. (2013).

The same happens with the training and professional development dimensions, with which we evaluate the initial and continuous training, the personal perspective, which measures the teacher's motivation, and the external perspective of the EFI, with which the material resources, elaboration and monitoring of the programming, all of them previously studied in Latorre (2007) or Valdemoros, Sanz, Ponce de León and Alonso (2018).

However, the dimensions most linked to a social perspective of the EFI, such as the contextual perspective, referred to the value given by families and fellow teachers, and social recognition of families and students about the activity performed by these teachers and child educators, are a novelty compared to other studies on teacher professional development (Latorre, 2007, Moreno et al., 2004, Sanz-Arazuri et al., 2013). It is precisely the introduction of these dimensions, together with the exploration of the relationship between the variables, their contrast and the evaluation of the statistical adjustment of the proposed theoretical model, which gives relevance to the instrument.

CONCLUSION

The QPD-IPE questionnaire offers a global, valid and reliable measure of teachers' professional development in relation to Infant Physical Education. This aforementioned instrument will provide relevant information to make decisions about teaching activity in Infant Physical Education and whose results will be reflected in the teaching-learning process.

However, this study is not exempt of limitations. We must highlight the limitations at the sample level, taking into account that the geographic location of the sample is restricted to the Autonomous Community of Castilla La Mancha. Therefore, as future prospects, we intend to replicate the study with a representative sample in Spain and internationally.

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