

Development and Validation of a Questionnaire (the IRA-AGHN) to Assess Teachers' Knowledge of Attention Deficit Hyperactivity Disorder

Marian Soroa^{1*}, Nekane Balluerka² and Arantxa Gorostiaga²

1 Department of Developmental and Educational Psychology, Donostia-San Sebastián School of Teacher Training, University of the Basque Country (UPV/EHU).

2 Department of Social Psychology and Behavioural Sciences Methodology, Psychology Faculty, University of the Basque Country (UPV/EHU).

Título: Elaboración y validación de un cuestionario (el IRA-AGHN) para evaluar el conocimiento de los maestros acerca del Trastorno por Déficit de Atención con Hiperactividad

Resumen: El objetivo del presente estudio consistió en desarrollar un cuestionario para evaluar el nivel de conocimiento que los docentes de educación infantil y primaria presentan con respecto al Trastorno por Déficit de Atención con Hiperactividad, el IRA-AGHN. Las propiedades psicométricas del instrumento fueron examinadas en una muestra de 752 maestros cuyo rango de edad oscilaba entre 20 y 64 años ($M = 41.57$; $DT = 9.69$). Los maestros pertenecían a 84 centros escolares de la Comunidad Autónoma del País Vasco y Navarra, los cuales fueron seleccionados de forma aleatoria. Se examinaron la validez factorial, la consistencia interna, la estabilidad temporal, la validez convergente y la validez externa del instrumento. Los resultados sugieren que el IRA-AGHN es un instrumento válido y fiable para evaluar el nivel de conocimiento de los docentes con respecto al TDAH.

Palabras clave: validez; fiabilidad; maestros; conocimiento sobre el TDAH.

Abstract: The purpose of this study was to develop a questionnaire, called IRA-AGHN, to assess infant and primary school teachers' knowledge of Attention Deficit Hyperactivity Disorder. The psychometric properties of this questionnaire were examined in a sample of 752 teachers aged between 20 and 64 years ($M = 41.57$; $SD = 9.69$). These teachers were employed at 84 randomly selected schools in the Autonomous Community of the Basque Country and Navarre. The factor validity, internal consistency, temporal stability, convergent validity and external validity of the instrument were all analysed. The results suggest that the IRA-AGHN is a valid and reliable measure for assessing teachers' knowledge of ADHD.

Key words: validity; reliability; teachers; knowledge about ADHD.

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders in childhood (APA, 2013; Barkley, 2004; Brown, 2003) and it has significant adverse academic and social effects on sufferers. The three main symptoms of ADHD are excessive activity, a persistent pattern of inattention and/or difficulty in controlling impulses. These are associated with a range of other problems, including delays in the development of motor and language skills, difficulties with sleep and bowel control, cognitive deficits, learning disabilities, discipline problems, troubled social relationships and emotional conflicts. All this may cause the daily life of children with ADHD to be filled with obstacles. Teachers, as the key educational figures in the school environment, play an essential role in helping children with ADHD to overcome these obstacles. Indeed, according to Pfiffner (2002), the decisive factor in whether or not children with ADHD are successful at school is their teacher.

It is estimated that 1 in 25 pupils suffers from ADHD (Barkley, 2002; Moreno, 2008; Moreno & Servera, 2002). Therefore, it is important that teachers are trained to detect the main symptoms of ADHD, and also that they are willing both to collaborate in the process of diagnosing the disorder and to participate in the implementation and evaluation of any treatment that is offered to these children. Increased

knowledge about ADHD can help teachers to correct any misconceptions they may have, enabling them to feel less insecure in their classroom practice with these children. Furthermore, a better understanding of the disorder makes it more likely that the teacher will have a more favourable attitude toward students with ADHD (Bekle, 2004; Ghanizadeh, Bahredar, & Moeini, 2006; Kos, Richdale, & Hay, 2006).

Various studies have shown that teachers generally have a moderate level of knowledge about ADHD, and that their understanding needs to be improved (Ghanizadeh et al., 2006; Grazyk et al., 2005; Jarque, Tárraga, & Miranda, 2007; Kos, Richdale, & Jackson, 2004; Scitutto, Terjesen, & Bender, 2000; West, Taylor, Houghton, & Hudyma, 2005; White et al., 2011). However, the results are not consistent across these studies. In some, teachers answers to questionnaires about ADHD were, on average, 80% correct (Barbarese & Olsen, 1998; Bekle, 2004; Jerome, Gordon, & Hustler, 1994; Jones & Chronis-Tuscano, 2008; Ohan, Cormier, Hepp, Visser, & Strain, 2008), whereas in other studies the figure did not exceed 53% (Jarque et al., 2007; Kos et al., 2004; Scitutto et al., 2000; Stacey, 2003; West et al., 2005). These variable results are probably due to methodological differences between the studies. The pioneering studies on teachers' knowledge of ADHD (Barbarese & Olsen, 1998; Jerome et al., 1994) used questionnaires with an average of 24 items and a two-option response format: True/False. Other authors have used similar measurement instruments so that their studies would be as comparable as possible to the initial studies in the field. However, the results obtained with dichotomous response formats can be misleading, since when respondents are in doubt they are encouraged to

*** Dirección para correspondencia [Correspondence address]:**

Marian Soroa. Department of Developmental and Educational Psychology, Donostia-San Sebastián School of Teacher Training, University of the Basque Country (UPV/EHU). Plaza Oñati, 3. 20018 Donostia-San Sebastián (España). E-mail: marian.soroa@ehu.es

choose one of the two possible answers, and this is likely to increase the percentage of correct answers due to the effect of guessing (Jarque et al., 2007; Kos et al., 2006; Scitutto et al., 2000).

The study by Scitutto et al. (2000) constituted a new chapter in the measurement of ADHD knowledge. These authors developed a 36-item questionnaire covering different dimensions or areas of knowledge about ADHD, and which, importantly, used a three-option response format: True/False/I Don't Know. This was also the first instrument designed to measure teachers' knowledge of ADHD for which indices of reliability and validity were also published. This questionnaire has provided the starting point for more recent studies (e.g. Guerra, 2010; Jarque et al., 2007; Stacey, 2003; West et al., 2005) which have reported more moderate levels of teacher knowledge than did the early research. This decrease in the percentage of correct answers may be related to the greater number of items in the questionnaire. Importantly, however, the three-option response format has resulted in more exhaustive information, revealing those aspects of ADHD about which teachers have better knowledge, those areas where knowledge is most lacking and those in which most errors are made (Jarque & Tárraga, 2008; Kos et al., 2006; Scitutto et al., 2000). Another series of studies have used five-option Likert-style response formats (Snider, Busch, & Arrowood, 2003) or multiple choice formats (Niznik, 2005; White, 2011), with the results obtained being similar to those in the three-option questionnaires.

The bulk of the studies conducted to date show that teachers have moderate ADHD knowledge. Notably, many teachers tend to lack knowledge and/or hold mistaken beliefs regarding the nature, the course, the consequences, the causes and the treatment of ADHD (Piffner, 2002). In view of this, Moreno (2008) considers that in order to meet the needs of students with ADHD, teachers must acquire information and knowledge about the characteristics and implications of the disorder, as well as about effective methods for treating it. Arcia, Frank, Sánchez-LaCay, and Fernández (2000) similarly note that teachers need more rigorous training not only regarding the causes of ADHD and how to identify its characteristics, but also in the use of effective classroom strategies. Furthermore, in terms of the gaps detected, teachers in various studies have explicitly stated their wish for more training on ADHD (Bussing, Gary, Leon, & Garvan, 2002; Jerome et al., 1994; Scitutto et al., 2000).

It is now relatively easy to access considerable amounts of information about ADHD, given the large amount of specialist literature that is available and the numerous websites that can be consulted. However, as Moreno (2008) points out, it would be advisable for teachers to explore the subject further through more formal channels such as specialized congresses and symposiums and/or courses, workshops and seminars on this disorder. The problem, as noted by Kos et al. (2006), is that those teachers who consider they have sufficient knowledge about ADHD tend not to search for additional information, whereas those who recognize

their lack of knowledge do look for more information. It is important, therefore, that educators are aware of their real level of ADHD knowledge and of the impact that gaps in their knowledge or mistaken ideas about ADHD may have on their work.

Although research on the ADHD knowledge of teachers is advancing worldwide, the number of instruments which measure this knowledge in a rigorous way is limited (Soroa, Balluerka, & Gorostiaga, 2012; Soroa, Gorostiaga, & Balluerka, 2013). Hence, there is a need to develop instruments for assessing teachers' ADHD knowledge in a valid and reliable way. In addition to detecting gaps in teachers' understanding of ADHD, the information gained through these instruments would help to design training that is tailored to the specific needs of teachers. This would ultimately foster the well-being of children with the disorder.

In this context, the object of the present study is to develop an instrument for assessing infant and primary teachers' knowledge of ADHD in a valid and reliable way. The remainder of this article describes and discusses the process of developing and validating this instrument, the IRA-AGHN.

Method

Participants

The sample comprised 752 teachers whose socio-demographic characteristics are shown in Table 1. These teachers worked at 84 state or state-subsidized schools in the Autonomous Community of the Basque Country (75.4%) and Navarre (24.6%). Schools were selected randomly from the data bases provided by the corresponding Department of Education in these Autonomous Communities. All participants gave informed consent. The study was approved by the Ethics Committee for Human Research at the University of the Basque Country/Euskal Herriko Unibertsitatea.

Teachers rated their perceived ADHD knowledge and capacity to teach children with ADHD on a ten-point scale, being the mean scores obtained 3.99 and 4.05 respectively ($SD = 1.73$ and $SD = 1.83$). On this scale, 1 indicated that teachers' ADHD knowledge was null and they were not prepared to teach children with ADHD, while a score of 10 meant that teacher had excellent ADHD knowledge and felt totally prepared to teach these children.

Instruments

The instruments used in this study are described below:

Questionnaire to Assess Teachers' Knowledge of ADHD ("*Irakasleek AGHNari buruz duten ezagutzaren ebaluatzeko galderna-sorta*" – IRA-AGHN). This questionnaire, written in Basque language, is designed to measure infant and primary teachers' knowledge of ADHD. It includes 26 items, of which 21 are true and 5 are false, and it assesses four areas

of knowledge: 1) General information about ADHD (e.g. *AGHN*a duten mutil eta nesken proportzioa antzerakoa da / 'The proportion of boys and girls with ADHD is similar'; false item); 2) Symptoms/Diagnosis of ADHD (e.g. *AGHN*a duten haurrek gauzak maiz ahazten dituzte / 'Children with ADHD often tend to forget things'; true item); 3) Etiology of ADHD (e.g. *Eguno bizitza erritmo estresagarriaren ondorioz haurrek AGHN*a izan dezakete / 'In children, ADHD may be caused by the stress generated by the current pace of life'; false item); and 4) Treatment of ADHD (e.g. *AGHN*a duen haurraren guraso eta irakasleek teknika psikologikoen aplikazioan aktiboki parte-hartu behar dute / 'Parents and teachers of children with ADHD need to actively participate in the application of psychological techniques'; true item). The questionnaire has a three-option response format (True/False/I Don't Know). Each correct answer scores 1 point, while incorrect answers and knowledge gaps score 0.

Table 1. Participants' socio-demographic information.

Variables	<i>n</i>	%
Sex		
Women	645	86
Men	102	14
Teaching stage		
Primary	356	47.5
Infant	218	29.1
Both	178	23.7
Specialization		
Primary	334	44.5
Infant	268	35.7
Special education	87	11.6
Foreign language	67	8.9
Physical education	50	6.7
Music education	39	5.2
ADHD Training		
Yes	309	41.1
No	443	58.9
ADHD Training sources		
Conferences	177	23.5
Teacher training course subjects	98	13
Continuing education courses	84	11.2
Family associations of children with ADHD	39	5.2
Masters' or postgraduate courses	27	3.6
Experience of Teaching Children with ADHD		
Yes	406	54.3
No	330	44.1
	Mean (SD)	Range
Age	41.57 (9.69)	20-64
Years of teaching experience	17.15 (10.30)	0-40
Hours of ADHD training	6.14 (20.15)	0-300
Number of children with ADHD taught during career	1.6 (2.57)	0-25

The Spanish version of the *Knowledge of Attention Deficit Hyperactivity Disorders Scale* (KADDS) (Jarque et al., 2007). This questionnaire assesses teachers' knowledge of ADHD. It consists of 36 items, 18 true and 18 false, which measure three areas of knowledge: 1) Symptoms/Diagnosis of

ADHD (e.g. *Para que un niño pueda ser diagnosticado de TDAH, los síntomas deben haber aparecido antes de los 7 años* / 'In order to be diagnosed with ADHD, the child's symptoms must have been present before age 7'; true item); 2) General information regarding the nature, causes and impact of ADHD (e.g. *Es posible que un adulto sea diagnosticado de TDAH, siempre y cuando los síntomas hayan aparecido en la infancia* / 'It is possible for an adult to be diagnosed with ADHD provided symptoms have appeared in childhood'; true item); and 3) Treatment of ADHD (e.g. *Los antidepresivos han sido eficaces para reducir los síntomas de muchos niños con TDAH* / 'Antidepressants have been effective in reducing symptoms for many ADHD children'; true item). The Spanish version of the KADDS has a three-option response format (True/False/I Don't Know), with each correct answer scoring 1 point and incorrect answers and knowledge gaps scoring 0. The Spanish version of the KADDS has shown adequate levels of reliability and validity (Jarque et al., 2007).

Socio-demographic variables questionnaire. This instrument was created ad hoc for this study and includes 13 questions (with different response formats) divided into six sections. It was designed to collect information about teachers' age, sex, stage of education taught and specialization, number of children in their classrooms, years of teaching experience, length of specific training on ADHD, information they have received on this disorder and the means through which they have been informed about it, the number of children diagnosed with ADHD they have taught during their career, whether or not they know anybody with ADHD outside their work environment, their perceived self-awareness regarding ADHD and their perceived capacity to teach children with ADHD. This questionnaire is shown in Appendix 1.

Procedure

Following the guidelines set out by Barbero (2003), Hernández, Fernández-Collado and Baptista (2006), and Moreno, Martínez and Muñoz (2004, 2006) for the construction of test items, and based on the scientific literature on ADHD, we formulated 105 initial statements for the IRA-AGHN. Eight experts on ADHD (university lecturers from different fields of knowledge and clinical or educational psychologists) were then consulted in order to obtain evidence regarding the content validity of the instrument. As a result of this consultation process the initial questionnaire was shortened to the 76 items that were considered most suitable for assessing teachers' knowledge of ADHD and which had the clearest correspondence with the four theoretical dimensions proposed for the questionnaire. At this point it was also decided that a three-option response format (True/False/I Don't Know) would be used.

The next stage involved conducting a pilot study of the questionnaire within its target population. A total of 98 infant and primary teachers from 17 schools in the Basque Country and Navarre participated in this study. Of these,

85% were women and 15% were men, with a mean age of 40 years ($SD = 9.8$) and an average of 15 years ($SD = 10$) of teaching experience. Based on the quantitative and qualitative analyses carried out in the pilot study, the items with the highest level of discrimination were selected and the wording of six of the statements was revised. This yielded a preliminary instrument of 51 items (for more exhaustive information regarding the content validity of the IRA-AGHN, see Soria et al., 2012).

In order to apply the instrument obtained in the pilot stage to a wider and more representative sample of teachers we telephoned the heads of a series of randomly selected schools. All these schools were briefed on the project and were invited to participate. A total of 84 schools agreed to do so. A member of the research team then visited these schools and explained the procedure for applying the questionnaires. In addition, each school head received a dossier containing all the documents concerning the project, the questionnaire management system, an informative letter with informed consent sheet attached for every teacher and three questionnaires per teacher: the socio-demographic variables questionnaire, the IRA-AGHN and the Spanish adaptation of the KADDS (Jarque et al., 2007). All teachers were briefed on the voluntary and confidential nature of the study. The school heads or heads of study were asked to take responsibility for handing out and collecting the questionnaires in accordance with the instructions given by the research team.

Data Analyses

All the statistical analyses were carried out with SPSS (version 20.0) except for the factor analysis, which used FACTOR 7.02 (Lorenzo-Seva & Ferrando, 2007).

A factor analysis with oblique rotation was performed on all 51 items in order to select the definitive items for the IRA-AGHN. Items with a factor loading equal to or higher than .35 and which adequately represented the underlying construct were selected. Based on the 26 selected items the dimensionality of the instrument was then assessed by means of an exploratory factor analysis based on polychoric correlations. The unweighted least squares estimation method was used for this purpose. The number of dimensions was decided by applying the Kaiser procedure, with the direct oblimin rotation method being used to simplify the factor structure.

In terms of the reliability analysis, the internal consistency of each dimension of the IRA-AGHN was first estimated through the omega coefficient, after which the temporal stability was calculated by means of the Spearman rho correlation coefficient. The analysis of temporal stability involved a

subsample of 123 teachers and a four-week interval between the first and second applications of the instrument.

The relationships between the scores obtained by participants on the different dimensions of the IRA-AGHN and those obtained on the comparable dimensions of the Spanish version of the KADDS (Jarque et al., 2007) were studied with the aim of finding evidence of convergent validity. Given that the assumption of normality was not met, the Spearman rho correlation coefficient was used for this purpose.

Finally, the relationships between the scores obtained by participants on the different dimensions of the IRA-AGHN and a series of variables related to the construct this instrument aims to measure were studied in order to obtain evidence of external validity. To this end, the Spearman rho correlation coefficient and the Mann-Whitney U test were used.

Results

Dimensionality of the instrument

Prior to carrying out the factor analysis with the 26 selected items, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were applied. The KMO index had a value of .85 and Bartlett's test was statistically significant ($\chi^2(325) = 8340.5$; $p < .00001$), thereby indicating the suitability of factor analysis. This analysis yielded a four-factor structure accounting for 53.2% of the total variance. Table 2 shows the factor loadings for each item, the percentage of explained variance for each factor, and the eigenvalues of the components.

The first factor, 'Etiology of ADHD', accounts for 29.15% of the variance and includes four items. This dimension refers to the possible causes which give rise to or impact on the occurrence of ADHD.

The second factor, 'Symptoms/Diagnosis of ADHD', accounts for 9.8% of the variance and includes 11 items. These items refer to the different symptoms which children with ADHD may present. This dimension also includes information regarding the process of diagnosing this disorder.

The third factor, 'General information about ADHD', accounts for 7.8% of the variance and includes four items. This dimension covers general information on the nature, prevalence, course of and problems associated with ADHD. The fourth and final factor, 'Treatment of ADHD', accounts for 6.4% of the variance and includes 7 items. This dimension provides information regarding the different types of interventions which are used with children with ADHD.

Table 2. Factor loadings of items, percentage of explained variance and the eigenvalues of IRA-AGHN factors (original items in Basque, with their English translation).

Items	Item factor loadings by components			
	1	2	3	4
Factor 1. Etiology of ADHD				
2. <i>Gurasoen heziketa estilo autoritario eta kritikoa onduko haurrek AGHNa izan dezakete</i> 'A critical and authoritarian style of education by parents can lead to ADHD'	.75			
9. <i>Egungo bizitzaren erritmo estresagarriaren ondorioz haurrek AGHNa izan dezakete</i> 'In children, ADHD may be caused by the stress generated by the current pace of life'	.52			
16. <i>Gurasoen dibortzioa edo anai-arreba baten jaiotza bezalako gertaera estresagarrien ondorioz haurrek AGHNa garatu dezakete</i> 'Stressful events such as divorce of parents or the birth of a new brother or sister may be the cause of ADHD'	.82			
24. <i>Hezkuntza txarra edo familia-giro kaotikoaren ondorioz haurrek AGHNa izan dezakete</i> 'ADHD can be caused by a bad education or a chaotic home environment'	.83			
Factor 2. Symptoms/Diagnosis of ADHD				
1. <i>AGHNa duten haurrek gelako arauak eta arau sozialak errespetatzeko zailtasunak izaten dituzte</i> 'Children with ADHD have difficulty complying with the rules of the classroom and social norms'	.63			
3. <i>AGHNa duten haurrek euren emozioak kontrolatzeko zailtasunak izaten dituzte, batez ere baserrea</i> 'Children with ADHD often have difficulty controlling their emotions, especially anger'	.53			
6. <i>AGHNa duten haurrak buru-efortzu jarraitua eskatzen duten lanak egin behar dituztenean kezatu egiten dira edota horiek egitea saibesten dute</i> 'Children with ADHD complain when they have to perform tasks that require sustained mental effort and try to avoid doing them'	.67			
8. <i>AGHNa duten haurrek, arropa, eskola-materiala, jostailuak, eta antzerako beste objektuak maiz galtzen dituzte</i> 'Children with ADHD often lose items such as clothing, school supplies, toys, etc.'	.69			
12. <i>AGHNa duten haurrek euren txanda itxaroteko zailtasunak dituzte</i> 'Children with ADHD have difficulty awaiting his or her turn'	.73			
15. <i>AGHNa duten haurrek euren ekintzen ondorioetan pentsatu gabe jarduten dute</i> 'Children with ADHD act without thinking through the consequences of their actions'	.67			
18. <i>AGHNa duten haurrek besteek ekintzak eteten dituzte edota borietan sartzen dira</i> 'Children with ADHD interrupt or intrude on the activities of others'	.71			
20. <i>AGHNa duten haurrek galdera amaitu baino lehen erantzuten dute</i> 'Children with ADHD start to answer before their interlocutor finishes asking the question'	.57			
21. <i>AGHNa duten haurrek badirudi ez dutela entzuten hitz egiten zaienean</i> 'Children with ADHD seem not to listen when spoken to'	.62			
23. <i>AGHNa duten haurrei kosta egiten zaie hasi dituzten lanak amaitzea</i> 'Children with ADHD have trouble completing the tasks they have started'	.64			
25. <i>AGHNa duten haurrek gauzak maiz ahazten dituzte</i> 'Children with ADHD often tend to forget things'	.66			
Factor 3. General information about ADHD				
4. <i>Oro bar, nerabezaroan gehiegizko aktibitatea gutxiu egiten da, baina inportantzia eta arreta-zailtasunak mantendu egiten dira</i> 'In general, excessive activity reduces in adolescence, though the impulsiveness and difficulties with attention remain'	.50			
7. <i>AGHNa duten mutil eta nesken proportzioa antzerakoa da</i> 'The proportion of boys and girls with ADHD is similar'	.65			
11. <i>AGHNa duten mutilek, neskek baino hiperaktibitate-inportantzia maila handiagoa aurkezten dute</i> 'Boys with ADHD tend to have a greater degree of hyperactivity-impulsivity than girls'	.72			
17. <i>AGHNa duten gazteek, gainerako gazteek baino maizago utzi behar dituzte ikasketak</i> 'Young people with ADHD drop out of school more frequently than others'	.44			
Factor 4. Treatment of ADHD				
5. <i>Irakasleak AGHNa duen haurrari aukerak eskaini behar dizkie gehiegizko mugimendua bideratu dezan</i> 'The teacher must provide opportunities for the student with ADHD to channel their excessive movement'	.36			
10. <i>AGHNa duen haurraren eskola-errendimendua eta eskola-egokitzapena hobetu daitezke baldin eta bere irakasleek nahaste horri buruzko heziketa zehatza badute</i> 'The performance and school adjustment of children with ADHD may improve if teachers have specific training in this disorder'	.61			
13. <i>AGHNa duten haurren arreta-gaitasuna hobetzeko teknika eta programa zehatzak existitzen dira</i> 'There are specific techniques and programmes to improve the attention span of children with ADHD'	.36			
14. <i>AGHNari buruzko informazio orokorra jasotzeko, irakasle, familiarterako eta ikasleek haur horiekiko dituzten jarrerak hobetzea dakar</i> 'Receiving general information about ADHD improves the attitudes of teachers, parents and classmates towards children who suffer from it'	.67			
19. <i>AGHNa duen haurraren guraso eta irakasleek teknika psikologikoen aplikazioan aktiboki parte-hartu behar dute</i> 'The parents and teachers of children with ADHD must actively participate in the application of psychological techniques'	.58			

‘Parents and teachers of children with ADHD need to actively participate in the application of psychological techniques’

22. *Irakasleak AGHNa duen ikaslea jasotzen ari den tratamenduan parte-bartzeak, terapiaren emaitzetan eragina du*

‘The collaboration of the teacher with the treatment being received by the child with ADHD has an influence on the result of that treatment’ .68

26. *AGHNa duen hauraren sintomak urteak pasa abala eta inolako tratamendurik gabe hobera egingo dutela uste izateak, etorkizunean izan ditzakeen aukerak murrizten dizkio*

‘Waiting for the symptoms of ADHD to improve over the years, without any kind of treatment implies, means taking away opportunities for the child’s future’ .41

Percentage of explained variance	29.15	9.8	7.8	6.4
Eigenvalue	7.58	2.55	2.04	1.67

Reliability

Omega values ranged between .76 and .90 for the four dimensions of the IRA-AGHN, which indicates good internal consistency. Test-retest correlations were also good, with values ranging between $r = .49$ and $r = .77$ ($p < .01$) for the four dimensions. Table 3 shows the indices of internal consistency and temporal stability for the four dimensions.

Relationship between the IRA-AGHN dimensions and those in the Spanish adaptation of the KADDS (Jarque et al., 2007)

The correlations between the scores obtained by participants on the three comparable dimensions of the IRA-AGHN and those in the Spanish adaptation of the KADDS (Jarque et al., 2007) ranged between $r = .33$ and $r = .54$ ($p < .01$ in all cases). More detailed information is shown in Table 4.

Relationship between IRA-AGHN dimensions and other variables

As Table 5 shows, the scores obtained by teachers on the ‘Symptoms/Diagnosis of ADHD’ dimension were moderately correlated with the number of children with ADHD that they had taught during their career ($r = .29$, $p < .001$), with their perceived knowledge of ADHD ($r = .37$, $p < .001$)

and with their perceived capacity to teach children with ADHD effectively ($r = 0.30$, $p < 0.001$). Teachers’ scores on the ‘General information about ADHD’ dimension showed a moderate correlation with their perceived knowledge of ADHD and with the number of specific ADHD training hours received ($r = .30$ in both cases, $p < .001$ and $p < .0001$, respectively).

Application of the Mann-Whitney U test to compare the scores obtained by teachers who had taught children diagnosed with ADHD with the scores of those who had not revealed statistically significant differences between the average ranges of these two groups on the ‘Symptoms/Diagnosis of ADHD’ dimension ($U = 44503$; $p < .0001$; $r = .29$).

However, variables such as having received specific ADHD training, being well informed about ADHD, being a special education teacher, or knowing people with ADHD outside the work environment did not show the expected relationships.

Table 3. Indices of internal consistency and temporal stability for the IRA-AGHN dimensions

Dimensions	Omega coefficient	Test-retest correlation
Etiology of ADHD	.87	.77
Symptoms/Diagnosis of ADHD	.90	.68
General information about ADHD	.76	.61
Treatment of ADHD	.80	.49

Table 4. Correlations between the scores obtained by participants on the three comparable IRA-AGHN dimensions and those in the Spanish adaptation of the KADDS.

IRA-AGHN dimensions	Dimensions of the Spanish adaptation of the KADDS		
	Symptoms/Diagnosis of ADHD	General information about ADHD	Treatment of ADHD
Symptoms/Diagnosis of ADHD	.45*		
General information about ADHD		.54*	
Treatment of ADHD			.33*

* $p < .01$

Table 5. Correlations between participants' scores on the IRA-AGHN dimensions and other variables.

Variables	Dimensions			
	Etio.	Sympt./ Diag.	Gen. inf.	Treat.
Teachers' perceived knowledge of ADHD	.20**	.37**	.30**	.19**
Teachers' perceived capacity to teach children with ADHD effectively	.16**	.30**	.24**	.13**
Hours of specific ADHD training	.14***	.27***	.30***	.17***
Number of children with ADHD taught during their career	.05	.29**	.18**	.10*

* $p < .01$ ** $p < .001$ *** $p < .0001$

Discussion

The goal of the present study was to develop and validate a questionnaire, the IRA-AGHN, to assess infant and primary teachers' knowledge of ADHD. To this end, the factor validity, internal consistency, temporal stability, convergent validity and external validity of the proposed instrument were analysed.

The results obtained reveal that the IRA-AGHN has a four-factor structure: 1) General information about ADHD; 2) Symptoms/Diagnosis of ADHD; 3) Etiology of ADHD; and 4) Treatment of ADHD. To our knowledge, there are no published reports of any instruments with a similar purpose for which a factor analysis has been conducted to confirm the multidimensional nature of the construct to be evaluated. All the factors showed good indices of internal consistency, as well as adequate temporal stability. The convergent validity of the questionnaire was analysed by calculating the correlations between the comparable dimensions of the IRA-AGHN and the Spanish adaptation of the KADDS (Jarque et al., 2007). These analyses provided evidence of convergent validity. In terms of the external validity of the instrument, it is worth noting that teachers' level of knowledge about different aspects of ADHD was positively related with the number of children with ADHD they have taught during their career, with the number of specific ADHD training hours received, with their perceived knowledge of ADHD and with their perceived capacity to teach children with ADHD effectively. These results are in line with those obtained by Jarque et al. (2007) and Scitutto et al. (2000), who developed or adapted instruments with purposes similar to the IRA-AGHN and who also reported evidence of external validity. Specifically, Jarque et al. (2007) found that the scores obtained by teachers on the different subscales of the Spanish adaptation of the KADDS showed moderate or low correlations with variables such as the number of children with ADHD taught and the degree of perceived self-efficacy to teach children with ADHD. Scitutto et al. (2000) found that the scores obtained by teachers on different subscales of the KADDS presented moderate or low correlations with their previous contact with children diagnosed with ADHD and their confidence in their ability to effectively teach children with ADHD. Thus, in terms of our

external validity results, it is worth highlighting that the variables most strongly correlated with teachers' knowledge of ADHD are those related to their specific ADHD training and having had direct contact with children diagnosed with ADHD. These results are in line with those of several studies that have analysed teachers' knowledge of ADHD, and which show that ADHD knowledge is related to prior contact with children with ADHD (Jarque et al., 2007; Kos et al., 2004; Perold, Louw, & Kleyhmans, 2010; Scitutto et al., 2000) and with previous training on ADHD (Jerome et al., 1994; Perold et al., 2010; Kos et al., 2004; Stacey, 2003; Vereb & DiPerna, 2004; West et al., 2005).

In terms of the correlations between the different dimensions of the IRA-AGHN and the socio-demographic variables analysed, the highest correlations correspond to the Symptoms/Diagnosis and General information dimensions, these being the areas of knowledge which most reflect direct contact with children with ADHD and previous training on ADHD. These results are also in line with the existing literature on the subject (e.g. Scitutto et al., 2000). This may be due to the fact that, as Anderson, Watt, Noble and Shanley (2012) note, the contents of the Symptoms/Diagnosis and General information dimensions are more observable on a daily basis in the classroom than are other aspects of ADHD.

On the whole, the results obtained in the process of validation of the IRA-AGHN indicate that it has adequate psychometric properties. This conclusion is further supported by the fact that the sample used for the validation was randomized, large and representative of the target population. If one considers that the IRA-AGHN features a three-option response format (True/False/I Don't Know) and that it is brief and easy to manage, it seems reasonable to conclude that it constitutes a highly useful tool with which teachers can obtain detailed information about their level of knowledge, false beliefs and knowledge gaps regarding ADHD.

It should, however, be noted that the IRA-AGHN is not able to assess teachers' knowledge regarding the different subtypes of ADHD (inattentive, hyperactive-impulsive and combined) identified by the DSM-V (APA, 2013), and it would therefore be advisable to complement its use with an assessment or observation procedure that could meet this objective.

As noted in the introduction, however, many of the instruments used to assess teachers' knowledge of ADHD suffer from methodological deficiencies and do not show adequate psychometric properties (Soroa et al., 2012; Soroa et al., 2013). It is in this regard that the IRA-AGHN provides an opportunity to study teachers' real knowledge of this subject, which will in turn enable the design and implementation of training programmes tailored to their needs.

Acknowledgements: The study was partially funded by a grant from the Research Bureau of the University of the Basque Country (General Funding for Research Groups, GIU11/29).

References

- American Psychiatric Association (APA, 2013). *Diagnostic and statistical manual of mental disorders* (5th. Ed.). Arlington, VA: American Psychiatric Association.
- Anderson, D. L., Watt, S. E., Noble, W., & Shanley, D. (2012). Knowledge of Attention Deficit Hyperactivity Disorder (ADHD) and attitudes towards teaching children with ADHD: The role of the teaching experience. *Psychology in the Schools*, 49(6), 511-525. Doi: <http://dx.doi.org/10.1002/pits.21617>
- Arcia, E., Frank, R., Sánchez-LaCay, A., & Fernández, M. C. (2000). Teacher understanding of ADHD as reflected in attributions and classroom strategies. *Journal of Attention Disorders*, 4(2), 91-101. Doi: <http://dx.doi.org/10.1177/10870547000400203>
- Barbarelli, W. J., & Olsen, R. D. (1998). An ADHD Educational Intervention for Elementary School teachers: A pilot Study. *Developmental and Behavioral Pediatrics*, 19(2), 94-100.
- Barbero, M. I. (2003). Psicometría. In M. I. Barbero (Coord.), E. Vila, & J. C. Suárez, *Principios básicos para la construcción de instrumentos de medición psicológica* (pp. 79-135). Madrid: UNED.
- Barkley, R. A. (2002). *Niños hiperactivos: Cómo comprender y atender sus necesidades especiales* (2nd. ed.). Barcelona: Paidós.
- Barkley, R. A. (2004). Adolescents with attention-deficit/hyperactivity disorder: An overview of empirically based treatments. *Journal of Psychiatric Practice*, 10(1), 39-56. Doi: <http://dx.doi.org/10.1097/00131746-200401000-00005>
- Bekle, B. (2004). Knowledge and attitudes about Attention-Deficit Hyperactivity Disorder (ADHD): A comparison between practicing teachers and undergraduate education students. *Journal of Attention Disorders*, 7(3), 151-161. Doi: <http://dx.doi.org/10.1177/108705470400700303>
- Brown, T. E. (2003). *Trastornos por déficit de atención y comorbilidades en niños, adolescentes y adultos*. Barcelona: Masson.
- Bussing, R., Gary, F. A., Leon, C. E., & Garvan, C. W. (2002). General Classroom Teachers' Information and Perceptions of Attention Deficit Hyperactivity Disorder. *Behavioral Disorders*, 27(4), 327-339.
- Ghanizadeh, A., Bahredar, M. J., & Moeini, S. R. (2006). Knowledge and attitudes towards attention deficit hyperactivity disorder among elementary school teachers. *Patient Education and Counselling*, 63, 84-88. Doi: <http://dx.doi.org/10.1016/j.pecc.2005.09.002>
- Graczyk, P. A., Atkins, M. S., Jackson, M. M., Letendre, J. A., Kim-Cohen, J., Baumann, B. L., & McCoy, J. (2005). Urban Educators' Perceptions of Interventions for Students with Attention Deficit Hyperactivity Disorder: A Preliminary Investigation. *Behavioral Disorders*, 30(2), 95-104.
- Guerra, F. R. (2010). *Teacher knowledge of Attention Deficit Hyperactivity Disorder among middle school students in South Texas*. (Doctoral Thesis, University of Texas, 2009). Retrieved from: <http://gradworks.umi.com/34/00/3400354.html>
- Hernández, R., Fernández-Collado, C., & Baptista, P. (2006). *Metodología de la investigación*. (4th. ed.). México: McGraw-Hill.
- Jarque, S., & Tárraga, R. (2008, April). *Adaptación y validación de la escala de conocimientos sobre el Trastorno por Déficit de Atención con Hiperactividad*. Proceedings of International Congress of Virtual Education CIVE 2008, Palma de Mallorca, Spain.
- Jarque, S., Tárraga, R., & Miranda, A. (2007). Conocimientos, concepciones erróneas y lagunas de los maestros sobre el trastorno por déficit de atención con hiperactividad. *Psicothema*, 19(4), 585-590.
- Jerome, L., Gordon, M., & Hustler, P. (1994). A comparison of American and Canadian Teachers' Knowledge and Attitudes Towards Attention Deficit Hyperactivity Disorder (ADHD). *Canadian Journal of Psychiatry*, 39, 563-567.
- Jones, H. A., & Chronis-Tuscano, A. (2008). Efficacy of teacher in-service training for Attention-Deficit/Hyperactivity Disorder. *Psychology in the Schools*, 45(10), 918-929. Doi: <http://dx.doi.org/10.1002/pits.20342>
- Kos, J., Richdale, A. L., & Hay, D. A. (2006). Children with Attention deficit Hyperactivity Disorder and their Teachers: A review of the literature. *International Journal of Disability, Development and Education*, 53(2), 147-160. Doi: <http://dx.doi.org/10.1080/10349120600716125>
- Kos, J. M., Richdale, A. L., & Jackson, M. S. (2004). Knowledge about Attention-Deficit/Hyperactivity Disorder: A comparison of in-service and preservice teachers. *Psychology in the Schools*, 41(5), 517-526. Doi: <http://dx.doi.org/10.1002/pits.10178>
- Lorenzo-Seva, U., & Ferrando, P. J. (2007). *FACTOR Version 7.02 for Win 95 / Win98 / Win2000 / Win NT*. Tarragona: Rovira i Virgili University.
- Moreno, I. (2008). *Hiperactividad infantil: Guía de actuación*. Madrid: Pirámide.
- Moreno, I., & Servera, M. (2002). Intervención en los trastornos del comportamiento infantil. In M. Servera (Coord.), *Los trastornos por déficit de atención con hiperactividad* (pp. 217-253). Madrid: Pirámide.
- Moreno, R., Martínez, R. J., & Muñiz, J. (2004). Software, instrumentación y metodología. *Psicothema*, 16(3), 490-497.
- Moreno, R., Martínez, R. J., & Muñiz, J. (2006). New Guidelines for Developing Multiple-Choice Items. *Methodology*, 2(2), 57-64. Doi: <http://dx.doi.org/10.1027/1614-2241.2.2.65>
- Niznik, M. E. (2005). *An exploratory study of the implementation and teacher outcomes of a program to train elementary educators about ADHD in the schools*. (Doctoral Thesis, University of Texas, 2004). Retrieved from: <http://gradworks.umi.com/31/43/3143438.html>
- Ohan, J. L., Cormier, N., Hepp, S. L., Visser, T. A. V., & Strain, M. C. (2008). Does Knowledge About Attention-Deficit/Hyperactivity Disorder Impact Teachers' Reported Behaviors and Perceptions? *School Psychology Quarterly*, 23, 436-449. Doi: <http://dx.doi.org/10.1037/1045-3830.23.3.436>
- Perold, M., Louw, C., & Kleyhans, S. (2010). Primary school teachers' knowledge and misperceptions of attention deficit hyperactivity disorder (ADHD). *South African Journal of Education*, 30, 457-473.
- Pfiffner, L. J. (2002). Potenciar la educación en la escuela y en casa: métodos para el éxito desde preescolar hasta el bachillerato. In R. Barkley (Ed.), *Niños hiperactivos. Cómo comprender y atender sus necesidades especiales* (2nd. ed.) (pp. 263-282). Barcelona: Paidós.
- Sciuotto, M. J., Terjesen, M. D., & Bender, A. S. (2000). Teachers' knowledge and misperceptions of Attention-Deficit/Hyperactivity Disorder. *Psychology in the Schools*, 37(2), 115-122. Doi: [http://dx.doi.org/10.1002/\(SICI\)1520-6807\(200003\)37:2<115::AID-PITS3>3.0.CO;2-5](http://dx.doi.org/10.1002/(SICI)1520-6807(200003)37:2<115::AID-PITS3>3.0.CO;2-5)
- Snider, V. E., Busch, T., & Arrowood, L. (2003). Teacher Knowledge of Stimulant Medication and ADHD. *Remedial and Special Education*, 24(1), 46-56. Doi: <http://dx.doi.org/10.1177/074193250302400105>
- Soroa, M., Balluerka, N., & Gorostiaga, A. (2012). Evaluation of the level of knowledge of infant and primary school teachers with respect to the Attention Deficit Hyperactivity Disorder (ADHD): Content validity of a newly created questionnaire. In J. M. Norvilitis (Ed.), *Contemporary trends in ADHD research* (pp. 127-152). Rijeka: InTech. Doi: <http://dx.doi.org/10.5772/29093>
- Soroa, M., Gorostiaga, A., & Balluerka, N. (2013). Review of tools used for assessing teachers' level of knowledge with regards attention deficit hyperactivity disorder (ADHD). In S. Banerjee (Ed.), *Attention Deficit Hyperactivity Disorder in Children and Adolescents* (pp. 151-177). Rijeka: InTech. Doi: <http://dx.doi.org/10.5772/54277>
- Stacey, M. A. (2003). *Attention-Deficit/Hyperactivity Disorder: General Education Elementary School Teachers' Knowledge, Training, and Ratings of Acceptability of Interventions*. (Doctoral Thesis, University of South Florida, 2003). Retrieved from: <http://etd.fcla.edu/SF/SFE0000084/Thesis.pdf>
- West, J., Taylor, M., Houghton, S., & Hudyma, S. (2005). A Comparison of Teachers' and Parents' Knowledge and Beliefs About Attention-Deficit/Hyperactivity Disorder (ADHD). *School Psychology International*, 26(2), 192-208. Doi: <http://dx.doi.org/10.1177/0143034305052913>
- Vereb, R. L., & DiPerna, J. (2004). Teachers' Knowledge of ADHD, Treatments for ADHD, and Treatment Acceptability: An Initial Investigation. *School Psychology Review*, 33(3), 421-428.
- White, S. W., Sukhodolsky, D. G., Rains, A. L., Foster, D., McGuire, J. F., & Seahill, L. (2011). Elementary School Teachers' Knowledge of Tourette Syndrome, Obsessive-Compulsive Disorder, & Attention-Deficit/Hyperactivity Disorder: Effects of Teacher Training. *Journal of Developmental Physical Disabilities*, 23(5), 5-14.

(Article received: 6-2-2013; revision received: 28-6-2013; accepted: 20-2-2014)

Appendix 1. Socio-demographic variables questionnaire

Please answer the questions in this section by filling in the blanks or with an "X" on the correct answer. Read all the questions and make sure you do not skip any.

1. PERSONAL INFORMATION

1.1. **Age:** _____

1.2. **Sex:** Male Female

2. TEACHING EXPERIENCE

2.1. Which **stage(s)** do you teach?

Infant education only

Primary education only

Both

2.2. What is your **specialization**?

Infant education

Primary education

Special education

Foreign language

Music education

Physical education

2.3. **How many children** are you teaching this year? _____

2.4. **How long** have you been working as a teacher? _____

3. TRAINING

3.1. Have you ever received **specific ADHD training**? Yes No. If your answer is Yes, please indicate where:

Teacher training course subjects

Postgraduate or Master's studies

Continuing education courses

Talks or conferences

Family associations of children with ADHD

Others (specify): _____

3.2. State the approximate **number of hours of ADHD training** you have received: _____

3.3. Have you received any other **information about ADHD**? Yes No. If your answer is Yes, state how you have been informed:

People around you: family, friends, colleagues, etc.

Parents of children with ADHD

Professionals outside your work environment treating your pupils: psychiatrists, clinical or educational psychologists, paediatricians, neurologists, etc.

Family associations of children with ADHD

Books

Scientific or professional journals

Mass media: T.V., internet, radio, newspapers, informative magazines, etc.

Others (specify): _____

If you had to choose one of the above, **which would you say most frequently provided you with information about ADHD?** _____

4. EXPERIENCE OF PEOPLE WITH ADHD

4.1. Have you **ever taught a child diagnosed with ADHD**? Yes No. If your answer is Yes, **how many** children diagnosed with ADHD have you taught **during your career**? _____

4.2. **Do you know anybody with ADHD** (child or adult) **outside your work environment**? Yes No

5. PERCEIVED KNOWLEDGE

5.1. How would you describe your level of knowledge about ADHD? (put an "X" where appropriate):

1	2	3	4	5	6	7	8	9	10
Null									Excellent

6. PERCEIVED TEACHING CAPACITY

6.1. How would you describe your capacity to teach children with ADHD? (put an "X" where appropriate):

1	2	3	4	5	6	7	8	9	10
Not prepared									Totally prepared