



How to cite this article:

Soriano Ferrer, M. & Echegaray-Bengoa, J. (2021). Knowledge and beliefs about ADHD of peruvian teachers: the role of teaching experience with ADHD. *MLS Educational Research*, 5(1), 25-46. doi: 10.29314/mlser.v5i1.277.

**KNOWLEDGE AND BELIEFS ABOUT ADHD OF PERUVIAN
TEACHERS: THE ROLE OF TEACHING EXPERIENCE WITH
ADHD**

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Abstract. Introduction. Studies that have analyzed teachers' knowledge, misconceptions and gaps about ADHD have focused primarily on North America, Europe and Asia, fundamentally. However, the knowledge of teachers in South America and Central America about ADHD has not been analyzed. Aims. Therefore, in this study we set two objectives: a) to compare the Peruvian pre-service teachers (PSTs) and in-service teachers' (ISTs) knowledge, misconceptions and lack of knowledge about ADHD, and b) to analyse the differences in knowledge, misconceptions and lacks of knowledge between ISTs with and without experience about ADHD. Method. Two hundred sixty-four teachers completed the Knowledge of Attention Deficit Disorder Scale (KADDS), the Index of Teaching Stress (ITS), and a socio-demographic questionnaire. Results showed that ISTs had more correct answers on total scale, on general information and on treatment sub-scales than PSTs. The PSTs had more lacks of knowledge on total scale than ISTs. The ISTs with experience about ADHD had more teaching stress, higher scores on self-efficacy and more accurate knowledge on total scale and on each sub-scale. In addition, ISTs knowledge correlated with post-grade education and years of experience. Self-efficacy correlated with experience about ADHD and years of experience. Discussion. The importance of misconceptions and knowledge gaps about ADHD for teacher training is discussed.

Keywords: Teachers' knowledge, ADHD, teaching stress, pre-service teacher, in-service teacher.

CONOCIMIENTOS Y CREENCIAS DE LOS MAESTROS PERUANOS SOBRE EL TDAH: EL ROL DE LA EXPERIENCIA DOCENTE EN EL TDAH

Resumen. Introducción. Los estudios que han analizado los conocimientos, creencias erróneas y lagunas de los profesores acerca del TDAH se han centrado fundamentalmente en América del Norte, Europa y Asia, fundamentalmente. Sin embargo, no se han analizado los conocimientos de los profesores de América del Sur ni de América del centro acerca del TDAH. Por ello, en este estudio nos planteamos dos objetivos: a) comparar los conocimientos, las creencias erróneas y las lagunas de conocimiento de los profesores sin experiencia (PSE) y de los profesores con experiencia (PCE), y b) analizar las diferencias en el conocimiento, las creencias y las lagunas entre los PCE que habían enseñado o no a alumnos con TDAH. Método. En total 264 profesores completaron la Knowledge of Attention Deficit Disorder Scale (KADDS), el Index of Teaching Stress (ITS), y un cuestionario socio-demográfico. Resultados. Los resultados mostraron que los PCE tuvieron mayores respuestas correctas en la escala total que los PSE. Los PCE con experiencia en TDAH presentaron mayores índices de estrés docente, aunque también mayor autoeficacia y mejor conocimiento sobre el TDAH. La autoeficacia correlacionó con la experiencia en TDAH. Discusión. Se discute la importancia de las creencias erróneas y de las lagunas de conocimiento acerca del TDAH para la formación del profesorado.

Palabras clave: Conocimiento docente, TDAH, estrés docente, profesores sin experiencia, profesores con experiencia.

Introduction

But it was not until 1982 that the educational laws allowed the creation of special education classrooms in ordinary schools. Later, the General Education Law (Ley N° 28044, 2003) opted for inclusive education and the normalization, quality, and equity of education. This meant that, all students can be educated with their peers in equal conditions. Thereby, quality educational attention is proposed for populations in situations of vulnerability for whatever reason (Salas et al., 2012). It should be noted that, this law includes ADHD in special educational needs.

Attention-deficit/hyperactivity disorder is one of the most frequent neurodevelopmental disorders in childhood and adolescence. It is characterized by the presence of a persistent pattern of inattention, and /or hyperactivity and impulsivity (DuPaul, & Stoner, 2003; Pierrehumbert et al., 2006). In addition, executive functions, which are necessary for planning, organizing and carrying out complex human behaviours over long periods of time, are affected (Barkley, 2011). These manifestations must be present before the age of twelve, and have to be present at least in two different settings, such as home and school. Children should present with at least six symptoms, while adults should present at least five. The diagnosis of ADHD should only be made if it is visibly interfering with the social, academic, occupational or recreational development of the child or adult (APA, 2014).

The prevalence is variable due to different factors. For example, in general, it is estimated to be only between 1-20%, at of school age worldwide (Polanczyk et al., 2007). A more specific study indicated that it is 3.4% (Polanczyk et al., 2015). In Spanish-speaking countries such as Spain, prevalence ranges from 2-6% (Criado-Álvarez, &

Romo-Barrientos, 2003), although its prevalence in preschool age is 5.4% (Canals et al., 2018). However, in Peru, where the studies are mainly clinical and few; the prevalence is between 5-10% (Saavedra Castillo, 2001; Tirado et al., 2012). This variability is due to methodological, demographic and cultural aspects as indicated in the recent meta-analysis (see Polanczyk et al., 2015).

In this sense, teachers are valuable sources of information with regard to identification, diagnosis, evaluations and treatment of ADHD, due to of their daily contact with children in a variety of settings (Bussing et al., 1998). In addition, most of the referrals to pediatricians are made by teachers (Arnett et al., 2013; Snider et al., 2003).

However, a few studies have analyzed teacher's knowledge, beliefs and misconceptions about ADHD, in comparison with studies that research on medication in ADHD. The majority of these studies have been carried out in North America, Middle East, Australia, Europe, and Asia (Alkahtani, 2013; Akram et al., 2009; Brook et al., 2000; Canu, & Mancil, 2012; Ghanizadeh et al., 2006; Graczyk et al., 2005; Havey, 2007; Hepperlen et al., 2002; Holst, 2008; Hong, 2008; Jarque et al., 2007; Jerome et al., 1994; Kos et al., 2004; Nur, & Kavakci, 2010; Poznanski et al., 2018; Sciutto et al., 2016; Soroa et al., 2016; Snider et al., 2003; Syed & Hussein, 2010; West et al., 2005). However, no studies were found investigating ADHD in South or Central America, neither in Africa.

The pioneering study of Jerome et al., (1994), revealed that 66% of all teachers had the misconception that sugar and food additives are the cause of ADHD (Barbaresi, & Olsen, 1998; Bekle, 2004; Piccolo-Torsky, & Waishwell, 1998; West et al., 2005), or that sugar has a significant influence on hyperactivity (Herbert et al., 2004; Jerome et al., 1994; Ghanizadeh et al., 2006; Perold et al., 2010; Sciutto et al., 2000; West et al., 2005). Also, that ADHD is caused by poor parenting (Ghanizadeh et al., 2006; Norvilitis & Fang, 2005). In addition, some studies indicate that there is a relationship between ADHD knowledge and confidence to teach children with ADHD (Alkahtani, 2013; Jarque et al. 2007; Sciutto et al, 2000).

There are even fewer studies that analyse the comparison of knowledge about ADHD among pre-service teachers (PSTs) and in-service teachers (ISTs) (Anderson, Watt, & Noble, 2012; Akram et al., 2009; Bekle, 2004; Jarque, & Tárraga, 2009; Jerome et al., 1999; Kos et al., 2004). Analysing this comparison is important, because it can help to know the level of initial preparation that the university offers about teaching of ADHD, and to compare this knowledge with knowledge gained from experience. For example, the first study in this line was conducted by Jerome et al. (1999). They found similar aspects than their study in 1994. Later, Bekle (2004) found similar results by Jerome et al., (1994). It was found that ISTs had a level of knowledge around 82.85%, while PSTs around 75.15%. A decade later they found false beliefs about the diet and its prognosis. In the same year another study (Kos et al., 2004) found that the knowledge of ISTs was higher (60.7%) than the PSTs (52.6%), and the perceived knowledge was 48% and 29%, respectively, that is, both groups have a greater real knowledge than perceived knowledge. Some years later in Spain a study (Jarque, & Tárraga, 2009) found that, both PSTs and ISTs had lower knowledge (less than 50%), although slightly higher of the ISTs, results are similar like Anderson et al. (2012). On the other hand, a study in Scotia (Akram et al., 2009) found that PSTs had more knowledge than ISTs, although in general both, PSTs and ISTs, have inadequate knowledge about ADHD, specifically about treatment.

It should be noted that, in the study of Jerome et al. (1994) the average general knowledge about ADHD was significantly higher (77%) than in the study by Sciutto et

al. (2000) that was lower (47%) and Kos et al. (2004) (60%). The research of Jerome et al. (1994) made use of a different methodology, because they provided the respondents with only two response options (true or false). This meant that respondents had a 50% chance of guessing the correct answer, which could account for the higher overall score. Which Sciutto et al. (2000) and Kos et al. (2004) used three response options (true, false or don't know). The don't know answer the credibility of the true and false responses increased and made it possible to distinguish more clearly between wrong responses seen as misperceptions.

Indeed, teachers have accurate knowledge on general information, symptoms/diagnosis and treatment about ADHD. Unfortunately, only few studies have attempted to assess teachers' knowledge of ADHD suggest that teachers often lack of knowledge about ADHD. Moreover, they tend to have substantial misconceptions about origin, course, causes and treatment of ADHD (Barbaresi & Olsen, 1998; Jerome et al., 1994; Sciutto et al., 2000; Snider et al., 2003; Vereb & DiPerna, 2004; West et al., 2005). Furthermore, it was also found that teachers have received shallow or insufficient training related to ADHD (Bussing et al., 1998; Jerome et al., 1994; Sciutto et al., 2000; Kos et al., 2004). In addition, this poor knowledge about ADHD, could have serious consequences. Teachers share that they feel helpless and frustrated when unsuccessful in helping a child (Hong, 2008). Moreover, behaviour of a child with ADHD influences their ability to control or regulate their classrooms adequately, because often these children have inappropriate interaction with classmates and teachers. In fact, this lack of training can generate teacher stress (Greene et al., 2002). For example, in the study by Greene et al. it was found that children with ADHD generate teaching stress. Results indicated that children with ADHD consumed more of the teacher's total time than children without attention and behavioural difficulties. This teaching stress can trigger negative feelings toward students with ADHD and towards their own work (Stormont, 2001). In addition, the impact of having a child with ADHD can influence the teacher's interaction process with all the students in his / her classroom (Bryne, 1994; Lamute et al., 1992). In other words, this lack of knowledge of teachers about ADHD, as well as the behavior of students with ADHD, negatively affect the teaching-learning process (Anderson et al., 2017; Lawrence et al., 2018; Rogers & Tannock, 2018; Toye et al., 2019), increasing the stress of teachers (Choi, 2017; Greene et al., 1997; Raggi et al., 2003; Skaalvik, & Skaalvik, 2009).

Many studies have tried to link knowledge about ADHD and professional experience, specifically direct experience with students with ADHD. In fact, numerous studies show that teachers' knowledge about ADHD was positively correlated with years of professional experience and / or previous experience with children with ADHD (Anderson et al., 2012; Bekle, 2004; Jerome et al., 1994, 1999; Kos et al., 2004; Sciutto et al., 2000; Sciutto et al., 2016; Soroa et al., 2016; Weyandt et al., 2009).

Additionally, teachers with a strong sense of efficacy tend to exhibit higher levels of planning and organization; in fact, they are more engaged with their job. At the same time, they have more new ideas, and experiment with new methods searching better results by their students (Brouwers, & Tomic, 2000; Tschannen-Moran, & Woolfolk Hoy, 2001; Simbula et al., 2011). While, teachers with low self-efficacy experience had more difficulties in teaching than teachers with high self-efficacy, in consequence they have lower levels of job satisfaction, and higher levels of job about stress (Skaalvik, & Skaalvik, 2009). Moreover, high levels of student disruptive behaviour, lead to a low level of teachers' self-efficacy in classroom management, which lead to a higher level of teaching stress, which in turn leads to a higher level of student disruptive behaviour

further reducing the level of teachers' self-efficacy (Brouwers, & Tomic, 2000). Different studies have also linked knowledge about ADHD with feelings of self-efficacy when teaching a child with ADHD, that is, teachers who feel more competent have more knowledge about ADHD (Alkahtani, 2013; Blotnicky- Gallant et al., 2015; Jarque et al., 2007; Soroa e tal., 2016; Sciutto et al., 2000). However, other studies have not found a significant correlation between total knowledge about ADHD and their feelings of self-efficacy when working with children with ADHD (Graeper et al., 2008; Jarque & Tárrega, 2009; Poznanski et al., 2018).

Therefore, based on these previous studies, the present research has two aims: to compare the Peruvian pre-service and in-service teachers' knowledge, misconceptions and lack of knowledge about ADHD and to analyze the differences in knowledge, misconceptions and lacks of information between ISTs with and without teaching experience about ADHD. Also, we explored the relationship between Knowledge of Attention Deficit Disorders Scale (KADDS) total score and various background characteristics, a series of correlations were used.

Method

Participants

The sample was composed by 264 Peruvian teachers in total. We divided this sample in two groups. First group consisted of 112 PSTs; second group consisted of 152 ISTs. All PSTs were female, while those 124 ISTs were female and 28 were male. In regards to age, the mean of PSTs was 23 years old and 4 months (SD=1.7), while ISTs were 35 years old and 5 months (SD=6.9). The mean teaching experience of the ISTs was ranged between 1 and 10 years. Fifty-nine PSTs were preparing to be teacher of kindergarten and 53 studying to be elementary school teachers.

Table 1

Demographic information of the sample of Peruvian pre-service and in-service teachers

| | PSTs | | ISTs | |
|--|-------|-------|-------|-------|
| | N=112 | % | N=152 | % |
| Gender | | | | |
| Female | 112 | 100.0 | 124 | 81.6 |
| Male | 0 | 0.0 | 28 | 18.4 |
| Age | | | | |
| M | 23.4 | | 35.5 | |
| SD | 1.7 | | 6.9 | |
| Teaching Experience (in years) | | | | |
| 0 | 112 | 100.0 | 0 | 0.0 |
| 1-10 | 0 | 0.0 | 74 | 48.7 |
| 11-20 | 0 | 0.0 | 55 | 36.2 |
| 21 + | 0 | 0.0 | 23 | 15.1 |
| Grades Taught | | | | |
| Kindergarten | 59 | 52.7 | 46 | 30.3 |
| Elementary | 53 | 47.0 | 91 | 59.9 |
| Secondary | 0 | 0.0 | 15 | 9.9 |
| Teachers' education | | | | |
| Graduate | 112 | 100.0 | 152 | 100.0 |
| Post-graduate | 0 | 0.0 | 56 | 36.8 |
| Exposure to child with ADHD | | | | |
| Yes | 20 | 17.9 | 64 | 42.1 |
| Few months | 19 | 17.0 | 0 | 0.0 |
| 1 year | 0 | 0.0 | 29 | 19.1 |
| 2 years | 0 | 0.0 | 16 | 10.5 |
| 3 + | 0 | 0.0 | 18 | 9.1 |
| Sources of information ^a | | | | |
| Subject-matter | 89 | 79.5 | 61 | 40.1 |
| Books | 83 | 74.1 | 86 | 56.6 |
| TV/radio | 48 | 42.9 | 133 | 87.5 |
| Special courses/Talks | 14 | 12.5 | 100 | 65.8 |
| Specialized Journals | 0 | 0.0 | 20 | 13.2 |
| None | 2 | 1.8 | 5 | 3.3 |
| Self-efficacy | | | | |
| Not prepared | 63 | 56.3 | 50 | 32.9 |
| Somewhat prepared | 49 | 43.8 | 83 | 54.6 |
| Quite prepared | 0 | 0.0 | 19 | 12.5 |

The ISTs consisted of 46 kindergarten teachers, 91 of primary and 15 of secondary teachers. In addition, 56 (36.8%) ISTs had postgraduate certificate. Regarding exposure to children with ADHD, sixty-four had more than one year of experience teaching a child with ADHD, whereas eighty-eight had no experience with ADHD. The main sources of information by PSTs were subject-matter and books (79.5% and 74.1% respectively). While those ISTs were TV/radio (87.5%), special courses/talks (65.8%), and books (56.6%). The majority of PSTs felt prepared to teach children with ADHD. The other hand, the majority of ISTs with and without experience about ADHD felt somewhat prepared. Finally, the sample was selected in the same proportion of state and private schools and universities located in urban areas with no socioeconomic disadvantages in Peru, as they were excluded schools in categories D and E according to the socioeconomic classification of the districts of Lima (Apeim, 2016) (See Table 1).

Instruments

Knowledge of Attention Deficit Disorders Scale- KADDS (Sciutto et al., 2000). Is a 36-item survey designed to measure teachers' knowledge and misconceptions of ADHD. There are three content areas: associated features (i.e., general information about

the nature, causes, and prognosis of ADHD; 15 items), symptoms/diagnosis of ADHD (9 items), and treatment of ADHD (12 items). The KADDS uses a true, false, or do not know format. This format makes it possible to differentiate between what teachers do not know and their erroneous beliefs (i.e. misconceptions).

The Index of Teaching Stress-ITS (Greene et al., 1997). The questionnaire contained 90 items in two sections. In Part A (Teacher Response to Student Behaviors), teachers rated the degree to which they found 47 problematic behaviors to be stressful or frustrating as applied to each student being rated. In Part B (Teacher Perceptions of Interactions/Self-Efficacy), teachers were asked to rate 43 statements, which explored (a) their perceptions of the impact of the student upon the teacher and teaching process, (b) their sense of efficacy and satisfaction in working with the student, and (c) the nature of their interactions with other adults involved with the student. The total score of this instrument conceived as a summative measure of the distress induced in the teacher as a result of the presence of a particular student in the teacher's classroom.

Self-efficacy. To measure self-efficacy, participants also rated the extent to which they could effectively teach a child with ADHD on a 7-point likert scale.

Demographic Information Questionnaire. Respondents supplied information about their age, gender, years of teaching experience, and teaching roles. Participants also indicated whether they had ever taught a child diagnosed with ADHD.

Procedure

The recruitment of participants for this study occurred by contacting the principals of the selected schools and universities. Once contacted, the objectives of the study were explained to the ISTs and PSTs. In a collective session, those ISTs and PSTs who decided to participate completed the surveys in the presence of the second author to clarify possible doubts related to the scale. Administration of the surveys to PSTs was carried out in the final year of the degree during the last practice teaching period, one to three months before graduation. ISTs completed the surveys in their schools.

Data analysis

Due to the fact that quantitative variables didn't had normal distribution using Kolmogorov-Smirnov test, the Mann-Whitney *U* test was used to perform our first and second objectives. The Bonferroni correction was applied to determine the acceptable significance levels. Moreover, the effect size was calculated through the Rosenthal's *r* (values below 0.2 represent a small effect size, 0.3 represents a medium effect, and 0.5 represents a large effect size). To explore the relationship between pre-service and in-service teachers' knowledge about ADHD and various background characteristics, a series of correlations were used.

Results

Teachers' Background

In the case of PSTs, subject-matter correlated with knowledge about ADHD ($r = .272, p < .004$). The ISTs ADHD' knowledge correlated with post-grade education ($r = .355, p < .001$), years of experience ($r = .496, p < .001$) and experience with children with ADHD ($r = .485, p < .001$). Moreover, the ISTs with experience about ADHD, correlated with years of experience ($r = .526, p < .001$), and exposure to a child with ADHD ($r = .471, p < .001$), and self-efficacy ($r = .475, p < .001$).

Comparison of Pre-service (PSTs) and In-service (ISTs) Peruvian Teachers.

The results of the ANOVAs reveal that ISTs obtain significantly more correct answers than PSTs (MR=146.17 and MR=113.95, respectively) on the total scale, $U_{(263)} = 6434.00$, $Z = -3.395$, $p < .001$, $r = .21$, with a medium effect size. Along the same lines, ISTs have more correct answers on the general information subscale, $U_{(263)} = 5857.50$, $Z = -4.356$, $p < .001$, $r = .26$, with a medium effect size. And on treatment subscale, $U_{(263)} = 6907.50$, $Z = -2.640$, $p < .008$, $r = .16$, with small effect size. However, no significant differences were found on the symptoms/diagnosis subscale, $U_{(263)} = 7958.00$, $Z = -.915$, $p < .360$, $r = .06$ (see Table 2).

In individualized analysis of items, there were some differences. ISTs had more correct answers than PSTs in several items, for example in item 17 “*Symptoms of depression are found more frequently in ADHD children than in non-ADHD children*”. $U_{(263)} = 6704.00$, $Z = -3.857$, $p < .001$, $r = .23$. As well in item 22 “*If an ADHD child is able to demonstrate sustained attention to video games or TV for over an hour, that child is also able to sustain attention for at least an hour of class or homework*”. $U_{(263)} = 5324.00$, $Z = -6.004$, $p < .001$, $r = .37$. Nevertheless, more accurate knowledge by PSTs was found in item 34 “*Behavioral/Psychological interventions for children with ADHD focus primarily on the child's problems with inattention*”. $U_{(263)} = 6784.00$, $Z = -3.462$, $p < .001$, $r = .21$ (See Table 3).

About misconceptions, no differences were found on total scale $U_{(263)} = 7576.00$, $Z = -1.535$, $p < .125$, $r = .09$, neither on general information, $U_{(263)} = 8186.00$, $Z = -.537$, $p < .591$, $r = .03$ or treatment $U_{(263)} = 8043.00$, $Z = -.799$, $p < .425$, $r = .05$ sub-scales. However, ISTs obtain significantly more misconceptions than PSTs on the symptoms/diagnosis sub-scale, $U_{(263)} = 5246.50$, $Z = -5.845$, $p < .000$, $r = .36$, with a large effect size (see Table 2).

Table 2

Descriptive Statics of Peruvian PSTs and ISTs in each of the subscales

| | PSTs (N=112) | | | | | | ISTs (N=152) | | | | | |
|---------------------|--------------------|----------|----------------|----------|-------------------|----------|--------------------|----------|----------------|----------|-------------------|----------|
| | Accurate knowledge | | Misconceptions | | Lack of knowledge | | Accurate knowledge | | Misconceptions | | Lack of knowledge | |
| | MR | SR | MR | SR | MR | SR | MR | SR | MR | SR | MR | SR |
| General Information | 108.80 | 12185.50 | 129.59 | 14514.00 | 149.11 | 16700.50 | 149.96 | 22794.50 | 134.64 | 20466.00 | 120.26 | 18279.50 |
| Symptoms/diagnosis | 127.55 | 14286.00 | 103.34 | 11574.50 | 147.86 | 16560.50 | 136.14 | 20694.00 | 153.98 | 23405.50 | 121.18 | 18419.50 |
| Treatment | 118.17 | 13235.50 | 128.31 | 14371.00 | 146.64 | 16424.00 | 143.06 | 21744.50 | 135.59 | 20609.00 | 122.08 | 18556.00 |
| Total Scale | 113.95 | 12762.00 | 124.14 | 13904.00 | 150.99 | 16910.50 | 146.17 | 22218.00 | 138.66 | 21076.00 | 118.88 | 18069.50 |

Note: M= Mean; MR= Mean range; SR= Sum of ranks

In individualized analysis of items were found differences. More misconceptions by ISTs were discovered in some items, for example in item 16 “*Current wisdom about ADHD suggests two clusters of symptoms: One of inattention and another consisting of hyperactivity/ impulsivity*”. $U_{(263)} = 6368.00$, $Z = -5.463$, $p < .000$, $r = .33$. However, in another items PSTs had more misconceptions, for example in item 32 “*The majority of children with ADHD evidence some degree of poor school performance in the elementary school years*”. $U_{(263)} = 7008.00$, $Z = -3.420$, $p < .001$, $r = .21$. And in item 36 “*Treatments for ADHD which focus primarily on punishment have been found to be the most effective in reducing the symptoms of ADHD*”. $U_{(263)} = 7676.00$, $Z = -3.939$, $p < .000$, $r = .24$ (See Table 3).

Table 3

The most common correct answers, misconceptions, and lacks of knowledge about ADHD of Peruvian PSTs and ISTs

| Nº | Item | Sc | PST % | IST % | A |
|--------------------------|---|----|-------|-------|---|
| <i>Correct answers</i> | | | | | |
| 3 | ADHD children are frequently distracted by extraneous stimuli. | S | 92.0 | 85.5 | T |
| 21 | In order to be diagnosed as ADHD, a child must exhibit relevant symptoms in two or more settings (e.g., home, school). | S | 88.4 | 82.9 | T |
| 26 | ADHD children often have difficulties organizing tasks and activities. | S | 79.5 | 80.3 | T |
| 9 | ADHD children often fidget or squirm in their seats. | S | 74.1 | 80.3 | T |
| 11 | It is common for ADHD children to have an inflated sense of self-esteem or grandiosity. | S | 63.4 | 64.5 | F |
| <i>Misconceptions</i> | | | | | |
| 4 | ADHD children are typically more compliant with their fathers than with their mothers. | G | 67.0 | 69.7 | T |
| 28 | There are specific physical features which can be identified by medical doctors (e.g. pediatrician) in making a definitive diagnosis of ADHD. | G | 50.9 | 70.4 | F |
| 31 | Children with ADHD are more distinguishable from normal children in a classroom setting than in a free play situation. | G | 55.4 | 55.3 | T |
| 24 | A diagnosis of ADHD by itself makes a child eligible for placement in special education. | G | 44.6 | 57.9 | F |
| 23 | Reducing dietary intake of sugar or food additives is generally effective in reducing the symptoms of ADHD. | T | 54.5 | 41.4 | F |
| <i>Lack of Knowledge</i> | | | | | |
| 1 | Most estimates suggest that ADHD occurs in approximately 15% of school age children. | G | 67.9 | 65.1 | F |
| 35 | Electroconvulsive Therapy (i.e. shock treatment) has been found to be an effective treatment for severe cases of ADHD. | T | 78.6 | 53.3 | F |
| 6 | ADHD is more common in the 1st degree biological relatives (i.e. mother, father) of children with ADHD than in the general population. | G | 55.4 | 44.1 | T |
| 15 | Side effects of stimulant drugs used for treatment of ADHD may include mild insomnia and appetite reduction. | T | 67.0 | 30.3 | T |
| 29 | In school age children, the prevalence of ADHD in males and females is equivalent. | G | 61.6 | 35.5 | F |

Note: Sc= Sub-scale; G= General Information, S= Symptoms-Diagnosis, T= Treatment; A= Answer: T=true, F=False

In relation to lack of knowledge, the PSTs obtain significantly more lacks of knowledge on total scale than ISTs (MR=150.99 and MR=118.88, respectively), $U_{(263)} = 6441.50$, $Z = -3.382$, $p < .001$, $r = .21$ with a medium effect size. No differences were found

on the general information sub-scale, $U_{(263)} = 6651.50$, $Z = -3.047$, $p < .002$, $r = .19$, or symptoms/diagnosis sub-scale, $U_{(263)} = 6791.50$, $Z = -2.882$, $p < .004$, $r = .18$, neither on treatment sub-scale, $U_{(263)} = 6928.00$, $Z = -2.608$, $p < .009$, $r = .16$ (see Table 2).

Differences were found in the individualized analysis of some items. The majority of these items evidenced more lacks of knowledge by PSTs than ISTs. For example, in item 7 “*One symptom of children with ADHD is that they have been physically cruel to other people*”. $U_{(263)} = 6552.00$, $Z = -4.307$, $p < .000$, $r = .27$. Or in item 15 “*Side effects of stimulant drugs used for treatment of ADHD may include mild insomnia and appetite reduction*”. $U_{(263)} = 5388.00$, $Z = -5.904$, $p < .000$, $r = .36$. As well in item 20 “*In severe cases of ADHD, medication is often used before other behavior modification techniques are attempted*”. $U_{(263)} = 6448.00$, $Z = -4.214$, $p < .000$, $r = .26$. However, in item 25 “*Stimulant drugs are the most common type of drug used to treat children with ADHD*”. $U_{(263)} = 6592.00$, $Z = -3.694$, $p < .000$, $r = .22$, more lacks of knowledge were found in ISTs than PSTs (See Table 3).

Comparison of In-service (ISTs) Peruvian Teachers with and without Teaching Experience with ADHD.

To perform our second objective, we compare the KADDS scores of ISTs with experience teaching with a child with ADHD ($n=64$) and ISTs without teaching experience with ADHD ($n=88$). To compare the relationship between ISTs stress and teaching experience with child with ADHD, was used the Mann-Whitney U test. Peruvian ISTs with experience about ADHD, had higher levels of teaching stress ($U_{(263)} = 255.50$, $Z = -4.321$, $p < .001$, $r = .27$). Also, they felt more self-efficacy teaching a child with ADHD ($U_{(263)} = 1169.50$, $Z = -6.349$, $p < .001$, $r = .39$).

In relation to KADDS scores, results show that, the ISTs with experience about ADHD had more accurate knowledge on the total scale ($U_{(263)} = 1169.00$, $Z = -6.002$, $p < .001$, $r = .37$) than ISTs without experience. As well as, on general information sub-scale ($U_{(263)} = 1630.50$, $Z = -4.460$, $p < .001$, $r = .27$), on symptoms/diagnosis sub-scale ($U_{(263)} = 1142.00$, $Z = -6.323$, $p < .000$, $r = .39$), and on treatment ($U_{(263)} = 1501.00$, $Z = -4.768$, $p < .001$, $r = .29$).

The ISTs without experience about ADHD had more misconceptions on symptoms/diagnosis sub-scale ($U_{(263)} = 1906.50$, $Z = -4.627$, $p < .001$, $r = .28$) than ISTs with experience.

Finally, the ISTs without experience about ADHD had more lack of information on the total scale ($U_{(263)} = 1273.50$, $Z = -5.697$, $p < .001$, $r = .35$) than ISTs with experience. Also on the general information sub-scale ($U_{(263)} = 1431.50$, $Z = -5.203$, $p < .001$, $r = .32$), on symptoms/diagnosis sub-scale ($U_{(263)} = 1219.00$, $Z = -6.145$, $p < .001$, $r = .38$), and on treatment sub-scale ($U_{(263)} = 1778.00$, $Z = -3.827$, $p < .001$, $r = .24$).

Discussion and Conclusions

The present study compares the knowledge, misconceptions and lack of knowledge of Peruvian PSTs and ISTs about ADHD. At the same time, the differences between ISTs with and without experience about ADHD are compared. Furthermore, the study also explores the relationship between KADDS in total score and various background characteristics.

Our findings indicated that ISTs had more correct answers than PSTs in total scale, concerning on general information and treatment subscales. This pattern of results is in accordance with the results of international research about ADHD knowledge (Anderson et al., 2012; Bekle, 2004; Jarque, & Tárraga, 2009; Jerome et al., 1999; Kos et al., 2004; Scitutto et al., 2016; Soroa et al., 2016; Weyandt et al., 2009).

However, ISTs obtained significantly more misconceptions than PSTs on symptoms/diagnosis sub-scale. In contrast, PSTs obtained more lacks of knowledge on total scale. In general, the PSTs' and the ISTs' knowledge of ADHD were insufficient, like several other studies demonstrated as well (Anderson et al., 2012; Akram et al., 2009; Jarque, & Tárraga, 2009; Kos et al., 2004). The subject matter of PSTs correlated with their knowledge of ADHD as the study by Kos et al. (2004). Similar to other studies (Jarque, et al., 2007; Jerome et al., 1994; Kos et al., 2004; Scitutto et al., 2000), our findings show that the knowledge of ISTs correlated with post-grade education, years of experience and the exposure to children with ADHD. Moreover, self-efficacy correlated with years of experience and exposure to a child with ADHD. Similar relationships were found by Jarque and Tárraga (2009) and Scitutto et al., (2000). In addition, this study discovered that, ISTs feel more stressed in teaching children with ADHD which is congruent to other studies (Bussing et al., 2002; Greene et al, 1997, 2002; Kyriacou, & Chien, 2009).

Both groups have similar scores about correct answers, for example concerning to the idea that *children with ADHD are frequently distracted by extraneous stimuli*. Both samples have an accurate knowledge of around 90%. About 85% knew that, *a child must exhibit relevant symptoms in two or more settings*. Also, around 80% are aware of the fact that *ADHD children often have difficulties organizing tasks and activities*. Approximately 75% of two groups are conscious of hyperactivity so that consequently *ADHD children often fidget or squirm in their seats*. Around 60% of PSTs and ISTs knew that *ADHD children have an inflated sense of self-esteem or grandiosity* (APA, 2014). However, differences were discovered in individualized items. In some items, the ISTs had more correct answers than PSTs. For example, the ISTs recognized that *symptoms of depression are found more frequently in ADHD children than in non-ADHD children*.

In relation to misconceptions, our study showed that Peruvian PSTs' and ISTs' most common misconceptions are those which were also identified in other studies, like mainly those from USA (Bekle, 2004; Canu, & Mancil, 2012; Graczyk et al., 2005; Jerome, et al., 1994; Piccolo-Torsky, & Waishwell, 1998; Hepperlen, et al., 2002; Snider, et al., 2003) and other countries (Alkahtani, 2013; Akram et al., 2009; Bekle, 2004; Brook et al., 2000; Ghanizadeh et al., 2006 ; Havey, 2007; Holst, 2008; Hong, 2008; Jarque, et al., 2007; Kos et al., 2004; Nur & Kavakci, 2010; Syed & Hussein, 2010; West et al., 2005). One of the main misconceptions is the belief that *sugar elimination diets are effective for reducing ADHD symptoms*, which almost 50% of PSTs and ISTs supposed wrongly. Throughout the years of research, this misconception continues to be among the most common about ADHD treatment. No scientific argument can be found for the influence of the diet as the cause of ADHD, or a diet change could influence the severity of symptoms (DuPaul, & Stoner, 2003; Ghanizadeh et al., 2006; Jerome et al., 1994; Perold et al., 2010; Scitutto et al., 2000; West et al., 2005). Another common misconception is related to the idea that *ADHD children are typically more compliant with their fathers than with their mothers*. Indeed, they are rated routinely as manifesting lower levels of symptoms by their fathers than their mothers (DuPaul, Barkley, & Connor, 1998; Tallmadge, & Barkley, 1983). There are some reasons for this misconception. One motive is for example the misbelief that employed mothers may feel more pressured, and

therefore tend to be more nervous and put more restrictions on their children, which make the child's symptoms greater (Webster-Stratton, & Hammond, 1997). Another possible reason is that, mothers often talk more with their child, repeat the instructions several times, or even use affection as a mean for the child to fulfill its obligations; while fathers do the opposite, they also impose more serious and direct discipline (Barkley, 2014). However, there were differences between PST and ISTs in some items. For example, ISTs showed more misconceptions than PSTs. For example, ISTs showed more misconceptions than PSTs concerning their latest knowledge about ADHD which refers to *two clusters of symptoms: One of inattention and another consisting of hyperactivity/impulsivity* (APA, 2014, DuPaul et al., 1997). The PSTs had more misconceptions than ISTs about the *poor school performance in the elementary school years of children with ADHD* (DuPaul, & Stoner, 1994). The PSTs mistakenly believe that *Treatments for ADHD which focus primarily on punishment have been found to be the most effective in reducing the symptoms of ADHD* (DuPaul & Stoner, 1994). These findings could be explained because the ISTs received university training more years ago than the PSTs and, in many cases, there was no training on ADHD in the curricula.

Several knowledge gaps of PSTs, as well as, of ISTs were found in this study. For example, more than 65% of PSTs and ISTs don't know anything about the *high prevalence of ADHD*. Given the extensive research on this topic that is a rather surprising fact (Criado-Álvarez & Romo-Barrientos, 2003; Polanczyk et al., 2007; Polanczyk et al., 2015; Saavedra-Castillo, 2001). Most of PSTs and almost 50% of ISTs don't know that *electroconvulsive therapy is not even effective in severe cases*. Another lack of knowledge is about *the family relationship in the transmission of the disorder*. A fact that surprises because of the great scientific research that supports this aspect (Bralten et al., 2013; Cortese, 2012; Song et al., 2009; Stergiakouli et al., 2015; Thapar et al., 2007). The majority of PSTs doesn't know the *side effect of stimulant drugs used for treatment of ADHD*. Finally, there were numerous differences in several items between PSTs and ISTs groups. In general, PSTs had more knowledge gaps than ISTs. For example, PSTs weren't conscious about the idea that *“One symptom of ADHD children is that they have been physically cruel to other people”* (APA, 2000). Neither they knew about the fact that *“side effects of stimulant drugs used for treatment of ADHD may include mild insomnia and appetite reduction”* (DuPaul et al., 1998), nor they knew anything about the use of medication in severe cases, before the use of other treatment technique (Jensen et al., 2001). Nevertheless, more ITSs than PSTs were unaware about the aspect that stimulant drugs are the most common use to treat children with ADHD (DuPaul, et al, 1998). In conclusion, the knowledge of PSTs as well as ISTs was insufficient. However, both groups clearly showed most knowledge in the sub-scale of symptoms/diagnosis. Nevertheless, they had many misconceptions and knowledge gaps around central axes of ADHD.

Our data also show a positive correlation between knowledge about ADHD and feelings of self-efficacy, both in PSTs and ISTs, as in studies previously carried out in different countries (Alkahtani, 2013; Blotnicky-Gallant et al., 2015; Jarque et al., 2007; Sciutto et al., 2000; Sciutto et al., 2016; Soroa et al., 2016; Weyandt et al., 2009), which is not strange, since these socio-economic demographics variables can constitute different sources of information about ADHD (Sciutto et al., 2016). However, other studies have not found a relationship between knowledge about ADHD and professional experience (Jarque & Tárrega, 2009; Poznanski, Hart, & Cramer, 2018).

Our work shows that it is the ISTs with direct experience with a child with ADHD, who have the greatest feelings of self-efficacy, although they are also the ones who

experience higher levels of teacher stress, as other studies have shown (Choi, 2017; Greene et al., 1997; Skaalvik & Skaalvik, 2009), possibly because direct experience with children with ADHD over several years makes them more realistic about the difficulties they may face in their classes. Previous experience in the education of children with ADHD makes them feel more competent when teaching in the classroom, but at the same time also more stressed because they are aware of the daily difficulties they have to face.

Limitations and Future Research

Our results further underline the urgent need for training of both groups, PSTs and ISTs, to improve the knowledge of ADHD. Our study also reveals the influence of some socio-demographic variables in this process. Nevertheless, several limitations should be mentioned that can affect the reach of the results. One of the main limitations is the selection of the teachers. We used a convenience sampling from the city of Lima (Peru). For this reason, the results cannot be generalized to the whole country. In future studies, it would be interesting to examine other areas and cities in Peru to generalize and confirm the results. Another limitation is the fact that, the teachers' academic records were not considered in the study. It is possible that teachers with higher academic marks would also have more knowledge about ADHD. Another possible limitation is related to the applied scale. The closed-response scale only provides a superficial view of the teachers' knowledge and beliefs about ADHD. Additionally, the different consequences of misconceptions should also be investigated and compared to the lack of information.

Implications for Practice

Despite the previously mentioned restrictions our findings have important educational repercussions. This study provides important information by differentiating between what teachers' don't know from what they erroneously think they know. In addition, this study coincides with many others about of misconceptions. Which show that misconceptions are resistant to change over time. An example for such a long-standing misconception is the belief that less sugar and additives in the diet can reduce ADHD. Moreover, lack of knowledge can make some teachers persist in their misconceptions, and they may lead to further expansion of incorrect information. For this reason, more empirical studies that refute erroneous knowledge are necessary.

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Fecha de recepción: 29/07/2019

Fecha de revisión: 15/10/2020

Fecha de aceptación: 22/12/2020

