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Cross-National Comparisons of Teachers' Knowledge and Misconceptions of ADHD

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Only the order of the first two authors reflects relative contribution to the manuscript. All remaining authors made equal contributions to the study. Remaining authors are listed in alphabetical order by country.

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Abstract

Attention-Deficit/Hyperactivity Disorder (ADHD) is among the most prevalent disorders of childhood and adolescence worldwide. Teachers are likely to play an important role in multiple stages of the help-seeking process (e.g., problem recognition) for children with ADHD. This study examined the relationship of prior exposure and ADHD training with teachers' knowledge and misconceptions of the disorder in a multinational sample. Teachers (N = 2,307) from nine countries (Czech Republic, Germany, Greece, Iraq, the Republic of Korea, Saudi Arabia, South Africa, United States, and Vietnam) completed measures of ADHD knowledge, prior exposure, and education/training related to ADHD. There was considerable variability in overall levels of knowledge and specific misconceptions across the countries sampled. Although the predictors of ADHD knowledge varied considerably across countries, some form of professional training and prior exposure to ADHD was associated with greater knowledge in the majority of countries. Implications for teacher training and the role teachers can play in the help-seeking process are discussed.

Keywords: Attention-Deficit/Hyperactivity Disorder (ADHD); cross-national; knowledge; misconceptions; teacher training.

Cross-National Comparisons of Teachers' Knowledge and Misconceptions of ADHD

Attention-Deficit/Hyperactivity Disorder (ADHD) is among the most prevalent disorders of childhood and adolescence. Worldwide prevalence rates center around 5% and range from 1% to 20% among school-aged children (Faraone, Sergeant, Gillberg, & Biederman, 2003; Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). The variability in prevalence rates across countries has led some researchers to question whether the ADHD diagnosis simply reflects the norms and biases of western cultures (J. C. Anderson, 1996; Timimi & Taylor, 2004). However, research demonstrating cross-cultural commonalities in etiology, symptom expression, and treatment outcomes supports that ADHD is not a "culturally constructed" disorder (Bauermeister, Canino, Polanczyk, & Rohde, 2010; Brewis, Schmidt, & Meyer, 2000; Rohde et al., 2005; Wolraich et al., 2003). Much of the variability in prevalence seen across countries has been attributed to differences in diagnostic criteria or study method (Polanczyk et al., 2007). However, the fact that there is such variability in diagnostic practices across countries is significant in itself (Conrad & Bergey, 2014). Variations in diagnostic practices, medication treatment prevalence, medical payment systems, school system policies, and cultural attitudes may influence the availability of and access to services for ADHD (Hinshaw et al., 2011). Therefore, culture and environment may play an important role in the help-seeking process for ADHD.

Models of help-seeking behavior for mental disorders depict four core stages: problem recognition, the decision to seek help, service selection, and service utilization (Andersen, 1995; Eiraldi, Mazzuca, Clarke, & Power, 2006). These models offer a framework for understanding how children with ADHD are identified and the pathways that their families pursue for treatment. Further, these models highlight potential avenues through which

culture and environment may exert an influence on the identification and treatment of ADHD. In the early stages, culture may provide important risk and protective factors and it may influence the threshold for pathological behavior (Canino & Alegría, 2008). In addition, once a problem has been identified, culture and environment may influence the decision to seek help or the perceptions of interventions (Bauermeister et al., 2010; Mah & Johnston, 2007).

Although much of the help-seeking process depends on the decisions of parents or guardians, teachers may also play an important role. Teachers are often the first source of referral for children with ADHD (Sax & Kautz, 2003; Snider, Frankenberger, & Aspenson, 2000) and they provide observational data for ADHD evaluations. They are also often called upon to implement educational interventions and provide feedback on treatment progress. Therefore, teachers' knowledge and misconceptions of ADHD may play an influential role throughout the help-seeking process (Canu & Mancil, 2012; Ohan, Cormier, Hepp, Visser, & Strain, 2008).

Teachers' Knowledge of ADHD

There is considerable research on North American teachers' understanding of ADHD and how this knowledge is related to their attitudes and behavior (Canu & Mancil, 2012; Hepperlen, Clay, Henly, & Barké, 2002; Pisecco, Huzinec, & Curtis, 2001; Power, Hess, & Bennett, 1995; Sciutto, Nolfi, & Bluhm, 2004; Sciutto, Terjesen, & Bender Frank, 2000; Vereb & DiPerna, 2004). There is also a growing body of research looking at teachers' knowledge and beliefs about ADHD in other countries including Australia (D. L. Anderson, Watt, Noble, & Shanley, 2012; Kos, Richdale, & Jackson, 2004; Ohan et al., 2008; West, Taylor, Houghton, & Hudyma, 2005), Iran (Ghanizadeh, Bahredar, & Moeini, 2006), Israel

(Brook, Watemberg, & Geva, 2000), the Republic of Korea (Hong, 2008), Scotland (Akram, Thomson, Boyter, & McLarty, 2009), Spain (Fernández, Mínguez, & Casas, 2007), and South Africa (Perold, Louw, & Kleynhans, 2010). However, there is relatively little research that systematically examines teachers' ADHD knowledge across countries (see Curtis et al., 2006; Jerome, Gordon, & Hustler, 1994; Norvilitis & Fang, 2005 for exceptions). The cross-national studies that do exist suggest that knowledge and attitudes about ADHD may vary across countries and are linked to training (Hinshaw et al., 2011).

Areas of ADHD Knowledge and Misconceptions. Several surveys have been constructed to measure ADHD knowledge and misconceptions. With the exception of Jerome's (1994) scale, which uses a True-False format, the other measures use a "True-False-Don't Know" format to distinguish guessing from misconceptions to the best possible extent (see Sciutto et al., 2000). Among the most commonly reported measures in publications are the Knowledge of Attention Deficit Disorders Scale (KADDS; Sciutto et al., 2000), the Knowledge and Beliefs Questionnaire (Kos et al., 2004), and the Knowledge about Attention Deficit Disorder Questionnaire (KADD-Q; West et al., 2005). Research using these measures has indicated that teachers are typically more knowledgeable about the basic symptoms and diagnosis of ADHD than about treatments, associated features (e.g., situational variation), and the etiology of ADHD. This pattern of results has been documented consistently using a variety of knowledge measures and in multiple countries (D. L. Anderson et al., 2012; Herbert, Crittenden, & Dalrymple, 2004; Jerome et al., 1994; Ohan et al., 2008; Perold et al., 2010; Sciutto et al., 2004, 2000; Vereb & DiPerna, 2004; West et al., 2005).

Studies of teachers' ADHD knowledge have also consistently identified common misconceptions. For instance, the belief that sugar has a significant influence on hyperactivity has been endorsed by a high percentage of teachers in Australia (West et al., 2005), Canada (Jerome et al., 1994), Iran (Ghanizadeh et al., 2006), South Africa (Perold et al., 2010), and the U.S. (Herbert et al., 2004; Sciutto et al., 2000). Other common misconceptions have been cited in multiple studies including the belief that prolonged stimulant use leads to abuse or addiction (Canu & Mancil, 2012; Snider, Busch, & Arrowood, 2003), that other dietary modifications (e.g., food additives) are effective in treating ADHD (Canu & Mancil, 2012; Ohan et al., 2008; West et al., 2005; Weyandt, Fulton, Schepman, Verdi, & Wilson, 2009), and that ADHD is caused by poor parenting (Ghanizadeh et al., 2006; Norvilitis & Fang, 2005).

Although specific misconceptions have been documented, research has not directly linked these misconceptions to teacher behaviors or experiences. Canu and Mancil (2012) suggest that specific misconceptions might be particularly important for the recognition, assessment and treatment of ADHD. For instance, a misconception that children with ADHD have an inflexible adherence to routines and rituals (i.e., a characteristic of autism) may interfere with problem recognition. Similarly, they suggest that an incorrect belief that stimulants lead to addiction might result in counterproductive recommendations such as dietary restrictions. Although this assertion has not been tested empirically with teachers, Sciutto (2015) found that college students' specific misconceptions about ADHD differentially predicted the acceptability of specific treatment alternatives.

ADHD Knowledge, Training, and Prior Experience with ADHD. Direct interaction with children who have ADHD may involve several key sources of information about the

disorder, including exposure to the symptoms of ADHD, information about diagnostic criteria, and participation in interventions. Thus, it is expected that personal interactions with a child diagnosed with ADHD would lead to increased knowledge of the characteristics of the disorder. Results from studies in various countries have documented higher levels of knowledge among teachers who have had more direct exposure to ADHD (Fernández et al., 2007; Kos et al., 2004; Perold et al., 2010; Sciutto & Terjesen, 2004; Sciutto et al., 2000) . Some research also suggests that the relationship between direct experience and knowledge may lead to stronger attitude certainty among teachers, with this greater confidence potentially resulting in more consistent implementation of behavior management or pedagogical strategies (D. L. Anderson, Watt, & Shanley, 2014).

In addition to direct interaction with children diagnosed with ADHD, more training and greater exposure to information about the disorder has been associated with higher levels of ADHD knowledge. For the most part, research with teachers in multiple countries has supported a link between ADHD knowledge and the extent of prior training related to ADHD. Specifically, teachers who report having read more professional articles or who have attended ADHD training workshops tend to score higher on measures of ADHD knowledge (Fernández et al., 2007; Jones & Chronis-Tuscano, 2008; Kos et al., 2004; Perold et al., 2010; West et al., 2005).

The purpose of the current study was to examine cross-national variations in teachers' knowledge and misconceptions about the symptoms and diagnosis, treatment, and associated features of ADHD. Specifically, we explored the relationship of ADHD knowledge and specific misconceptions with professional training and prior experiences with ADHD. A greater understanding of ADHD knowledge and misconceptions, and their relation to prior

experiences, may shed light on the help-seeking process and may inform training programs related to ADHD.

Method

Participants

A total of 2,307 teachers from nine different countries participated in this study. A breakdown of teacher demographic characteristics by country is presented in Table 1. Overall, the majority of respondents in all countries were female. In general (i.e., middle 50%), teachers were within the age range of 30 to 48 with Vietnam having the lowest mean age and Germany having the highest. With regard to years of teaching experience, the middle 50 percent of the entire sample had been teaching between 5 and 21 years with Vietnam having the lowest mean level of experience and Germany having the highest.

Teachers provided information on their current school placements. In general, most of the teachers reported that their current position was in a general education classroom (i.e., not a special education placement) and most teachers (87% overall) were employed in a public or government funded school setting. Approximately half (51%) of the teachers described the location of their school as urban, with approximately equal proportions of participants working in rural or suburban locations. Descriptive statistics on the teachers' school placements by country are presented in Table 2.

Materials

Knowledge of Attention Deficit Disorders Scale (KADDS; Sciutto et al., 2000). The KADDS is a 36-item survey designed to measure teachers' knowledge and misconceptions of ADHD in 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 the *treatment* of ADHD (12 items). The KADDS uses a true (T), false (F) or don't know (DK) format. This format allows for potential differentiation of what teachers *do not know* from what they believe incorrectly (i.e., misconceptions). For the purposes of this study, we computed two separate scores: *misconceptions* (total number of incorrect answers) and *knowledge* (total number of correct answers). For example, if a teacher answers 20 items correctly, 11 incorrectly, and chooses "Don't Know" for 5 items, her knowledge score would be 20 and her misconceptions score would be 11. "Don't Know" responses are not counted toward the knowledge or misconceptions scores. In addition to the original KADDS items, three items currently under development were added for this study but were not included in calculation of total knowledge or misconception scores.

In previous studies with U.S. samples, internal consistency of the KADDS total score has ranged from .82 to .89 (Herbert et al., 2004; Sciutto et al., 2004, 2000). Subscale reliability is more variable and tends to be lower ($.52 < \alpha < .75$). Two-week test-retest correlations for the KADDS total and subscale scores are moderate to high ($.59 < r < .76$; Sciutto & Terjesen, 2004). With regard to validity, prior research with U.S. samples suggests that KADDS scores are sensitive to educational interventions (Sciutto & Terjesen, 2004) and are positively related to the extent of prior experience with ADHD students (Sciutto et al., 2004), confidence in recognizing ADHD (Herbert et al., 2004), and the amount of exposure to research or courses on ADHD (Sciutto et al., 2004). Studies of teachers outside of the U.S. have found comparable psychometric properties. For instance, internal consistency of the KADDS total score has been good ($\alpha > .80$) in Spain (Fernández et al., 2007), Saskatchewan

(Hepp, 2009), and South Africa (Perold et al., 2010). Data from these samples also provide evidence to support the validity of the KADDS. Higher KADDS scores have been associated with greater prior exposure to children with ADHD, general level of training (i.e., in-service vs. pre-service), and greater exposure to information about ADHD (Fernández et al., 2007; Hepp, 2009; Perold et al., 2010). To date, however, there are no studies investigating the dimensional equivalence of the KADDS across countries.

Teacher Background Survey. Teachers answered a series of questions about their demographic characteristics (i.e., age, gender, education level, years of teaching experience), their current teaching position (i.e., grades taught, special education placement, typical class size) and their current school environment (i.e., public or private school, geographic location). Teachers also provided information about their professional experience related to ADHD. Specifically, they estimated how many children with ADHD that they have taught and indicated if they currently had a child with ADHD in their class. They also indicated if they had a close friend or family member who had been diagnosed with ADHD. With regard to ADHD training, teachers estimated the number of professional articles/papers they have read related to ADHD. They also estimated the number of ADHD-specific workshops or service trainings that they have ever attended. Finally, teachers estimated the number of their college or graduate courses that covered ADHD in detail (i.e., more than one class period). Descriptive statistics on teachers' professional experience with ADHD are presented in Table 3.

Procedure

Teachers in each of the 9 countries completed a measure of ADHD knowledge followed by the teacher background survey. All countries used the same materials, but the survey was adapted based on specific differences across countries (e.g., types of educational degrees available, classification of schools and grade levels). Details about recruiting procedures, geographic details, and survey translations for each country are summarized in the following text.

Czech Republic. We contacted the heads of schools within all regions of the Czech Republic (i.e., 13 districts and Prague) with a request to carry out the study in their schools. Teachers had the option of completing the materials online or in written form. We distributed a total of 1115 surveys and received 482 (43.2%) fully completed surveys from 114 primary and secondary schools. The survey was translated from English to Czech language using the back translation method. No incentive was provided for participation.

Germany. We recruited teachers from elementary and lower-track secondary schools in three districts located in Bavaria (the South of Germany). We sent surveys to school headmasters who consented to participate. We provided enough surveys for all teachers in the schools (N = 1016) and received 350 (34.5%) usable responses. The survey was translated from English to German, retranslated to English by another person and then checked for consistency by another, bilingual person. No incentive was provided for participation.

Greece. We recruited teachers from public and private schools located in 5 regions of Greece: Attica (46%), Central Macedonia (23%), Peloponnese (17%), Central Greece (8%) and Thessaly (6%). We sent surveys (hard copy and electronic) to head teachers of

randomly chosen primary and secondary schools that agreed to participate. We distributed a total of 305 surveys and received 198 (64.9%) usable responses. The English version of the survey was adapted into Greek language using a translation-back-translation procedure by two English language teachers. No incentive was provided for participation.

Iraq. We recruited teachers from the Erbil governorate in the northern region of Iraq We provided school administrators from 16 primary and secondary schools (first through ninth grade) a brief description of the study and answered questions via follow-up phone calls and school visits. We distributed a total of 360 surveys (all hard copy) and received 200 (55.6%) fully completed responses. The survey was translated from English to Arabic by one of the researchers and was reviewed by an Arabic linguistic specialist. No incentive was provided for participation.

Republic of Korea. We sent the survey to 10 different primary and secondary schools, mostly from Pusan (the second largest city in Korea, located in the Southeast). Some surveys were distributed in person and others were completed online. We distributed a total of 300 surveys and received 146 (48.7%) fully completed responses. The survey was translated into Korean and back-translated to English to check the validity of the translation. There was a raffle for a $100 gift certificate from a major department store chain in Korea for participating in the survey.

Saudi Arabia. We recruited participants from 37 randomly selected schools (preschool through ninth grade school) in the middle region of Saudi Arabia. All teachers in this sample were working in single-sex schools. We distributed a total of 2000 surveys and received 429 (21.5%) usable responses. The questionnaire was translated from English to

Arabic by one of the researchers and a professional translator, and back-translated by a second professional translator who had no knowledge of the English version. Three faculty members from the department of special education who are bilingual in Arabic and English verified accuracy of the translation. No incentive was provided for participation.

South Africa. We contacted principals from 20 primary and 20 high schools randomly selected from a database of schools within the Western Cape (one of nine provinces in South Africa). We explained the purpose of the study and requested consent to distribute the surveys. We distributed approximately 250 surveys and received 212 (84.8%) usable responses. Teachers completed an English version of the survey either online or in person. No incentive was provided for participation.

United States. A total of 159 teachers provided usable data. We sent a brief description of the purpose of the study and an internet link to colleagues working with school districts in several regions of the United States. Because surveys were distributed entirely online for this sample, it is not possible to estimate the total number of teachers contacted for participation. Respondents were primarily from the Northeastern (58%) and Southern states (34%). Teachers completed the English version of the survey. No incentive was provided for participation.

Vietnam. Participants included teachers from various school districts located in or near a large metropolitan area in northeastern Vietnam. All participants were recruited from the local schools that were affiliated with the faculty at the Hanoi National University of Education (HNUE). We distributed approximately 150 surveys and received 131 (87.3%) usable responses. The questionnaire was translated, back-translated, and edited by a

Vietnamese psychology student along with faculty members from HNUE and St. John's University. Teachers also completed measures of teacher affect, cognitions, and behavior, which were included as part of a separate study. Teachers received $10 for completing the measures for both studies.

Results

Reliability

Cronbach's alpha values for the total knowledge and misconception scores are presented in Table 4. Overall, the total knowledge scores had adequate internal consistency with six of the nine countries having alpha levels at or above .70. The Cronbach's alpha for two other countries, Germany and Saudi Arabia, were just below that level at .69 and .67, respectively. The lowest reliability was from Iraq (alpha = .48). For the most part, alpha levels for the misconception total scores were low, ranging from .38 (Iraq) to .67 (Greece). Consistent with prior research, internal consistency for the KADDS subscales were lower (none exceeded .71) than alpha scores for the total scale. This is expected given the lower number of items, but also suggests that interpretation of subscales may not be warranted. Therefore, we restricted inferential analyses to KADDS scores for which there was a Cronbach's alpha of .6 or greater. Alpha levels exceeded .6 for all three subscales (i.e., associated features, symptoms/diagnosis, treatment) in only one country (South Africa) and for the misconceptions total score in only four countries (Greece, Korea, South Africa, Vietnam). One reason for low internal consistency on the subscales or in some countries might be that the dimensions assessed by the KADDS are not equivalent across countries. Because sample sizes for most of the countries fell below general guidelines recommended for factor analysis (Tabachnick & Fidell, 2012), we did

not evaluate the dimensional structure of the KADDS across samples. Consequently, for the remainder of the results, we did not conduct inferential analyses of KADDS subscale scores or total misconception scores. Instead, we focused on the analysis of overall knowledge scores and descriptive data on specific misconceptions.

Knowledge and Misconceptions

Across all eight countries, there was a weak positive correlation between total knowledge scores and total misconception scores, r (1998) = .12, p < .001[1]. Teachers scoring high in knowledge were likely to score somewhat higher on misconceptions. Correlations between knowledge and misconceptions were positive and weak to moderate in seven of the eight countries. However, there was a moderate negative correlation for teachers from the Czech Republic, r (478) = - .45, p < 001. The median correlation between misconceptions and knowledge for individual countries was .26.

We conducted a one-way analysis of variance to evaluate differences in KADDS total knowledge scores across the countries for which Cronbach's alpha was above .6. There was a significant difference in total knowledge scores among the eight countries[2], F(7, 2096) = 421.99, p < .001, $\eta^2_{overall}$ = .585. Because the homogeneity of variance assumption was violated and there were unequal sample sizes, we conducted pairwise comparisons using the Games-Howell correction to evaluate differences in knowledge between specific countries. Descriptive statistics for each country and pairwise comparison are reported in Table 4. Overall, teachers in the United States, the Czech Republic, and Germany were highest in overall knowledge while Saudi Arabia, Vietnam, and the Republic of Korea had the lowest scores.

[1] Data from Iraq were not included for any analyses of overall knowledge scores.

In addition to total knowledge scores, we also examined the percentage of KADDS items scored as misconceptions. The misconception scores by country are presented in Table 4. However, as mentioned above, we did not conduct inferential analyses using total misconception scores because of low levels of internal consistency in five of the nine countries. However, an examination of the frequency of specific misconceptions is still potentially valuable. Percentages of common misconceptions by country are reported in Table 5. We selected misconceptions that were among the five most common misconceptions for multiple countries in the study. In general, these misconceptions were observed in more than a third of teachers across countries. While there was some variability in specific misconceptions by country, there appear to be some misconceptions that consistently warrant attention. Consistent with prior research, many teachers responded incorrectly to questions about dietary interventions. For instance, 38 percent of teachers across all countries believed that sugar elimination diets have been shown to reduce the symptoms of ADHD. In other areas, 28 percent of teachers across all countries believed that there are specific physical features of ADHD that can be identified in a medical examination and 38 percent believed that an inflexible adherence to specific routines or rituals is a characteristic of ADHD.

ADHD Knowledge, Training and Prior Experiences

We examined KADDS scores in relation to a range of variables that might be expected to influence teachers' knowledge of the disorder. Specifically, we focused on teachers' prior training experience with ADHD (i.e., articles, workshops, coursework) and variables that are likely to be reflective of personal exposure to the disorder (i.e., years teaching, personal contact). It is important to note, however, that teachers' knowledge of

ADHD may also influence their willingness to seek additional training or interact with ADHD populations. The nature of our design does not permit definitive conclusions about whether training influences knowledge or vice versa. Because teachers may not be able to accurately recall the precise number of articles read or workshops taken over the years, we used ordinal response categories (e.g., none, 1 or 2, 3 or 4, etc.) to get broad estimates of teachers' prior ADHD training. To analyze the relationship of ADHD knowledge to prior training, we conducted a series of Spearman rank order correlations for each of the prior training variables (i.e., articles read, workshops attended, courses taken) in each country. We also correlated knowledge scores with the prior exposure variables. Specifically, we examined years of teaching experience and personal experience with someone diagnosed with ADHD. The amount of teaching experience is potentially relevant for knowledge because of the increased opportunities for personal interaction with ADHD in an academic context (Bell, Long, Garvan, & Bussing, 2011). Personal experience with someone diagnosed with ADHD is potentially relevant because it may involve several key sources of information about the disorder, including exposure to the symptoms of ADHD, information about diagnostic criteria, and participation in interventions. Zero-order correlations of ADHD knowledge with prior training and experience variables are presented in Table 6.

To examine whether similar factors predict ADHD knowledge in different countries, we conducted a series of simultaneous regression analyses using professional training (i.e., articles, workshops, courses) and prior exposure variables (i.e., teaching experience, personal contact) as predictors of total KADDS scores. Because the interpretation of ordinal level predictors may be problematic in linear regression (Tutz & Gertheiss, 2014), we converted each of the professional training variables to a categorical variable reflecting

either the presence or absence of that form of training (e.g., attended a workshop or not). Thus, a one-unit change in the regression weights can be interpreted as the degree of change in the criterion (e.g., knowledge) associated with having participated in some level of that form of training. Results of the regression analyses are presented in Table 7. Although the training and exposure predictors combined accounted for a significant amount of variance in seven of the eight countries, the R^2 values were modest. The combination of predictors accounted for more than 15 percent of the variance in only three countries (Greece, South Africa, United States). With regard to specific predictors, professional training, in some form, was a significant predictor of ADHD knowledge for five of the eight countries. Teachers with prior training (i.e., articles read, workshops, or courses) tended to score higher on the total knowledge scale. The type of training seemed to matter somewhat, with most countries showing at least one form of training to be a better predictor than others. For instance, in the United States, reading professional literature was a significant predictor of knowledge but workshops and courses were not. With regard to prior exposure variables, knowing someone with ADHD was associated with greater knowledge in five of the eight countries. Years of teaching experience was positively related to knowledge in three countries, the United States, South Africa, and Saudi Arabia, and was negatively associated with knowledge in the Republic of Korea.

Discussion

Knowledge

In this study, we provided a systematic examination of teachers' ADHD knowledge, training, and prior experience across nine countries. The results from this study are consistent with the pattern of results from previous studies conducted within individual

countries using the KADDS. For the most part, overall levels of knowledge were comparable to those found in other studies using the KADDS in Saskatchewan (Hepp, 2009), Spain (42.5%; Fernández et al., 2007), South Africa (42.6%; Perold et al., 2010) and the United States (47.8%; Sciutto et al., 2000). The modest levels of overall knowledge across samples suggest a need for educational interventions with teachers. Furthermore, our results suggest that the specific nature of these interventions may need to be different across countries. For instance, the high rate of "don't know" responses in Saudi Arabia (i.e., > 70%) might indicate a need for enhancing access to information about ADHD. In other countries like Iraq, Greece and the Republic of Korea, misconceptions were quite common. Interventions with teachers in these countries might also need to focus on refuting inaccurate information about ADHD.

Professional Training, Prior Experiences and ADHD

Teachers' prior ADHD training, in one form or another, was related to overall ADHD knowledge. Teachers who had more exposure to information about ADHD through professional literature, formal trainings, or higher education courses tended to show higher knowledge of ADHD. The link between knowledge and training in this study is modest but consistent with previous studies (Fernández et al., 2007; Jones & Chronis-Tuscano, 2008; Kos et al., 2004; Perold et al., 2010; Sciutto et al., 2000). It should be noted, however, that we only examined the quantity of teachers' professional training related to ADHD. It may also be important to investigate the specific nature of teachers' ADHD training. It is possible that certain training experiences may be less effective or may inadvertently strengthen misconceptions. For instance, teachers may hold inaccurate pre-existing beliefs that are either not covered or not refuted specifically in their training.

Simply providing information through workshops or textbook style readings may not be sufficient to refute misconceptions (Guzzetti, 2000).

In addition, some forms of training may also narrow teachers' focus by modeling what kind of information is most relevant. For instance, if training includes no information on medication, teachers may interpret this as tacit approval of pre-existing beliefs that medication is not effective, dangerous, or addictive. In essence, the scope of a particular training session may provide fertile soil for a confirmation bias, in which teachers are more accepting of some information and less likely to seek contradictory evidence (see Nickerson, 1998 for a review of confirmation bias). In this study, we did not examine the specific content or focus of teachers' trainings. Future research should examine the specific nature of training and its relationship to teachers' ADHD knowledge and misconceptions.

In addition to professional training, personal contact with ADHD was a fairly consistent predictor across countries. Previous studies have shown a link between ADHD knowledge and direct contact with children with ADHD. Specifically, ADHD knowledge was higher among teachers who had taught a child with ADHD (Kos et al., 2004; Sciutto et al., 2000) and the number of children with ADHD taught (Fernández et al., 2007; Perold et al., 2010; Sciutto et al., 2004, 2000). In this study, we found that teachers who knew a close friend or family member who was diagnosed with ADHD tended to have higher levels of knowledge. Having a friend or family member with ADHD is likely to provide salient and personally-relevant information about the symptoms, diagnosis, and treatment of ADHD. Moreover, research on interventions for stigma have consistently identified interpersonal contact as an effective component of interventions (Corrigan, Morris, Michaels, Rafacz, & Rüsch, 2012). Therefore, as others have suggested, teacher training programs may be best

served by a multidimensional focus with exposure to relevant information (and misconceptions) about ADHD supplemented by direct exposure to children with ADHD and interaction with teachers who display favorable attitudes and strong knowledge of the disorder (D. L. Anderson et al., 2014; Bell et al., 2011).

ADHD Misconceptions

Several specific misconceptions were common among samples of teachers across countries. For example, the belief that sugar elimination diets are effective for reducing ADHD symptoms was observed in nearly 40 percent of teachers across countries. This continues to be among the most common misconceptions about ADHD treatment (Ghanizadeh et al., 2006; Jerome et al., 1994; Perold et al., 2010; Sciutto et al., 2000; West et al., 2005). Some countries (e.g., South Africa, Germany) had very high rates of this misconception. The reasons for the higher rates in these countries are not clear. It is possible that information about broader health benefits of specific diets (e.g., reduction of obesity, diabetes, etc.) is more salient in these countries, particularly in the schools. Therefore, teachers may be more willing to accept that reducing sugar intake would have a variety of positive outcomes, including the reduction of ADHD symptoms.

In addition to beliefs about sugar intake, several other misconceptions common among teachers in this study suggest interesting avenues for exploration. For instance, a relatively high percentage of teachers responded incorrectly to the statement that children with ADHD display an inflexible adherence to nonfunctional routines or rituals, a behavior more characteristic of autism spectrum disorders. This belief may reflect a tendency to attribute anything negative to ADHD. Several studies have documented stigma associated with ADHD (Glass & Wegar, 2000; Kellison, Bussing, Bell, & Garvan, 2010; Martin,

Pescosolido, Olafsdottir, & Mcleod, 2007; Walker, Coleman, Lee, Squire, & Friesen, 2008). This stigma may manifest itself in a tendency to attribute a range of problematic behaviors to ADHD. Alternatively, the misconception about adherence to routines may indicate confusion about the boundaries between ADHD and autism. Whether our results reflect stigma or a persistent misconception about the boundaries between autism and ADHD, these beliefs are likely to have an impact on the help-seeking process (e.g., problem recognition stage).

Previous research has documented misconceptions about stimulant medication (Canu & Mancil, 2012; Snider et al., 2003). The belief that prolonged use of stimulants would lead to increased substance abuse in adulthood was a fairly common misconception in the present study. In addition to the relatively high overall rates of this misconception, there was also considerable variability across countries. This variability is not surprising given that health beliefs, including the willingness to take medication, are embedded within cultural worldviews (Ng & Klimidis, 2008). Additional research is needed to connect the misconception about stimulant use to explanatory models or causal attributions that might provide insight into the help-seeking process for ADHD. For the purposes of teacher training, it may be useful to determine whether the misconception about substance abuse with stimulants is specific to this form of treatment or part of broader beliefs about biological influences on behavior. This issue may be particularly important to examine across countries given the high degree of variability in perceptions of ADHD as a "medical" or biological phenomenon (Conrad & Bergey, 2014).

Limitations

The results of this study are limited in several ways. First and foremost, cross-national comparisons of constructs like knowledge are complicated. Differences in ADHD knowledge scores across countries in this study should not be solely attributed to cultural differences. There are many explanations for differences in scores across cultural groups (e.g., education, socialization, media exposure) and the number of rival explanations may be even greater when the cultures being compared vary widely (van de Vijver & Leung, 2000). Therefore, any differences across countries in this study should serve only as a catalyst for additional analysis of the reasons for and meaning of those differences.

Beyond the specific variables examined in this study, understanding cross-national differences in ADHD is complicated by the substantial international variation in diagnostic and treatment procedures (Hinshaw et al., 2011). Although much of the variability in ADHD prevalence can be accounted for by methodology (i.e., different diagnostic practices, sampling methods), there are important historical, cultural and economic factors that are likely to affect all stages of the help-seeking process. For instance, teachers' knowledge of ADHD may be influenced by the extent to which standardized behavioral measures are routinely used in the assessment process in a given country or region. Completing these measures may sensitize teachers to the behaviors that are important to identification and diagnosis of the disorder. Unfortunately, in the current study, we did not collect systematic information that would allow us to adequately examine the effect of variations in diagnostic practices and other structural factors. Future research may address this issue more directly by examining individual teachers' understanding of policies or participation in diagnostic procedures rather than drawing broader conclusions based on region or country status.

One other important reason for caution in interpreting differences across countries in the current study is the inherent difficulty in adapting a measure like the KADDS for use in multiple cultures. Researchers have distinguished between test translation and test adaptation (Hambleton, 2005). Test translation is only one step in the process of adapting a measure for use in other cultures. Translation errors may compromise the ability to draw valid conclusions. In different languages, the same word may elicit different meanings, which in turn affects the thought processes of the respondent (Ercikan & Lyons-Thomas, 2013). Translation errors may also include a lack of equivalence in the properties, format, and/or cognitive demands of items (Solano-Flores, Backhoff, & Contreras-Niño, 2009). Because culture can not be dissociated from language, effective test adaptation must go beyond simple translation (Solano-Flores, Trumbull, & Nelson-Barber, 2002). Ercikan and colleagues suggest that measurement equivalence requires evidence that the different versions of the test are capturing equivalent constructs, have similar psychometric characteristics, and are administered under equivalent testing conditions (Ercikan & Lyons-Thomas, 2013). In the case of the KADDS, we need additional evidence that the meaning of ADHD knowledge is comparable across countries and that the KADDS measures this construct in an equivalent way. There is some evidence from international studies that the different versions of the KADDS have shown comparable psychometric properties (e.g., internal consistency, correlations with training and experience) in samples of teachers (Fernández et al., 2007; Hepp, 2009; Perold et al., 2010; Sciutto et al., 2000). However, additional evidence of the construct equivalence and the equivalence of testing conditions is needed to draw more definitive conclusions about cross-national differences in ADHD knowledge.

The KADDS is designed to distinguish between lack of knowledge (i.e., don't know responses) and misconceptions (i.e., incorrect responses). Although this approach minimizes the impact of guessing, misconceptions scores on the KADDS may be influenced to some degree by "overconfidence" as reflected in the small but positive correlations between knowledge and misconceptions. It is possible that teachers vary in their willingness to commit to an answer and this is reflected in their endorsement of misconceptions on the KADDS. For instance, in the Saudi Arabian sample, both knowledge and misconceptions were low because teachers overwhelmingly chose the "don't know" option. This may be because of a lack of training, less access to information, or to a different threshold for committing to an answer. This threshold may be, in part, influenced by broader cultural factors (e.g., familiarity with survey formats). Furthermore, because the KADDS uses a true-false-don't know format, all misconceptions and correct answers are weighted equally. An incorrect answer may be the result of a strongly held belief or a weakly held one. The T-F-DK format gives little information about the strength of people's confidence in the accuracy of their knowledge. Strength of belief may be clinically important to the study of help-seeking because strongly held, but incorrect, beliefs are harder to change and may adversely affect the interpretation of new information (D. L. Anderson et al., 2012; Dole & Sinatra, 1998; Taylor & Kowalski, 2004). Therefore it may be important for future studies to measure strength of misconceptions (Sciutto, 2015).

Finally, the results of the study reflect regional variations in sampling and may not be representative of the broader population of teachers within each country. We did not use a random sampling procedure and did not stratify our sampling methods to reflect the distribution of various teacher characteristics. Regional differences in the prevalence of

ADHD in the U.S. are well documented (Fulton et al., 2009; Perou et al., 2013) and we would expect teachers' exposure to ADHD to also vary by region in the U.S. and in other countries. Therefore, the extent to which the pattern of results in this study can be generalized within and beyond the specific regions sampled in this study is not clear.

Conclusion

Despite the limitations described above, the results of the present study can inform our understanding of teachers' role in the help-seeking process for ADHD. Teachers are likely to play a direct or indirect role in multiple stages of the help-seeking process. Examination of ADHD knowledge and misconceptions may provide guidance for the design and evaluation of training programs for teachers. Differences across countries in overall knowledge and misconceptions suggest considerable variability in exposure to ADHD information and training. Our results also suggest that specifically identifying and refuting misconceptions may be a useful component in ADHD trainings. In addition, training programs that incorporate direct exposure to children with ADHD or exemplary teachers may be particularly valuable in addressing both knowledge and attitudes toward ADHD. Ideally, this training will enhance problem recognition and allow teachers to be a more helpful resource to parents as they consider the need to seek treatment and the options available for that treatment.

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Table 1

Descriptive Statistics for Teacher Demographics by Country.

	Country								
Teacher Characteristic	CZ	DE	GR	IQ	KR	SA	ZA	US	VN
N	482	350	198	200	146	429	212	159	131
Gender									
% Male	12	28	37	44	22	45	13	10	40
% Female	88	70	63	56	78	55	87	90	60
Age									
M	37.57	47.71	43.75	39.73	37.67	34.18	41.65	43.03	32.95
SD	10.64	9.35	7.91	10.26	8.62	7.61	11.94	11.40	8.30
Teaching Experience (Years)									
M	12.66	21.19	15.72	14.58	10.08	10.48	17.21	13.80	9.95
SD	10.26	10.76	7.16	11.30	9.14	7.45	11.10	8.65	8.27

Note. Percentages for gender are based on participants who provided complete information. CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

Table 2. Descriptive Statistics for Teacher School Placements by Country.

	Country								
Placement Characteristic	CZ	DE	GR	IQ	KR	SA	ZA	US	VN
Currently Special Education									
% Yes	13.9	0.0	13.2	5.0	0.0	9.3	15.6	45.3	29.8
% No	86.1	100.0	86.4	95.0	98.6	90.7	84.0	50.9	53.4
Typical Class Size									
M	22.32	21.59	18.45	31.04	31.08	33.33	29.42	16.14	13.16
SD	6.11	3.28	7.10	6.59	8.91	11.79	7.36	10.21	7.99
Grades Taught									
% PreK – 5th grade	63.3	47.9[a]	39.7	49.0	21.2	58.7	66.9	52.2	27.1[b]
% 6th and above	35.7	47.9	59.8	51.0	91.7	40.8	27.4	44.0	23.6
Type of School									
% Public	95.2	99.1	88.3	82.0	84.2	100.0	91.3	82.9	N/A
% Private	4.8	0.9	11.7	18.0	15.8	0.0	8.7	17.1	N/A

*Note. P*ercentages may not sum to 100 because participants chose not to respond to the question, provided a response that did not fit into the prescribed options, or chose multiple options (e.g., taught more than one grade). CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

[a] Schools in Germany were classified as either 1st through 4th or 5th through 10th grades.
[b] A large number of teachers did not respond to the question about grade levels taught.

Table 3. Descriptive Statistics for Teachers' Professional Experience with ADHD.

	Country								
Placement Characteristic	CZ	DE	GR	IQ	KR	SA	ZA	US	VN
Articles Read									
None	10.6	1.2	25.3	54.0	62.3	99.1	9.8	4.0	31.8
1 – 3	29.0	30.5	41.9	34.0	28.8	0.9	42.2	22.0	46.4
4 – 6	25.9	39.2	17.2	2.0	7.5	0.0	20.6	28.7	14.5
7 – 9	14.9	13.1	9.1	4.0	0.0	0.0	6.9	15.3	6.4
10 or more	19.5	16.0	6.6	6.0	1.4	0.0	20.6	30.0	0.9
Workshops Attended									
None	36.1	33.6	36.9	88.0	67.8	99.5	34.0	32.9	70.5
1 – 2	35.7	46.4	29.3	10.0	30.1	0.5	41.9	30.9	23.2
3 – 4	17.2	16.2	20.2	2.0	0.7	0.0	12.3	16.8	4.5
5 or more	11.0	3.8	13.6	0.0	1.4	0.0	11.8	19.5	1.8
Courses Taken									
None	64.7	82.8	24.2	86.0	57.5	90.7	57.6	38.5	55.0
1 – 2	28.2	13.1	42.9	12.0	39.7	9.3	28.8	41.9	36.9
3 – 4	4.4	3.5	15.7	2.0	2.7	0.0	9.8	10.8	6.3
5 or more	2.7	0.6	17.2	0.0	0.0	0.0	3.9	8.8	1.8

Note. All values represent the percentage of teachers falling into each category of professional experience. *P*ercentages may not sum to 100 because some participants chose not to respond to the question. CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

Table 4

Descriptive Statistics and Reliability Coefficients for KADDS Scores by Country.

	Knowledge				Misconceptions				Don't Know	
Country	*M*	*SD*	% Correct	Alpha	*M*	*SD*	% Incorrect	Alpha	M	SD
Czech Republic	20.58_{b}	6.15	57	.84	7.32	3.40	20	.58	8.09	5.55
Germany	19.53_{bc}	4.40	54	.69	6.09	2.71	17	.49	10.38	5.43
Greece	16.89_{e}	4.69	47	.70	10.70	4.18	30	.67	8.43	6.73
Iraq	16.04	3.73	45	.48	11.95	3.32	33	.38	8.02	5.08
Republic of Korea	14.21_{f}	5.03	39	.74	9.25	3.95	26	.63	12.54	7.46
Saudi Arabia	5.25_{h}	3.50	15	.67	5.25	3.08	15	.59	25.52	5.73
South Africa	18.56_{cd}	5.99	52	.84	6.48	3.29	18	.61	10.86	7.88
United States	22.22_{a}	4.75	62	.74	5.71	2.94	16	.55	8.06	5.81
Vietnam	11.84_{g}	5.16	33	.75	8.45	4.01	23	.64	15.66	7.78

Note. Mean scores reflect the total number of items (out of 36) scored as correct, incorrect (i.e., misconception) or don't know. Means that share a common subscript are not significantly different from each other using the Games-Howell correction. A comparison of means was only conducted for knowledge scores. Data from Iraq were not included in comparison of means across countries due to low internal consistency.

Table 5

Common Misconceptions about ADHD by Country.

	Country								
Item Content[a]	CZ	DE	GR	IQ	KR	SA	ZA	US	VN
Children with ADHD have more problems in novel than in familiar situations.	72.8	82.0	71.7	59.0	63.0	12.6	55.2	50.6	40.5
Compliance not different with fathers than mothers.	52.7	52.9	43.9	36.5	28.8	12.5	37.1	47.7	49.6
Sugar elimination diets are effective.	31.4	50.3	43.9	28.0	42.5	27.1	73.6	37.7	16.8
Behavioral treatments focus primarily on inattention rather than non-compliance.	37.3	38.0	51.0	59.0	40.4	21.0	42.0	30.7	40.5
Children with ADHD have inflexible adherence to specific routines or rituals.	47.9	24.9	70.7	42.5	31.5	17.2	60.8	30.5	33.6
Symptoms need not be present at young age.	45.9	42.0	20.2	17.0	33.6	12.6	41.7	59.7	33.8
Specific physical features can be used by medical doctors to diagnosis of ADHD.	24.7	9.7	78.3	36.5	59.6	17.2	23.1	9.7	26.7
Use of stimulant medications leads to increased drug/alcohol addiction.	23.4	30.6	65.2	53.5	37.7	15.6	16.0	17.6	25.2

Note. Numbers represent percentage of teachers who responded incorrectly to the specific item. CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

[a] Item wording is rephrased to summarize misconception

Table 6

Correlations of Training and Experience Variables with ADHD Knowledge.

	Country								
Correlation with Total Knowledge	CZ	DE	GR	IQ[a]	KR	SA	ZA	US	VN
Professional Training[b]									
Articles Read	.04	.19**	.45***	---	.02	.16**	.51***	.32***	.14
Workshops Attended	.02	.15**	.51***	---	-.01	.11*	.42***	.24**	.10
Courses Taken	-.09	.00	.47***	---	.11	.16*	.21**	.25**	.21*
Personal Experiences									
Years of Teaching Experience[c]	.05	.01	.14	---	-.33***	.07	.24**	.20*	.08
Know Someone with ADHD[d]	.19***	.23***	.01	---	.11	.15**	.36***	.21**	-.13

$p < .05$, $^{**}p < .01$, $^{***}p < .001$

Note. CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

[a] Analyses not included because of low internal consistency of the knowledge score.
[b] Spearman rank order correlations.
[c] Pearson correlations.
[d] Point-biserial correlations (1 = Yes, 0 = No).

Table 7. Professional Training and Prior Experience as Predictors of Overall ADHD Knowledge by Country.

	Country								
Predictor	CZ	DE	GR	IQ[a]	KR	SA	ZA	US	VN
Read at least one article	-.114*	.051	.120+	---	.022	.218**	.011	.309***	.035
Attended at least one workshop	.062	.124*	.352***	---	-.011	.020	.105	.021	.167
Took at least one course	-.109*	-.011	.080	---	.063	.206***	.114	.124	.132
Years of teaching experience	.054	.008	.104	---	-.320***	.091*	.197*	.175*	.035
Know someone with ADHD	.201***	.197***	.047	---	. 128	.150**	.265**	.164*	.076
R^2	.062***	.063**	.219***	---	.130**	.135***	.153**	.213***	.080

+p< .10, *p< .05, **p < .01, ***p<.001

Note. Values for individual predictors represent Beta coefficients. CZ= Czech Republic, DE = Germany, GR = Greece, IQ = Iraq, KR = Republic of Korea, SA = Saudi Arabia, US = United States, ZA = South Africa, VN = Vietnam.

[a] Analyses not included because of low internal consistency of the knowledge score.