

# Korean Pre-Service Teachers' Knowledge of Attention-Deficit/Hyperactivity Disorder (ADHD): A Comparison With the German Sample

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**Abstract.** The aim of this study was to investigate Korean pre-service teachers' knowledge of ADHD and to compare it with a previous German study (Lee, Lammers, & Witruk, 2015). Pre-service teachers' characteristics (e.g. demographics and ADHD-related experiences) were compared by differentiating between their sub-groups. In total, 441 pre-service teachers participated in this study. Data collection took place from January to March in 2015, and SPSS 22.0 was applied for data analysis. The results showed that Korean pre-service teachers' overall knowledge is rather low (42.28%). They are highly aware of ADHD characteristics (e.g. Students from any walk of life have ADHD; correct answer: *true*; accuracy: 79.8%), but lack knowledge of the cause of ADHD (e.g. Family dysfunction can increase the likelihood that a student will be diagnosed with ADHD; correct answer: *true*; inaccuracy: 68.9%), and have less knowledge of the prevalence of ADHD (e.g. Approximately 5% Korean school-aged students have ADHD; correct answer: *true*; no information rate: 56.7%). Moreover, their level of knowledge differs depending on ADHD-related experiences (e.g. whether training on ADHD has been provided in university). When compared with German pre-service teachers' situation, the results of this research were remarkably similar to those from the Korean pre-service teachers' sample. In conclusion, this study emphasized the importance of ADHD-related experiences, which can be a positive outlook on how to improve pre-service teachers' accurate knowledge of ADHD. The more such experiences pre-service teachers have, the higher the level of their knowledge of ADHD will be. These experiences can help

pre-service teachers to successfully prepare themselves to manage students with ADHD in the future.

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**Keywords:** *knowledge of ADHD, pre-service teachers, Korea, Germany.*

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## Introduction

### Background of the Study

Managing students with attention-deficit/hyperactivity disorder (ADHD) in the classroom poses numerous challenges for teachers with class progress. The class is often disrupted by students with ADHD due to their inattentive and disruptive behavior (Kos, Richdale, & Hay, 2006; Lee, 2017). For these reasons, teachers often feel frustrated and overwhelmed about managing such students in the classroom (Bussing, Gary, Leon, Garvan, & Reid, 2002; Kim, Choi, & Kong, 2013).

This challenge for in-service teachers is of great concern for pre-service teachers, too (Lee, Lammers, & Witruk, 2015). Since there is a high possibility that they will have to manage students with ADHD in their future classrooms, it is equally important for pre-service teachers to be well prepared to effectively manage students with ADHD in the future. Having comprehensive understanding (e.g. factual knowledge) of ADHD is the first step to help pre-service teachers to prepare for their work (Canu & Mancil, 2012; Kos, Richdale, & Jackson, 2004).

ADHD is presumed to exist in numerous cultures (Lee & Witruk, 2016a, 2016b). Although primary symptoms of ADHD (inattention, hyperactivity, and impulsivity) and its prevalence rate (worldwide: 5.3%; Korea<sup>1</sup>: 5.9%; Germany: 4.8%) (Cho et al., 2009; Polanczyk, Lima, Horta, Biederman, & Rohde, 2007; Schlack, Hölling, Kurth, & Huss, 2007) are similar across different cultures, the ways in which students with ADHD are understood and perceived are different depending on different cultural perspectives (Hong, 2008; Moon, 2012). Taken from this perspective, teachers also have their unique ways of interpreting the behavior of different students within their cultural circumstances, for example, individualism (in Germany) versus collectivism (in Korea) (Lee, 2008; Lee & Witruk, 2017; Moon, 2012).

In Korea, as a collectivistic culture, to maintain harmony within the group, people need to know the social order based on hierarchies (Hoppe-Graff & Kim, 2005). This can also be applied to the school setting such as the relationship between students (a lower hierarchy) and teachers (a higher hierarchy). Korean students are expected to respect teachers, and teachers are expected to show authority to students. Thus, disruptive

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<sup>1</sup> From here onward, Korea represents South Korea.

behavior of students with ADHD is perceived as abnormal behavior in comparison to individualistic cultures such as Germany (Hong, 2008; Lee & Witruk, 2016a).

Students with ADHD in Korea attend regular classes (e.g. an inclusion setting). However, this inclusion setting seems to be challenging for students with ADHD to cope with the difficulties that they face with (Hwang & Evans, 2011; Jung & Choi, 2010). Therefore, the success of students with ADHD in an inclusion classroom depends on how their teachers provide these students with appropriate education and support (Kos et al., 2006; Sharma, Forlin, Loreman, & Earle, 2006), which, in turn, enables these students to adjust at school (Kang, Kim, & Yang, 2011; Lee & Witruk, 2016a).

### Teachers' Knowledge of ADHD

Teachers are considered to be influential people who are able to notice ADHD-related behavioral problems at school. Teachers with accurate knowledge of ADHD can provide students' parents with proper advice and make suggestions to parents to get professional assessment and treatment (Anderson, Watt, Noble, & Shanley, 2012; Kos et al., 2004). Since pre-service teachers are very likely to have to manage students with ADHD, it is equally important for pre-service teachers to have correct knowledge of ADHD (Bekle, 2004; Kang et al., 2011; Lee et al., 2015; Sharma et al., 2006).

Comparison between in-service and pre-service teachers' knowledge of ADHD revealed contradictory results. For example, Kos et al. (2004) investigated Australian in- and pre-service teachers' knowledge of ADHD and found that in-service teachers had a higher level of knowledge compared to pre-service teachers, similar to those reported by Anderson et al. (2012) and Bekle (2004). On the other hand, Jerome et al. (1999) found no significant differences between Canadian in- and pre-service teachers. Overall scores for both in- and pre-service teachers were very similar and found no significant improvement in the knowledge of pre-service teachers compared to in-service teachers, similar to the Australian sample of Murray (2010).

**In-service sample.** In-service teachers' knowledge of ADHD has been consistently investigated in many countries, for instance, in the USA (Jerome, Gordon, & Hustler, 1994; Scitutto, Terjesen, & Frank, 2000), Australia (Kos, 2004; Murray, 2010), Germany (Döpfner, 2003; Schmiedeler, 2013), and Korea (Kang et al., 2011; Lee & Witruk, 2016b).

Scitutto et al. (2000) were the first to investigate American primary school teachers' knowledge of ADHD using the Knowledge of Attention Deficit Disorders Scale (KADDS, a *yes/no/don't know* format: accuracy: 47.8 %). Unlike previous knowledge assessments (a *yes/no* format that gives teachers a 50 % chance of guessing the answers), this format reduced the chance of guessing the answer and has been adopted in many countries.

In 2011, Kang et al. (2011) analyzed 204 Korean elementary school teachers' knowledge of ADHD using KADDS (Scitutto et al., 2000). The average of their knowledge scope was 53.3%. No evidence was found about what teachers know incorrectly (inaccuracy) or do not know (no information rate) about ADHD. As for specific knowledge in terms of

correct responses, 48.9 % of teachers correctly understand ADHD characteristics (e.g. “Children with ADHD are more distinguishable from normal children in a classroom setting than in a free play situations”; correct answer: *yes*), 59.3% of teachers were found to correctly know the symptoms/diagnosis (e.g. “ADHD children often fidget or squirm in their seats”; correct answer: *yes*), and 54.3% of teachers correctly knew its treatment/management (e.g. “Parent and teacher training in managing an ADHD child are generally effective when combined with medication treatment”; correct answer: *yes*).

A similar research was conducted in Germany. Schmiedeler (2013) investigated 353 primary and secondary school teachers using KADDS (Sciutto et al., 2000). 54.2% of teachers’ knowledge was found to be correct (accuracy), 16.9% of teachers were found to believe information that was wrong (inaccuracy), and 28.8% of teachers had no information (no information rate). As for specific knowledge of correct responses, 43.9% of teachers correctly knew ADHD characteristics (e.g. “It is possible for an adult to be diagnosed with ADHD”; correct answer: *yes*), 72.6% of teachers correctly knew the symptoms/diagnosis (e.g. “ADHD children are frequently distracted by extraneous stimuli”; correct answer: *yes*), and 53.1% of teachers correctly knew the treatment/management (e.g. “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 maintain attention for at least an hour of class or homework”; correct answer: *no*).

To speak of cross-cultural findings, Jerome et al. (1994) tested elementary school teachers for their knowledge of ADHD (with a *true/false* format) in America and Canada. The total accuracy of American teachers was 77%, whereas that of Canadian teachers turned out to be 78%. More currently, Lee and Witruk (2016b) investigated Korean and German primary and secondary school teachers’ knowledge of ADHD (in a *true/false/don’t know* format). The total accuracy of Korean teachers was found to be 77%, whereas that of German teachers was 74.52%. The research results revealed a small but significant difference between the two countries in their knowledge of ADHD. Korean teachers’ knowledge was limited but significantly higher than that of German teachers.

Numerous studies found positive relations between teachers’ knowledge and experiences related to ADHD. Teaching experience with students having ADHD has an impact on their knowledge (Bekle, 2004; Kos et al., 2004; Sciutto et al., 2000). Teachers who participated in the ADHD-related training were observed to have greater knowledge than those with less or no such experience (Jerome et al., 1994; Lee & Witruk, 2016b; Murray, 2010). A personal experience of ADHD (e.g. teachers with family members, relatives or friends having ADHD) was found to be positively related to teacher’s knowledge of ADHD (Blume-D’ Ausilio, 2005; Schmiedeler, 2013).

Studies on the link between teachers’ experience and knowledge of ADHD showed contradictory findings. No significant relationship was found between the years of general teaching experience and teachers’ knowledge of ADHD (Blume-D’ Ausilio, 2005; Kos et al., 2004; Ohan, Cormier, Hepp, Visser, & Strain, 2008; Schmiedeler, 2013). As

for ADHD-related experiences, Murray (2010) found no significant difference between teachers' experience of working with students having ADHD and their ADHD-related knowledge, which was also confirmed by Kang et al. (2011) and Schmiedeler (2013). Similarly, Bekle (2004) found no significant relationship between teachers' experience of learning about ADHD management skills and their knowledge.

**Pre-service sample.** Although a number of studies have consistently investigated in-service teachers' knowledge of ADHD (e.g. Lee & Witruk, 2016b), only a handful has researched pre-service teachers (e.g. Lee et al., 2015). Lee et al. (2015) assessed 234 German pre-service teachers' knowledge of ADHD (in a *true/false/don't know* format). The total accuracy (correct responses) was found to be 51.60%, whereas inaccuracy (incorrect responses) made up 21.60%, and no information rate ('not known' responses) was 25.80%. The results of Lee et al.'s research (2015) were a little lower compared to the previous German in-service sample (Lee & Witruk, 2016b). The most correctly answered item of German pre-service teachers was ADHD characteristics: "Students from any walk of life can have ADHD" (correct answer: *true*), which was also confirmed by Kos et al. (2004). On the other hand, they showed misperception in terms of an ADHD subtype: "A student who is not over-active, but fails to pay attention, can have ADHD" (correct answer: *true*), which was contradictory to the previous studies of the in-service sample (Sciutto et al., 2000; Schmiedeler, 2013). German pre-service teachers had less information regarding the prevalence of ADHD: "Approximately 5% of German school-aged students have ADHD" (correct answer: *true*). This result could be a good point to have in mind as pre-service teachers do not yet know enough about ADHD but still have an opportunity to learn the ADHD epidemiology through university education or the curriculum.

Lee et al. (2015) investigated German pre-service teachers' knowledge of ADHD by making differentiations based on the following four selected variables: (a) pre-service teachers' current major, either primary or secondary education at university (further: future school type); (b) pre-service teachers' current year of studies, either the third and fourth year of a Bachelor programme (further: study progress); (c) whether training on ADHD has been provided in university (further: university education); and (d) whether participants have personal experience in relation to ADHD (further: personal experience).

The findings of the study by Lee et al. (2015) demonstrated that (a) pre-service teachers majoring in special education had a significantly higher level of knowledge of ADHD than those in primary education, (b) no significant difference was observed between pre-service teachers in their lower year of studies and higher year of studies, (c) pre-service teachers who learned about ADHD management skills during their university training showed a significantly higher level of knowledge than those without such experience, and (d) no significant difference was found between pre-service teachers with and without personal experience.

Studies have consistently reported that pre-service teachers have less opportunities to learn about ADHD at the university level (Jerome, Washington, Laine, & Segal, 1999; Kang et al., 2011; Lee et al., 2015) and that they express a high degree of interest in par-

participating in additional training on ADHD after graduation (Bekle, 2004; Bussing et al., 2002; Lee, 2017; Lee & Witruk, 2016b). It should be investigated as to how pre-service teachers' intentions of participating in in-service ADHD training (further: intended training) relate to the impact on their knowledge of ADHD.

### **The Current Study**

The aim of this study was to investigate Korean pre-service teachers' knowledge of ADHD and to compare the results with the earlier German pre-service sample (Lee et al., 2015). Five variables (a: future school type, b: study progress, c: university education, d: intended training, and e: personal experience) were selected based on the previous research findings and then compared by differentiating between the sub-groups. The following research questions (RQ) were addressed in this study:

- RQ 1. Which particular facts are 'correctly known' or 'incorrectly known' and 'not known' by Korean pre-service teachers?
- RQ 2. Does Korean pre-service teachers' knowledge on ADHD differ according to the selected variables?
- RQ 3. With reference to RQ 1 and RQ 2, are there any differences between the Korean and the German samples?

## **Methods**

### **Participants**

441 Korean pre-service teachers (137 males, 304 females) who were in Years 3 and 4 of a four-year Bachelor degree programme and Master students in their final year of a two-year Master programme from Seoul Special City and North Chungcheong province participated in this research. The age of pre-service teachers ranged from 18 to 30 years (M age = 23.63, SD = 1.33) (see Table 1).

### **Survey Instrument**

Kos et al. (2004) developed an ADHD-knowledge questionnaire (in a *true/false/don't know* format) based on Scituito et al. (2000) and Jerome et al. (1994). In 2016, Lee and Witruk modified the questionnaire compiled by Kos et al. (2004) to investigate Korean and German in-service teachers' knowledge of ADHD. For this current study, the same questionnaire written by Lee and Witruk (2016b) was used with a slight modification for the Korean pre-service sample.

**Knowledge of ADHD.** The questionnaire consisted of 22 items (in a *true/false/don't know* format) to assess what pre-service teachers correctly know (accuracy), incorrectly know (inaccuracy), and do not know (no information) about ADHD. The possible range of scores was from 0 to 44 points ('correctly known': 2 points; 'incorrectly known': 1 point;

‘not known’: 0 point). Higher scores reflect a higher level of knowledge of ADHD. The internal consistency of the study by Lee and Witruk (2016b) was 0.745, and that of this current study was 0.741.

Table 1  
*Frequencies and Percentages of Pre-service Teachers’ Characteristics*

Variables		Frequency	Percent
Demographics			
Gender	Male	137	31.1
	Female	304	68.9
Age	18–20	8	1.8
	21–25	350	79.4
	26–30	83	18.8
Future School Type <sup>a</sup>	Primary	186	42.2
	Secondary	255	57.8
Study Progress <sup>b</sup>	Bachelor Year 3	143	32.4
	Bachelor Year 4	169	38.3
	Master Year 2	129	29.3
ADHD-related experiences			
University Education <sup>c</sup>	Yes	182	41.3
	No	259	58.7
Intended Training <sup>d</sup>	Yes	346	78.5
	No	95	21.5
Personal Experience <sup>e</sup>	Yes	132	29.9
	No	309	70.1

*Note.* \* = Five selected variables. <sup>a</sup> Future School Type = Current major, either primary or secondary education at the university. <sup>b</sup> Study progress = Current year of studies: either the third and fourth year of a Bachelor programme or the second year of a Master programme. <sup>c</sup> University Education = University education or curriculum involved developing skills to manage students with ADHD. <sup>d</sup> Intended Training = the intention of participating in ADHD training after graduation. <sup>e</sup> Personal Experience = Private experience with ADHD such as a family member, friend or relatives who have been diagnosed with ADHD.

**Characteristics.** Four items were included to investigate pre-service teachers’ demographics (gender, age, future school type, and study progress). Three more items were then added in terms of their ADHD-related experiences (university education, intended training, and personal experience of ADHD) (see a more detailed description of the study variables in Note of Table 1).

### Data Collection

This current study was carried out in Korea from January to March in 2015. The author contacted two professors from the Korean University of Education and the Kyunghee

University, as well as six in-service teachers in charge of the training practice<sup>2</sup> to request cooperation. The data were collected from pre-service teachers who were willing to participate in this study. The questionnaire was filled in after their class or at home and returned the following week.

### **Data Analysis**

SPSS 22.0 was used to answer the research questions. A frequency analysis was conducted to examine the accuracy of the coding data and the coding error, and any cases with missing values ( $n = 126$ ) were excluded from the analysis (i.e., listwise deletion). Finally, frequency analyses and mean analyses were applied to answer the research questions.

## **Results**

### **Knowledge of ADHD (RQ 1)**

As shown in Table 2, the average of Korean pre-service teachers' knowledge of ADHD is rather low (42.28%), and their misperception (24.70%) and no information rates (33.02%) are still high. A frequency analysis was used to investigate what pre-service teachers know correctly or incorrectly, as well as to find out about a complete lack of information about ADHD. Table 2 presents Korean pre-service teachers' responses as well as a division of each item (characteristics, cause, and general knowledge of ADHD) (from Murray, 2010) and criteria of the data analysis (e.g. high, rather low).

**Correctly known.** "Students from any walk of life can have ADHD" (correct answer: *true*) and "ADHD affects male students only" (correct answer: *false*) turned out to be the most correctly answered items. The correct rate of knowledge of ADHD was 79.8 % and 74.4 % ('*high*'), respectively.

**Incorrectly known.** "Family dysfunction can increase the likelihood that a student will be diagnosed with ADHD" (correct answer: *true*) and "Students with ADHD cannot sit still long enough to pay attention" (correct answer: *false*) turned out to be the most incorrectly answered items. The incorrect rate of this knowledge was 68.9% and 55.6% ('*rather high*'), respectively.

**Not known.** "ADHD is caused by too much sugar in the diet" (correct answer: *false*) and "Approximately 5% of Korean school-aged students have ADHD" (correct answer: *true*) were the items that were most frequently answered to as 'not known'. The 'not-known' rate was 58.7% and 56.7% ('*rather high*'), respectively.

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<sup>2</sup> Korean undergraduate and grade school students who are attending the University of Education (i.e., pre-service teachers) have to participate in "the training practice" for 6 to 8 weeks at primary or secondary school to graduate their university as well as to take a national teacher qualification exam.

Table 2  
*Percentage of Correctly Known, Incorrectly Known and Not Known Items for Korean Pre-Service Teachers*

Item	Sub-scale	Description	Correctly known	Incorrectly Known	Not Known
1	CH	There is a greater number of boys than girls with ADHD. (True)	225 (51.0%)	32 (7.3%)	184 (41.7%)
2	CA	ADHD students are born with biological vulnerabilities toward inattention and poor self-control. (True)	85 (19.3%)	234 (53.1%)	122 (27.6%)
3	CH	A student who is not over-active but fails to pay attention can have ADHD. (True)	291 (66.0%)	85 (19.3%)	65 (14.7%)
4	CA	ADHD is often caused by food additives. (False)	106 (24.0%)	114 (25.9%)	221 (50.1%)
5	GE	ADHD can be diagnosed in the doctor's office most of the time. (False)	125 (28.4%)	207 (46.9%)	109 (24.7%)
6	CH	Students with ADHD always need a quiet environment to concentrate. (False)	264 (59.9%)	63 (14.3%)	114 (25.8%)
7	GE	Approximately 5% of Korean school-aged students have ADHD. (True)	142 (32.2%)	49 (11.1%)	250 (56.7%)
8	CH	ADHD students are usually from single parent families. (False)	259 (58.7%)	23 (5.2%)	159 (36.1%)
9	GE	Diets are usually not helpful in treating most students with ADHD. (True)	39 (8.8%)	234 (53.1%)	168 (38.1%)
10	CA	ADHD can be inherited. (True)	114 (25.9%)	146 (33.1%)	181 (41.0%)
11	CH	All students with ADHD are over-active. (False)	277 (62.8%)	62 (14.1%)	102 (23.1%)
12	CH	There are several subtypes of ADHD. (True)	225 (51.0%)	36 (8.2%)	180 (40.8%)
13	CH	ADHD affects male students only. (False)	328 (74.4%)	8 (1.8%)	105 (23.8%)
14	CA	The cause of ADHD is not completely known. (True)	199 (45.1%)	66 (15.0%)	176 (39.9%)
15	CA	ADHD is the result of poor parenting practices. (False)	201 (45.6%)	108 (24.5%)	132 (29.9%)
16	CH	If a student can play Nintendo for hours, then s/he probably doesn't have ADHD. (False)	245 (55.6%)	70 (15.9%)	126 (28.5%)
17	CH	Students with ADHD cannot sit still long enough to pay attention. (False)	119 (27.0%)	245 (55.6%)	77 (17.4%)
18	CA	ADHD is caused by too much sugar in the diet. (False)	152 (34.5%)	30 (6.8%)	259 (58.7%)

(continued)

Table 2 (continued)

Item	Sub-scale	Description	Cor- rectly known	Incorrectly Known	Not Known
19	CA	Family dysfunction can increase the likelihood that a student will be diagnosed with ADHD. (True)	31 (7.0%)	304 (68.9%)	106 (24.1%)
20	CH	Students from any walk of life can have ADHD. (True)	352 (79.8%)	28 (6.3%)	61 (13.9%)
21	CH	Students with ADHD usually have good peer relations because of their outgoing nature. (False)	220 (49.9%)	53 (12.0%)	168 (38.1%)
22	CH	Students with ADHD generally display an inflexible adherence to specific routines or rituals. (False)	48 (10.9%)	233 (52.7%)	160 (36.4%)
Average			186 (42.3%)	109 (24.7%)	146 (33.0%)

*Note.* CH = Characteristics of ADHD. CA = Cause of ADHD. GE = General Knowledge of ADHD (accepted by Murray, 2010's division). 'True' and 'False' represent the correct answer for each item. Criteria of data analysis: (a) Very low: 0–10%; (b) Low: 11–30%; (c) Rather low: 31–50%; (d) Rather high: 51–70%; (f) High: 71–90%; (g) Very high: 91–100%.

### Knowledge of ADHD with Selected Variables (RQ 2)

Several mean analyses were conducted to compare pre-service teachers' knowledge of ADHD based on five selected variables.

As shown in Table 3, neither future school type nor study progress was found to have a significant difference between the sub-groups. As for the future school type, no significant group difference was noticed between pre-service teachers majoring in primary school teaching and secondary school teaching. As for study progress, no significant group difference was found among the following three selected groups: (a) Year 3 of Bachelor programme, (b) Year 4 of Bachelor programme, and (c) Year 2 of Master programme.

On the other hand, their ADHD-related experiences (university education, intended training, and personal experience) have a significant impact on their knowledge of ADHD. First, a significant difference was found between pre-service teachers who had acquired ADHD management skills at their university compared to those who had no such experience. Second, a significant difference was noticed between pre-service teachers who were interested in participating in additional ADHD training after graduation compared to those with no such intention. And third, a significant difference was also observed between pre-service teachers with personal experience of ADHD compared to those without any such experience.

Table 3

*Descriptive Statistics on Korean Pre-service Teachers' Knowledge of ADHD by Selected Variables*

		N	Mean Analyses		T/F
			M	SD	
Demographics					
Future	Primary	186	33.00	4.08	1.236
School	Secondary	255	32.52	3.97	
Study	Bachelor Year 3	143	32.68	4.09	.148
Progress	Bachelor Year 4	169	32.64	3.81	
	Master Year 2	129	32.88	4.22	
ADHD-related experiences					
University	Yes	182	33.31	3.71	-2.577*
Education	No	259	32.32	4.18	
Intended	Yes	346	32.95	3.92	-2.281*
Training	No	95	31.89	4.28	
Personal	Yes	132	33.52	3.73	-2.725**
Experience	No	309	32.39	4.09	

*Note.* The possible range of knowledge scores was from 0 to 44. *SD* = standard deviation. See Note in Table 1 for specific explanations of the five selected variables. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

**Comparison with the German Pre-service Sample (RQ 3)**

The findings of each research question (RQ) were then compared with the previous German study conducted by Lee et al. (2015) who had adapted the same instrument for the German pre-service sample.

**Knowledge of ADHD (RQ 1 comparison).** German pre-service teachers (51.60%) reported higher accuracy compared to the Korean sample (42.28%). On the other hand, the sample of Korean pre-service teachers showed higher inaccuracy (24.70%) as well as no information rate (33.02%) compared to the German sample ('incorrectly known': 21.60% and 'not known': 25.80%).

Table 4 presents particular facts of 'correctly known' (accuracy), 'incorrectly known' (inaccuracy), and 'not known' (no information rate) knowledge items of the Korean and the German pre-service samples.

As for the responses 'correctly known', both Korean and German pre-service teachers knew ADHD characteristics correctly ("Students from any walk of life can have ADHD"; correct answer: *true*; accuracy in Korea: 79.8% and Germany: 98.7%).

**Table 4**  
**Particular Facts of 'Correctly Known', 'Incorrectly Known', and 'Not Known' Items by Korean and German Samples**

Accuracy:					
'Correctly Known' responses					
Korean Sample	Correct answer	Accuracy	German Sample	Correct answer	Accuracy
1 CH	Students from any walk of life can have ADHD.	79.8%	CH	Students from any walk of life can have ADHD.	98.7%
2 CH	ADHD affects male students only.	74.4%	CH	ADHD affects male students only.	93.6%
3 CH	A student who is not over-active but fails to pay attention can have ADHD.	66.0%	CA	The cause of ADHD is not completely known.	88.8%
Inaccuracy:					
'Incorrectly Known' responses					
Korean Sample	Correct answer	Inaccuracy	German Sample	Correct answer	Inaccuracy
1 CA	Family dysfunction can increase the likelihood that a student will be diagnosed with ADHD.	68.9%	CH	A student who is not over-active but fails to pay attention can have ADHD.	68.8%
2 CA	ADHD students are born with biological vulnerabilities toward inattention and poor self-control.	53.1%	GE	ADHD can be diagnosed in the doctor's office most of the time.	66.8%
3 GE	Diets are usually not helpful in treating most students with ADHD.	53.1%	CH	Students with ADHD always need a quiet environment to concentrate.	63.1%
No Information Rate:					
'Not Known' responses					
Korean Sample	Correct answer	No Information Rate	German Sample	Correct answer	No Information Rate
1 CA	ADHD is caused by too much sugar in the diet.	False	GE	Approximately 5% of German school-aged students have ADHD.	True
2 GE	Approximately 5% of Korean school-aged students have ADHD.	True	GE	Diets are usually not helpful in treating most students with ADHD.	True
3 CA	ADHD is often caused by food additives.	False	CH	Students with ADHD generally display an inflexible adherence to specific routines or rituals.	False

*Note.* See Note in Table 2 for abbreviations and criteria of the data analysis.

As for the responses ‘incorrectly known’, Korean pre-service teachers showed misperception of ADHD regarding the cause of this disorder (“Family dysfunction can increase the likelihood that a student will be diagnosed with ADHD”; correct answer: *true*; inaccuracy: 68.9 %). German pre-service teachers, on the other hand, had incorrect information about the characteristics of ADHD (especially its subtypes: “A student who is not over-active but fails to pay attention can have ADHD”; correct answer: *true*; inaccuracy: 68.8%).

As for the responses ‘not known’, Korean pre-service teachers did not know the cause of this disorder (“ADHD is caused by too much sugar in the diet”; correct answer: *false*; no information rate: 58.7%). German pre-service teachers had no information about the prevalence of ADHD (“Approximately 5% of German school-aged students have ADHD”; correct answer: *true*; no information rate: 61.0%).

**Knowledge of ADHD with selected variables (RQ 2 comparison).** Both similarities and differences were observed between Korean and German pre-service teachers.

To speak of similarities, pre-service teachers’ study progress and their university education were found to be similar in both countries. No significant differences were noticed between pre-service teachers by study progress. On the other hand, a significant difference was found between pre-service teachers who had acquired ADHD management skills at their university and those with no such experience (through their university education).

Analysis of the differences between the two countries revealed contradictory results based on pre-service teachers’ future school type and personal experience. While no significant group difference was observed between Korean pre-service teachers majoring in primary and secondary education (future school type), German pre-service teachers majoring in special education had a significantly higher level of knowledge compared to those majoring in primary education (study progress). In addition, a significant difference was found between Korean pre-service teachers with a personal experience of ADHD compared to those with no such experience, whereas no significant difference was noticed in the German pre-service sample (personal experience).

As for intended in-service training, a significant difference was found between Korean pre-service teachers who intended to participate in in-service training compared to those without such an intention. In the German sample, Lee et al. (2015) did not investigate this issue.

## Discussion

This study aimed at investigating Korean pre-service teachers’ knowledge of ADHD and comparing it with the findings of the previous study conducted in Germany (Lee et al., 2015). The summary of the research findings are as follows:

1. Korean pre-service teachers correctly know ADHD characteristics but their knowledge of the cause of ADHD is incorrect, and they have less information about the prevalence of ADHD in comparison to the German sample.
2. Korean pre-service teachers' knowledge differs depending on ADHD-related experiences, which also has a significant impact on their knowledge of ADHD.
3. When compared with German pre-service teachers, the results were remarkably similar to those from the current Korean pre-service sample (except for the knowledge item 'incorrectly known').

### **Knowledge of ADHD (RQ 1 Findings)**

Korean pre-service teachers' knowledge is rather low (42.28%), and their misperception (24.70%) and no information rates (33.02%) are still high. This result is consistent with the previous studies that found that in-service teachers have a significantly higher level of knowledge compared to pre-service teachers (Anderson et al., 2012; Bekle, 2004; Kos et al., 2004). However, these results should be interpreted with caution. Although a *true/false/don't know* format was used in this study, it still leaves a 33/33/33 chance of guessing the correct answer (cf. a *true/false* question: the guessing rate is 50/50). Thus, if pre-service teachers are not willing to admit their lack of knowledge, they might choose to answer either 'true' or 'false' (with a 50/50 chance), instead of 'don't know.'

Korean pre-service teachers know ADHD characteristics correctly, having in mind that they are familiar with ADHD as far as its initial concept goes. On the other hand, they were found to have either misperception or no information about ADHD in terms of its prevalence rate and cause. This finding supports the previous studies of in-service sample (Kos, 2004; Murray, 2009; Ohan et al., 2008) that reported that teachers often have misperception of ADHD causes and treatment. Since pre-service teachers are often university students preparing to become teachers, they still have time and opportunities to change their misperception as well as obtain some new information about ADHD.

Korean pre-service teachers' knowledge of ADHD is significantly lower than that of in-service teachers, with gaps of the in- and pre-service samples being approximately 30% (in-service teachers: 77% and pre-service teachers: 42.28%). These results can be a crucial point for pre-service teachers to continuously study about ADHD to improve their knowledge and prepare themselves to manage students with ADHD in the future inclusive classroom.

### **Knowledge of ADHD with Selected Variables (RQ 2 Findings)**

From five selected variables, Korean pre-service teachers' ADHD-related experiences (university education, intended training, and personal experience) turned out to have a significant relationship with their knowledge of ADHD compared to their future school type and study progress. However, these results should be interpreted with caution. In this study, only one *yes* or *no* question was asked of each ADHD-related experience

question. This means that the difference between with and without such experience can be small. Thus, it is difficult to find a group difference in practical significance, which is a limitation of this study.

Despite the above-mentioned limitations, the importance of ADHD-related experiences is highlighted in this study, which can be a positive outlook on how to improve pre-service teachers' knowledge of ADHD.

First, through university education - Korean pre-service teachers who acquired ADHD management skills during their university studies showed a significantly higher level of knowledge compared to those without such education. This finding was contradictory to the previous findings (Anderson et al., 2012; Armitage & Conner, 2001; Murray, 2010) which reported that pre-service teachers with learning experience regarding ADHD at their university had no significantly deeper knowledge compared to those without such experience. This finding can be interpreted in the following way: even though less than 50% of Korean pre-service teachers had an opportunity to learn about ADHD at their university, the effectiveness of their university education seems to be higher. It can be assumed that the more ADHD management skills pre-service teachers acquire at their university, the higher the level of their knowledge of ADHD will be. Thus, the importance of university education can never be overemphasized for pre-service teachers to gain correct knowledge of ADHD. Future studies should evaluate the current university curriculum in terms of skills offered for managing students with ADHD to modify or enhance information about ADHD as well as management skills for these students.

Second, through intended training - Korean pre-service teachers with an intention of participating in ADHD training after graduation had a significantly higher level of knowledge of ADHD compared to those without such an intention. This finding is consistent with the previous studies (Bekle, 2004; Jerome et al., 1999; Lee, 2017) which reported that pre-service teachers had great intentions of participating in ADHD training when they become teachers. In this study, about 80% of Korean pre-service teachers shared intentions of participating in ADHD workshops or seminars when they become teachers, which could explain their accurate knowledge of ADHD as well as prevention of misperception and no information about ADHD. It would appear necessary to investigate how pre-service teachers' intentions of participating in in-service ADHD training could relate to as well as have an impact on their knowledge of ADHD.

Third, through personal experience - pre-service teachers with a personal experience of ADHD were found to have a significantly higher level of knowledge of it compared to those without any such experience. Blume-D' Ausilio (2005) and Schmiedeler (2013) support this theory. Since pre-service teachers have not yet gained any experience in managing students with ADHD in the classroom, this personal experience can be an influential factor that allows them to gain ADHD-related experience prior to teaching, for instance, through volunteer work for an ADHD summer camp during university breaks

and/or by meeting with family members of a person diagnosed with ADHD. Due to a lack of past studies on this issue, it is recommended that the topic of pre-service teachers' personal experiences of ADHD should be explored in greater detail.

Unlike ADHD-related experiences (university education, intended training, and personal experience), pre-service teachers' future school type and study progress were not significantly related to their knowledge of ADHD. Hence, caution should be taken when interpreting these findings as follows:

As for future school type, no previous studies were found to have compared primary and secondary pre-service samples. Only one in-service sample study was carried out by Lee and Witruk (2016b) which noticed no significant difference between primary and secondary in-service teachers' knowledge of ADHD. Since most of the students with ADHD go from primary school to secondary school in Korea (e.g. high school and university) (Kim et al., 2013; Lee, 2017), precise ADHD knowledge is necessary not only for primary school teachers but for secondary school teachers, too. To date in Korea, children with ADHD and their teachers focus more on ADHD research and take a greater interest in studies on adolescents having ADHD.

As for study progress, no significant difference was observed among pre-service teachers in Year 3 or 4 of their undergraduate studies or Year 2 of their Master programme, in terms of their ADHD-related knowledge. This result is contradictory to the findings of Canu and Mancil (2012) who reported that pre-service teachers in higher years of their studies had a higher level of knowledge of ADHD compared to those being in lower years. Since the participants of this study are in relatively higher years of their studies (almost their final year of a Bachelor or Master programme), the gap between their year of studies seems small. Future studies should investigate the improvement of pre-service teachers' knowledge from first to final years of studies. Longitudinal studies could be the key to investigating how pre-service teachers' ADHD-related knowledge develops throughout their education period.

### **Comparison with the German Pre-service Sample (RQ 3 Findings)**

In this section, the German pre-service sample from the previous study by Lee et al. (2015) is compared with the results of this study to discuss the findings or research questions 1 and 2.

**Knowledge of ADHD (RQ 1 comparison).** The results about the overall accuracy of ADHD-related knowledge showed some difference between the Korean and German pre-service samples. German pre-service teachers' accuracy (51.60%) was higher than that of the Korean sample (42.28%). Pre-service teachers in both countries were found to not know about ADHD more than they incorrectly knew about it. For practical purposes, learning new information might be easier than modifying wrong information. This means that both Korean and German pre-service teachers still have an opportunity to work out how to manage these students in the classroom at their current university.

When compared to German pre-service teachers' specific knowledge of ADHD, the results were remarkably similar to those from the present Korean pre-service sample (excluding 'incorrectly known') as follows:

With regard to correct responses, both Korean and German pre-service teachers correctly understood ADHD characteristics. This result implies that pre-service teachers in both countries have no prejudices against students with ADHD based on their social status and gender, confirming the results of Lee et al. (2015).

As for incorrect responses, Korean pre-service teachers incorrectly answered about the cause of this disorder, whereas German pre-service teachers had the greatest misperception of ADHD characteristics (especially, the subtypes of ADHD). These findings need to be carefully examined. Since Korea belongs to a more collectivistic culture, the misperception of family-related issues could have a more negative impact on the Korean cultural perspective. As for German pre-service teachers, they need to be re-educated as regards the fundamental knowledge of ADHD symptoms to change their current misperception.

As far as 'not known' responses are concerned, both Korean and German pre-service teachers have no information related to the prevalence of ADHD. The result could be a good point indicating that pre-service teachers do not yet know about the prevalence of ADHD, but still have a chance to learn about the theoretical background of ADHD (e.g. prevalence, diagnosis).

Since pre-service teachers will be influential people who will have to identify ADHD-related behavior in the future and refer such students to professionals for further diagnosis and treatment (Döpfner, 2003, Kos et al., 2004; Murray, 2010; Ohan et al., 2008), their knowledge of ADHD should not be ignored. Therefore, it is proposed that further investigations are conducted on pre-service teachers' knowledge of ADHD in other cultures so that pre-service teachers have confidence to manage students with ADHD in their future classrooms.

**Knowledge of ADHD with selected variables (RQ 2 comparison).** The results of the research show both similarities and differences between Korean and German pre-service teachers.

As for future school type, no significant group difference was found between primary and secondary education in Korea. In the German sample, on the other hand, a significant difference was observed. German pre-service teachers majoring in special education had a significantly higher level of this knowledge compared to those majoring in primary education. This reinforces the findings of Lee et al. (2015) who found that pre-service teachers majoring in special education (in Germany) seem to have learned more about ADHD during their studies at university compared to those majoring in primary and secondary education. Since this study did not investigate Korean pre-service teachers majoring in special education, further studies should investigate Korean special education samples and compare them to the German ones.

As for study progress, no significant group difference was noticed between pre-service teachers in a lower semester and those in a higher semester (or Master studies) for both

Korean and German samples, which is contradictory to the findings of Canu and Mancil (2012). These results can be interpreted either positively or negatively. From a positive perspective, pre-service teachers learn about ADHD in their lower semesters and have a similar level of knowledge compared to pre-service teachers in higher semesters. From a negative perspective, on the contrary, pre-service teachers in higher semesters should have a higher level of knowledge (since they have learned more about ADHD at university) compared to pre-service teachers in lower semesters. These findings ask for conducting further investigations in greater detail to confirm the two assumptions above.

As for university education and intended training, significant differences were found between pre-service teachers with and without the two mentioned variables in both Korean and German samples. These results emphasize the importance of university education as well as intended ADHD training, which can influence teachers' knowledge of ADHD. Development of effective ADHD pre-service training programmes at university (pre-service level) is suggested, as well as implementation of these programmes at the in-service level is needed.

As regards personal experience, a significant difference was noticed between pre-service teachers with and without ADHD-related experience for the Korean sample, but not for the German one. Since German in-service teachers' personal experience of ADHD was positively related to their knowledge of ADHD (Schmiedeler, 2013), an investigation of the group differences between German in-service and pre-service teachers could be beneficial in the future.

### **Implications, Limitations, and Recommendations**

**Implications.** Pre-service teachers' accurate knowledge of ADHD (e.g. its characteristics and cause) can be the first step to teach and manage students with ADHD in their future classrooms, which, in turn, can enhance pre-service teachers' confidence in managing such students without hindrance. On the other hand, if pre-service teachers know incorrectly or do not know about ADHD and students with ADHD, they will neither be able to manage such students effectively nor will they be able to refer these students to professionals (e.g. psychologists, doctors) for a diagnosis or treatment. Therefore, it is necessary to provide theoretical and practical training through a university programme and curriculum. This training can be a crucial factor for future teachers to teach and manage students with ADHD effectively.

**Limitations and Recommendations.** First, the majority of the samples were pre-service teachers from two universities (the Korean University of Education and the Kyunghee University). It is recommended collecting data from other universities so that the results could be better transferable with participants being from all Korea. Second, other types of pre-service teachers (e.g. university students majoring in special education) should be investigated and compared to primary and secondary school pre-service teachers in the future. Third, qualitative methodology such as ground theory could help in under-

standing pre-service teachers' specific knowledge of ADHD in greater detail. Fourth, it is the interval variables rather than the dichotomous variables that are suggested for the analysis of ADHD-related experiences. The interval variables will represent more detailed and abundant results of the research findings.

## Conclusion

Three significant findings from this current study are as follows: Korean pre-service teachers' knowledge of ADHD is rather low but they can still improve their knowledge through ADHD-related experiences. In addition, the results of the study were notably similar to the German pre-service sample. These findings suggest some important points for pre-service teachers (for both Korean and German ones) in an attempt to look for opportunities to gain more experience of ADHD in their daily life, for instance, by taking courses on ADHD at university or meeting people with ADHD in their surroundings. These efforts can be fundamental for pre-service teachers to acquire correct knowledge of ADHD, which, in turn, will help them prepare themselves to manage students with ADHD within an inclusion setting in the very near future.

This study can be the first step towards understanding Korean pre-service teachers' knowledge of ADHD by comparing it with the German in-service sample. This study can also be regarded as a preliminary resource for modifying university education to provide pre-service teachers with greater opportunities to learn about ADHD and to successfully apply correct knowledge in their future classrooms when being prepared to manage future students with ADHD.

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## Korėjos būsimųjų mokytojų žinios apie aktyvumo ir dėmesio sutrikimą (ADS): palyginimas su situacija Vokietijoje

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### Santrauka

Šio tyrimo tikslas buvo ištirti Korėjos būsimųjų mokytojų žinias apie aktyvumo ir dėmesio sutrikimą (ADS) bei palyginti jas su ankstesniu analogišku tyrimu Vokietijoje (Lee, Lammers ir Witruk, 2015). Būsimųjų mokytojų ypatybės (tokios kaip demografiniai rodikliai ir turima patirtis, susijusi su ADS) buvo lyginamos skirstant juos į pogrupius. Iš viso šiame tyrime dalyvavo 441 būsımasis mokytojas. Tyrimo duomenys buvo renkami 2015 m. sausio–kovo mėnesiais. Duomenų analizei buvo pasitelkta programa SPSS 22.0. Tyrimo rezultatai parodė, kad

bendros Korėjos būsimųjų mokytojų žinios yra gan menkos (42,28 proc.). Jie puikiai išmano ADS būdingus bruožus (pvz.: Moksleiviai iš bet kurio visuomenės sluoksnio turi ADS; teisingas atsakymas: *teisybė*; atitikimas: 79,8 proc.), tačiau jiems trūksta žinių apie ADS priežastis (pvz.: Šeimos narių funkciniai sutrikimai gali padidinti tikimybę, kad moksleiviui bus diagnozuotas ADS; teisingas atsakymas: *teisybė*; neatitikimas: 68,9 proc.), jie mažiau žino apie ADS paplitimą (pvz.: Apie 5 proc. Korėjos mokyklinio amžiaus vaikų turi ADS; teisingas atsakymas: *teisybė*; šios informacijos neturėjo 56,7 proc.). Be to, jų žinių lygis skiriasi atsižvelgiant į jų turimą patirtį, susijusią su ADS (pvz., atsižvelgiant į tai, ar universitete buvo mokoma apie ADS). Palyginti su Vokietijos būsimaisiais mokytojais, Korėjos būsimųjų mokytojų tyrimo rezultatai buvo labai panašūs. Apibendrinant galima teigti, kad šis tyrimas pabrėžė patirties su ADS svarbą, o tai gali būti akstinas tobulinti būsimųjų mokytojų tiksliai žinias apie ADS. Kuo daugiau tokios patirties turi būsimoji mokytojai, tuo gilesnės bus jų žinios apie ADS. Tokia patirtis gali padėti būsimojiems mokytojams sėkmingai pasiręsti suvaldyti moksleivius, turinčius ADS, ateityje.

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**Esminiai žodžiai:** *žinios apie aktyvumo ir dėmesio sutrikimą (ADS), būsimoji mokytojai, Korėja, Vokietija.*

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