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PSYCHOLOGICAL AND ACADEMIC FUNCTIONING AMONG
YOUTH IN SOUTH KOREA**

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ASSOCIATIONS BETWEEN SLEEP PROBLEMS AND PSYCHOLOGICAL AND
ACADEMIC FUNCTIONING AMONG YOUTH IN SOUTH KOREA

A dissertation submitted in partial fulfillment
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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New York

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ABSTRACT

ASSOCIATIONS BETWEEN SLEEP PROBLEMS AND PSYCHOLOGICAL AND ACADEMIC FUNCTIONING AMONG YOUTH IN SOUTH KOREA

Yea Seul Pyun

Sleep problems are common among children and adolescents. Children and adolescents with and without a psychiatric diagnosis experience sleep problems. Furthermore, secondary to sleep problems they suffer from psychological sequelae and academic difficulties. Although sleep problems are universal, Asian youth tend to sleep less and have more sleep problems. In South Korea, children and adolescents experience high levels of emotional and behavioral difficulties including depression, suicidal ideation, and disruptive behaviors. The current study aimed to investigate how sleep problems among a non-clinical sample of South Korean youth were related to psychological functioning including emotional problems, aggressive behaviors, and academic performance. A sample of 196 South Korean children and adolescents and their parents completed the Sleep Disorder Inventory for Students (SDIS) and the Conners Comprehensive Behavior Rating Scale (CBRS). Academic grades were also obtained from the parents. The translated SDIS had good reliability, good concurrent validity, but poor replicated factor structure. Consistent with previous literature, results indicated that children with more symptoms of sleep difficulties as measured by scores on the New Total Sleep Disturbance Index (New SDI) and excessive daytime sleepiness (EDS) exhibited higher levels of emotional distress. Similarly, adolescents with higher scores on the New SDI, EDS, and delayed sleep phase syndrome (DSPS) presented with more

emotional distress and aggressive behaviors as well as poorer academic functioning. Furthermore, the relationship between sleep problems and academic functioning was mediated by emotional distress, such that children and adolescents with more sleep problems exhibited poor psychological functioning, which in turn negatively influenced their academic functioning. These findings suggest the importance of recognizing sleep problems on youth's psychological and academic functioning. It is important to provide interventions to reduce sleep problems, which in turn improve psychological and academic functioning. Despite significant findings, the factor structures of the translated SDIS were not replicated and there were limited variances within sleep problems and psychological and academic functioning in the sample. Thus, further research should use psychometrically stronger measures to examine the complex relationships among sleep problems, psychological functioning, and academic difficulties among youth with clinically significant sleep problems.

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INTRODUCTION

Sleep problems are commonly seen among children and adolescents (Gregory & Sadeh, 2016; Meltzer et al., 2010; Owens, 2007) with approximately 25 – 37% of children having experienced at least one type of sleep problem that is considered a sleep disorder or mild sleep disturbance during childhood (Owens, 2007; Owens et al., 2000). Sleep problems range from mild sleep disturbances (i.e., frequent night waking and snoring) to sleep disorders (i.e., obstructive sleep apnea, periodic limb movement disorder/restless leg syndrome, and narcolepsy). Other sleep problems include parasomnias (i.e., nightmares, sleep walking, and teeth grinding), insomnia, and excessive daytime sleepiness (Meltzer & Mindell, 2006).

The proportion of sleep problems are higher among children and adolescents with psychiatric disorders including anxiety, depression, and neurodevelopmental disorders including autism spectrum disorder (ASD) and attention deficit and hyperactivity disorder (ADHD) (Alfano et al., 2009; Gregory & Sadeh, 2016; Meltzer et al., 2010; Owens et al., 2000) than among children without psychiatric disorders. However, children and adolescents without any clinical diagnosis also suffer from sleep problems (Gregory & Sadeh, 2016; Owens, 2007). Furthermore, a recent review has suggested that sleep problems may be a risk factor for developing psychiatric disorders (Gregory & Sadeh, 2016). Thus, it is important to examine sleep problems among a nonclinical population.

The prevalence rates of sleep problems within the general population of children and adolescents vary depending on type of sleep problems, age, and gender as well as culture. For example, the prevalence range for insomnia has been estimated from less

than 1% to 20% of children and adolescents (Johnson et al., 2006; Kim et al., 2017; Liu et al., 2008; Meltzer et al., 2010; Ohida et al., 2004; Roberts et al., 2008) while excessive daytime sleepiness has been estimated from 7 to 36% of children and adolescents globally (Choi et al., 2009; Joo et al., 2005; Liu et al., 2003; Liu et al., 2008; Ohida et al., 2004).

With regards to age and gender, kindergarteners tend to have more frequent night awakenings than 3rd and 4th graders (Owens, Spirito et al., 2000) while 6th graders have more excessive daytime sleepiness (Sadeh et al., 2000) and insomnia (Johnson et al., 2000) than younger children. Furthermore, boys are more frequently diagnosed with sleep disorders (Meltzer et al., 2010), parasomnias (Owens, Spirito et al., 2000), snoring (Joo et al., 2005; Kim et al., 2017; Lee et al., 2012), and sleep-disordered breathing (Owens, Spirito et al., 2000) than are girls. On the other hand, girls have more insomnia (Joo et al., 2005; Ohida et al., 2004) and excessive daytime sleepiness symptoms than do boys (Joo et al., 2005; Lee et al., 2012; Ohida et al., 2004).

Sleep problems are universal. Approximately one in four children experience sleep problems during childhood and the prevalence rates may seem similar across different countries (Owens, 2007). However, sleep problems have been linked to cultural norms (Mindell et al., 2010; Sadeh et al., 2011). When comparing Asian countries to Western countries, children and adolescents in Asian countries tend to have less total sleep time (Jiang et al., 2007; Mindell et al., 2010; Ohida et al., 2004) and more sleep problems (Gradisar et al., 2011; Jiang et al., 2007; Liu et al., 2005; Mindell et al., 2010; Ohida et al., 2004; Sadeh et al., 2011) than youth in Western countries. For example, about 50% of Asian adolescents experience daytime sleepiness while only 20% of

American adolescents experience this (Gradisar et al., 2011). Even more specifically, especially as it relates to this study, South Korean youth appear to have significantly less total sleep time (Mindell et al., 2010) and have later bedtimes (Gradisar et al., 2011; Yang et al., 2005) when compared with other Asian countries and even when compared with Western countries. Among children and adolescents in South Korea, approximately 13 - 15% have sleep disordered breathing (Kim et al., 2017; Yoon et al., 2007) and 13 - 31% have insomnia (Joo et al., 2005; Kim et al., 2017; Yoon et al., 2007). The prevalence rates of excessive daytime sleepiness among adolescents have ranged from 11 to 16% (Choi et al., 2009; Joo et al., 2005). Despite high prevalence of sleep problems, there is limited research on sleep problems among children and adolescents in South Korea. Previous research also has not examined how sleep problems could relate to psychiatric problems for South Korean youth (Choi et al., 2009; Joo et al., 2005; Kim et al., 2017; Yoon et al., 2007). Furthermore, parents and physicians have frequently overlooked the importance of sleep in children's functioning (Yoon et al., 2007). Thus, it is important to examine sleep problems among youth in South Korea.

Mental Health among Youth in South Korea

Mental health problems have increased among youth in South Korea by 2% over one year based on the survey, the use of counseling of children with mental health problems and depressive symptoms in 2018 (Statistics Korea, 2018). Among children aged 6 to 12 years, 16.1% meet criteria for at least one diagnosis and 28.1% exhibit psychiatric symptoms (Park et al., 2015). Furthermore, children and adolescents exhibit disruptive behaviors in South Korea. Among school-aged children in South Korea,

ADHD is the most prevalent disorder (5.9%), followed by oppositional defiant disorder (4.9%), and conduct disorder (0.4%) (Park et al., 2015).

South Korean youth also experience high rates of internalizing disorders. There are high rates of anxiety disorders (10.3%), including specific phobia (9.6%) and separation anxiety disorder (0.9%) (Park et al., 2015). Depression has been more common among South Korean teens; 38% of middle and high school students experience depressive symptoms (Park et al., 2012). Relatedly, about 25% of youth between age 9 and 24 years old have experienced depressive symptoms daily for two weeks during the last 12 months (Statistics Korea, 2018). Depression is a significant risk factor for suicidal ideation and suicide attempts (Lee et al., 2007). South Korean youth exhibit high rates of suicide. Since 2007, suicide has been the leading cause of death for South Korean youth (Statistics Korea, 2018). South Korea has the highest suicide rate among the Organization for Economic Co-operation and Development (OECD) countries (OECD, 2015), and its rate is the 10th highest in the world (World Health Organization, 2015).

Despite the high prevalence of mental health problems, there is limited research exploring how sleep problems may be related to the mental health problems among youth in South Korea.

Sleep Problems and Youth Functioning

Psychological functioning

As mentioned above, sleep problems are common among children and adolescents (Gregory & Sadeh, 2016; Meltzer et al., 2010; Owens, 2007; Owens, Spirito et al., 2000) and have been closely related to children and adolescents' functioning at home and school globally (e.g., Alfano et al., 2009; Hiscock et al., 2007; Jiang et al., 2007; Johnson

et al., 2000; Lam et al., 2003; Shin et al., 2003). Sleep problems have also been linked to emotional problems (Alfano et al., 2009; Hiscock et al., 2007; Johnson et al., 2000; Lam et al., 2003; Lee et al., 2012; Paavonen et al., 2003; Perfect et al., 2014). Children with sleep problems are also more likely to endorse internalizing problems, including anxiety/depression (Paavonen et al., 2003). Insomnia and excessive daytime sleepiness are related to overall internalizing problems and emotional symptoms among youth (Perfect et al., 2014). Specifically, anxiety and depression are associated with overall sleep problems (Alfano et al., 2009), insomnia (Perfect et al., 2014), and excessive daytime sleepiness (Perfect et al., 2014). In South Korea, adolescents who experience insomnia and snoring have higher rates of suicidality and depression, respectively, than do those without them (Lee et al., 2012).

In addition to emotional problems, behavioral problems have been globally related to sleep problems among children and adolescents (Hiscock et al., 2007; Jiang et al., 2007; Lam et al., 2003; Paavonen et al., 2003; Perfect et al., 2014). Parents of young children with sleep problems have reported that their children have more feeding problems and temper tantrums compared to those without sleep problems (Jiang et al., 2007). Inattentive and hyperactivity symptoms have been commonly identified in children with sleep problems (Hiscock et al., 2007; Paavonen et al., 2003), including insomnia and excessive daytime sleepiness (Alfano et al., 2009). Children who have been diagnosed with sleep problems endorse higher aggressive and externalizing behaviors than children without sleep problems (Lam et al., 2003). Among South Korean youth, high school students who have experienced excessive daytime sleepiness are more likely

to smoke cigarettes and drink alcohol than those without excessive daytime sleepiness (Joo et al., 2005).

Sleep problems have been associated with long-term psychological functioning (Gregory & O'Connor, 2002; Johnson et al., 2000; Paavonen et al., 2003). Children who had sleep problems at age 4 were more likely to subsequently experience depression, anxiety, attention problems, and aggression during mid-adolescence when they were between 13 and 15 years (Gregory & O'Connor, 2002). Children whose parents reported that their children having difficulty sleeping at age 6 had higher rates of anxiety/depression at age 11 (Johnson et al., 2000). Sleep problems reported by child at age 8 were also associated with social and attention problems at age 12 (Paavonen et al., 2003). Given the previous literature on the impact of sleep problems on subsequent psychological and academic functioning (Gregory & O'Connor, 2002; Johnson et al., 2000; Paavonen et al., 2003), this current study will examine how current sleep problems were predictive of emotional, behavioral, and academic problems.

Academic functioning

Sleep problems have been associated with school functioning (Joo et al., 2005; Pagel et al., 2007; Perfect et al., 2014; Shin et al., 2003). Children and adolescents with insomnia (Perfect et al., 2014) and excessive daytime sleepiness (Pagel et al., 2007; Perfect et al., 2014) have lower school performance (i.e., GPA) than those without them. Several studies have examined the relationship between sleep problems and academic functioning in South Korea (Joo et al., 2005; Shin et al., 2003). Among high school students in South Korea, a higher number of students who have exhibited excessive

daytime sleepiness have lower self-reported academic performance than those without excessive daytime sleepiness (Joo et al., 2005; Shin et al., 2003).

Despite adverse relationships between sleep problems and psychological and academic problems, there is limited research investigating how sleep problems are related to the psychological and academic functioning of youth in South Korea. Several studies have examined the relationship between sleep problems, psychological functioning, and academic performance (Joo et al., 2005; Lee et al., 2012; Shin et al., 2003), but these have had samples limited to adolescents (i.e., middle and high school students). Furthermore, the extent to which they examined psychological and academic functioning (i.e. GPA, depression, and suicidality) has been limited. In sum, previous literature has not provided sufficient evidence of the impact of sleep problems on overall functioning in children and adolescents. In order to clarify this relationship, the current study will expand previous findings by examining associations between sleep problems and psychological and academic functioning. This will include an analysis of emotional problems, aggressive behaviors, and academic performance among youth from elementary, middle, and high schools.

Furthermore, studies that measured sleep problems in South Korean youth did not use questionnaires that had been validated in the Korean language (Choi et al., 2009; Joo et al., 2005; Kim et al., 2017; Lee et al., 2012; Yang et al., 2005). The Pediatric Sleep Questionnaire (PSQ) and Sleep Habits Survey have good validity and reliability in English (Chervin et al., 2000; Johns, 1992; Wolfson et al., 2003), but they have not been validated in Korean. This may limit the extent to which they accurately measure sleep problems in Korean youth. In order to address this issue, the current study will provide

preliminary psychometric properties of the Korean version of the Sleep Disorder Inventory for Students (SDIS; Luginbuehl, 2004).

Relationships between Psychological and Academic Functioning

As highlighted above, sleep has played an important role in children's psychological and academic functioning, respectively (Joo et al., 2005; Pagel et al., 2007; Perfect et al., 2014; Shin et al., 2003). There has been substantial evidence that psychological functioning is related to academic performance in children and adolescents (Chen et al., 2010; Fröjd et al., 2008; Jaycox et al., 2009; Nelson et al., 2004; Owens et al., 2012). Children and adolescents with internalizing and externalizing behaviors struggle with academic achievement (Nelson et al., 2004). Adolescents with more depressive symptoms tend to have lower grades (Fröjd et al., 2008; Owens et al., 2012), academic impairment (Jaycox et al., 2009), and more declines in their grades from the previous school year (Fröjd et al., 2008). Higher levels of anxiety are also related to lower academic performance in children (Owens et al., 2012). Among Chinese children, aggression has been found to have a long-term effect on their academic achievement and development (Chen et al., 2010).

Building upon the finding described above, the current study will examine the extent to which psychological functioning mediates the relationship between sleep problems and academic performance. The current study will evaluate two models: 1) the direct relationships between sleep problems and psychological and academic functioning, and 2) the indirect relationships between sleep problems and academic functioning through psychological functioning. As the data is naturalistic and cross-sectional, despite previous literature support (Gregory & O'Connor, 2002; Johnson et al., 2000; Paavonen

et al., 2003), it would not be fully explanatory to only test the directionality of one mediation model. Thus, following the recommendations of Kenny (2018), the reversed models will be examined to understand the mediation model further. Gender and ages are adjusted in both models given different presentations of sleep problems, psychological difficulties, and academic functioning depending on age and gender.

CURRENT STUDY

Hypothesis 1

It is hypothesized that the Korean version of the Sleep Disorder Inventory for Students (SDIS) will have good psychometric properties in this sample. More specifically:

- a) The SDIS will have acceptable internal consistency (i.e., $\alpha \geq .7$) and the reliability scores obtained in this sample will be similar to scores obtained in the United States.
- b) The factor structure between the English and Korean versions of the SDIS will be maintained.
- c) To establish concurrent validity, the SDIS will be significantly related to sleep-related items on the CBRS-P and CBRS-SR.

Hypothesis 2

Sleep problems will be positively related to emotional, behavioral, and academic problems. More specifically, it is hypothesized that:

- a) The Total Sleep Problems, Excessive Daytime Sleepiness (EDS), and Delayed Sleep Phase Syndrome (DSPS) on the SDIS will be significantly related to the Emotional Distress content scale on the CBRS-P and CBRS-SR, respectively.
- b) The Total Sleep Problems, Excessive Daytime Sleepiness (EDS), and Delayed Sleep Phase Syndrome (DSPS) on the SDIS will be significantly related to the Aggressive Behaviors content scale on the CBRS-P and CBRS-SR, respectively.
- c) The Total Sleep Problems, Excessive Daytime Sleepiness (EDS), and Delayed Sleep Phase Syndrome (DSPS) on the SDIS will be significantly related to

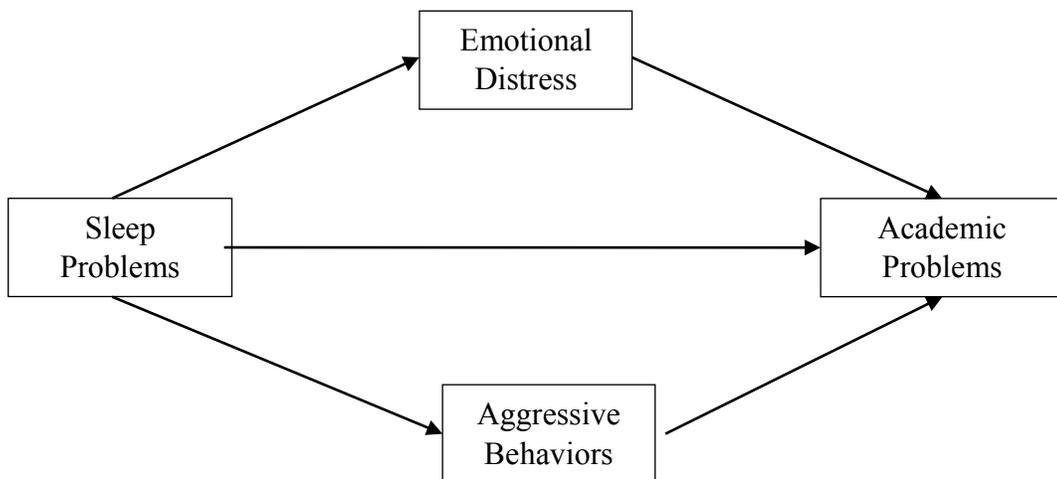
parental reported grades and the Academic Difficulties content scale on the CBRS-P and CBRS-SR, respectively.

Hypothesis 3

The relationships between sleep problems and academic problems will be partially mediated by emotional and behavioral problems, such that more sleep problems will predict higher emotional and behavioral problems, which, in turn, will predict more academic problems. See Figure 1. The reversed model will be examined to understand the mediation model further.

Figure 1

Hypothesized Mediation Model



METHOD

Procedure

This project was part of a larger research project at St. John's University that focused on gathering data about student behavior and the standardization and validation of a measure of sleep problems among youth internationally. This research project examined the data from South Korea. Potential schools and participants were selected through the project researchers (i.e., doctoral candidates) and teacher coordinators at schools between October and November during the 2016 academic year.

Once the schools were identified and an informal agreement for data collection was established, one teacher coordinator per school was appointed to obtain consent from the school's principal (see Appendix A), recruit participants, obtain parental consent (see Appendix B), distribute questionnaires and reimbursements, and collect questionnaires. The target total number of participants was 204 based on the research budget of the project. Approximately 17 participants were recruited per grade from grades 1-12. One teacher per school was appointed as the teacher coordinator and they randomly selected potential participants for each grade. Child and parent questionnaires were sent home after parental consent and child assent (see Appendix C) were obtained.

All participants were compensated to participate in the study. Children and parents received gift cards or snacks (i.e., hamburgers). The snacks varied depending on the location, but all compensations were roughly equal in value, approximately \$4.00 per person. Parents who completed an additional questionnaire for the purpose of the large research project were compensated with additional \$5.00 gift cards. Teacher coordinators received a gift card and a St. John's University tumbler, and schools also received a gift

(i.e., tea). This study was approved by the Institutional Review Board (IRB) at St. John's University prior to data collection, and the data was limited to research purposes only.

Translation

The Conners Comprehensive Behavior Rating Scale (CBRS; Conners, 2008) and Sleep Disorder Inventory for Students (SDIS; Luginbuehl, 2004) were first forward translated into Korean and then back-translated to English following International Test Commission (ITC) guidelines (ITC, 2016) in order to accurately translate items and maintain constructs. They were translated and edited by translators and the primary researchers to ensure the accuracy of translations. The translators were three Korean doctoral students who are fluent in Korean and English studying in the fields of counseling psychology and clinical psychology in the United States. Then, the translators and researchers consulted with teachers in Korea to make sure that the translated items were culturally appropriate. See Lin (2018) for detailed information regarding data collection and procedure.

Participants

Participants were recruited from a convenience sample from elementary, middle, and high schools from urban and suburban cities in South Korea. Of 204 participants, 196 participants (96%) consented to participate in the study. The participants were on average 11.89 years of age ($SD = 3.15$; Range = 6 – 17 years). 49.5% of students were male ($n = 97$) and 48.5% were female ($n = 95$) with five students not indicating their age or gender. Of the final sample, 53.6% ($n = 105$) were enrolled in elementary school (grades 1-6), 27.6% ($n = 54$) were in middle school (grades 7-9), and 18.9% ($n = 37$) were in high school (grades 10-12). Please see Table 1 for detailed demographic characteristics.

Measures

The following measures were selected from the large research study in Korea for the purpose of the current study.

Demographic questionnaire

Demographic questionnaires were administered to parents to collect sociodemographic information about participants (see Appendix D).

Sleep Disorder Inventory for Students (SDIS)

Sleep problems were assessed by the Sleep Disorder Inventory for Students (SDIS; Luginbuehl, 2004). The SDIS is a parent-reported screening inventory measuring sleep disorders, parasomnias, and a total score of sleep disturbance in youth ages 2 to 18 years old. There are two forms depending on children's age. The SDIS-Children's Form (SDIS-C) is used for children 2 to 10 years old and the SDIS-Adolescent Form (SDIS-A) is used for adolescents 11 to 18 years old. They consist of 25-30 items and 10 general health questions. Items are rated on a 7-point scale based on their child's behaviors during the last 6 to 12 months. Both forms yield the Total Sleep Disturbance Index (SDI), Obstructive Sleep Apnea Syndrome (OSAS), Periodic Limb Movement Disorder (PLMD), Excessive Daytime Sleepiness (EDS), and Delayed Sleep Phase Syndrome (DSPS). The SDIS-A also measures an additional sleep disorder, Narcolepsy (NARC). For the current study, the SDI and behaviorally based sleep disorders, the EDS and DSPS scales, were used to evaluate sleep disorders because the participants in the study were not clinically referred for sleep disturbances so the prevalence of medically based disorders such as the OSAS, RLS, and NARC would be expected to be low.

The English version of both of the SDIS forms have strong psychometric properties in the United States (Luginbuehl et al., 2008). The validation study scales have adequate to excellent internal reliability (SDIS-C Total $\alpha = .91$; SDIS-C EDS $\alpha = .84$; SDIS-C DSPS $\alpha = .76$; SDIS-A Total $\alpha = .92$; SDIS-A EDS $\alpha = .83$; SDIS-A DSPS $\alpha = .71$). The SDIS-C has excellent test-retest reliability ($\alpha = .97$) and the SDIS-A has good test-retest reliability ($\alpha = .86$). Both forms have good validity where both forms have good sensitivity (SDIS-C Total = .82; SDIS-A Total = .81) and high specificity (SDIS-C Total = .91; SDIS-A Total = .95).

Conners Comprehensive Behavior Rating Scale (CBRS)

Emotional, behavioral, and academic problems were assessed by the Conners Comprehensive Behavior Rating Scale (CBRS; Sparrow, 2010; Conners, 2008). The CBRS assesses a wide range of emotional, behavioral, academic, and social functioning in youth ranging in age from 6 through 18 years. There are three forms available: the parent form (CBRS-P), the self-report form (CBRS-SR), and the teacher form (CBRS-T). The CBRS-SR is available for children older than 8 years old. The CBRS has acceptable internal consistency (the CBRS-P Content scales $\alpha = .88$; CBRS-SR Content Scales $\alpha = .89$), test-retest (the CBRS-P Content scales $r = .85$; CBRS-SR Content Scales $r = .69$), and inter-rater reliability (the CBRS-P Content scales $r = .76$) (Conners, 2008). In the Korean sample, the CBRS has good internal consistency (the CBRS-P Content scales $\alpha = .87$; CBRS-SR Content Scales $\alpha = .81$) (Lin, 2018). In the current study, the Emotional Distress, Aggressive Behaviors, and Academic Difficulties content scales on CBRS-P and CBRS-SR were used to measure psychological and academic functioning, specifically emotional, behavioral and academic problems.

Parental reported grades

Parents were asked to provide child's grades in school in the demographic questionnaire. The question was: *Which most accurately describes your child's grades in school?* (A = Receives all A's/mostly A's; B = Receives some A's and some B's; C = Receives mostly B's; D = Receives some B's and some C's; E = Receives mostly C's; F = Receives mostly D's; G = Receives mostly F's). Parental reported grades have been demonstrated to be good indicators of child's academic performance when compared to final grades and achievement test, even though parents tend to overestimate final grades (Maguin & Loeber, 1996). Thus, they were used in the current study to evaluate youth's academic functioning.

Analysis Plan

All descriptive and inferential statistics were conducted in IBM SPSS Statistics 24 (SPSS). The first 25 items on the SDIS-C and 30 items on the SDIS-A were used in the current study because they are used to evaluate overall sleep problems and sleep subscales. In addition to two subscales, EDS and DSPS, the new *T*-score of total sleep problems (i.e., new SDI) was created by using combined raw scores of EDS and DSPS to represent overall sleep problems. This new SDI was used instead of the original SDI to test hypotheses 2 and 3.

To evaluate the psychometric properties of the Korean-version of the SDIS, internal consistency was tested by calculating Cronbach's alpha to examine the reliability of the translated measure. The Cronbach's alpha coefficients of the Korean sample were then compared to those of the U.S. normative sample collected by the publishers for the standardization of the SDIS by conducting chi-square (χ^2) statistic through Cocron

(Diedenhofen & Musch, 2016). Confirmatory factor analysis was used to test factor structure of the Korean-version of the SDIS through MPlus (Muthén & Muthén, 2012). Lastly, concurrent validity was tested by conducting bivariate correlations between the SDI and combined scores of sleep related items on the CBRS-P and CBRS-SR respectively. Three items on the CBRS-P and five items on the CBRS-SR were identified to be related to sleep problems.

The direct relationships between sleep problems and psychological and academic functioning, respectively, were assessed using bivariate correlations. The indirect relationships between sleep problems and academic functioning through psychological functioning were tested by using mediation models using PROCESS in SPSS. Gender and age were entered as covariates.

RESULTS

Missing Data

Before beginning analysis, the dataset was examined for missing data. There were 4 participants who did not complete the SDIS so they were excluded from all data analyses. The total of 123 participants completed the SDIS-A and 69 participants completed the SDIS-C. The SDIS manual was consulted for guidelines to score scales with an acceptable number of missing values (Luginbuehl, 2004). As the first 30 questions on the SDIS-A and 25 questions on the SDIS-C are part of the five subscales and total index score, the remaining questions were not examined in the current study. Participants who had 20% or less missing data were included for analyses (i.e., participants who answered at least 24 items on the SDIS-A or 20 items on the SDIS-C). Two participants from the SDIS-C and one participant from the SDIS-A did not complete more than 50 % of the items so they were excluded from the analysis. One participant from the SDIS-A did not complete about 37% of the items so this participant was also excluded in the analysis. Six participants from the SDIS-C and ten participants from the SDIS-A had less than 20% of missing items and were included in the analysis. Thus, 121 participants for the SDIS-A and 64 participants for the SDIS-C were included in data analyses. Little's MCAR test was performed to assess for patterns of missing data on SDIS. The results indicated that the data on the SDIS-C were determined to be missing completely at random (SDIS-C: $\chi^2 = 73.16$ [91]; $p = .92$) while the data on the SDIS-A were not determined to be missing at random (SDIS-A: $\chi^2 = 564.95$ [363]; $p < .001$). By looking at missing data on the SDIS-A, the missing data patterns were based on items (i.e., 28, 29, and 30). Maximum Likelihood estimation was used to account for any

remaining missing data.

Regarding the two Conners CBRS forms, the Conners CBRS manual was used for guidelines to score scales with an acceptable number of missing values (Conners, 2010). Among a total of 196 parents who participated in this study, there were 29 parents and one child who exceeded the number of allowable missing responses on at least one subscale of CBRS-P and CBRS-SR, respectively. Conners (2010) provided a formula to adjust the total raw score of each scale based on how the participants responded to other items on the same scale.

For both SDIS and CBRS, winsorizing was performed in order to deal with outliers. Bootstrapping was also performed as a non-parametric remedy in order to further smooth out any concerns about skewness, and kurtosis.

Descriptive Statistics

Means and standard deviations for emotional, behavioral, and sleep problems are reported based on their age group in Tables 1 and 2. Based on the SDIS cut-off scores recommended for assessing sleep problems (Luginbuehl, 2004), the mean scores of DSPS, EDS, and SDI fell within the “normal” range (i.e., *T*-scores under 60) for children and adolescents. Regarding the CBRS, compared to the U.S. normative sample (Conners, 2008), the Korean sample means of the raw scores on the CBRS were significantly different. To be specific, the Korean parents reported that their children had significantly lower Emotional Distress ($t(189) = -3.84, p < .001$), Aggressive Behaviors ($t(189) = -8.41, p < .001$), and Academic Difficulties ($t(189) = -5.03, p < .001$) than those in the U.S.. Korean youth also reported having lower Emotional Distress ($t(170) = -2.12, p = .04$), Aggressive Behaviors ($t(170) = -13.51, p < .001$), and Academic Difficulties ($t(170) = -$

6.39, $p < .001$) than American youth. Grades were initially collected into seven groups, but they were recoded to five in order to minimize issues in the analyses: 1 = Receives all A's/mostly A's; 2 = Receives A's and B's; 3 = Receives B's; 4 = Receives B's and C's; 5 = Receives below C's).

Table 1

Means and Standard Deviations for Children (N=69)

Variable	<i>n</i>	%	<i>M</i>	<i>SD</i>	Range
SDIS-C	69				
DSPS	64	93	45.06	3.53	10
EDS	64	93	42.44	3.31	10
SDI	64	93	43.47	5.43	31
CBRS-P	69				
ED	68	99	5.51	5.90	20
AB	68	99	1.22	1.68	5
AD	68	99	3.30	4.27	13
CBRS-SR	53				
ED	53	100	12.50	10.67	39
AB	53	100	3.26	2.88	8
AD	53	100	3.83	3.65	12

Note. DSPS = Delayed Sleep Phase Syndrome; EDS = Excessive Daytime Sleepiness; SDI = Total Sleep Disturbance Index; ED = Emotional Distress; AB = Aggressive Behaviors; AD = Academic Difficulties.

Table 2

Means and Standard Deviations for Adolescents (N = 123)

Variable	<i>n</i>	%	<i>M</i>	<i>SD</i>	Range
SDIS-A	123				
DSPS	121	98	43.74	8.79	28
EDS	121	98	39.69	5.25	18
SDI	121	98	43.33	6.49	36
CBRS-P	123				
ED	122	99	6.68	6.68	20
AB	122	99	1.37	1.62	5
AD	122	99	3.89	4.31	13
CBRS-SR	123				
ED	117	95	17.62	14.09	47
AB	117	95	2.79	2.72	8
AD	117	95	5.20	3.66	12

Note. DSPS = Delayed Sleep Phase Syndrome; EDS = Excessive Daytime Sleepiness; SDI = Total Sleep Disturbance Index; ED = Emotional Distress; AB = Aggressive Behaviors; AD = Academic Difficulties.

Psychometric Properties of the Korean-version SDIS

Reliability. Internal consistency was measured for the Total Sleep Disturbance Index (SDI). The Cronbach's alpha for the SDIS-C was .89. The Cronbach's alpha for the SDIS-A was .92. Please see Table 3 for internal consistency for each subscale. When the Cronbach's alpha coefficients of the Korean sample were compared to those of the U.S. normative sample collected by the publishers for the standardization of the SDIS (i.e., SDIS-C SDI $\alpha = .91$; SDIS-A SDI $\alpha = .92$), they were not significantly different from each other for both SDIS forms on the SDI (SDIS-C: $\chi^2(1) = 1.06, p = .30$; SDIS-A: $\chi^2(1) = 0.00, p > .05$). Thus, the result supported the hypothesis 1 a), such that the SDIS had acceptable internal consistency and the reliability scores obtained in this sample were similar to scores obtained in the United States.

Table 3

Summary of Internal Consistency for the SDIS: Children's and Adolescent Forms

SDIS Groups	SDI	SDIS Subscales				
		OSAS	PLMD	DSPS	EDS	NARC
Children's Form (SDIS-C)	.89	.80	.80	.62	.76	N/A
Adolescent Form (SDIS-A)	.92	.81	.77	.83	.87	.86

Note. SDI = Total Sleep Disturbance Index; OSAS = Obstructive Sleep Apnea Syndrome; PLMD (Periodic Limb Movement Disorder); DSPS = Delayed Sleep Phase Syndrome; EDS = Excessive Daytime Sleepiness; NARC = Narcolepsy.

Confirmatory factor analysis of the SDIS. Confirmatory factor analysis (CFA) was conducted to assess the degree to which the factor structure of the SDIS in the Korean version would be consistent with the U.S. standardization sample. A model fit was evaluated using the model chi-square difference test (χ^2), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual index (SRMR). A good model fit is determined by non-significant p -value on the chi square *test* (i.e., $p > .05$), CFI values of .90 or greater, RMSEA and SRMR values of less than .08 respectively, and TLI values of .95 or greater (Barbeau et al., 2019; Hooper et al., 2008; Kenny, 2015).

The four-factor model of the SDIS-C was assessed, but the model demonstrated a poor fit ($\chi^2(268) = 909.49, p < .001, CFI = .41, TLI = .34, RMSEA = .19, SRMR = .12$). As the current study focused on the DSPS and EDS, the two-factor model was explored. The model modification indices were followed to improve the model fit by correlating items within the DSPS and EDS (i.e., correlating items 24 and 25, 4 with 20, and 8 with 16 respectively). Despite modifications, the result indicated the two-factor model of the SDIS-C had a poor fit ($\chi^2(39) = 86.70, p < .001, CFI = .84, TLI = .77, RMSEA = 0.14, SRMR = .09$). The one-factor model of the SDIS-C was also assessed, but the model

demonstrated a poor fit ($\chi^2(275) = 986.82, p < .001, CFI = .34, TLI = .28, RMSEA = .20, SRMR = .13$).

The five-factor and two-factor models of the SDIS-A were assessed but they failed to produce convergences. The one-factor model of the SDIS-A was performed, but the model demonstrated a poor fit ($\chi^2(405) = 1333.13, p < .001, CFI = .49, TLI = .45, RMSEA = .14, SRMR = .12$). These results indicated a poor model fit of the SDIS in both forms and as such this hypothesis 1 b) was not supported.

Concurrent validity. It was hypothesized the SDI would be significantly related to the sum of the sleep related items on the CBRS-P and CBRS-SR. A Pearson Correlation was used to evaluate their relations. The SDI on the SDIS-C was significantly correlated with the sum of the sleep related items on the CBRS-P ($p = .02$) and CBRS-SR ($p = .03$). The SDI on the SDIS-A was also significantly correlated with the sum of the sleep related items on the CBRS-P ($p < .001$) and CBRS-SR ($p = .02$). The sums of the sleep items on the CBRS-P and CBRS-SR were significantly correlated as well ($p < .001$). Thus, the SDIS's concurrent validity was established, supporting the hypothesis 1 c). Detailed correlation coefficients are reported in Table 4.

Table 4

Correlation Coefficients for Associations Between the SDI and Sleep Items on the CBRS

Measure	1	2	3	4
1. SDIS-C SDI	-			
2. SDIS-A SDI	-	-		
3. CBRS-P	.30*	.60***	-	
4. CBRS-SR	.36*	.28**	.28***	-

Note. SDI = Total Sleep Disturbance Index; CBRS-P = CBRS-parent form; CBRS-SR = CBRS-self-report form.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Direct Relationships between Sleep Problems and Youth Functioning

Table 5 presents bivariate correlations amongst variables for children. Among children, the New SDI was positively related to parent-reported and self-reported Emotional Distress, respectively. The EDS was also positively related to parent-reported and self-reported Emotional Distress, respectively. However, both New SDI and EDA were not significantly related to Aggressive Behaviors, Academic Difficulties, and parent-reported grades, respectively. Lastly, the DSPS was not significantly related to any psychological and academic functioning.

Table 5

The Bivariate Correlations among Main Measures for Children

Variables	1	2	3	4	5	6	7	8	9
NEW SDI	-								
DSPS	.76***	-							
EDS	.92***	.48***	-						
CBRS-P ED	.44***	.23	.47***	-					
CBRS-P AB	.14	.04	.17	.50***	-				
CBRS-P AD	.20	.08	.20	.43***	.51***	-			
CBRS-SR ED	.41**	.21	.42**	.31*	.26	.21	-		
CBRS-SR AB	.05	-.08	.09	.21	.35*	.09	.39**	-	
CBRS-SR AD	.17	-.01	.20	.07	.21	.30*	.58***	.41**	-
Grades	.01	-.04	.45	.18	.33**	.60***	-.03	-.03	.06

Note. New SDI = New Total Sleep Disturbance Index; DSPS = Delayed Sleep Phase Syndrome; EDS = Excessive Daytime Sleepiness; ED = Emotional Distress; AB = Aggressive Behaviors; AD = Academic Difficulties.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Bivariate correlations between variables for adolescents are presented in Table 6.

As expected, the New SDI, DSPS, and EDS was positively related to parent-reported Emotional Distress, Aggressive Behaviors, and Academic Difficulties, respectively. They were also positively related to self-reported Emotional Distress and Academic Difficulties, respectively. However, self-reported Aggressive Behaviors and parent-

reported grades were not significantly related to any sleep problems, respectively. Thus, the hypothesis 2 was partially supported.

Table 6

The Bivariate Correlations among Main Measures for Adolescents

Variables	1	2	3	4	5	6	7	8	9
NEW SDI	-								
DSPS	.93 ^{***}	-							
EDS	.92 ^{***}	.82 ^{***}	-						
CBRS-P ED	.54 ^{***}	.50 ^{***}	.52 ^{***}	-					
CBRS-P AB	.33 ^{***}	.30 ^{**}	.30 ^{**}	.54 ^{***}	-				
CBRS-P AD	.34 ^{***}	.29 ^{**}	.34 ^{***}	.63 ^{***}	.47 ^{***}	-			
CBRS-SR ED	.30 ^{**}	.32 ^{**}	.23 [*]	.29 ^{**}	.17	.16	-		
CBRS-SR AB	.08	.11	.01	.08	.12	.08	.61 ^{***}	-	
CBRS-SR AD	.24 ^{**}	.24 ^{**}	.19 [*]	.26 ^{**}	.06	.37 ^{***}	.53 ^{***}	.29 ^{**}	-
Grades	-.01	-.04	.01	-.02	.08	.39 ^{***}	-.15	-.13	.18

Note. New SDI = New Total Sleep Disturbance Index; DSPS = Delayed Sleep Phase Syndrome; EDS = Excessive Daytime Sleepiness; ED = Emotional Distress; AB = Aggressive Behaviors; AD = Academic Difficulties.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Indirect Relationships between Sleep Problems and Academic Functioning

Multiple mediation analysis was conducted to investigate the mediating roles of psychological functioning (i.e., Emotional Distress and Aggressive Behaviors) between sleep problems and academic functioning using PROCESS. The indirect effect was tested using a percentile bootstrap estimation approach with 5000 samples. In the mediation analysis, gender and age were used as covariates.

Mediation Models among Children. The results of the mediation models indicated that there were three significant indirect effects among children. First of all, the indirect effect of the EDS on Academic Difficulties was positive and statistically significant ($\beta = .20$, Boot SE = .04, 95% Boot CI = .04, .45) via self-reported Emotional Distress, but not via self-reported Aggressive Behaviors ($\beta = .02$, Boot SE = .03, 95%

Boot CI = -.01, .12). This suggested that the EDS was associated with the self-reported Academic Difficulties as mediated by self-reported Emotional Distress. The EDS was a significant predictor of the self-reported Emotional Distress ($\beta = 1.17$, $SE = .36$, $p = .002$), and that the self-reported Emotional Distress was a significant predictor of the self-reported Academic Difficulties ($\beta = .17$, $SE = .04$, $p < .001$).

In addition, the indirect effect of the EDS on the Academic Difficulties was significant via the parent-reported Aggressive Behaviors ($\beta = .09$, $Boot SE = .07$, 95% $Boot CI = .002, .30$), but not via the parent-reported Emotional Distress ($\beta = .10$, $Boot SE = .10$, 95% $Boot CI = -.06, .34$). This indicated that the EDS was associated with the parent-reported Academic Difficulties as mediated by parent-reported Aggressive Behaviors. The EDS had positive effect on the parent-reported Emotional Distress ($\beta = .79$, $SE = .53$, $p < .001$), but not on the parent-reported Aggressive Behaviors ($\beta = .10$, $SE = .05$, $p = .08$). On the other hand, the parent-reported Aggressive Behaviors had positive effect on the parent-reported Academic Difficulties ($\beta = .90$, $SE = .30$, $p = .004$) while the parent-reported Emotional Distress did not have significant effect on the parent-reported Academic Difficulties ($\beta = .13$, $SE = .10$, $p = .17$).

Lastly, the indirect effect of the New SDI on the self-reported Academic Difficulties was statistically significant via the self-reported Emotional Distress ($\beta = .12$, $Boot SE = .05$, 95% $Boot CI = .03, .24$), but not via the self-reported Aggressive Behaviors ($\beta = .01$, $Boot SE = .01$, 95% $Boot CI = -.01, .06$). In other words, the New SDI was associated with the self-reported Academic Difficulties as mediated by the self-reported Emotional Distress. The New SDI had positive effect on the self-reported Emotional Distress ($\beta = .64$, $SE = .20$, $p < .003$), and the self-reported Emotional Distress

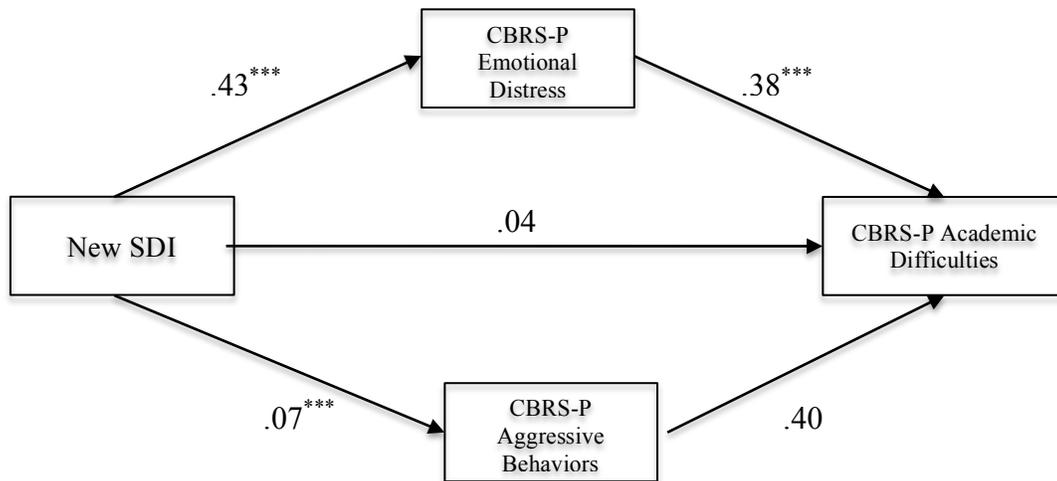
has positive effects on the self-reported Academic Difficulties ($\beta = .18$, $SE = .04$, $p < .001$).

The above models were reversed and evaluated to provide support to the theoretically hypothesized models. The results suggested that similar mediational patterns were found in the reversed models, such that the academic functioning could affect the psychological functioning, and in turn, the psychological functioning could affect sleep problems.

Mediation Models among Adolescents. The results of the mediation models indicated that the Emotional Distress significantly mediated the effect on New SDI, DSPS, and EDS on Academic Difficulties reported by parents and self, but not the Aggressive Behaviors. To be specific, the indirect effect of the New SDI on the self-reported Academic Difficulties was statistically significant via the self-reported Emotional Distress ($\beta = .06$, $Boot SE = .03$, $95\% Boot CI = .02, .13$), but not via the self-reported Aggressive Behaviors ($\beta = .001$, $Boot SE = .01$, $95\% Boot CI = -.01, .03$). Please see Figure 2 for more details.

Figure 2

The Mediating Effect of the New SDI on the Parent-Reported Academic Difficulties

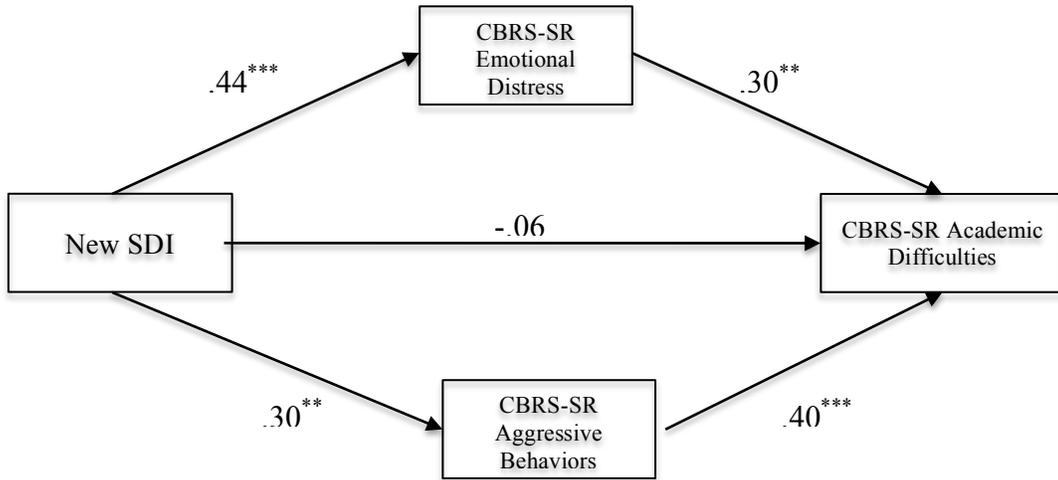


Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Similarly, the indirect effect of the New SDI on the parent-reported Academic Difficulties was significant as mediated by the parent-reported Emotional Distress ($\beta = .17$, Boot SE = .0, 95% Boot CI = .10, .25), but not by the self-reported Aggressive Behaviors ($\beta = .001$, Boot SE = .01, 95% Boot CI = -.002, .07). Please find Figure 3 for more details. Thus, the New SDI was associated with the Academic Difficulties as mediated by the Emotional Distress.

Figure 3

The Mediating Effect of the New SDI on the Self-Reported Academic Difficulties

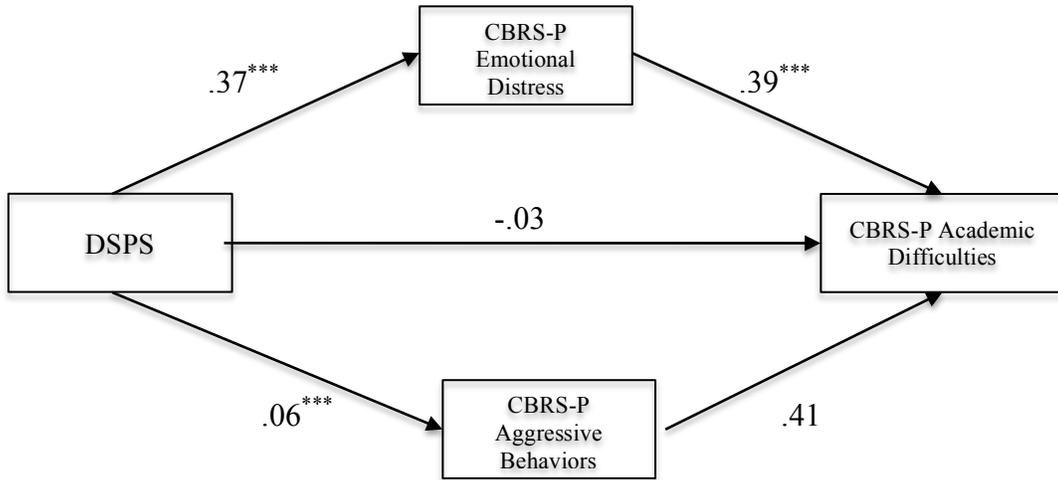


Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

In terms of the DSPS, there were significant mediating effects of the Emotional Distress on the associations between the DSPS and the Academic Difficulties, as reported by parents ($\beta = .15$, Boot SE = .03, 95% Boot CI = .09, .22) and self ($\beta = .06$, Boot SE = .03, 95% Boot CI = .02, .12). However, both parent- and self-reported Aggressive Behaviors were not the significant mediators (CBRS-P: $\beta = .21$, Boot SE = .02, 95% Boot CI = -.001, .07; CBRS-SR: $\beta = .001$, Boot SE = .01, 95% Boot CI = -.01, .02). Please see Figures 4 and 5 for more details.

Figure 4

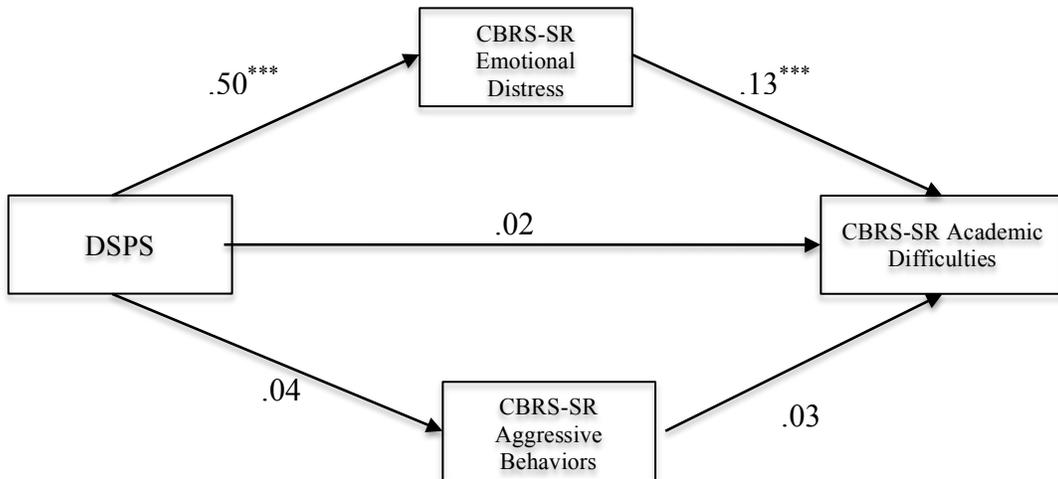
The Mediating Effect of the DSPTS on the Parent-Reported Academic Difficulties



Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 5

The Mediating Effect of the DSPTS on the Self-Reported Academic Difficulties



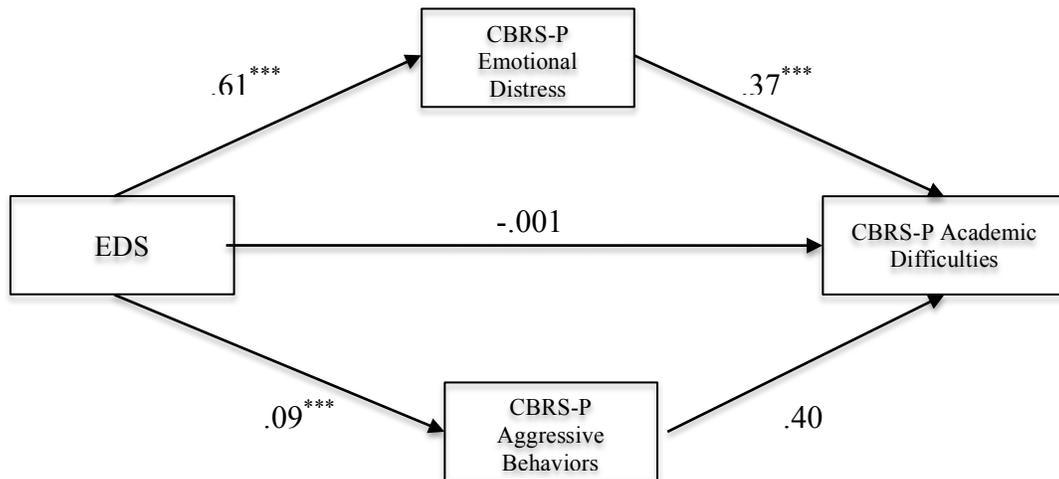
Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Lastly, the indirect effect of the EDS on the parent-reported Academic Difficulties was statistically significant via the parent-reported Emotional Distress ($\beta = .23$, Boot SE

= .05, 95% Boot CI = .13, .35), but not via the parent-reported Aggressive Behaviors ($\beta = .04$, Boot SE = .03, 95% Boot CI = -.004, .10).

Figure 6

The Mediating Effect of the EDS on the Parent-Reported Academic Difficulties

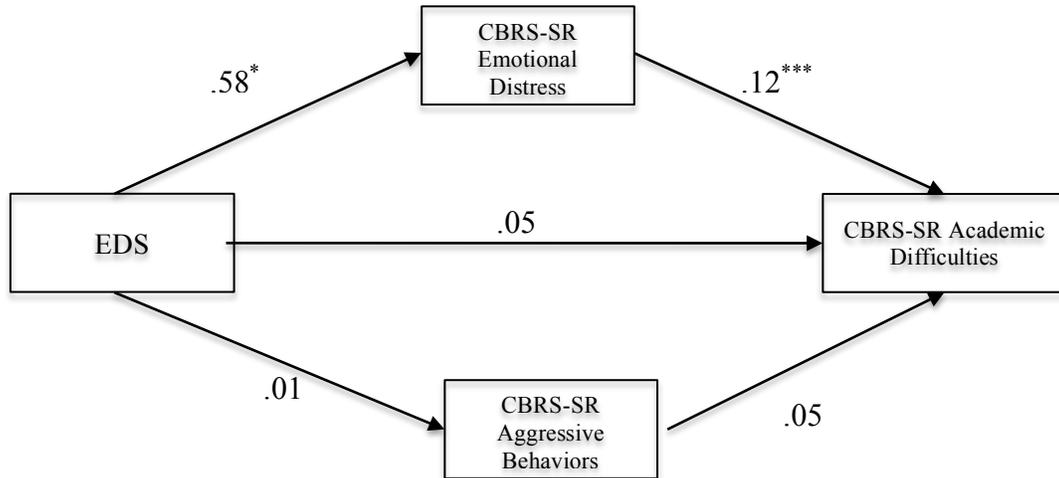


Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Furthermore, the indirect effect of the EDS on the self-reported Academic Difficulties was statistically significant as mediated by the self-reported Emotional Distress ($\beta = .07$, Boot SE = .04, 95% Boot CI = .01, .15), but not by the self-reported Aggressive Behaviors ($\beta = .001$, Boot SE = .01, 95% Boot CI = -.01, .02). Please refer to Figure 8. Thus, the EDS was associated with the parent- and self-reported Academic Difficulties as mediated by the parent-reported Emotional Distress, respectively.

Figure 7

The Mediating Effect of the EDS on the Self-Reported Academic Difficulties



Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Consistent with the mediation models among children, the reversed models were further assessed among adolescents. The results suggested that their mediational patterns were similar across both original and reversed models, indicating that academic problems leading to sleep problems was as reasonable as sleep problems leading to academic problems. Thus, the hypothesized models are only theoretically sound.

DISCUSSION

Sleep problems are common and universal among children and adolescents (Gregory & Sadeh, 2016; Meltzer et al., 2010; Owens, 2007), which have been linked to adverse effects in psychological functioning (Alfano et al., 2009; Hiscock et al., 2007; Jiang et al., 2007; Johnson et al., 2000; Lam et al., 2003; Lee et al., 2012; Paavonen et al., 2003; Perfect et al., 2014) and academic performance (Joo et al., 2005; Pagel et al., 2007; Perfect et al., 2014; Shin et al., 2003). The delayed sleep phase syndrome (DSPS) (Johnson et al., 2006; Kim et al., 2017; Liu et al., 2008; Meltzer et al., 2010; Ohida et al., 2004; Roberts et al., 2008) and excessive daytime sleepiness (EDS) (Choi et al., 2009; Joo et al., 2005; Liu et al., 2003; Liu et al., 2008; Ohida et al., 2004) were especially common among children and adolescents. However, there is limited literature to explain how sleep problems are related to psychological and academic functioning in Asian countries despite higher prevalence of sleep problems than Western countries (Gradisar et al., 2011; Jiang et al., 2007; Liu et al., 2005; Mindell et al., 2010; Ohida et al., 2004; Sadeh et al., 2011). The current study aimed to examine how sleep problems are related to psychological and academic functioning among children and adolescents in South Korea, where children and adolescents experience high rates of sleep problems (Choi et al., 2009; Joo et al., 2005; Kim et al., 2017; Yoon et al., 2007) and mental health problems (Lee et al., 2007; Park et al., 2012; Park et al., 2015; Statistics Korea, 2018).

Psychometric Properties of the Korean-version of the Sleep Disorder Inventory for Students

As hypothesized, the Korean-version of the SDIS yielded acceptable internal consistency across the subscales in both children's and adolescent forms. The internal

consistency coefficients of the SDI on both forms were comparable to those of the US normative sample. However, the DSPS scale on the children's form (SDIS-C) was questionable ($\alpha = .62$). The weak internal consistency of the DSPS scale on the SDIS-C could be explained by the small number of items in the subscale (i.e., only 4 items) (Luginbuehl, 2004). A similar finding in regard to weak internal consistency within the DSPS on the SDIS-C was also emerged in the US version of the SDIS ($\alpha = .76$) (Luginbuehl, 2004). Thus, the subsequent analyses using the DSPS on the SDIS-C should be interpreted with caution given the poor internal consistency.

It was hypothesized that the factor structures of the Korean version of the SDIS would be maintained. Confirmatory factor analyses (CFA) were conducted to evaluate the factor structures on both SDIS-C and SDIS-A. Unlike the US version of the SDIS, good model fits were not obtained in the Korean version of the SDIS. As the current study used only two subscales, the two-factor models were explored, but they still produced poor model fits even with significant model modifications due to cross-loadings and shared covariances within and outside of factors. The SDIS-A factor models failed to produce convergences during analysis and after alternative solutions, such as identifying problematic items and dropping them, were performed. The lack of consistent factor structures with the US version could be due to a small number of participants for each form. It has been recommended that a sample size in the range of 100 to 200 (MacCallum et al., 1999; Matsunaga, 2010; O'Rourke & Hatcher, 2013) or approximately 5 participants per item (Matsunaga, 2010; O'Rourke & Hatcher, 2013) for CFA. In this study, there were only 69 participants for 25 items on the SDIS-C and 123 participants for 30 items on the SDIS-A. Furthermore, there were notably less variances within each

subscale, as the sample did not include children who were specifically identified as having sleep problems. Thus, future studies should include both children with and without sleep problems to have a better understanding of how sleep problems are related to psychological and academic functioning.

Lastly, concurrent validity of the Korean version of the SDIS was evaluated by using the sleep related items on the CBRS-P and CBRS-SR. Both SDI scores on the SDIS-C and SDIS-A were significantly correlated with sums of the identified sleep items on the CBRS-R and CBRS-SR. However, different measures, such as the Korean version of the Epworth Sleepiness Scale (KESS; Cho et al., 2010), should be used to evaluate concurrent validity of the SDIS because there were only three items on the CBRS-P and five items on the CBRS-SR that were related to sleep. Thus, it would be difficult to conclude that the Korean version of the SDIS had good validity without further evidence.

Overall, unlike U.S. version of the SDIS, the Korean version did not have strong psychometric properties. The Korean version had good reliability and concurrent validity, but confirmatory factor analysis suggested that the Korean SDIS yielded different factors than the proposed U.S. model. Thus, the main analyses should be interpreted with great caution.

The Direct Relationships between Sleep Problems and Psychological and Academic Functioning

The current findings were consistent with previous literature (Joo et al., 2005; Lee et al., 2012; Shin et al., 2003), such that sleep problems were related to more emotional, behavioral, and academic problems. The EDS was significantly associated with only the Emotional Distress, indicating children with more symptoms on the EDS exhibited higher

levels of the Emotional Distress, as reported by parents and self. Sleep problems appeared to be more strongly associated with psychological and academic functioning in adolescents. Adolescents who struggled with the EDS, DSPS, and total sleep problems (i.e., the New SDI) presented with higher levels of the psychological, and academic problems. As adolescents tend to struggle more with insomnia/DSPS and EDS than children (Johnson et al., 2000; Lee et al., 2012), sleep problems appear to be more influential on adolescents than children. Overall, sleep problems appeared to have more influence on emotional distress than on aggressive behaviors, academic difficulties, and grades.

The Mediating Effect of Psychological Functioning on the Relationship between Sleep Problems and Academic Functioning

The effect of sleep problems on academic problems was mediated by emotional and behavioral problems in children and adolescents. Children who exhibited more EDS had more Academic Difficulties when they had poor Emotional Distress and Aggressive Behaviors. Having more overall sleep problems (i.e., the New SDI) were also associated with the Academic Difficulties, as mediated by the Emotional Distress as well.

Adolescents with overall sleep problems, the DSPS, and EDS, respectively, had more Academic Difficulties when they had higher levels of the Emotional Distress. The Aggressive Behaviors were not a significant predictor of the associations between the sleep problems and academic problems. This may be due to the overlapping variance within psychological functioning measures (i.e., Emotional Distress and Aggressive Behaviors).

There is no existing literature that has evaluated mediating models that measure the effects of sleep problems on children and adolescents' functioning. Based on the current findings, sleep problems appear to be associated with psychological and academic functioning in children and adolescents, and psychological difficulties mediate the relationship between sleep problems and academic difficulties. It is possible that children and adolescents may have more difficulty focusing on academic difficulties when they struggle behaviorally and emotionally, which can in turn be influenced by sleep problems. However, the reversed mediation models were also significant, such that the academic functioning could be associated with sleep problems through psychological functioning. Despite unresponsive reversed models, from conceptual point of view, the initial hypothesized models make sense, but further studies should explore both models to further understand the interactions among sleep problems, psychological functioning, and academic problems.

Limitations

This study has a number of limitations. First, the study was limited by a relatively small sample for conducting CFA and path analyses. The sample is also not representative of the entire Korean youth with and without sleep problems. Sample size is one of the strongly hypothesized reasons for the lack of replication of factor structure and less than ideal model fits. Furthermore, the use of a general population sample likely led to finding a weaker relationship among academic difficulties, behavioral problems, and sleep difficulties in this study. Translation effects could have also impacted factor replicability. The measures were translated by Korean doctoral students in the fields of psychology and primary researchers rather than language translators (Lin, 2018). Thus,

the items may not capture cultural and linguistic differences. Despite poor factor structures, the SDIS demonstrated good reliability and concurrent validity. However, it was still a preliminary effort at measuring psychometric properties of the Korean version of the SDIS rather than the rigorous psychometric evaluation necessary for formal scale development. Thus, future studies should include collecting a large sample both with and without sleep problems and evaluate psychometric properties of the SDIS with updated translations.

Furthermore, the mediation model that was conceptually hypothesized and assessed in this study was not supported because the reverse model statistically worked. As the current study was naturalistic and cross-sectional, it is critical for future studies to evaluate causal directions between sleep problems and academic difficulties through psychological problems by gathering on longitudinal data and/or comparing groups with and without a randomized sleep intervention.

Despite these limitations, this study contributes to the growing literature about the sleep problems in children and adolescents in three important ways: 1) the preliminary development of the Korean-version of the SDIS; 2) the examination of relationships between sleep problems and psychological and academic functioning; and 3) the use of path analyses for mediating effects between variables.

Clinical Implications and Future Directions

The findings further highlight the importance of recognizing sleep problems on youth psychological and academic functioning. Sleep problems are associated with high levels of psychological and academic difficulties. The current study provides additional support for the mediation models the previous literature have not provided. Given that

psychological functioning played a mediating role between sleep problems and academic functioning, we wish to emphasize how important it is to focus on children and adolescents with psychological difficulties especially internalizing problems (i.e., Emotional Distress). Future studies should include longitudinal data to provide how sleep could impact their functioning. Based on the findings of the current study, interventions should continue to be developed to target sleep problems, which can lead to improvement of psychological and academic functioning (Bei et al., 2013; Shin et al., 2017; Wiggs & France, 2000). However, it is important to note that academic difficulties can lead to sleep problems so helping children and adolescents cope better with academic problems can be a part of a sleep intervention as well.

Based on this data, however, it is unclear how children and adolescents report their own sleep issues. Adolescents may have a better understanding of their own sleep-related problems than their parents. Thus, it is important to conduct future research examining self-reported sleep problems including delayed sleep phase syndrome (DSPS) and excessive daytime sleepiness (EDS) as well as teacher-reported measures of psychological and academic functioning in children and adolescents. Additionally, it is important to examine other variables that could contribute to sleep problems in children and adolescents, such as medical problems (Lewandowski et al., 2011) and number of hours of sleep (Joo et al., 2005).

The Korean translated and adapted version of the SDIS can serve as a good foundation as a pilot assessment tool to use in the identification of sleep problems among South Korean youth, given the high prevalence of sleep problems in South Korea (Choi et al., 2009; Joo et al., 2005; Kim et al., 2017; Yoon et al., 2007). It is our hope that the

SDIS can be used to diagnose as well as develop treatment and intervention plans for children and adolescents in order to improve not only their sleep but also their mental health.

APPENDICES

Appendix A: School Consent



September 1, 2016

Dear School Principal,

My name is Mark Terjesen and I am a faculty member in the department of psychology at St. John's University (New York). I am writing to request your assistance in a research project that could have benefit for children within your school. Specifically, we are looking to recruit children and parents to take part in a research study designed to learn more about children's sleep patterns and how they relate to their thought patterns and behavior. Parents, teachers and children would be asked to complete and return a brief questionnaire packet that will include measures of sleep behavior, behavior rating and children's emotion. For children under 8 years of age, only their parent and teacher will complete these forms. For children from 10-18, parents and teachers will complete some forms as well the student. Overall, participation should take approximately 30 minutes for parents and teachers and 30 minutes for students. In addition, all families and teachers who participate will be given gifts as a token of appreciation for their participation. This study, we believe, is important because it may help us better understand the relationship between sleep and the way children think and their behavior better.

Confidentiality of your student's research records will be strictly maintained and responses will be kept confidential with the following exception: the researcher is required by law to report to the appropriate authorities, suspicion of harm to yourself, to children, or to others.

If you would like, when all results are complete, we can inform you of the findings and implications found in the study.

Please allow me to thank you in advance for your consideration. I look forward to hopefully beginning a dialogue about possible recruitment. If you are interested, please do not hesitate to contact me at (718) 990-5860 or terjesem@stjohns.edu.

Sincerely,

Mark D. Terjesen, Ph.D.
Director, Graduate Programs in School Psychology
St. John's University
8000 Utopia Parkway
Marillac Hall SB36
Jamaica, NY 11439

St. John's University, Department of Psychology, 8000 Utopia Parkway, Marillac Hall SB36, Jamaica, NY 11439 p: (718)990-5860; F: (718)990-5926

Appendix B: Parent Consent



September 1, 2016

Dear Parent,

My name is Mark Terjesen, Ph.D. and I am a faculty member in the psychology department at St. John's University (New York). We would like to invite you and your child to take part in a research study designed to learn more about children's patterns of thought and behavior. We are requesting your voluntary participation in the current study. If you agree to participate and give permission for your child's participation in this study, you will be asked to complete a brief questionnaire packet that will include a demographic questionnaire, a measure of sleep behavior, a measure of children's emotion and a behavior rating scale. If your child is over 8 years of age, they will be asked to complete a brief questionnaire packet that will include a measure of sleep behavior, a behavior rating scale, and an emotion scale. Participation should take you about 30 minutes and your child about 30 minutes. If you would like to participate, please fill out the questionnaire packet and return it in the attached sealed envelope to your child's classroom teacher. The researchers will give your child a questionnaire packet to fill out and return in a separate sealed envelope. The teacher will then return your and your child's sealed envelopes to the researcher along with those of other participants.

If you and your child decide to participate, you will be provided with a gift as a token of appreciation for your participation. Upon completion of the measures, you will have the option to A) pick up the gift at the school or B) your child will be given the gift card and sign that he/she received it. Additionally, you will be helping us understand the relationship between children sleep patterns and the way they think and behave better.

Confidentiality of you and your child's research records will be strictly maintained by assigning a code to the parental consent and child assent and keeping them separate from parental measures and child measures. This coded list linking an identification number to the consent and measures will be kept locked in the faculty members office and only he and the researchers will have access to this list. You and your child's responses will be kept confidential with the following exception: we are required by law to report to the appropriate authorities, suspicion of harm to yourself, to children, or to others. Participation in this study is voluntary. You or your child may refuse to participate or withdraw at any time without any penalty. In addition, you and

your child have the right to skip or not answer any questions you or he/she prefers not to answer. Nonparticipation or withdrawal will not affect your child's grades or academic standing. You and your child will be asked questions about different thoughts, emotions, and behaviors. Although unlikely, if any issues or concerns should arise for you or your child about your participation in this study, you may e-mail us at terjesem@stjohns.edu.

Please allow us to thank you in advance for your cooperation. In the event that you need any additional information regarding this research project, you may call Dr. Mark Terjesen at (718) 990-5860. Results of the present investigation will be available upon request and all inquires may be directed to the researchers at terjesem@stjohns.edu. For questions about your rights as a research participant, you may contact the university's Human Subjects Review Board, St. John's University, (718)-990-1440. You have received a copy of this consent document to keep.

Sincerely,

Mark D. Terjesen, Ph.D.

Agreement to Participate

I agree to participate in and allow my child, _____(name) , to participate in the study described above.

I will pick up the gift card from school.

I agree to let my child pick up and sign for the gift card.

I do not agree to participate in or allow my child, _____(name), to participate in the study described above.

Signature

Date

St. John's University, Department of Psychology, 8000 Utopia Parkway, Marillac Hall SB36, Jamaica, NY 11439

p: (718)990-5860; F: (718)990-5926

Appendix C: Child Assent



September 1, 2016

Dear Student,

My name is Mark Terjesen, Ph.D. and I am a professor at St. John's University (New York). Right now, we are trying to learn more about the way that children and teenagers think and act and would like your help. If you agree to participate, you will be asked to answer questions about things you may think about and ways you might behave as well as about your sleep habits. Your parents have already agreed to allow us to ask you to participate, but the choice is yours. You should only participate if you want to. It should take you about 30 total minutes. If you want to be in the study and answer questions for us, please answer the questions in your packet, put it back in the envelope, seal the envelope, and give it to your teacher. Your teacher will then return your packet to us without looking at it.

If you and your parents answer questions for us, you will be given a gift as a token of our appreciation. You will be asked questions about different thoughts, emotions, and behaviors. Although unlikely, if any issues or concerns should come up about your participation in this study, you may e-mail us at terjesem@stjohns.edu. If you agree to participate, you should know that your teacher, classmates, and even your parents won't know what you've said. It is important for you to know that there are no right or wrong answers. We will not tell anyone what you've said with the following exceptions: We are required by law to report to the appropriate authorities, suspicion of harm to yourself, to children, or to others. You should also know that if you decide to help us or if you decide to say "no," your choices will not affect your grades. Being in the study is up to you and you may also decide to stop after you begin or not answer questions that you don't want to answer.

We want to thank you in advance for your help as this will really help us learn more about student behavior and thoughts. If you would like to know more about the study you can e-mail us or call me at (718) 990-5860. Results of the study will be made available upon request, you can ask for them by e-mailing us at terjesem@stjohns.edu. For questions about your rights as a research participant, you may contact the university's Human Subjects Review Board, St. John's University, (718)-990-1440. We have enclosed a second copy of this consent document to keep.

Sincerely,

Mark Terjesen, Ph.D.

Agreement to Participate

I agree to participate in the study described above.

I do not agree to participate in the study described above.

Signature

Date

Appendix D: School Demographic Questionnaire

Parent-Child Demographic Information

(To be completed by parent)

1) **Today's Date:** _____ / _____ / _____
Month Day Year

2) **Child's Birth Date:** _____ / _____ / _____
Month Day Year

3) **Age:** _____

4) **Gender:** Female / Male

5) **Child's Grade in School (circle 1):**

Elementary School: 1 2 3 4 5 6

Middle School: 1 2 3

High School 1 2 3

6) **Which most accurately describes your child's grades in school:**

A) Receives all A's/mostly A's

E) Receives mostly C's

B) Receives some A's and some B's

F) Receives mostly D's

C) Receives mostly B's

G) Receives mostly F's

D) Receives some B's and some C's

7) **If your child is NOT Korean, what is the ethnicity of your child?**

8) Does your child receive any special academic accommodations **from the school**?

Yes / No

If yes, what are they? (circle all that apply)

A) Speech/Language

E) Inclusion Classroom

B) Physical Therapy

F) Individual Counseling

C) Occupational Therapy

G) Group Counseling

D) Resource Room

9) Is the child receiving any **psychological services**? Yes / No

If yes, what for? (circle all that apply)

A) Adjustment Difficulties

F) Eating Disorders

B) Social Skills Development

G) Anxiety

C) Academic Difficulties

H) ADHD

D) Behavior Problems

I) Other:

E) Depression

10) Is this a **bilingual home**? Yes / No

If yes, what language is spoken in the home?

11) The **person filling out the questionnaires** is Male / Female

For questions 12-21, “caretaker” refers to a person who is responsible for meeting the daily needs of the child in the home.

12) Is there a **female caretaker** in the home? Yes / No

13) **Ethnicity of female caretaker, if not Korean:**

14) **What is the female caretaker relationship to the child:**

- | | |
|----------------------|-----------------------|
| A) Biological Parent | D) Grandparent |
| B) Adopted Parent | E) Foster-care parent |
| C) Step-parent | F) Not Applicable |

15) **Employment status of female caretaker:**

- A) Employed full-time (greater than 35 hours per week)
- B) Employed part-time (between 20 and 35 hours per week)
- C) Employed part-time (less than 20 hours per week)
- D) Not presently employed
- E) Information not known

16) **Age of female caretaker:** _____

17) Is there a **male caretaker** in the home? Yes / No

18) **Ethnicity of male caretaker, if not Korean:**

19) What is the **male caretaker relationship** to the child:

- | | |
|----------------------|-----------------------|
| A) Biological Parent | D) Grandparent |
| B) Adopted Parent | E) Foster-care parent |
| C) Step-parent | F) Not Applicable |

20) **Employment status of male caretaker:**

- A) Employed full-time (greater than 35 hours per week)
- B) Employed part-time (between 20 and 35 hours per week)
- C) Employed part-time (less than 20 hours per week)
- D) Not presently employed
- E) Information not known

21) **Age of male caretaker:** _____

22) **Number of adults** (over age 18) in the home: _____

23) Are there **other children present in the household?** Yes / No
If so, how many? _____

What is the **present child's birth rank** (i.e. 1st, 2nd, 3rd, etc.)?

24) **Annual Household Income in 2015 in KRW (₩):**

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