

Associations between daily lifestyle characteristics and latent depressive symptoms in elementary school children: A cross-sectional survey

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This study aimed to identify associations between daily lifestyle characteristics and latent depressive symptoms in young children by analyzing self-reported questionnaire data. In 2011, in Nagasaki Japan, a cross-sectional survey of 1961 children aged between 10 and 12 years was conducted. Children answered questionnaires that collected demographic information, along with daily lifestyle characteristics, and were administered the Birmaher Depression Self-Rating Scale for Children (DSRSC-J). The mean age of the participants was 10.98 years (± 0.83 standard deviation [SD]) with a mean DSRSC-J raw score of 11.61 (± 6.34 SD). In total, 24.7% of participants reported depressive symptoms. A multiple logistic regression analysis revealed that depressive symptoms were associated with female gender (odds ratio [OR]: 1.86; 95% CI: 1.48–2.33), experiencing growth (OR: 1.25; 1.07–1.44), a bedtime later than 11 pm (OR: 1.25; 1.01–1.66), skipping breakfast (OR: 1.55; 1.15–2.10), and not having a set dinner time (OR: 1.65; 1.32–2.07). Conversely, absence of depressive symptoms was associated with involvement in school-related athletic clubs (OR: 0.60, 95% CI: 0.48–0.76) and at home studying for at least one hour per day (OR: 0.67, 95% CI: 0.54–0.84). Depressive symptoms in young children were associated with social contact and their parent's lifestyles. Non-experts in the field of mental health who interact with young children should carefully note the presence of factors associated with depressive symptoms as this would help children with latent depressive symptoms receive prompt and timely care.

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Introduction

Childhood depression is a common mental health problem that presents a serious challenge for children. Major depressive disorder (MDD) reportedly has a prevalence of 1–6% in adolescents and does not disappear with age and transitions to MDD in adults.¹ Depressive symptoms in children can lead to social and educational impairments, such as recurrent suicidal ideation, reduced academic ability, and social with-

drawal.¹ MDD in children and adolescents is diagnosed differently from that of adults as depression in children is often expressed through aggression or frustration rather than as depressed mood.²

It is important to devise precautionary measures that could be applied when depressive symptoms in children are latent. Engaging non-experts in mental health (e.g. teachers or sport coaches) has been shown to be effective in preventing childhood depression.^{3,4} Since non-experts can observe lifestyle

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habits in children more easily, they should be aware of straightforward indicators of depression in children. Furthermore, this information may prove to be useful compared to structured interviews or biological indicators.³

Previous studies noted an association between adolescent depression and daily lifestyle. For example, adolescent moods are affected by breakfast consumption,⁵⁻⁸ and sufficient sleep and physical activity are associated with reduced depressive symptoms.⁹⁻¹¹ Conversely, watching television is associated with significantly greater risk of developing depression.¹²⁻¹⁵ Even playing video games is reportedly to be associated with adolescent depression, particularly in Asia.¹⁴⁻¹⁶ Moreover, with the increased use of mobile phones and the internet, excessive mobile phone use is reportedly associated with children's depression and sleep disturbances,¹⁷⁻¹⁹ while internet use is correlated with depressive symptoms.^{17,19-23} There are various studies on the mental health in younger patients, however most of these focus on high-schoolers or college students.

To date, few studies have focused on examining the associations of depressive symptoms in younger children, particularly those of elementary school age. Therefore, our study aimed to investigate factors associated with depressive symptoms, with a particular focus on lifestyle factors of young children from 10 to 12 years old. This may enable non-experts to delineate symptoms of latent stage depression in children based on daily lifestyle characteristics and allow the identification of those at risk of mental disorders and provide early appropriate interventions.

Materials and Methods

Procedure

This study was designed as a cross-sectional descriptive study of school children in Sasebo City, a mid-sized city located in Nagasaki prefecture. Sasebo City has an estimated population of approximately 250,000 people, and houses multiple military bases. From December 2010 to January 2011, a comprehensive survey of the lifestyle factors and mental health status of all school age children was conducted in Sasebo City and included all elementary schools, encompassing the 4th-6th grades.²⁴ We reanalyzed this survey data in order to identify relationships between elementary school children depressive symptoms and self-reported lifestyle factors. This study was carried out in accordance with the tenets of the Declaration of Helsinki, and was approved by the ethics committee of Nagasaki University, Japan (approval number: 1803103).

Study questionnaire

The questionnaire was composed of 42 items that collected demographic information including gender, age, grade, family structure, and a depressive symptoms scale. Additionally, lifestyle data were collected, which included daily meal numbers, sleep habits, attitude towards schoolwork, extra-curricular activities, leisure activities, and electronic media use. The questionnaire was written using expressions easily understood by children. Answers to each question were selected from 2–4 choices, and questions with associated answer choices included the following: 1) Do you eat breakfast? (eat almost every day, 3-5 times a week, once or twice a week, hardly ever), 2) Do you eat dinner at a fixed time? (not at a fixed time, usually at a fixed time), 3) What time do you wake up every morning? (before 7 am, between 7 am and 7:30 am, between 7:30 am and 8 am, after 8 am), 4) Do you take part in extracurricular activities in school? (I belong to an athletic club, I belong to a cultural activity club, I belonged to a club in the past but not currently, I do not take part in any club activities), 5) Are you attending a cram school? (yes, no), and 6) How long do you watch TV, excluding learning programs, per day? (I rarely watch TV, 30 minutes per day, one hour per day, 2 hours per day, 3 hours per day). Regarding extracurricular activities of Japanese children, almost all students belong to one or more school-based clubs, which may be divided into athletic or cultural clubs. The latter mainly consists of school extracurricular programs, such as playing the piano or calligraphy. In this questionnaire, children were asked whether they were a part of an athletic or cultural club.

The students were informed of the aim and method of the survey. Questionnaires were submitted anonymously, if a student or his or her parents did not want to participate in the survey, the student submitted a blank questionnaire. Written explanations of the survey were distributed to participating students and their parents or guardians prior to survey administration. Children submitted their questionnaires in an envelope, so that teachers were unable to see their answers. Submission of a completed questionnaire was regarded as the child and their parents having provided informed consent to participate in the study. There were a total of 2055 questionnaires distributed to all students in Sasebo.

Variables used to assess depressive symptoms

Depressive symptoms were assessed using the Japanese version of the Birlleson Depression Self-Rating Scale for Children (DSRSC-J).²⁵ The DSRSC-J is a self-reported measure of depression, which consists of 18 items that assess

affective, psychological, and somatic features of depressive symptoms. This scale is appropriate for children 7–13 years old and the questions are designed using expressions that are easily understood by children. Cut-off points for positive depressive symptoms were based on previous studies and a score of <16 was defined as not having depressive symptoms whereas a score ≥ 16 was defined as having depressive symptoms.²⁵

Statistical analysis

All analyses were performed using the Statistical Package for the Social Sciences software, version 25 (SPSS, IBM Co., Ltd., New York, United States). Continuous variables were expressed as means with standard deviations (SD) and categorical variables were expressed as percentages. Chi-square and t-tests were used to assess characteristics, lifestyle aspects, and depressive symptoms. Multiple logistic regression analysis was used to determine lifestyle factors associated with depressive symptoms in children. The dependent variable was the group with depressive symptoms, having a DSRSC-J raw score of 16 or greater, or not. Outcomes were expressed

as an odds ratio (OR) with a 95% confidence intervals (CI). A p value of ≤ 0.05 was considered statistically significant. Independent variables included demographic and lifestyle items such as gender, grades, wake time, bedtime, breakfast consumption, stability of dinner times, engaging in extracurricular activities, and use of electronic media. The group without depressive symptoms were considered to be the reference group. A stepwise backward selection method was employed and criterion for variable removal was $p > 0.05$. Since the distributions of provided answers were highly skewed, variables such as time spent watching TV, and time spent playing games were regarded as categorical variables.

Results

Of the 2055 distributed questionnaires a total of 1961 were completed, yielding an overall response rate of 95.4%. As shown in Table 1, 940 (47.9%) participants were boys. The mean age was 10.98 years old (SD=0.83, range: 10–12 years old) and mean (\pm SD) DSRSC-J raw score was 11.61 \pm 6.34 (range: 0–35).

Table 1. Study participant characteristics.

Variables		n	%
Gender (boy/girl)	940/1021 (47.9%=boy)		
Age	10.98 \pm 0.83 (range 10–12)		
DSRSC-J	11.61 \pm 6.34 (range 0-35)		
Wake up after 7 am	no/yes	1026/935	52.3/47.7
Go to bed after 11 pm	no/yes	714/1247	36.4/63.6
Skip breakfast	no/yes	1715/246	87.5/12.5
Have unstable evening meal time	no/yes	1325/636	67.6/32.4
Study at home for more than one hour per day	no/yes	845/1116	43.1/56.9
Belong to athletic club in school	no/yes	812/1149	41.4/58.6
Attend cram school	no/yes	1031/930	52.6/47.4
Belong to cultural extracurricular activity club	no/yes	1457/504	74.3/25.7
Watch TV for more than 3 hours per day	no/yes	1218/743	62.1/37.9
Play games (including computer game)	no/yes	1070/891	54.6/45.4
Use the Internet	no/yes	1308/654	66.7/33.3
Interact with friends via e-mail using a mobile device	no/yes	1126/835	57.4/42.6
Talk to friend by phone	no/yes	1048/913	53.4/46.6

Data are represented as n (%) or mean \pm standard deviation.

DSRSC-J: Birlson Depression Self-Rating Scale for Children.

Table 2 compares children with depressive symptoms by demographic and lifestyle characteristics. Participants with depressive symptoms, namely a DSRSC-J score ≥ 16 , composed 24.7% of the study sample. Depressive symptoms were more frequent in girls, higher schoolers, individuals with bedtimes after 11 pm, skipped breakfast, had an unstable evening meal time, watched TV for more than 3 hours per day, interacted with friends by e-mail on a mobile device, and those who talked to friends with their phone. A lower frequency of depressive symptoms was found among children who studied at home an hour a day, were part of a school athletic club, and among those who reported playing games. No statistically significant association was found between depressive symptoms and children who woke up after 7 am, attended cram schools, participated in cultural extracurricular activities, or those who reported internet use.

Table 3 shows the results of multiple logistic regression analysis that set the DSRSC-J score as the dependent variable and demographic characteristics and lifestyle aspects as independent variables. Results revealed that depressive symptoms were associated with the female gender (OR: 1.86, 95% CI: 1.48–2.33), those experiencing growth (OR: 1.25, 95% CI: 1.07–1.44), going to bed after 11 pm (OR: 1.25, 95% CI: 1.01–1.66), skipping breakfast (OR: 1.55, 95% CI: 1.15–2.10), or those who reported having irregular dinner times (OR: 1.65, 95% CI: 1.32–2.07). In contrast, absence of depressive symptoms was associated with belonging to an athletic club in school (OR: 0.60, 95% CI: 0.48–0.76) as well as studying at home an hour a day (OR: 0.67, 95% CI: 0.54–0.84).

Discussion

We investigated the relationship between depressive symptoms and comprehensive lifestyle aspects of elementary school-aged children. The results of this study suggest that depressive symptoms were associated with young children who experience irregular dinner time, stay up late at night, and skip breakfast. Furthermore, participating in school athletic clubs and studying for an hour a day at home are associated with an absence of depressive symptoms.

Our findings that depressive symptoms were more common in girls when compared to boys, and that experiencing growth and female hormonal changes were related to depressive symptoms, were similar to the findings of previous studies.^{1,26–28} The depressive symptoms prevalence among elementary school students in Sasebo City was 24.7%, during the studied period, and this was higher than what has been

previously reported in studies examining comparable populations in Asia. The prevalence of depression in 11-year-old children was previously reported to be 0.4–2.2%.¹ With regards to similar Asian studies, a 2011 Korean study of approximately 80,000 students reported that the prevalence of adolescent depression was 1.1%,²⁹ whereas a study of 82,592 students in China suggested a prevalence of 1.3%.²⁷ However, a Japanese junior high school study enrolling 409 participants found that 24.9% of students were in a depressive state,¹⁰ similar to what is reported in this current study. It is difficult to directly compare findings of depressive symptoms across studies as the symptom scales used to assess childhood depression were different. There are various mental health disorders in children, some which may present similar to depression, such as psychosis, autism spectrum disorder, and attention deficit disorder.² In the current study, children who scored above the cut-off point on the DSRSC-J were classified as having depressive symptoms. However, it is possible that some of these cases may not have been true clinical depression.

The current study showed that skipping breakfast and having irregular dinner times were associated with depressive symptoms, which is generally consistent with previous studies in children.^{6–8} This study also found that irregular dinner times had a greater odds ratio compared to skipping breakfast in developing depressive symptoms. Regarding sleep, the results of the current study were also similar to what has been previously reported.⁹ The current study found that depressive symptoms were more closely associated with staying up late at night rather than waking up earlier.^{30–31} A later dinner time often results in a later bedtime, and we anticipated that these two items might occur together. If we were to assume that parents are primarily responsible for preparing dinner, then parental lifestyles may affect dinner times and, consequently, the mood and bedtime of their children.³²

Several studies have reported that exercise habits are associated with a reduction in depressive symptoms.^{9–11} The results of this study also showed that children who participated in athletic clubs had a lower prevalence of depressive symptoms. Attending cram schools has been regarded as a major stressor for children; however, we found no statistically significant relationships between attending such a school and depressive symptom in the multiple logistic regression analysis. In addition to exercise habits, we also found that studying at home for more than an hour a day was associated with an absence of depressive symptoms. Other studies have shown that parents can influence their child's mood.^{4,10,33} These findings indicated that children who spend time with their parents may have a decreased prevalence of depression, and that studying did not influence the mood of younger children.

Table 2. Comparison of characteristics and lifestyle variables between children with and without depressive symptoms.

Variables		Without depressive symptoms (n=1477) ^a 75.3%	With depressive symptoms (n=484) ^b 24.7%	P-value
Gender (boy/girl)		770 (81.9%)/ 707(69.2%)	170(18.1%)/ 314 (30.8%)	<0.0001
Age		10.91 ± 0.83	11.18 ± 0.79	<0.0001
Wake up after 7 am	no/yes	775(75.5%) / 702(75.1%)	251(24.5%) / 233(24.9%)	0.83
Go to bed after 11 pm	no/yes	582(81.5%) / 895(71.8%)	132(18.5%) / 352(28.2%)	<0.0001
Skip breakfast	no/yes	1320(77.0%) / 157(63.8%)	395(23.0%) / 89(36.2%)	<0.0001
Have irregular evening meal time	no/yes	1047(79.0%) / 430(67.6%)	278(21.0%) / 206(32.4%)	<0.0001
Study at home for more than one hour per day	no/yes	610(72.2%) / 867(77.7%)	235(27.8%) / 249(22.3%)	0.006
Belong to athletic club in school	no/yes	543(66.9%) / 934(81.3%)	269(33.1%) / 215(18.7%)	<0.0001
Attend cram school	no/yes	780(75.5%) / 697(74.9%)	251(24.3%) / 233(25.1%)	<0.753
Belong to cultural extracurricular activity club	no/yes	1103(75.7%) / 374(74.2%)	354(24.3%) / 130(25.8%)	0.51
Watch TV for more than 3 hours per day	no/yes	945(77.6%) / 532(71.6%)	273(22.4%) / 211(28.4%)	0.004
Play games	no/yes	782(73.1%) / 695(78.0%)	288(26.9%) / 196(22.0%)	0.013
Use the internet	no/yes	998(76.3%) / 479(73.4%)	310(23.7%) / 174(26.6%)	0.165
Interact with friends using a mobile device	no/yes	882(78.3%) / 595(71.3%)	244(21.7%) / 240(28.7%)	<0.0001
Talk to friends by phone	no/yes	809(77.2%) / 668(73.2%)	239(22.8%) / 245(26.8%)	0.041

DSRSC-J: Birlson Depression Self-Rating Scale for Children.

Data are represented as n (%) or mean ± standard deviation * p values are shown for Chi-square test for categorical variables and t-test for continuous variables. ^a Students with a DSRSC-J score of <16; ^b Students with a DSRSC-J score of >16.

Table 3. Multiple logistic regression analysis of the factors associated with depressive symptoms.

Variables	OR	95% CI	P value
Gender (girl)	1.86	1.48-2.33	<0.0001
Age (years)	1.25	1.07-1.44	0.004
Go to bed after 11 pm (yes)	1.25	1.01-1.66	0.039
Skip breakfast (yes)	1.55	1.15-2.10	0.004
Have an unstable dinner time (yes)	1.65	1.32-2.07	<0.0001
Belong to athletic club in school (yes)	0.6	0.48-0.76	<0.0001
Study at home for one hour per day(yes)	0.67	0.54-0.84	<0.0001

Data are expressed as odds ratios (ORs) with 95% confidence intervals (CI), with p values ≤ 0.05 being considered statistically significant. The dependent variable was the group with depressive symptoms or not.

It has already been noted that exposure to media influences childhood psychiatric symptoms. Addiction, aggression, and depression have often been discussed as being associated with consumption of media including television, portable music, mobile phones, video games, and internet social network services.¹²⁻²³ It is also apparent that Asian school children are particularly prone to depressive symptoms associated with media use when compared to children in other countries.¹⁹ However, this study did not identify a relationship between depressive symptoms in children and the time spent watching TV, using the Internet and mobile phones. These apparent differences across studies may be due to the fact that participants enrolled in previous studies were predominately high school or college students, and relationships between electronic media use and depression in younger children have not been examined in sufficient detail. Prior studies have also suggested that there is an association between playing games and depressive symptoms in adolescents. However, we did not find a correlation between playing games and depressive symptoms in the current study. We found that not all electronic media used was related to depressive symptoms, however, media that reduced social contact times were conversely associated with depressive symptoms.

We investigated a wide range of lifestyle characteristics common in children in order to investigate how these may influence odds ratios related to latent depressive symptoms. Although the results of this study were similar to those of previous studies, a notable strength of our study was that we focused on evaluating elementary school aged children. Furthermore, the identified lifestyle factors would be meaningful to both clinicians and laypersons with regards to identifying underlying psychiatric issues. More accurate identification of lifestyle factors associated with depressive symptoms could reduce false-positive cases of childhood depression. The current study suggests that parents and societal contacts are central lifestyle aspects that associated with a decrease in self-reported depressive symptoms in children. Thus, it is important to evaluate parental lifestyles and attitudes outside the home when assessing the potential underlying mental health issues in children.

It should be noted that this study was also subject to limitations. First, this was a cross-sectional study and therefore we were unable to establish the causality of our findings. Second, we analyzed the data obtained through self-administered questionnaires, which is not as accurate in assessing the mental state of children compared to a structured interview. Third, since the study participants included only children

living in Sasebo City, it is difficult to generalize our findings to all Japanese children. Fourth, there were potential confounding factors that were not assessed in this study including family income, school records, omega fatty acid consumption, and comorbidities (e.g. autistic spectrum or attention deficit hyperactivity disorders), all of which may affect depressive symptoms. Lastly, since smartphone use has more recently become ubiquitous in younger children, the data set that we analyzed did not accurately capture such a change. Future studies should examine the relationships between depressive symptoms in the context of more recent technologies used by young children.

Conclusions

This study found that depressive symptoms in children were associated with several lifestyle aspects related to meals, sleep habits, and extracurricular activity participation. Furthermore, we found that depressive symptoms were influenced by social contacts and parental lifestyles. These findings suggest that non-experts in the field of mental health who regularly interact with young children may be able to use these factors to identify children who are at risk of developing depression. This could help children with latent depression to receive timely interventions, and thereby improve the treatment and prevention of childhood depression.

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References

- 1) Thapar A, Collishaw S, Pine DS, Thapar AK. Depression in adolescence. *Lancet* 379: 1056-1067, 2012
- 2) American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders. 5th edition.* (American Psychiatric Press, Washington, DC) 2012
- 3) Ojio Y, Yonehara H, Taneichi S et al. Effects of school-based mental health literacy education for secondary school students to be delivered by school teachers: A preliminary study. *Psychiatr Clin Neurosci* 72: 723-730, 2018
- 4) Herres J, Kobak R. The Role of Parent, Teacher, and Peer Events in Maintaining Depressive Symptoms during Early Adolescence. *J Abnorm Child Psychol* 43: 325-337, 2015
- 5) Fulkerson JA, Sherwood NE, Perry CL, Neumark-Sztainer D, Story M. Depressive symptoms and adolescent eating and health behaviors: A multifaceted view in a population-based sample. *Prev Med* 38: 865-875, 2004
- 6) Fulkerson JA, Kubik MY, Story M, Lytle L, Arcan C. Are there nutritional and other benefits associated with family meals among at-risk youth? *J Adolesc Health* 45: 389-395, 2009
- 7) Arora M, Nazar GP, Gupta VK, Perry CL, Reddy KS, Stigler MH. Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: Results of a cross-sectional study. *BMC Pub Health* 12: 881, 2012
- 8) Lia Y, Lvb MR, Weic YJ et al. Dietary patterns and depression risk: A meta-analysis. *Psychiatry Res* 253: 373-382, 2017
- 9) Owens J. Insufficient sleep in adolescents and young adults: An update on causes and consequences. *Pediatrics* 134: 921-932, 2014
- 10) Hyakutake A, Kamiyo T, Misawa Y et al. Cross-sectional observation of the relationship of depressive symptoms with lifestyles and parents' status among Japanese junior high school students. *Environ Health Prev Med* 21: 265-273, 2016
- 11) Shimura A, Hideo S, Takaesu Y, Nomura R, Komada Y, Inoue T. Comprehensive assessment of the impact of life habits on sleep disturbance, chronotype, and daytime sleepiness among high-school students. *Sleep Med* 44: 12-18, 2018
- 12) Ferguson CJ, Miguel CS, Hartley RD. A multivariate analysis of youth violence and aggression: The influence of family, peers, depression, and media violence. *J Pediatr* 6: 904-908, 2009.
- 13) Brian AP, Swanier B, Georgiopoulos AM, Land SR, Fine MJ. Association between media use in adolescence and depression in young adulthood: A longitudinal study. *Arch Gen Psychiatry* 66:181-188, 2009.
- 14) Mathers M, Canterford L, Olds T, Hesketh K, Ridley K, Wake M. Electronic media use and adolescent health and well-being: Cross-sectional community study. *Acad Pediatr* 9: 307-314, 2009.
- 15) Cillero IH, Jago R. Systematic review of correlates of screen-viewing among young children. *Prev Med* 51: 3-10, 2010
- 16) Desai RA, Krishnan-Sarin S, Cavallo D, Potenza MN. Video-gaming among high school students: Health correlates, gender differences, and problematic gaming. *Pediatr* 126: 1414-1424, 2010
- 17) Lee SY, Lee D, Nam CR et al. Distinct patterns of Internet and smartphone-related problems among adolescents by gender: Latent class analysis. *J Behav Addict* 7: 454-465, 2018.
- 18) Tamura H, Nishida T, Tsuji A, Sakakibara H. Association between excessive use of mobile phone and insomnia and depression among Japanese adolescents. *Int J Environ Res Pub Health* 14: 701, 2017
- 19) Spada MM. An overview of problematic Internet use. *Addict Behav* 39: 3-6, 2014.
- 20) Kitazawa M, Yoshimura M, Murata M et al. Associations between problematic Internet use and psychiatric symptoms among university students in Japan. *Psychiatry Clin Neurosci* 72: 723-730, 2018.
- 21) Kawabe K, Horiuchi F, Ochi M, Oka Y, Ueno S. Internet addiction: Prevalence and relation with mental states in adolescents. *Psychiatry Clin. Neurosci* 70: 405-412, 2016
- 22) Tateno M, Teo AR, Shiraiishi M, Tayama M, Kawanishi C, Kato TA. Prevalence rate of Internet addiction among Japanese college students: Two cross-sectional studies and reconsideration of cut-off points of Young's Internet Addiction Test in Japan. *Psychiatry Clin Neurosci* 72: 723-730, 2018.
- 23) Chih A, Huang W, Chen H, Wang YC, Wang LM. Internet abusers associate with a depressive state but not a depressive trait. *Psychiatry Clin Neurosci* 68: 197-205, 2014
- 24) Yamada S, Imamura A, Honda S et al. Characteristics of inattention and hyperactivity, perception of general health, and reading literacy of Japanese adolescents: Results from a large-scale community sample. *Acta Medica Nagasakiensia* 61: 71-79, 2017
- 25) Birmaher B, Hudson I, Buchanan DG, Wolff S. Clinical evaluation of a self-rating scale for depressive disorder in childhood (Depression Self-Rating Scale). *J Child Psychol Psychiatry* 28: 43-60, 1987
- 26) Kawachi I, Berkman F. Social ties and mental health. *J Urban Health Bull NY Acad Med* 78:458-467, 2001
- 27) Dan-Dana X, Wen-Wanga R, Xiao-Lanc C et al. Prevalence of major depressive disorder in children and adolescents in China: A systematic review and meta-analysis. *J Affect Disord* 241: 592-598, 2018.
- 28) Ghandour RM, Sherman LJ, Vladutiu CJ et al. Prevalence and Treatment of Depression, Anxiety, and Conduct Problems in US Children. *J Pediatr* 206: 256-267, 2019
- 29) Park HY, Heo J, Subramanian SV, Kawachi I, Oh J. Socioeconomic inequalities in adolescent depression in South Korea: A multilevel analysis. *PLOS ONE* 7: e47025, 2012
- 30) Jennifer M. Bowers, MA, Anne Moyer. Effects of school start time on students' sleep duration, daytime sleepiness, and attendance: a meta-analysis. *Sleep Health* 3: 423-431, 2017
- 31) Lewin DS, Wang G, Chen YI, Skora E, Hoehn J, Baylor A, Wang J. Variable School Start Times and Middle School Student's Sleep Health and Academic Performance. *J Adolesc Health* 61: 205-211, 2017.
- 32) Marie BH Yap, Jorm AF. Parental factors associated with childhood anxiety, depression and internalizing problems: A systematic review and meta-analysis. *J Affect Disord* 175: 424-440, 2015
- 33) Pössel P, Burton SM, Cauley B, Sawyer MG, Spence SH, Sheffield J. Associations between social support from family, friends, and teachers and depressive symptoms in adolescents. *J Youth Adolescence* 47: 398-412, 2018.

