

The Association of Grit and Self-Control with Parent-Child Relationships, Mental Health, and Lifestyles of Japanese Adolescents: A Cross-Sectional Online Survey

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Background: Non-cognitive skills (NCS) are vital components of a socially and financially successful life, developed through childhood education, family and school environments, and social settings. The effects of NCS in adulthood have been studied, whereas those in adolescents have rarely been examined in Japan. Grit and self-control are significant components of NCS. This study focused on the influence of grit and self-control on lives of adolescents.

Objective: The aim of this study was to examine the relationship between grit and self-control, and Japanese adolescents' mental health, lifestyle at school and home, and parent-child relationships.

Methods: In April 2016, we performed an observational cross-sectional study using an online survey. Participants were 1,566 mothers and their children (8th year of school) in Japan. The survey included items on background, grit and self-control scales, and mental health (DSRS-C); mothers provided social, financial, and educational information and information on parent-child relationships.

Results: Of the 1,566 adolescent participants, 783 were boys and 783 were girls. Mean scores for grit and self-control were 3.07 ± 0.60 and 2.97 ± 0.64 , respectively. Grit and self-control were significantly correlated with mental health scores ($r = -0.34$, $p < 0.0001$). All adolescent lifestyle parameters were significantly associated with both grit and self-control ($p < 0.0001$). Adolescents with good parent-child relationships exhibited higher grit and self-control scores. Moreover, good parent-child relationships were significantly associated with better mental health scores.

Conclusion: Our results implied that good parent-child relationships may promote the development of grit, self-control, and good mental health among adolescents, leading to favorable lifestyles at home and school.

Keywords: non-cognitive skills, DSRS-C, questionnaire

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I. Introduction

Non-cognitive skills (NCS) are vital elements for achieving academic success, physical well-being, and financial stability¹⁾. In 2006, economist James Heckman also highlighted the important role of NCS in economic development²⁾. NCS have been studied and analyzed in economic and educational contexts, where

cognitive skills refer to academic abilities expressed as literacy, numeracy, and intelligence quotient (IQ). NCS include “the ability to work in groups, to maintain good interpersonal relations, a positive attitude, control impulses, and to demonstrate goal-directed behavior”³⁾. To express these abilities more concisely, other researchers use the term “motivation, perseverance, and self-control”⁴⁾. Psychologist Angela Duckworth

suggested “grit” as one of the most important skills for personal success, defined as a combination of passion and perseverance in dealing with long-term goals⁵). Grit can be considered an important construct in NCS.

NCS have been referred to as life skills or socio-economic skills, making it difficult to evaluate quantitatively, unlike cognitive skills. Duckworth, however, successfully developed a scale to measure “grit” in 2009⁶), that has been widely used all over the world since then. Self-control is also evaluated with the quantitative scale⁷). In this study, we examined grit and self-control in adolescents, being major components of NCS and appropriate indicators to conduct a scientific study. However, some previous studies used the term “NCS” instead of the specific components. In these instances, we used the same terminology.

The cognitive skills represented by academic achievement compared to grit and self-control are separate items but are closely interrelated⁸). Those who have a high level of cognitive skills, however, do not necessarily have high grit and self-control, but those with high grit and self-control are likely to have good cognitive skills⁸). Grit and self-control are important determinants for accomplishing life goals because success requires individuals to regulate their attention and behavior while avoiding temptation (i.e., self-control) and continuing to persevere despite setbacks (i.e., grit)⁹).

Many cross-sectional, longitudinal, and observational studies, including those using a randomized controlled trial method, have investigated the effects of grit and self-control. For example, some studies have explored how grit and self-control can predict academic achievement in adolescents⁸)¹⁰⁻¹⁵). Childhood grit and self-control have also been found to affect outcomes in adulthood. For instance, childhood self-control can predict physical health, financial status, and public safety in adulthood¹⁶). The High Scope Perry Preschool Program¹⁷) and Carolina Abecedarian Project¹⁸) have also provided evidence supporting the contribution of NCS to socioeconomic success, better health, lower crime, and drug-abuse rates, as well as academic achievement¹⁴)¹⁹)²⁰). These programs focused on high-quality childhood education by developing characteristics and behaviors that are valued in the labor market¹). Kautz suggested that early childhood education was the most cost-effective intervention for developing NCS, generating economic productivity and creating social wellbeing¹⁴).

Contrastingly, a study by the Washington State Institute for Public Policy revealed that social policy programs targeted in early life did not have significant

benefit-cost ratios²¹). This finding does not deny the importance and cost-effectiveness of early childhood programs – but it added evidence that later treatment and amelioration using evidence-based programs can also expect cost-effective outcomes²¹).

A recent meta-analysis provided evidence that NCS play a role in improving the psychosocial, cognitive, and language domains and promoting academic achievement; however, these results were not always consistent²²). Many such studies have applied a variety of interventions, ranging from child- and teacher-focused curricula to interventions with more multidimensional content, including parents, children, and teachers. However, the effectiveness of NCS interventions varies, and the most effective intervention is yet to be identified²²).

Previous studies in Japan have explored the relationship between NCS and adulthood outcomes through a survey targeting young adults. Experiences and roles at school, such as club leaders, were also examined as being possible factors influencing the development of NCS²³). However, NCS have rarely been examined among adolescents in Japan. In this study, we targeted adolescents and their mothers to obtain comprehensive information regarding their school and family environment. The aim of this study was to examine the relationship between grit, self-control, mental health, lifestyles at home and school, and parent-child relationship of Japanese adolescents. This study hoped to raise awareness of the significance of grit and self-control for this age group in terms of promotion of their mental health and academic and social performance. The results of this study could guide educators and parents to adjust and enhance their approaches toward their students and children accordingly.

II. Methods

1. Study design

We performed an observational cross-sectional study. Participants were voluntarily recruited through an internet-based research company. All participants provided informed consent to participate by submitting an online questionnaire. This study was approved by the Ethical Committee Registry of the Faculty of Medicine, Kagawa University (Heisei 27-221, March 28, 2016) and conducted in accordance with the principles described in the Declaration of Helsinki.

2. Study Population

The study sample included 1,566 mothers and their children (783 for each gender). Child participants were aged 14–15 years and were attending their 8th year of school in Japan. An internet-based research company was used to identify eligible participants from a database including individuals throughout Japan with an even gender distribution. Registered individuals in the database are labelled according to demographic and social backgrounds like gender, age, residential area, family members and their age. The research company retrieved and requested eligible individuals to join this study through e-mail and offered online shopping coupons as a reward for participation. This study chose mothers and children able to complete the questionnaire concurrently in the same room as participants. Valid answers were ensured by adding dummy questions in the questionnaire. Participants who met the inclusion criteria and provided all valid answers within one week were included in the study. All respondents voluntarily joined this study, and answered self-administered online questionnaires. The investigation was conducted in April, 2016.

3. Questionnaire

The questionnaire was divided into two sections: the first for mothers and the second for their children. Mothers answered questions regarding their marital status, annual household income, and the age, work hours, and educational background of both mothers and fathers. Questions also included children's demographic and lifestyle characteristics (e.g., gender, number of siblings, academic achievements, after-school activities, school attendance, screen time, and sleep time). Mothers then assessed both their relationship with the child and the relationship between the child and the father on a 3-point Likert-type scale (i.e., 1 = good, 2 = neither good nor poor, 3 = poor). The children answered questions about their grit, self-control and mental health.

4. Grit and Self-Control

The Grit-S scale (including the Perseverance of Effort and Consistency of Interest subscales) contains eight statements rated on a 5-point Likert-type scale (i.e., 1 = not like me at all, 5 = very much like me). Items include the following: “New ideas and projects sometimes distract me from previous ones,” “I am a hard worker,” “I have difficulty maintaining my focus on projects that

take more than a few months to complete,” and “I finish whatever I begin”⁶⁾²⁴⁾. The Brief Self-Control Scale contains 13 items rated on a 5-point Likert-type scale (i.e., 1 = not like me at all, 5 = very much like me). Items include the following: “I have a hard time breaking my bad habits,” “I am lazy,” “I am able to work effectively toward long-term goals,” and “I often act without thinking through all the alternatives”⁷⁾²⁵⁾. Both scales were rated as having good validity and reliability in both Japanese and English⁶⁾⁷⁾²⁴⁾²⁵⁾.

5. Mental Health

Mental health was evaluated according to the Birlerson Depression Self-Rating Scale for Children (DSRS-C), that is designed for use among respondents aged 7 years and older. It contains 18 items rated on a 3-point Likert-type scale (0 = always, 1 = sometimes, and 2 = not at all)²⁶⁾²⁷⁾. Thus, the total score ranged from 0 to 36. Depression was indicated by a total score of 16 or above. Items are related to positive attitudes (e.g., “I have lots of energy”), negative feelings (e.g., “I feel very lonely” and “I think life is not worth living”), and symptoms affected by mental status (e.g., insomnia or stomach ache). The DSRS-C demonstrated good validity and reliability in both Japanese and English²⁶⁾²⁷⁾.

6. Statistical Analysis

Continuous variables were summarized using means and standard deviations (e.g., grit, self-control, and DSRS-C scores), while categorical variables were presented as absolute numbers and relative percentages (e.g., gender, annual income, and educational background of parents). Exploratory analyses were conducted to compare grit and self-control according to lifestyle parameters. ANOVA was used for variables with three levels, and a t-test was employed for those with two levels. ANCOVA was used to adjust by gender. The relationship between grit, self-control, and the parent-child relationship was examined using an ANOVA and Tukey-Kramer HSD test, while Spearman's correlation was used to examine the relationship between mental health scores, grit, and self-control. ANCOVA was also used to adjust by gender. Missing values were not estimated in this study. All analyses were performed using JMP Pro 13.2.1 for Windows (SAS Institute, Cary, USA) ($p < 0.05$ indicated statistical significance).

III. Results

This study surveyed 1,566 mother-child pairs. Relevant background information is presented in **Table 1**. There

Table 1 Child and parent backgrounds

N = 1566	n (%) or mean \pm SD
Boys	783 (50)
Girls	783 (50)
Academic achievement	
Good	557 (35.6)
Average	714 (45.6)
Poor	265 (16.9)
Sleep time (per night)	
Less than 6 hours	188 (12.0)
6–8 hours	1271 (81.2)
More than 8 hours	101 (6.5)
After-school activities	
Sports	971 (62.0)
Other activities	466 (29.1)
Has a good friend	1486 (94.9)
School absenteeism	20 (1.3)
Mental health (DSRS-C)	10.5 \pm 5.5
Presence of depressive symptoms (DSRS-C score > 15)	290 (18.5)
Self-control	2.97 \pm 0.64
Grit	3.07 \pm 0.60
Perseverance of Effort	3.23 \pm 0.81
Consistency of Interest	2.94 \pm 0.66
Has developmental disabilities	61 (3.9)
Single parent	184 (11.8)
Household annual income	
<2.5 million yen	132 (8.5)
2.5–5 million yen	420 (26.8)
5–10 million yen	791 (50.5)
>10 million yen	223 (14.2)
University graduates	
Mother	414 (26.4)
Father	684 (49.5)
Relationship with mother	
Good	1,423 (90.9)
Neither good nor poor	118 (7.5)
Poor	25 (1.6)
Relationship with father	
Good	1,044 (75.6)
Neither good nor poor	245 (17.7)
Poor	93 (6.7)

Abbreviations: SD, standard deviation.

were a total of 783 boys (50% of the children sampled); 35.6% and 16.9% indicated good and poor academic achievement, respectively. The mean mental health score was 10.5 \pm 5.5, with 290 children (18.5% of the total sample) having scores indicating presence of depressive symptoms (**Table 1**). Regarding parents' backgrounds, 11.8% were single, 26.4% mothers, and 49.5% fathers were university graduates. Cronbach's alpha was 0.78 for the Grit-S scale (0.82 for the Perseverance of Effort; 0.71 for Consistency of Interest) and 0.86 for the Brief Self-Control Scale.

1. Grit, self-control, parent-child relationships, adolescents' mental health, and lifestyle parameters

Mean scores were 3.07 \pm 0.60 for grit (3.23 \pm 0.81 for Perseverance of Effort; 2.94 \pm 0.66 for Consistency of Interest) and 2.97 \pm 0.64 for self-control (**Table 1**). Girls recorded significantly better scores for both grit and self-control than boys ($p < 0.0001$); however, Consistency of Interest was not significantly different between boys and girls ($p < 0.76$) (**Table 2, Figure 1**). **Figure 2** showed the mean scores for self-control and grit according to the quality of the parent-child relationship. According to the Tukey-Kramer HSD test, adolescents with good parent-child relationships exhibited higher grit and self-control scores regardless of the gender of the parent ($p < 0.01$). Even after adjusting by gender, better parent-child relationships were significantly associated with higher grit and self-control scores regardless of the gender of the parent ($p < 0.01$). Grit, self-control, and mental health scores were significantly correlated: adolescents with lower grit ($r = -0.34$, $p < 0.0001$) and self-control ($r = -0.34$, $p < 0.0001$) had lower mental health scores (**Figure 3**). Moreover, regarding the relationship between grit, self-control, and adolescent lifestyle parameters, such as homework submission and game use under rules (**Table 3**), all parameters were significantly associated with both grit and self-control ($p < 0.01$), except for the association between mother-child relationship and consistency of interest ($p = 0.53$). After adjusting by gender, all parameters except homework submission ($p = 0.2$) were still significantly associated with grit, perseverance of effort and self-control, but not consistency of interest.

2. Parent-child relationships and adolescents' mental health

Mother-child relationships were mostly good (90.9%;

Table 2 Self-control and grit scores according to gender

N = 1566	Boys (783)	Girls (783)	p-values
	Mean \pm SD	Mean \pm SD	
Self-control	2.87 \pm 0.62	3.06 \pm 0.64	<0.0001
Grit	3.01 \pm 0.59	3.34 \pm 0.59	<0.0001
Perseverance of Effort	3.10 \pm 0.79	3.35 \pm 0.80	<0.0001
Consistency of Interest	2.93 \pm 0.66	2.95 \pm 0.67	0.76

Abbreviations: SD, standard deviation.

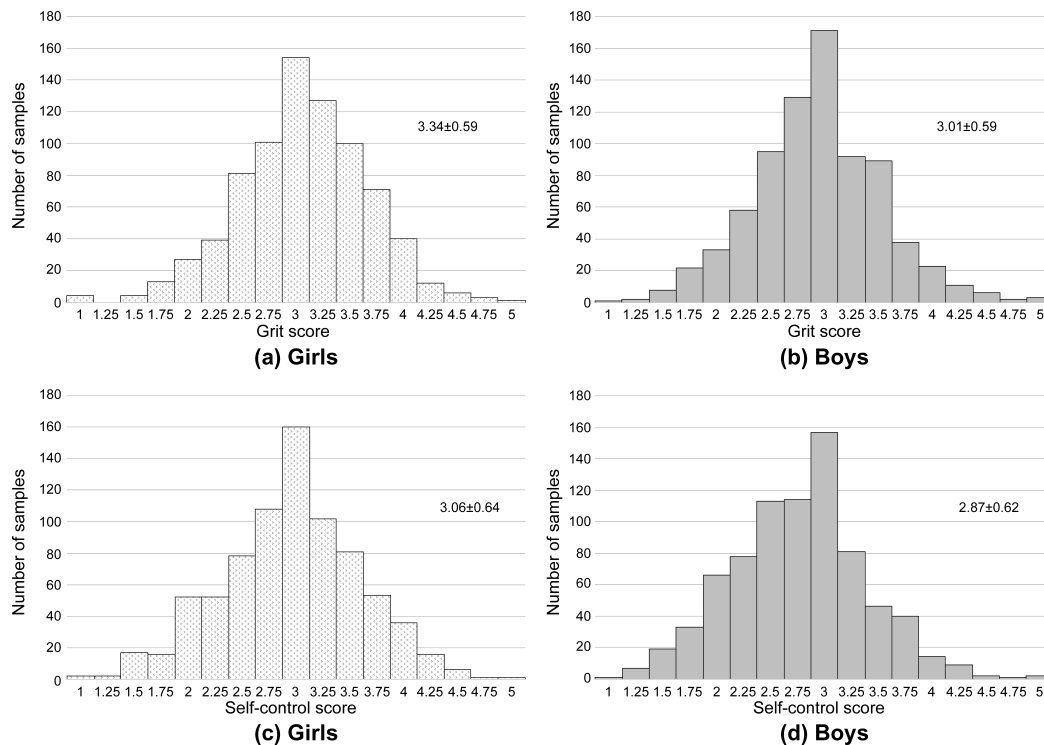


Figure 1 Distribution of grit and self-control scores for girls and boys (n = 783)

- (a) (b) Grit
(c) (d) Self-control

only 1.6% indicated a bad relationship). In contrast, 75.6% of all father-child relationships were good (6.7% reported a bad relationship) (Table 1). Figure 4 showed the mean mental health scores according to the parent-child relationship. Here, good parent-child relationships were significantly associated with better mental health scores.

IV. Discussion

Our study examined the associations between grit, self-control, lifestyle parameters, the parent-child relationship, and mental health among adolescents in Japan. Our results indicated that better parent-child

relationships were associated with higher grit and self-control scores, better mental health, and more favorable adolescent lifestyle conditions. Previous studies targeting adolescents have focused on the association of academic achievement with higher grit and self-control scores. In addition, this study implied that interventions designed to promote good parent-child relationships may promote the development of grit, self-control, and good mental health among adolescents, leading to favorable lifestyles at home and school. Our study thus provides useful information for parents, educators, and medical professionals.

This study found statistically significant differences between boys and girls in self-control and the

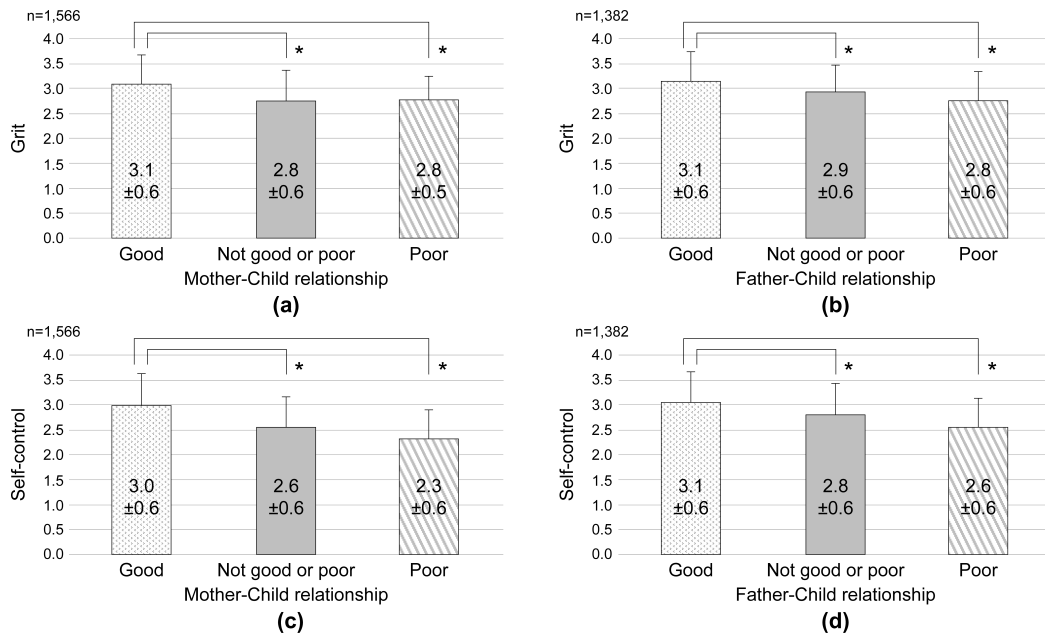


Figure 2 Mean scores for grit and self-control according to the quality of the parent-child relationship
 (a) Mother-child relationship and grit
 (b) Father-child relationship and grit.
 (c) Mother-child relationship and self-control.
 (d) Father-child relationship and self-control

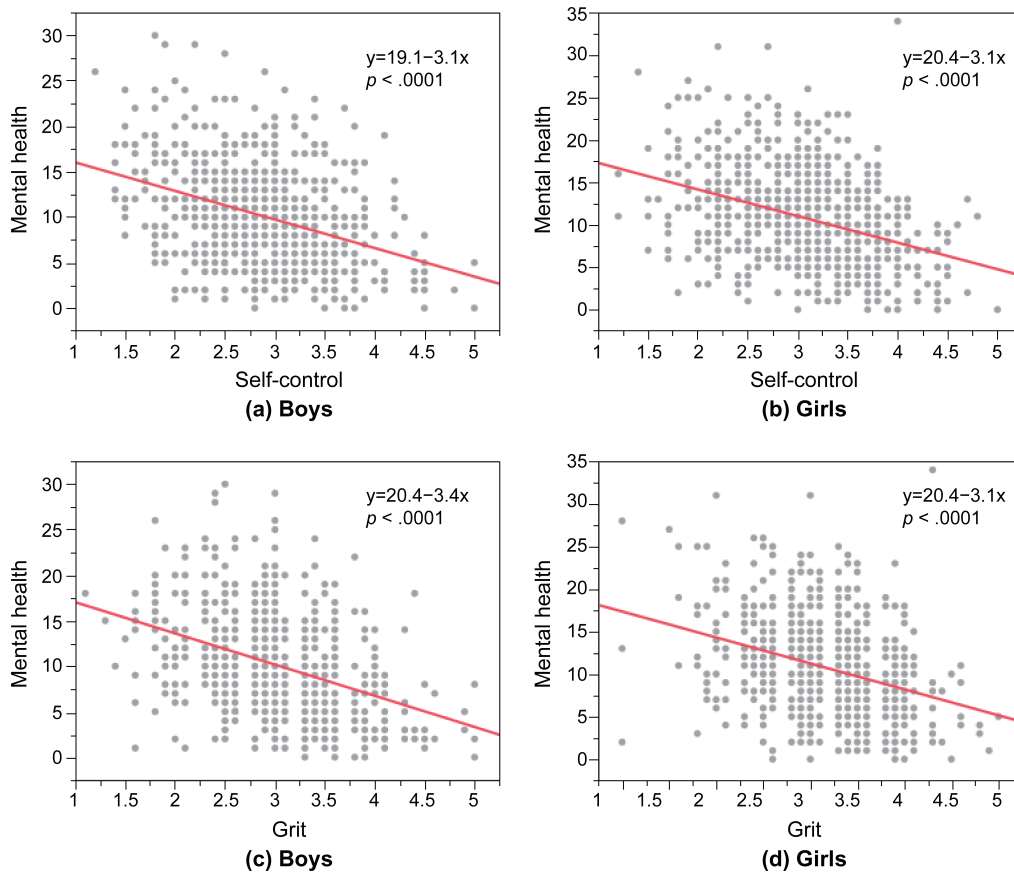


Figure 3 Relationship between self-control, grit, and mental health: single regression analysis
 (a) (b) Self-control and mental health
 (c) (d) Grit and mental health
 * $p < 0.01$

Table 3 Relationship between self-control, grit, and lifestyle parameters

		Self-control			Grit			Perseverance of Effort			Consistency of Interest		
n = 1,566		mean ± SD	p	p'	mean ± SD	p	p'	mean ± SD	p	p'	mean ± SD	p	p'
Academic achievement	Good	3.2 ± 0.6			3.4 ± 0.6			3.7 ± 0.7			3.1 ± 0.7		
	Average	2.9 ± 0.6			3.0 ± 0.5			3.1 ± 0.7			2.9 ± 0.6		
	Poor	2.6 ± 0.6	**	**	2.7 ± 0.6	**	**	2.7 ± 0.8	**	**	2.7 ± 0.7	**	0.94
Goes to school late	Never	3.0 ± 0.6			3.1 ± 0.6			3.3 ± 0.8			3.0 ± 0.6		
	Once/semester	2.7 ± 0.6			2.8 ± 0.6			2.9 ± 0.8			2.8 ± 0.7		
	More	2.5 ± 0.7	**	**	2.7 ± 0.6	**	**	2.6 ± 0.8	**	**	2.8 ± 0.7	*	0.93
Homework submission	Always can	3.2 ± 0.6			3.2 ± 0.5			3.5 ± 0.7			3.0 ± 0.6		
	Sometimes cannot	2.7 ± 0.6			2.8 ± 0.6			2.9 ± 0.8			2.8 ± 0.7		
	Cannot	2.4 ± 0.6	**	*	2.6 ± 0.5	**	0.2	2.5 ± 0.7	**	*	2.7 ± 0.6	**	0.17
Monthly allowance	Use as planned	3.2 ± 0.5			3.2 ± 0.6			3.4 ± 0.8			3.0 ± 0.7		
	Cannot use	2.8 ± 0.6	**	**	2.8 ± 0.6	**	**	2.8 ± 0.8	**	**	2.7 ± 0.7	**	0.86
Game use within rules	Can use	3.1 ± 0.6			3.2 ± 0.6			3.4 ± 0.8			3.0 ± 0.6		
	Cannot use	2.6 ± 0.6	**	**	2.7 ± 0.6	**	**	2.8 ± 0.8	**	**	2.7 ± 0.7	**	0.72
Games on weekdays	<1 h	3.2 ± 0.6			3.3 ± 0.6			3.5 ± 0.8			3.1 ± 0.7		
	1-2 h	3.0 ± 0.6			3.1 ± 0.5			3.3 ± 0.7			3.0 ± 0.6		
	>2 h	2.8 ± 0.6	**	**	2.9 ± 0.6	**	**	3.0 ± 0.8	**	**	2.8 ± 0.7	**	0.74
Game on weekends	<2 h	3.2 ± 0.6			3.3 ± 0.6			3.5 ± 0.8			3.1 ± 0.6		
	2-4 h	3.0 ± 0.6			3.1 ± 0.6			3.2 ± 0.8			2.9 ± 0.6		
	>4 h	2.8 ± 0.6	**	**	2.9 ± 0.6	**	**	3.0 ± 0.7	**	**	2.7 ± 0.6	**	0.74
Has depressive symptoms [#]	Yes	2.7 ± 0.6			2.8 ± 0.5			2.8 ± 0.8			2.8 ± 0.7		
	No	3.0 ± 0.6	**	**	3.1 ± 0.6	**	**	3.3 ± 0.8	**	**	3.0 ± 0.7	**	0.67
Mother-child relationship	Good	3.0 ± 0.6			3.1 ± 0.6			3.3 ± 0.8			3.0 ± 0.7		
	Neither good nor poor	2.6 ± 0.6			2.8 ± 0.6			2.8 ± 0.7			2.8 ± 0.7		
	Poor	2.3 ± 0.6	**	**	2.8 ± 0.5	**	**	2.7 ± 1.0	**	**	2.9 ± 0.8	0.53	0.77
Father-child relationship	Good	3.1 ± 0.6			3.1 ± 0.6			3.3 ± 0.8			3.0 ± 0.7		
	Neither good nor poor	2.8 ± 0.6			2.9 ± 0.6			3.1 ± 0.7			2.8 ± 0.6		
	Poor	2.6 ± 0.6	**	**	2.8 ± 0.6	**	**	2.8 ± 0.8	**	**	2.8 ± 0.7	**	0.86

Abbreviations: SD, standard deviation. p: p-value, *<0.01; **<0.001. p': p-value after adjusting by gender. *<0.01; **<0.001.

[#] the children with a score that was greater than the cut-off score of 16 on the DSRs-C which was indicative of depression.

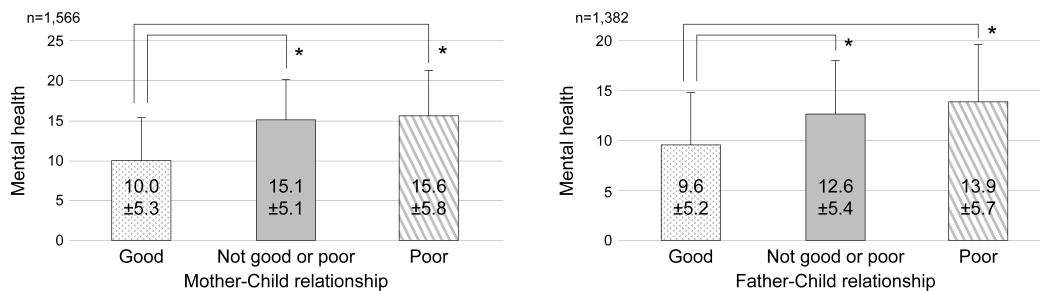


Figure 4 Mean mental health scores according to the quality of the parent-child relationship
* p < 0.01

Perseverance of Effort (a subscale of grit). Previous studies have also indicated that girls had better grit scores than boys⁽⁸⁾⁽¹⁵⁾⁽²⁸⁾ e.g., 3.43 ± 0.64 for girls, 3.31 ± 0.70 for boys, p < 0.01⁽⁸⁾ and 3.49 ± 0.42 for girls, 3.29 ± 0.53 for boys, p < 0.05⁽²⁸⁾. Higher self-control scores were

also observed in girls⁽²⁹⁾. Girls appeared to be more able to control their emotions and behaviors, steadily pursue goals, and develop good study habits. Considering gender as a confounder between examined parameters like lifestyle and parent-child relationships and grit and self-

control, we adjusted gender to analyze their associations. Our study suggested that grit consists of the perseverance of effort and consistency of interest subscales, and mainly perseverance of effort as a grit was significantly associated with favorable lifestyle and good relationships with parents.

As Scorza discussed, childhood educational interventions are effective for achieving successful outcomes in school and the labor market³⁾; however, this is insufficient. Parent-child interactions are also considered important for developing NCS. Thus, interventions encouraging strong attachment and responsive parenting facilitate children's development of NCS³⁾¹⁴⁾. For example, Heckman's Perry Preschool program was successful because it not only provided education to treatment-group children, but also taught parents about appropriate parent-child interactions during 90-minute weekly home visits over a 2-year period³⁰⁾. Family interventions of this type may produce long-term positive effects that are useful for children in their later lives¹⁾. However, such effects are underestimated when compared to those of childhood education. Our study results support the idea that family interventions focusing on good parent-child relationships may promote the development of grit and self-control and lead to a successful life.

Regarding school lifestyle factors, grittier students showed overall better school attendance¹⁰⁾. Students with better grit and self-control in our study tended to arrive at school on time. Moreover, our study uniquely found that grit and self-control were associated with lifestyle as characterized by homework submission rates, playing games under restrictions, and responsible use of monthly allowances. Favorable lifestyles both at home and school were observed in adolescents with better grit and self-control.

This study examined adolescent mental health in the context of grit and self-control in Japan. While previous research has examined grit related to mental health among university students³⁾¹³⁾²⁾, adolescents have rarely been considered. In addition, research has indicated that grit and school satisfaction are positively associated among adolescents⁸⁾, but few studies have examined how these items are associated with mental health. Here, we found significant correlations between mental health, grit, and self-control. Previous studies showed that primary school students recorded higher scores on both grit and self-control than secondary school students⁸⁾²⁹⁾. However, higher scores are expected among older and more mature adolescents³³⁾. In contrast, they tend to have difficulty

controlling their impulses and making appropriate decisions under frustrating conditions. Thus, they are expected to behave more impulsively than younger children and feel depressed when their objectives are not met³⁴⁾³⁵⁾.

In reality, secondary school students exhibit more depressive tendencies than elementary school students³⁶⁾; depressive symptoms tend to increase from childhood through adolescence before peaking between 15 and 17 years of age (and then decrease in young adulthood)³⁷⁾. These symptoms may increase during adolescence because of changing school environments and new sources of stress, such as those related to making new friends and taking exams³⁷⁾. Puberty may also cause difficulties when interacting with parents. Thus, grit and self-control may decrease in quality during adolescence compared with childhood. This is in accordance with the increase in depressive symptoms seen during adolescence, which may help explain how poor mental health affects grit and self-control levels and how poor grit and self-control levels affect mental health. This study revealed that good parent-child relationships were significantly associated with good mental health, thereby implying that adolescents can achieve good mental health through good parent-child relationships, even during puberty, and will consequently be able to maintain or improve their grit and self-control levels. Furthermore, achieving good grit and self-control levels through good parent-child relationships will help maintain or improve mental health.

This study has several limitations. First, it used a cross-sectional design, and thus we cannot make any inferences regarding the causality of the observed associations between grit, self-control, the parent-child relationship, and child mental health. Second, selection bias may have influenced our results. The number of respondents who had graduated from university was twice the Japanese national average³⁸⁾ for both mothers and fathers. This may have been because this study was conducted on the internet, and participants were likely to be more computer-literate and educated. Moreover, most mothers in this study had good relationships with their children. This could be because mothers were required to ask their children to participate in the study, thus implying the existence of a good relationship. Third, the fathers did not participate in this study; therefore, there is a possibility of bias in terms of the father-child relationship results.

Despite these limitations, this study provides useful information for families with adolescents, child educators, and pediatricians. This study similarly

implies that interventions designed to promote parent-child relationships during childhood to adolescence may increase mental health in children and promote the improvement of grit and self-control levels, or that improved grit and self-control might improve mental health, leading to positive lifestyle conditions at home and school. Future studies should assess interventions by families with adolescents, child educators, and pediatricians or medical practitioners to assist adolescents to achieve better success in their school achievements, improve their mental health and their general lifestyle choices. Studies should determine the effectiveness of these interventions for children and how to adapt them according to age.

V. Conclusion

This study indicated that higher grit and self-control scores were significantly associated with favorable lifestyles, better mental health, and good parent-child relationships among adolescents. Our results implied that good parent-child relationships may promote the development of grit, self-control, and good mental health among adolescents, leading to favorable lifestyles at home and school.

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Main Works:

- Yasuda S, Suzuki H, Htun Y et al.: Hour-specific nomogram for transcutaneous bilirubin in newborns in Myanmar. *Pediatrics International* 62: 1049-1053, 2020
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Membership in Learned Societies:

- Japan Pediatric Society
- Japanese Society of Public Health
- Japan International Child Health Association
- The Japanese Society of Child Health