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How Worries about Interpersonal Relationships, Academic Performance, Family Support, and Classmate Social Capital Influence Suicidal Ideation among Adolescents in Japan

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Suicide is an important public health issue for adolescents. To investigate the risk and protective factors for adolescent suicide, a cross-sectional questionnaire-based survey was conducted at a junior high school (n = 379) in Japan in 2018. After obtaining survey data, we conducted univariate and logistic regression analyses to test for associations between suicidal ideation and several factors, including worries (i.e., about school life, interpersonal relationships at school, family life, interpersonal relationships at home, and academic performance), perceived support from school staff and family members, and social capital. In this context, the existence of trustful relationships between classmates was used as indicators of social capital. The results showed that the prevalence of suicidal ideation was 10.5%. The risk of suicidal ideation was increased by worries about 1) interpersonal relationships at school, 2) interpersonal relationships at home, and 3) academic performance, but was decreased by social support from family members and trusting relationships. Further, the rate of suicidal ideation was higher among students who expressed all these three worries when compared to those who expressed two or fewer worries. In addition, looking at students who expressed all these three worries simultaneously, the rate of suicidal ideation was higher among those with lower levels of support from family members and fewer trustful relationships. Our results suggest that the prevention of adolescent suicide should include strategies for reducing worries about interpersonal relationships at school/home and academic performance while finding ways to enhance family support and classmate social capital.

Keywords: academic performance; adolescents; family support; social capital; suicidal ideation
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Introduction

Suicide and suicidal ideation of adolescents in Japan

In general, each suicide is a personal tragedy. When looking at the issue from a larger perspective, substantial economic, social, and psychological burdens are placed on individuals, families, communities, and even nations (WHO, World Health Organization 2014). Suicide is also a major public health issue for young people throughout the world (Hawton et al. 2012). In fact, the WHO reports that suicide is the second leading cause of death, accounting for 8.5% of all deaths among young adults aged 15-29 years (WHO 2014). In Japan, research has shown that the suicide rate among youths aged 10-14 (1.58/100,000) exceeds the worldwide pooled mortality rate (0.93/100,000) (Glenn et al. 2020). In this context, a 2019 report issued by the

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Ministry of Health, Labour and Welfare of Japan showed that suicide was the second and first leading cause of death for aged 10-14 and 15-39 respectively, while it was not among the top 10 causes of death among children up to the age of nine (Ministry of Health, Labour and Welfare of Japan 2020). Adolescent suicide is thought to be influenced by complex interactions involving a variety of biological, psychiatric, psychological, and social factors, with suicidal ideation sometimes translating into actual self-harm or suicide (Hawton et al. 2012). Focusing on Japan, this study investigated suicidal ideation among junior high school students who have reached the age at which rates begin to rise, ultimately exceeding the global average.

Risk factors for suicide

A previous systematic review examined the psychosocial risk factors for suicidality among adolescents, thus identifying three main factors that appear to increase the risk: psychological factors, stressful life events, and personality traits (Carballo et al. 2020). Here, specific events included being bullied, peer conflicts, family conflicts, and academic performance problems. Indeed, a substantial amount of research has been conducted on the risk factors for suicide and mental health issues among younger individuals. For example, one recent study found that poorer school interpersonal relationships were associated with a higher risk of mental health problems (Li et al. 2020). There is also evidence that bullying is associated with suicidal ideation and actual suicide attempts (Smalley et al. 2017; Zwald et al. 2018). Further, Consoli et al. (2013) proposed that assessments of suicide risk in adolescents should consider the quality of their family relationships. In this regard, several studies have shown that suicidal behavior is related to negative relationships with parents, parental disagreements, family conflicts, and poor child-rearing practices (Lai and McBride-Chang 2001; Consoli et al. 2013; Carballo et al. 2020). Academic stress has also been found to play key roles in suicidal ideation among adolescents (Masood et al. 2018), with relevant studies showing higher risks of suicidality among individuals with low (Castellví et al. 2020) and/or poorly perceived (Martin et al. 2005) academic performance. According to Carballo et al. (2020), various components and factors contribute to the risk and development of both suicidality and suicidal behaviors among youths, thus suggesting a cumulative/interactive process. As such, this study analyzed the associations between suicidal ideation and worries related to school, family, and academic performance.

Protective factors for suicide

Support: On the other side of the issue, many scholars have focused on the protective factors for mental health among adolescents, with evidence generally pointing to the importance of support sources (Klineberg et al. 2006). Here, research has consistently shown that parents, teachers, and family members are the most important sources of support for preventing depression in children and adolescents (Gariepy et al. 2016). In this context, studies have further examined the impacts of school-based and family support on youth suicide, with results showing that teacher support is a particularly protective factor against suicidal ideation (Sun et al. 2006; Madjar et al. 2018). Meanwhile, a systematic review found that high levels of parental support were negatively related to the risk of suicide among adolescents (Ati et al. 2021). This makes it clear that suicide prevention is a multifaceted approach (Chan et al. 2009). Thus, this study investigated whether support derived from school staff and family members protected against suicidal ideation among adolescents.

Social capital: Putnam (2000) defined social capital as the existence of "connections among individuals-social networks and the norms of reciprocity and trustworthiness that arise from them." According to Kawachi et al. (2008), social capital can influence health in several contexts, including residential communities, schools, workplaces, and even at broader levels of spatial aggregation (e.g., states, regions, and countries). Kawachi and Berkman (2000) further suggested that interpersonal trust was an important component of social capital, while other studies have shown that it is related to mental health (Ziersch et al. 2005), and may prevent the onset of depression (Kim et al. 2012). Some studies have similarly found that higher social trust is inversely associated with suicide rates (Kelly et al. 2009; Okamoto et al. 2013).

The literature suggests that social capital is closely related to mental health among adolescents, with findings specifically showing that lower levels of social capital are associated with health complaints, poorer well-being (Eriksson et al. 2012), and depressive symptoms (Aslund et al. 2010). Morrow (1999) pointed out that many studies measuring social capital have tended to assume that individual children are solely influenced by family structures and school issues, thus neglecting broader social contexts, including friends, social networks, non-school activities such as paid work, and community engagement. Langille et al. (2012) used perceptions of trust and helpfulness of others at school as measured of social capital and found that social capital protected against suicidal ideation and actual suicide attempts. However, little is available on association between suicidal ideation and trusting relationships between classmates. To address these gaps, this study investigated the level of trustworthiness between classmates, in which trustful relationships were considered a feature of social capital.

Summation of the study purpose

Although studies have revealed various risk/protective factors related to suicidal ideation, few have investigated the cumulative/interactive effects of these factors. In addition, most related studies have assumed that individual children are solely influenced by family structures and school

issues, and neglected to investigate the influence that are derived from broader social contexts. Therefore, this study investigated the associations between suicidal ideation and worries (school, family, and academic), perceived social support (support from school and family), and social capital (social trust) among junior high school students in Japan. Our results would be useful evidence for interventions aimed at preventing suicide among adolescents.

Methods

Data and study sample

We conducted a cross-sectional study in Maebashi City, the prefectural capital of Gunma Prefecture, Japan in July of 2018. Gunma Prefecture is located about 100 km northwest of Tokyo with a population of 1,949,440 (October 1, 2018) and population density of 306.4 people/ km^2 (Gunma Prefecture 2018). Suicide mortality rate of Gunma Prefecture in 2018 was 18.5 per 100,000 population, not far different from the national level of 16.5 per 100,000 (the highest was Yamanashi Prefecture 24.8 and the lowest was Tokushima Prefecture 12.0 per 100,000) (Ministry of Health, Labour, and Welfare 2019).

A total of 394 students in a junior high school participated (13-15 years of age, grades 7-9) in this study. Self-administered anonymous questionnaire was distributed to and collected from each student by their respective class teachers regardless of whether they were answered, and given approximately 10 minutes to complete. Informed consent including their right not to answer the questions was obtained from all students before their participation. A total of 15 questionnaires were excluded from analysis, including 13 for missing values and two for invalid responses, thereby resulting in 379 valid questionnaires (96.2%). This study was approved by the Ethics Committee of Gunma University.

Measures

The questionnaire consisted of items on sociodemographic characteristics (gender, grade), suicidal ideation, worries, social support, and social capital.

Suicidal ideation and worry: We assessed suicidal ideation over the last two weeks with the following question: "Did you think that you feel like committing suicide (Anata wa jisatsu shitai to omotte imasuka)?" Here, answers were given on a 4-point scale: never (mattaku omowanai) = 1, rarely (hotondo omowanai) = 2, sometimes (tokidoki omou) = 3, often (omou) = 4. While the prevalence for each of these four responses was revealed through the descriptive analysis, this variable was treated as an ordinal scale during the Spearman's correlation analysis. In all other analyses, those who responded "never = 1" or "rarely = 2" were classified as "students without suicidal ideation," while those who responded "sometimes = 3" or "often = 4" were classified as "students with suicidal ideation."

Respondents were asked whether they had felt worried on five aspects over the last two weeks: "What is the level of your worry about school life / interpersonal relationships at school / family life / interpersonal relationships at home / or academic performance (Anata no gakkou seikatu ni okeru shinpaigoto / gakkou nai deno taijin kankei no nayamigoto / katei nai ni okeru shinpaigoto / kateinai ni okeru ningen kankei no nayamigoto / gakugyou eno nayamigoto wa donoteido desuka)?". Respondents answered to these questions using a 4-point scale: hardly any (hotondo nai) = 1, a little (amari nai) = 2, somewhat (tashou wa aru) = 3, a lot (ooini aru) = 4. While the distribution of the four response types was shown through the descriptive analysis, these variables were treated as ordinal scales during the Spearman's correlation analysis, and dichotomized for all other analyses, with "hardly any = 1" and "a little = 2" considered less worrisome, and "somewhat = 3" and "a lot = 4" considered more worrisome.

Support and social capital: Respondents were asked the level of social support and trust between classmates (as a feature of social capital) they usually perceived. Two questions were asked to identify the degree of support respondents received from school staff and family members: "Do you feel that you are supported by your school staff / family members (Gakkou / kazokuno hito wa anata wo sapouto shite kurete iruto kanjite imasuka)?" They were answered using a 4-point scale: hardly any (hotondo soude nai) = 1, a little (amari soude nai) = 2, somewhat (tashou wa sou) = 3, a lot (ooini sou) = 4. As with the items used to measure worry, the distribution of the four responses types were shown through the descriptive analysis. However, both variables were treated as ordinal scales during the Spearman's correlation analysis, and dichotomized for all other analyses, with "hardly any = 1" and "a little = 2" indicating lower support, and "somewhat = 3" and "a lot = 4" indicating higher support. We assessed the level of trustful relationships between classmates using the following item: "Do your classmates trust each other (Anata no kurasu-meito doushi wa shinrai shiatte imasuka)?" Here, answers were given on an 11-point scale; 0 = no trust at all (mattaku shinrai shiatte inai), 10 = trust each other strongly (ooini shinrai shiatteiru). Trust between classmates was treated as a continuous variable for both the descriptive analysis and Spearman's correlation analysis, but was dichotomized for all other analyses (< 6 = lower trust, ≥ 6 = higher trust).

Statistical analysis

Descriptive statistics were calculated for suicidal ideation, worry, support, and trusting relationships between classmates. Fisher's exact tests were performed to analyze the differences in suicidal ideation across grades and according to sex. To compare intergrade differences in worry, support, and trustful relationships, Fisher's exact tests were used for the categorical variables (i.e., worries and supports), while Kruskal-Wallis tests were used for the

continuous variable (i.e., trustful relationships between classmates). Meanwhile, the Holm test was used for *post hoc* analyses in order to compare results based on grades. Spearman's correlations were used to identify relationships between suicidal ideation, worries, support, and trustful relationships. The strength of association was assessed using the following rho cut-points: < 0.3 designated as "small," 0.3-0.5 as "medium," and ≥ 0.5 as "large" (Cohen 1988).

Univariate logistic regression analyses were performed to examine the associations between suicidal ideation and gender, grade, worries, support, and trustful relationships between classmates, while a multivariate logistic regression with backward stepwise elimination process ($p < 0.05$) was conducted to identify the most important predictors of suicidal ideation. When there was a high correlation ($r > 0.80$) between variables, one of the variables were removed from further analysis to avoid multicollinearity. The area under the receiver operating characteristic (ROC) curve was used to assess goodness-of-fit for the model; here, ROC area scores above 0.80 were considered excellent for discrimination (Hosmer et al. 2013). Multicollinearity was assessed using the variance inflation factor (VIF). We also examined differences in the rate of suicidal ideation between subgroups that were assembled based on variable combinations that remained in the stepwise model. All statistical tests and analyses were two-sided (statistical significance determined at $p < 0.05$). All analyses were performed using the EZR statistical software package, version 1.4.2 (Saitama Medical Center, Jichi Medical University, Saitama, Japan) (Kanda 2013).

Results

Descriptive characteristics

Of all the participants (N = 379), 126 were 7th grade, 125 were 8th grade, and 128 were 9th grade.

Table 1 shows the distribution of responses to the items used to measure suicidal ideation. Overall, 9.2% of respondents answered "sometimes," while 1.3% answered "often," for a total of 10.5% combined. The rates of respondents who answered "sometimes" or "often" were 6.4% in the 7th grade (sometimes 5.6%, often 0.8%), 12.0% in the 8th grade (sometimes 10.4%, often 1.6%), and 13.3% in the 9th grade (sometimes 11.7%, often 1.6%). Although we found no significant gender differences in the prevalence of suicidal ideation by grade, 9th grade students were significantly more likely to answer "sometimes" or "often" when compared to those in the 7th grade.

Table 2 shows the distributions for worries, social support, and trustful relationships between classmates. For the question about worries related to school life, 38.0% of all respondents answered "somewhat" (31.4%) or "a lot" (6.6%), and respondents in the 8th grade were more likely to answer "somewhat" or "a lot" when compared to those in the 7th grade. Regarding worries over interpersonal relationships at school, 31.9% of all respondents answered "somewhat" (22.7%) or "a lot" (9.2%) and respondents in the 8th grade were significantly more likely to answer "somewhat" or "a lot" when compared to those in the 7th or 9th grades.

To the question about worries related to family life, 19.8% of all respondents answered "somewhat" (14.0%) or "a lot" (5.8%), and there were no significant differences among grades. As for worries about interpersonal relationships at home, only 16.1% of all respondents answered "somewhat" (10.6%) or "a lot" (5.5%). Here, students in the 9th grade were significantly more likely to answer "somewhat" or "a lot" when compared to those in the 7th grade. Similarly, students in the 8th grade were more likely to answer "somewhat" or "a lot" when compared to those in the 7th grade.

Surprisingly, 60.9% of all respondents answered "somewhat" (39.8%) or "a lot" (21.1%) when asked whether they worried about academic performance. Here, those in the 8th and 9th grades were significantly more likely to answer "somewhat" or "a lot" when compared to those in the 7th grade.

For the items asking about the level of support from school staff, 23.3% of all respondents answered "hardly any" (7.7%) or "a little" (15.6%), and respondents in the 8th grade were significantly more likely to answer "hardly any" or "a little" when compared to all others. Regarding support from family members, 9.8% of all respondents answered "hardly any" (3.2%) or "a little" (6.6%). Here, those in the 8th and 9th grades were significantly more likely to answer "hardly any" or "a little" when compared

Table 1. The distribution of suicidal ideation by grade.

		7th grade			8th grade			9th grade			Holm post-hoc test		
	Total (N = 379)	boys (N = 63)	girls (N = 63)	Total (N = 126)	boys (N = 65)	girls (N = 60)	Total (N = 125)	boys (N = 67)	girls (N = 61)	Total (N = 128)	7th vs. 8th	7th vs. 9th	8th vs. 9th
Suicidal ideation, n (%)													
never	276 (72.8)	53 (84.1)	54 (85.7)	107 (84.9)	52 (80.0)	39 (65.0)	91 (72.8)	45 (67.2)	33 (54.1)	78 (60.9)	0.241	**< 0.001***	0.241
rarely	63 (16.6)	6 (9.5)	5 (7.9)	11 (8.7)	9 (13.9)	10 (16.7)	19 (15.2)	15 (22.4)	18 (29.5)	33 (25.8)			
sometimes	35 (9.2)	3 (4.8)	4 (6.4)	7 (5.6)	4 (6.2)	9 (15.0)	13 (10.4)	5 (7.5)	10 (16.4)	15 (11.7)			
often	5 (1.3)	1 (1.6)	0 (0.0)	1 (0.8)	0 (0.0)	2 (3.3)	2 (1.6)	2 (3.0)	0 (0.0)	2 (1.6)			

Fisher's exact tests were used for the analysis of gender differences in the prevalence of suicidal ideation by grade. In addition, Fisher's exact tests with Holm adjustment were used for the analysis of grade differences. *$p < 0.05$.

Table 2. The distribution of characteristics and variables by grade.

	7th grade (N = 126)	8th grade (N = 125)	9th grade (N = 128)	Total (N = 379)	Holm post-hoc test
Worry about school life, n (%)					
hardly any	44 (34.9)	27 (21.6)	27 (21.1)	98 (25.9)	a
a little	49 (38.9)	35 (28.0)	53 (41.4)	137 (36.2)	
somewhat	26 (20.6)	50 (40.0)	43 (33.6)	119 (31.4)	
a lot	7 (5.6)	13 (10.4)	5 (3.9)	25 (6.6)	
Worry about interpersonal relationships at school, n (%)					
hardly any	58 (46.0)	30 (24.0)	43 (33.6)	131 (34.6)	a, c
a little	41 (32.5)	40 (32.0)	46 (35.9)	127 (33.5)	
somewhat	19 (15.1)	34 (27.2)	33 (25.8)	86 (22.7)	
a lot	8 (6.3)	21 (16.8)	6 (4.7)	35 (9.2)	
Worry about family life, n (%)					
hardly any	73 (57.9)	53 (42.4)	50 (39.1)	176 (46.4)	-
a little	31 (24.6)	46 (36.8)	51 (39.8)	128 (33.8)	
somewhat	15 (11.9)	18 (14.4)	20 (15.6)	53 (14.0)	
a lot	7 (5.6)	8 (6.4)	7 (5.5)	22 (5.8)	
Worry about interpersonal relationships at home, n (%)					
hardly any	90 (71.4)	67 (53.6)	58 (45.3)	215 (56.7)	b
a little	21 (16.7)	36 (28.8)	46 (35.9)	103 (27.2)	
somewhat	8 (6.3)	14 (11.2)	18 (14.1)	40 (10.6)	
a lot	7 (5.6)	8 (6.4)	6 (4.7)	21 (5.5)	
Worry about academic performance, n (%)					
hardly any	29 (23.0)	17 (13.6)	16 (12.5)	62 (16.4)	a, b
a little	40 (31.7)	24 (19.2)	22 (17.2)	86 (22.7)	
somewhat	42 (33.3)	47 (37.6)	62 (48.4)	151 (39.8)	
a lot	15 (11.9)	37 (29.6)	28 (21.9)	80 (21.1)	
Support from school staff, n (%)					
hardly any	6 (4.8)	16 (12.8)	7 (5.5)	29 (7.7)	a, c
a little	17 (13.5)	26 (20.8)	16 (12.5)	59 (15.6)	
somewhat	54 (42.9)	63 (50.4)	72 (56.2)	189 (49.9)	
a lot	49 (38.9)	20 (16.0)	33 (25.8)	102 (26.9)	
Support from family members, n (%)					
hardly any	2 (1.6)	4 (3.2)	6 (4.7)	12 (3.2)	a, b
a little	6 (4.8)	11 (8.8)	8 (6.2)	25 (6.6)	
somewhat	27 (21.4)	43 (34.4)	46 (35.9)	116 (30.6)	
a lot	91 (72.2)	67 (53.6)	68 (53.1)	226 (59.6)	
Trustful relationships between classmates, Mean ± SD (Range)	7.6 ± 1.9 (1-10)	6.2 ± 2.5 (0-10)	7.3 ± 2.0 (0-10)	7.0 ± 2.2 (0-10)	a, c

Fisher's exact tests were used for the analysis of worry and support, and Kruskal-Wallis test was used for the analysis of trustful relationships between classmates by grade, with the use of the Holm adjustment for multiple comparisons.
a, Significant difference ($p < 0.05$) between 7th and 8th grade; b, between 7th and 9th grade; c, between 8th and 9th grade, respectively. SD, Standard deviation.

to those in the 7th grade. As for the existence of trustful relationships between classmates, the mean score for all students was 7.0, with a standard deviation of 2.2. However, respondents in the 8th grade reported significantly lower levels of trust than those in the 7th and 9th grades.

Table 3 shows the Spearman correlation coefficients between variables. While suicidal ideation exhibited a moderately positive association with all types of worry, social supports and trustful relationships between classmates had negative correlations with suicidal ideation. Meanwhile, worries about school life showed strong positive associations with worries about interpersonal relationships at school ($r = 0.687$) and academic performance ($r = 0.579$). Worries about family life were strongly correlated with worries about interpersonal relationships at home ($r =$

Table 3. Spearman correlations (r) between the variables.

Variables	1	2	3	4	5	6	7	8
1. Suicidal ideation	-	-	-	-	-	-	-	-
2. Worry about school life	0.422*	-	-	-	-	-	-	-
3. Worry about interpersonal relationships at school	0.496*	0.687*	-	-	-	-	-	-
4. Worry about family life	0.387*	0.428*	0.447*	-	-	-	-	-
5. Worry about interpersonal relationships at home	0.434*	0.379*	0.401*	0.813*	-	-	-	-
6. Worry about academic performance	0.346*	0.579*	0.437*	0.381*	0.317*	-	-	-
7. Support from school staff	−0.226*	−0.194*	−0.305*	−0.211*	−0.203*	−0.149*	-	-
8. Support from family members	−0.250*	−0.223*	−0.255*	−0.431*	−0.439*	−0.179*	0.441*	-
9. Trustful relationships between classmates	−0.285*	−0.371*	−0.372*	−0.233*	−0.215*	−0.290*	0.396*	0.266*

*$p < 0.05$.

Table 4. Predictors associated with suicidal ideation based on unadjusted and adjusted logistic regression.

	Factor	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
	Intercept		0.05 (0.01-0.18)***
Characteristics	Gender		
	Boys	1.00	Rejected[a]
	Girls	1.89 (0.96-3.70)	
	Grade		
	7th grade	1.00	Rejected[a]
	8th grade	2.01 (0.82-4.93)	
	9th grade	2.26 (0.94-5.44)	
Worries related to school	Worry about school life		
	hardly any / a little	1.00	Rejected[a]
	somewhat / a lot	8.11 (3.62-18.20)***	
	Worry about interpersonal relationships at school		
	hardly any / a little	1.00	1.00
	somewhat / a lot	13.40 (5.74-31.50)***	6.84 (2.73-17.10)***
Worries related to households	Worry about family life		
	hardly any / a little	1.00	-
	somewhat / a lot	6.60 (3.31-13.1)***	
	Worry about interpersonal relationships at home		
	hardly any / a little	1.00	1.00
	somewhat / a lot	6.40 (3.18-12.90)***	2.96 (1.30-6.76)**
Worry related to academic performance	Worry about academic performance		
	hardly any / a little	1.00	1.00
	somewhat / a lot	6.65 (2.31-19.10)***	4.07 (1.28-12.90)*
Support and trust	Support from school staff		
	hardly any / a little	1.00	Rejected[a]
	somewhat / a lot	0.46 (0.23-0.91)*	
	Support from family members		
	hardly any / a little	1.00	1.00
	somewhat / a lot	0.26 (0.12-0.59)**	0.34 (0.12-0.99)*
	Trustful relationships between classmates		
	Lower (0-5)	1.00	1.00
	Higher (6-10)	0.26 (0.13-0.52)***	0.42 (0.19-0.93)*

Worry about family life was excluded from the model to avoid multicollinearity. For adjusted logistic regression model, the area under the receiver operating characteristic (ROC) curve was 0.861 (95% CI = 0.811, 0.912). [a]Variable was entered into backwards stepwise regression model but then subsequently rejected from the model since it was $p \geq 0.05$. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
OR, Odds ratio; CI, Confidence interval.

0.813). We also found that support from school staff, support from family members, and trustful relationships between classmates had negative correlations with all types of worry. All relationships were found to be statistically significant.

Associations between suicidal ideation and factors of worry, support, and social capital according to the logistic regression models

As shown in Table 4, the associations between suicidal ideation and gender/grade were not significant in the unadjusted models. On the other hand, worries about school life, interpersonal relationships at school, family life, interpersonal relationships at home, and academic performance were each associated with a higher risk of suicidal ideation, while support from school staff, support from family members, and trustful relationships between classmates were significant protective factors against suicidal ideation.

Following the backward stepwise regression results (Table 4), gender and grade were eliminated from the multivariable model. Worries about interpersonal relationships at school [Adjusted Odds Ratio (AOR) = 6.84, 95% Confidence Interval (CI), 2.73-17.10, $p < 0.001$], interpersonal relationships at home (AOR = 2.96, 95% CI, 1.30-6.76, $p < 0.01$), and academic performance (AOR = 4.07, 95% CI, 1.28-12.90, $p < 0.05$) remained from the four worry variables using the backward stepwise regression. In addition, support from family members (AOR = 0.34, 95% CI, 0.12-0.99, $p < 0.05$) and trustful relationships between classmates (AOR = 0.42, 95% CI, 0.19-0.93, $p < 0.05$) remained from the three variables concerning support and trust. The ROC area scores were above 0.80, thus indicating excellent discrimination. Finally, the VIF for all employed variables was < 1.1, suggesting the lack of collinearity.

Effects of all three types of worry (independent variables) on suicidal ideation when looking at support from family members and trustful relationships

Fig.1 shows the prevalence of suicidal ideation when stratified based on a combination of support from family members and the three variables dealing with worry (i.e., interpersonal relationships at school, interpersonal relationships at home, and academic performance), which remained in the stepwise model. Differences in the prevalence of suicidal ideation between subgroups were assessed using Fisher's exact tests, while the Holm adjustment was used for multiple comparisons. For students who expressed worry over all three variables, the prevalence of suicidal ideation was higher for those indicating lower support from family members (77.8%) when compared to those indicating higher support (32.0%) ($p = 0.025$). When looking at students who expressed worry over two variables, the prevalence of suicidal ideation was also higher among those with lower family support (50.0%) when compared to those with higher support (20.8%), although this difference was not statistically significant ($p = 0.212$). After isolating students who indicated lower levels of support from family members, the Holm post-hoc test indicated that the prevalence of suicidal ideation was higher among those who expressed worry over all three variables (77.8%) when compared to those who only indicated one variable (5.3%) ($p < 0.01$). Notably, the same was true when isolating those who indicated higher levels of family support, although at lower percentages (32.0% for three variables, 0.0% for no variables; $p < 0.001$, 4.6% for one variable; $p = 0.001$).

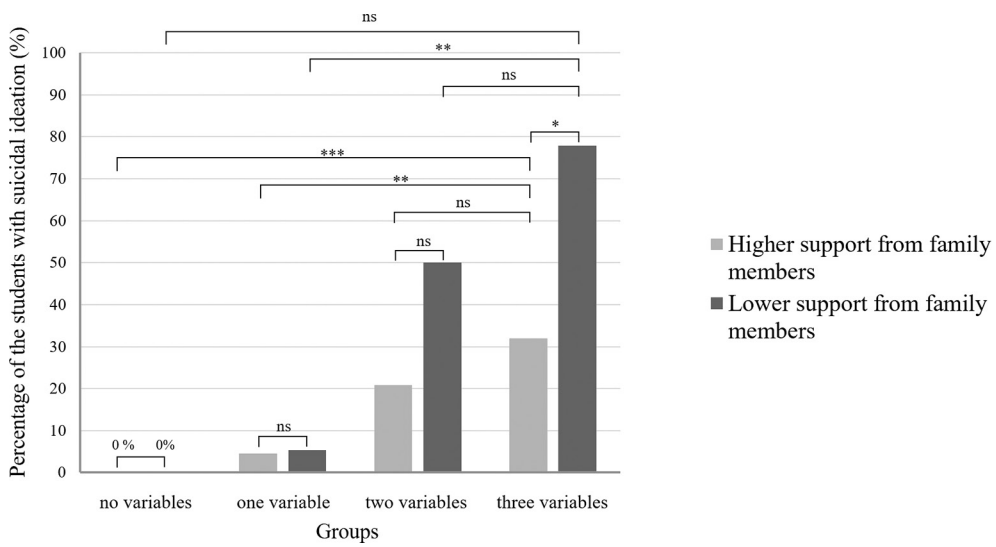

Fig. 1. Prevalence of suicidal ideation when stratified based on a combination of support from family members and the three variables dealing with worry (i.e., interpersonal relationships at school, interpersonal relationships at home, and academic performance).
Statistically significant differences within groups are determined with Fisher's exact tests; differences between groups with Fisher's exact tests with Holm adjustment. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ns, not significant.

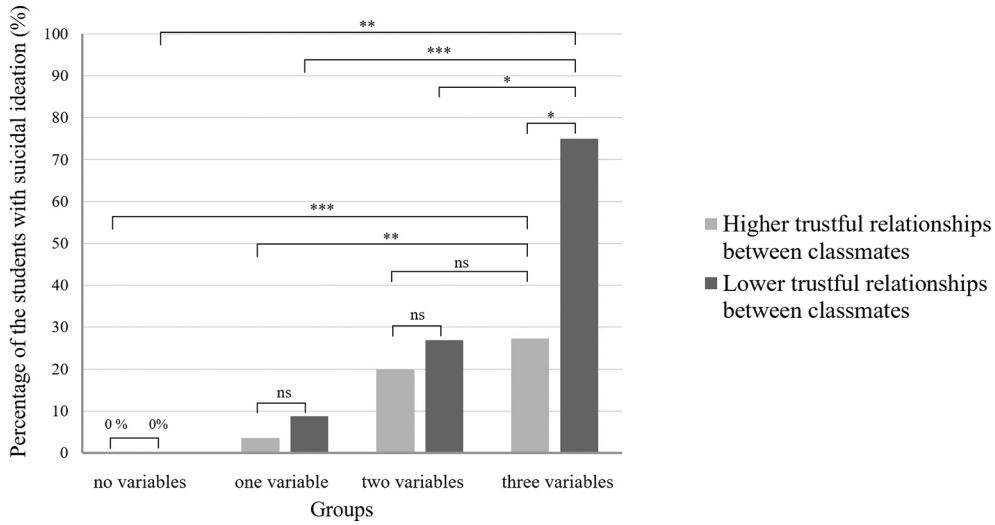

Fig. 2. Prevalence of suicidal ideation when stratified based on a combination of trustful relationships between classmates and the three variables dealing with worry (i.e., interpersonal relationships at school, interpersonal relationships at home, and academic performance).
Statistically significant differences within groups are determined with Fisher's exact tests; differences between groups with Fisher's exact tests with Holm adjustment. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ns, not significant.

Fig. 2 shows the prevalence of suicidal ideation when stratified based on a combination of trustful relationships between classmates and all three variables dealing with worry. Among respondents who expressed worry over three variables, the prevalence of suicidal ideation was higher for those who indicated lower trustful relationships (75.0%) when compared to those who indicated higher trustful relationships (27.3%) ($p = 0.012$). When isolating respondents who indicated lower trustful relationships, those who expressed worry over three variables had a higher prevalence of suicidal ideation (75.0%) when compared to those who expressed worry over none (0.0%) ($p = 0.001$), one (8.8%) ($p < 0.001$), and two (26.9%) ($p = 0.023$). When isolating respondents who indicated higher trustful relationships, a higher prevalence of suicidal ideation was also found for those who expressed worry over three variables (27.3%) when compared to those who expressed worry over none (0.0%) ($p < 0.001$) and one (3.5%) ($p = 0.004$).

Discussion

This cross-sectional study examined the relationships between several positive and negative factors associated with suicidal ideation in a sample of adolescents from Japan. Overall, we found that 10.5% respondents "often" or "sometimes" experienced suicidal ideation in the last two weeks. This finding is similar to those from previous studies showing that 10.3% of Japanese students in grades 7 through 9 had experienced suicidal ideation in the weeks prior to investigation (Kawabe et al. 2016), 10.3% of students in grades 7 through 9 (Oshima et al. 2012) and 11.7% of students in grades 7 through 12 (Nishida et al. 2014) reported recent experiences with suicidal ideation. Looking at longer timeframes involving adolescents, studies have also shown that 25.7% experienced suicidal ideation over the year prior to assessment (Nagamitsu et al. 2020), while percentages ranging from 35.3% (Katsumata et al. 2008) to 40.4% (Matsumoto et al. 2008) reported lifetime histories with the condition. Further, Nock et al. (2013) found that approximately one-third of adolescents with suicidal ideation were expected to develop suicide plans during the same life stage, with approximately 60% of those individuals attempting actual suicide. These findings including our study results indicate that a certain number of students experienced suicidal ideation, and these students may develop suicide plans or suicide attempts in the future, which further emphasizes the urgent need for interventions.

Worries about school life and interpersonal relationships at school were more prevalent among 8th grade students when compared to those in the 7th and 9th grades. By contrast, 8th and 9th grade students tended to worry more about family life, interpersonal relationships at home, and academic performance. Further, the Spearman's rank correlation showed positive correlations between suicidal ideation and worries about school life, interpersonal relationships at school, interpersonal relationships at home, and academic performance. This was consistent with the results of the univariate logistic regression analyses. Among these variables, the multivariable regression analysis showed that worries about relationships at school, relationships at home, and academic performance were independently associated with suicidal ideation. With regard to existing research, a previous study reported a correlation between conflicts with peers/teachers and suicidal ideation (Kim 2021), while another indicated that adolescents who were satisfied with their family relationships were less prone to the condition (Samm et al. 2010). One study also showed that suicidal ideation was associated with poor self-reported academic

performance (Hesketh et al. 2002). In our study, the rate of respondents who answered "somewhat" or "a lot" when asked about worries over interpersonal relationships at school and home were 31.9% and 16.1%, respectively. The rate of those who expressed worry about academic performance was even higher (60.9%). These worries could increase the risk of suicidal ideation, so it is important to monitor these students.

In addition, for students who perceived similar levels of support from family members and trustful relationships between classmates, the risk of suicidal ideation seemed to increase as the degree of overlap with worries about interpersonal relationships at both school and home, and academic performance increased. A seminal systematic review indicated that both the school and home contexts were related to youth suicidal behavior, with higher numbers of negative life events showing a positive dose-response relationship (Serafini et al. 2015). Their results are in line with our results. Our results suggest that, the effects are cumulative, and it is possible that students who lose place at both school and home are at particular risk for suicidal ideation, especially because children tend to spend most of their time at school and home. Previous studies have also shown that suicidal ideation is associated with whether students feel a sense of belonging at school (Sun and Hui 2007) and in the context of their families (Ploskonka and Servaty-Seib 2015).

In this study, we found that students who perceived higher support from family members and more trustful relationships between classmates tended to have lower levels of suicidal ideation. Our results are similar to those reported by both Bračič et al. (2019) and Langille et al. (2012). That is, Bračič et al. (2019) found that depressive feelings and family support independently affected suicidal ideation, while Langille et al. (2012) found that perceived trust and helpfulness at school protected against the condition. Harpham (2008) emphasized the importance of defining the reference area when asking participants about trust in social capital research. Langille et al. (2012) focused on the relationship between suicidal ideation and perceived trustworthiness among others at school, while we examined the relationship between suicidal ideation and perceived trustful relationships in classroom. Nevertheless, both findings highlight the importance of establishing environments in which students can trust each other, especially in regard to the prevention of suicidal ideation.

Notably, our results also indicated that support from family members remained significant independent predictors in the multivariable logistic model; however support from school staff did not retain its significance in the model. Banstola et al. (2020) similarly found that the association between suicidal behavior and family social capital was stronger than that between suicidal behavior and school social capital, in which case perceived social support is regarded as a component of cognitive social capital (Harpham 2008). Meanwhile, a study in Jamaica reported that factors in the home could protect against suicidal ideation, but that those outside the home were not associated with the condition (Abel et al. 2012). However, other researchers found that support from parents and support from teachers were independently associated with suicidal ideation and behaviors at the individual level (Madjar et al. 2018). It is unlikely that support from school staff does not protect against suicidal ideation. Further research is needed to clarify the individual effects of support from family members and school staff on suicidal ideation among adolescents.

Students who perceived higher levels of support from family members and/or trustful relationships between classmates were less likely to have suicidal ideation, even if they simultaneously worried about interpersonal relationships at school, interpersonal relationships at home, and academic performance. However, there were no statistically significant differences in suicidal ideation between students with higher and lower levels of support from family member and/or trustful relationships between classmates among the respondents who reported two or fewer worries. Similar results were produced by Mackin et al. (2012), who found that protective factors did not have marked effects on the relationship between suicide risk and attempt among participants with smaller numbers of risk factors; however, protective factors were associated with a lower percentage of reported suicide attempts among those with larger numbers of risk factors. Our findings also suggest that both support from family members and increased social capital protect adolescents who simultaneously worry about interpersonal relationships at schools, interpersonal relationships at home, and academic performance.

According to Kawachi and Berkman (2001), "the perceived availability of functional support is thought to buffer the effects of stress by enhancing an individual's coping abilities." Kang et al. (2017) further indicated that parental support particularly mediated the relationship between life stress and suicidal ideation among middle school students. Similarly, another previous study showed that greater levels of perceived family support were associated with a weaker the relationship between depression and suicidal ideation among adolescents (Rubio et al. 2020). Kawachi and Berkman (2000) previously stated that neighborhood social capital could affect health in the form of access to local services and amenities. In Gunma Prefecture, school counselors are assigned to all junior-high schools since 2018 and > 95% are regular placement; this is higher than the national level (96%-98% assigned rate and 84%-92% regular placement between 2018-2020) (Gunma Prefecture 2019, 2020, 2021). School counselors visit schools to provide psychological consultations and support to students and their parents. In this regard, students who perceive the existence of social capital with their classmates may be more likely to access these services, in which case they are less likely to develop suicidal ideation, even if they are worried about each of the factors investigated in this study.

Due to their significance, our results should be considered in interventions aimed at suicide prevention among adolescents. We found that worries about interpersonal relationships at school, interpersonal relationships at home, and academic performance independently increased the risk of suicidal ideation in this demographic. On the other hand, we found that perceived support from family members and trusting relationships between classmates were protective factors against suicidal ideation. Moreover, perceived trustful relationships between classmates may even reduce the risk of suicidal ideation for students who simultaneously worry about all three of the above factors. In this context, prevention programs should not only focus on suicide as an individual issue, but also in view of a community issue. Teachers and other school staff should note the importance of building trust in the class environment when attempting to prevent suicidal ideation. Although our findings emphasize the importance of several risk and protective factors, continued research is needed to understand the complex relationships between individual- and community-level factors in regard to suicidal ideation among adolescents.

This study also had some limitations. First, we implemented a cross-sectional design, which prevented us from establishing causal relationships between suicidal ideation and the investigated risk/protective factors. Second, all questionnaires were self-reported, which increases the risk of bias. Third, the assessment was limited to adolescents at a specific junior high school in Japan, which diminishes the generalizability of the results. Finally, all worries, forms of support, and suicidal ideation were measured using one question each, which may not reflect the situation correctly. Regarding support, Harpham (2008) argued that "it is worth separating out instrument (help to do things), emotional (help to feel things), and informational (help to do know things) support" components, as all are thought to have different relationships with health outcomes. In this study, we could not elaborate on the relationships between support classifications and suicidal ideation.

In conclusion, our findings have sociological and pragmatic implications for understanding suicidal ideation among adolescents. First, 10.5% of our Japanese junior high school sample experienced suicidal ideation over the two-week period prior to investigation. This suggests that a certain number of junior high school students may attempt suicide, which emphasizes an urgent need for continued research on suicidal ideation among youths. Second, our results showed that worries about interpersonal relationships at school, interpersonal relationships at home, and academic performance were independently related to suicidal ideation, while perceived support from family members and social capital with classmates worked as protective factors. Third, students who perceived higher support from family members and higher social capital with classmates were less likely to experience suicidal ideation when compared to those who did not, even when they simultaneously worried about all three of the abovementioned factors.

Taken together, these findings show the importance of collaboration between schools and families when attempting to prevent suicidal ideation among junior high school students. School staff must make particular efforts to reduce worries about interpersonal relationships at school and academic performance, and should also provide class environments in which students can trust one other. Meanwhile, family members should work to develop good interpersonal relationships with students while continually offering support.

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Conflict of Interest

The authors declare no conflict of interest.

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