

## Anger and Impulsivity among Japanese adolescents: A nationwide representative survey

Osamu Itani, MD, PhD<sup>a</sup>; Yoshitaka Kaneita, MD, PhD<sup>a,\*</sup>; Takeshi Munezawa, PhD<sup>b</sup>; Maki Ikeda, PhD<sup>c</sup>; Yoneatsu Osaki, MD, PhD<sup>d</sup>; Susumu Higuchi, MD, PhD<sup>e</sup>;  
Hideyuki Kanda, MD, PhD<sup>f</sup>; Sachi Nakagome, MD, PhD<sup>c</sup>; Kenji Suzuki, MD, PhD<sup>g</sup>; and  
Takashi Ohida, MD, PhD<sup>c</sup>

### ABSTRACT

*Objective:* This study aimed to clarify the prevalence of anger and impulsivity and its associated factors through a nationwide survey of junior and senior high school adolescent students in Japan.

*Method:* A self-administered questionnaire ((1) personal data, (2) lifestyle, (3) mental health status (4) feelings of anger and impulsivity) was distributed to junior and senior high school students in Japan. Among the total of 10,955 junior and 5,115 senior high schools nationwide, 130 and 110 were randomly selected. Of those, 92 junior and 80 senior high schools participated in the survey. The survey period was from December 2008 to the end of January 2009. A total of 95,980 questionnaires were collected. After excluding invalid responses, the remaining 94,777 responses (response rate: 62.3%) were analyzed.

*Results:* From the questions regarding anger and impulsivity, 8.7% (95% confidence interval: 8.5–8.9%) and 7.5% (95% confidence interval: 7.3–7.7%) of the participants were considered to have experienced intense anger and impulsivity. Logistic regression analysis indicated that the odds ratios for experiencing intense feelings of anger were significantly higher among students who smoked, consumed alcohol, skipped breakfast, did not wish to go to university, had short sleep duration, had decreased positive feelings, had increased depressive feelings, or used mobile phones for longer hours. The odds ratios for experiencing intense impulsivity were significantly higher among students who smoked, consumed alcohol, skipped breakfast,

did not participate in club activities, had short sleep duration, had decreased positive feelings, had increased depressive feelings, or used mobile phones for longer hours.

*Conclusion:* The results suggest that healthy lifestyle habits, good sleep habits, and improved mental health are important for preventing intense feelings of anger and impulsivity among adolescents.

**Keywords:** Puberty, prevalence, cross-sectional, Epidemiology, Associated Factors

The prevalence of violent behavior in adolescents attending junior and senior high schools in Japan has been increasing. According to the “Research on various problems in student guidance, such as students’ problematic behavior” survey conducted by the Japanese Ministry of Education, the incidence rate of violent behavior (per 1,000 people) increased from 4.3 in junior and 1.3 in senior high schools in 1997 to 10.7 and 2.8, respectively, in 2012. <sup>1</sup> The Ministry pointed out that this increased school violence in recent years has been mainly attributable to an increase in sudden violent outbursts among children without previous behavior problems. <sup>2</sup> Such outbursts are usually caused by trivial matters. Other behavioral problems among school children in Japan in recent years have included impulsive and random vandalism and verbal abuse. <sup>2</sup>

Studies using several approaches have been conducted to clarify the mechanisms responsible for such sudden outbursts of anger and impulsivity in adolescents. One such approach has been to focus on psychological perspectives. Increases in the rate of violence by adolescents, particularly in the USA in the 1990s and after, have heightened public concern about anger, and this in turn has prompted basic research on this issue. <sup>3</sup> Tangney et al. developed the Anger Response Inventory–Adolescence scale and used it to study sex differences in anger. <sup>4</sup> Although in previous studies of anger, the definitions of anger and methods for measuring it varied, <sup>3</sup> Spielberger et al. systematized the concept of anger and defined it as being a manifestation of emotion leading to responses that motivate aggressive behavior, and considered that hostility was a series of complex behavioral manifestations directed against others. This led to the proposal of the so-called “Anger-Hostility-Aggression” theory. <sup>5</sup> In addition, Furlong and Smith statistically classified the expression patterns of anger into six subtype. <sup>6</sup> Based on their findings, they then developed the “Multidimensional School Anger Inventory” scale, which is designed to measure school-related anger experiences in adolescents. <sup>3</sup> Impulsivity has also been investigated in psychological studies because impulsive behavior can cause various social problems. Previous studies have also indicated that impulsivity is not a unidimensional but a multidimensional concept. <sup>7-9</sup> Barratt created the Barratt Impulsiveness Scale (BIS) as an instrument for measurement of impulsivity, <sup>10</sup>

and developed the BIS-10 for use with a questionnaire in clinical situations.<sup>11</sup> The revised version, BIS-11,<sup>12</sup> is currently used worldwide.<sup>13</sup>

Other studies of violent behavior have employed a brain science approach. Such studies have gradually clarified the functions of the amygdalae that control emotions such as anger and the prefrontal area that controls impulsivity. The amygdalae are located bilaterally in the anterior inner sides of the temporal lobes. It is known that monkeys whose amygdalae have been removed lack affect, including anger (known as Klüver-Bucy Syndrome).<sup>14</sup> In addition, there is a case report of a patient with lesions specifically in the prefrontal area of the brain whose impulsivity was increased with negligible motor paralysis and speech disorder.<sup>15</sup>

To date, most studies on expression of anger or impulsivity in adolescents have been performed from psychological and physiological perspectives, and few have adopted an epidemiological approach. Kerr et al. conducted an epidemiological study of anger in 411 adolescents and reported associations between anger and lifestyle habits, such as alcohol consumption and aerobic activity.<sup>16</sup> However, no previous epidemiological studies have used representative, large-scale samples. In the present study, therefore, we conducted a nationwide survey of anger and impulsivity in a population of nearly 100,000 nationally representative Japanese adolescents. Our aims were (1) to clarify the prevalence of anger and impulsivity among adolescent students, and (2) to identify the factors associated with these forms of behavior.

## **METHOD**

### **Subjects and Sampling**

For this study, of the 10,955 junior high schools and 5,115 senior high schools registered in Japan in May 2008, 130 junior high schools (selection rate: 1.2%) and 110 senior high schools (selection rate: 2.2%) were sampled. We used a stratified, single-stage cluster-sampling method. Using this method, we divided Japan into regional blocks and randomly selected schools from each block. To avoid any sampling bias toward any regional

blocks, stratified sampling was performed with regional blocks as the strata. All the students enrolled in the sampled schools were the subjects of this study. The sample size was determined by referring to the response rate and confidence intervals based on the variance of the results obtained from the previous studies.<sup>17</sup>

In the Japanese education system, children enter primary school at the age of 6 years and leave after 6 years of study. They then enter junior high school for 3 years of study, followed by a further 3 years at senior high school. In this report, the first to third years of junior high school are called the 7th to 9th grades, and the first to third years of senior high school are called the 10th to 12th grades.

### Survey Procedure

We sent a letter to the principal of each selected school asking for cooperation in our survey, along with the same number of questionnaires and envelopes as the number of students enrolled at the school. At each school that agreed to participate in our survey, each class teacher was instructed to protect the privacy of the respondents and to explain to the students that the completed questionnaires would not be seen by the teachers and that it was not necessary for the students to participate if they were not willing to do so. After the questionnaires had been filled in, they were placed in the envelopes provided, which were then sealed with an adhesive flap. Delivery and collection of the questionnaires were entrusted to the teachers, who were instructed to follow the guidelines for conducting the survey. The teachers collected and sent the sealed envelopes back to Nihon University School of Medicine without opening them. The survey period was from December 2008 to the end of January 2009. This survey was approved by the Ethics Committee of Nihon University School of Medicine. Financial support for this study was provided by a health science Research Grant from the Ministry of Health Labor and Welfare of the Japanese Government.

### Response Rates

Replies were obtained from 92 junior high schools (school response rate 70.8%) and 80 of

senior high schools (school response rate 72.7%). A total of 95,680 envelopes were collected. The student response rate as a proportion of students enrolled at the sampled schools was 92.3% for the junior high schools, 83.8% for the senior high schools, and 87.2% as a whole. Accordingly, the overall response rate was 64.1% for the junior high schools, 62.1% for the senior high schools, and 62.9% as a whole.

Of the collected questionnaires, 903 were excluded because the sex or grade was not specified or the answers were inconsistent. The data for the remaining 94,777 questionnaires were analyzed.

## Measures

The major areas that were included in the questionnaire were (1) personal data, (2) lifestyle, (3) mental health status, and (4) feelings of anger and impulsivity. The personal data included sex, school grade, and type of school (junior/senior high school).

The questions related to lifestyle were whether the student ate breakfast (daily/occasionally/never) whether he or she participated in extracurricular activities (participating/not participating). Moreover, the question, "How many days did you smoke during the previous month?" was included in the questionnaire. Similarly, the question "How many days did you consume alcoholic beverages during the previous month?" was asked. In addition, a question regarding sleep duration was included. The question about sleep duration was "How many hours on average have you slept at night during the previous month? (less than 5 hours/5 hours or more but less than 6 hours/6 hours or more but less than 7 hours/7 hours or more but less than 8 hours/8 hours or more but less than 9 hours/9 hours or more). If the response to this question was "Less than 5 hours," then the student was defined as having "short sleep duration." A question about the number of hours of mobile-phone use per day was also included (less than 1 hours/1 hours or more but less than 2 hours/2 hours or more).

To evaluate the mental health statuses of the respondents, 2 independent factors (depression/anxiety and decrease in positive feeling) included in the 12-item General Health Questionnaire (GHQ-12)<sup>18, 19</sup> were used. One of the items from the depression/anxiety factor

(whether the respondent had felt an unusual amount of unhappiness and depression in the previous 30 days) was evaluated (not at all/no more than usual/more than usual/much more than usual). One of the items from the decrease in positive feeling factor (whether the respondent was able to enjoy normal activities more than usual in the previous month) was also evaluated (more so than usual/same as usual/less than usual/much less than usual). Previous studies have shown that evaluation of mental health status using depression symptoms with the GHQ-12 and with this cutoff point has a sensitivity of 87.0% and a specificity of 85.1%.<sup>20</sup>

The question on feelings of anger was “Have only you felt angry, or have you felt angry more strongly than others during the previous month, even though you may have seen, heard, or experienced the same things as others?” The question on impulsivity was “Have you behaved impulsively (for example, behaved violently, used abusive language, made an impulsive purchase despite having no money, ate or drank too much, etc.) during the previous month?” Participants were requested to select one answer option for each of these questions from among the following options: never, seldom, sometimes, often, and always. Those who selected often or always were defined as having experienced intense anger or impulsivity.

### Statistical Analyses

First, the frequency of experiencing feelings of anger was calculated, based on sex and grade at school. We examined associations between school grade and the frequency of experiencing feelings of anger based on sex, using the  $\chi^2$  test. We then examined associations between sex and the frequency of experiencing feelings of anger, again using the  $\chi^2$  test. Next, multiple logistic regression analysis was performed to examine the factors associated with intense feelings of anger. Specifically, experiencing intense feelings of anger was used as an objective variable, and the following factors were considered as independent variables: sex, grade at school, alcohol-drinking, smoking, eating breakfast, extracurricular activities, wish to go to university, sleep duration, mental health status, and hours of mobile-phone use per day.

Analysis of impulsivity was also performed using the same methods as those described above for feelings of anger. We set the level of significance at  $P < 0.05$ . All analyses were performed using IBM SPSS Statistics version 19.0 for Windows (IBM Corp., Somers, NY, USA).

## RESULTS

### Prevalence of anger and impulsivity

Table 1 shows the frequency of experiencing feelings of anger based on sex and grade. The prevalence of experiencing intense feelings of anger among the participants as a whole was 8.7% (95% confidence interval: 8.5–8.9%), and the corresponding prevalences for male and female students were 7.8% (95% confidence interval: 7.6–8.0%) and 9.6% (95% confidence interval: 9.3–9.9%), respectively. The prevalence among girls was higher than that among boys in all school grades, and also became higher for both sexes as the grade increased.

Table 2 shows the frequency of experiencing impulsivity based on sex and grade. The prevalence of experiencing intensive impulsivity among the participants as a whole was 7.5% (95% confidence interval: 7.3–7.7%), and the corresponding prevalences for male and female students were 7.0% (95% confidence interval: 6.8–7.2%) and 8.1% (95% confidence interval: 7.9–8.3%), respectively. The prevalence among girls was higher than that among boys in all school grades, and also became higher for both sexes as the grade increased.

### Logistic-regression analyses

Table 3 shows the results of multiple logistic regression analysis in which experiencing intense feelings of anger was used as an objective variable. The adjusted odds ratios for experiencing intense feelings of anger were significantly higher among students who smoked, consumed alcohol, skipped breakfast, did not wish to go to university, had short sleep duration, had decreased positive feelings, had increased depressive feelings, or used mobile phones for longer hours.



Table 4 shows the results of multiple logistic regression analysis in which experiencing intense impulsivity was used as an objective variable. The adjusted odds ratios for experiencing intensive impulsivity were significantly higher among students who smoked, consumed alcohol, skipped breakfast, did not participate in club activities, did not wish to go to university, had short sleep duration, had decreased positive feelings, had increased depressive feelings, or used mobile phones for longer hours.

## DISCUSSION

The results of this study appear to be representative of the study population for 3 reasons: (1) the subject schools were selected randomly from among those nationwide, (2) the sample size was very large and the number of analyzed cases exceeded 90,000, and (3) the rate of response to the questionnaires was acceptably high.

In this study, significant associations were recognized between anger/impulsivity and smoking/alcohol consumption. Dose-response relationships were observed between them; the adjusted odds ratio for anger or impulsivity increased as the amount of smoking or alcohol consumption increased. With regard to associations between smoking and anger, Gehricke et al. performed an experiment in which 20 nonsmokers were divided into two groups, one with and one without attached nicotine patches, who were then required to play a match-type computer game.<sup>21</sup> The time taken to react against an opponent's attack (a shorter time reflecting a higher intensity of anger) and the length of retaliation (a longer time reflecting a higher intensity of anger) were then measured as anger indices. At the same time, the active areas of the brain were observed using positron emission tomography. The results of this study suggested that nicotine does have an impact on the areas of the brain involved in the inhibition of negative emotions such as anger.

Chermack and Giancola conducted an interesting study on the effects of alcohol consumption on impulsivity or aggression. Two subjects competed with each other to show the most rapid response to optical stimuli on a PC screen, and the winner was allowed to inflict

an electric shock on the loser.<sup>22</sup> The results of this study suggested an association between alcohol intake and the level of aggression. Josephs and Steele have pointed out a phenomenon known as alcohol myopia, in which an intoxicated person's attention is attracted to stimuli at the center of his/her consciousness whereas his/her interests in stimuli at the periphery of consciousness are decreased.<sup>23</sup>

Our present findings revealed a significant association between skipping breakfast and anger/impulsivity. Harada et al. conducted a questionnaire survey on the ingredients of meals taken by 2,279 children aged 0–15 years. They subsequently calculated the amount of tryptophan taken in at breakfast, and then examined associations between the amount of tryptophan ingested and anger. The results suggested an association between tryptophan intake and levels of anger in children.<sup>24</sup>

The present study also demonstrated a significant association between short sleep duration and anger/impulsivity. In a study of 20 university students, Taub reported that students with short sleep times exhibited significantly higher levels of anger, as scored on a mood scale.<sup>25</sup> However, other epidemiological studies have reported no significant association between sleep duration and anger.<sup>26–28</sup> Thus, at least in terms of epidemiology, no conclusive results have yet emerged.<sup>29</sup> In the context of brain science, one of the hypotheses proposed for the mechanism whereby sleep deprivation causes anger is a decline in function of the prefrontal cortex.<sup>29–36</sup> With regard to associations between sleep and impulsivity, Ireland et al. conducted a study of 184 prisoners aged 14–20 years, who were serving jail sentences because of violence or traffic offenses.<sup>37</sup> The subjects were questioned about sleep quantity before and after imprisonment, as well as the intensity of impulsivity, using the Barratt Impulsivity Scale-II,<sup>38</sup> and the results were then evaluated and analyzed to examine associations. This revealed an association between impulsivity and sleep quantity. Several other studies conducted previously have also reported an association between sleep deprivation and impulsivity.<sup>39–41</sup>

The present study also revealed a significant association between long hours of mobile-phone use and anger/impulsivity. Billieux et al. conducted a questionnaire survey of

108 female undergraduate psychology students to investigate the actual conditions of mobile-phone use and self-awareness of their own mobile phone dependency; the level of impulsivity was evaluated using the UPPS Impulsive Behavior Scale. They reported that a relationship could be established between the use of and perceived dependence on a mobile phone and two facets of impulsivity: urgency and lack of perseverance.<sup>42</sup>

The present study demonstrated significant associations between mental health status, such as an increase in depression and a decrease in positive affect, and anger/impulsivity. Swanson et al. conducted an epidemiological study in a catchment area and reported an association between depression and violent behavior.<sup>43</sup> Fava et al. reported that some patients expressed sudden anger when presenting with symptoms similar to a panic attack and that patients having such attacks were more likely to have a higher rate of depression. Such attacks were named anger attacks.<sup>44</sup>

The present study had some limitations. First, because the data were collected through a self-administered questionnaire and the collected responses were subjective, it is possible that there were differences between the prevalence found in this study and the actual prevalence. Second, because the questionnaire response rate for junior and senior high schools as a whole was 62.9%, a certain degree of non-response bias may have existed. However, this response rate is considered to be sufficient for this type of epidemiological survey. Third, because this was a cross-sectional study, a causal relationship could not be determined. For example, this study found associations between lifestyle habits (such as smoking and alcohol intake) and anger/impulsivity, such that lifestyle habits may induce anger or impulsivity. However, the possibility that anger/impulsivity may induce these lifestyle habits cannot be refuted. We need to plan a longitudinal study to resolve this limitation and establish a causal relationship.

Based on the present findings, it is suggested from a public health viewpoint that if intensive anger or impulsivity is recognized in adolescents, lifestyle habits (such as smoking and alcohol consumption) that may harm their future health or create problems with their mental status may be an issue. The findings of this study may be useful in suggesting

important areas for further exploration and/or guidance for adolescents with self-reported issues of anger/impulsivity. In addition, from a clinical psychiatric perspective, the findings of our study may be helpful for the diagnosis, screening, and treatment of underlying diseases such as attention deficit hyperactivity disorder (ADHD). ADHD is a clinical psychiatric disease for which the diagnostic criterion is impulsivity; an associated feature that supports the diagnosis is irritability (sudden outbursts of anger).<sup>45</sup> Furthermore, the associations between lifestyle habits and anger/impulsivity demonstrated in our study may serve to improve our understanding of the pathological background of diseases such as ADHD.

**Table 1. Japanese adolescentsにおける男女別および学年別のAngerの感情**

	N	この30日間に自分だけが強い怒りを感じたか(%)					P value <sup>a</sup>	P value <sup>b</sup>
		never	seldom	sometimes	often	always		
Male							<0.001	<0.001
<i>Junior high school</i>								
7th Grade	6,431	61.6	19.2	13.2	3.6	2.4		
8th Grade	6,697	60.1	19.3	13.6	4.6	2.4		
9th Grade	6,232	60.0	18.0	14.3	4.6	3.1		
<i>Senior high school</i>								
10th Grade	10,055	54.4	19.7	17.5	5.5	2.9		
11th Grade	9,485	52.7	19.8	18.9	5.6	3.0		
12th Grade	8,656	56.1	17.5	17.9	5.1	3.3		
Total	47,556	56.9	19.0	16.3	4.9	2.9		
 Female							<0.001	
<i>Junior high school</i>								
7th Grade	6,709	54.3	22.3	16.1	4.7	2.6		
8th Grade	6,782	50.0	22.0	18.8	6.4	2.7		
9th Grade	6,517	46.9	22.3	21.3	6.2	3.3		
<i>Senior high school</i>								
10th Grade	9,883	42.6	24.1	23.0	6.9	3.4		
11th Grade	8,569	40.8	23.8	24.5	7.1	3.7		
12th Grade	7,818	45.5	22.1	22.9	6.6	2.9		
Total	46,278	46.1	22.9	21.4	6.4	3.2		

<sup>a</sup> P value was calculated by  $\chi^2$  test, 5 (Anger; never, seldom, sometimes, often, always)  $\times$  6 (Grade; 7th, 8th, 9th, 10th, 11th, 12th)

<sup>b</sup> P value was calculated by  $\chi^2$  test, 5 (Anger; never, seldom, sometimes, often, always)  $\times$  2 (Sex; Male, Female)  
Subject with missing data were excluded from the analysis.

**Table 2. Japanese adolescentsにおける男女別および学年別のImpulsivityの感情**

	N	この30日間に衝動的に行動したか(%)					P value <sup>a</sup>	P value <sup>b</sup>
		never	seldom	sometimes	often	always		
Male							<0.001	<0.001
<i>Junior high school</i>								
7th Grade	6,431	66.6	15.7	12.5	3.5	1.7		
8th Grade	6,697	63.5	17.3	13.1	4.2	2.0		
9th Grade	6,232	64.4	15.3	13.7	4.1	2.5		
<i>Senior high school</i>								
10th Grade	10,055	58.3	18.6	15.9	4.7	2.5		
11th Grade	9,485	57.1	18.3	17.1	5.2	2.4		
12th Grade	8,656	58.8	16.1	16.9	5.2	3.0		
Total	47,556	60.8	17.1	15.2	4.6	2.4		
Female							<0.001	
<i>Junior high school</i>								
7th Grade	6,709	64.8	16.9	13.0	3.5	1.9		
8th Grade	6,782	60.7	17.8	14.9	4.9	1.8		
9th Grade	6,517	57.6	18.4	16.5	5.0	2.5		
<i>Senior high school</i>								
10th Grade	9,883	49.2	20.9	21.1	6.3	2.6		
11th Grade	8,569	47.0	20.1	23.4	6.6	2.9		
12th Grade	7,818	49.7	19.6	21.6	6.3	2.8		
Total	46,278	54.0	19.1	18.9	5.6	2.5		

<sup>a</sup> P value was calculated by  $\chi^2$  test, 5 (Impulsivity; never, seldom, sometimes, often, always)  $\times$  6 (Grade; 7th, 8th, 9th, 10th, 11th, 12th)

<sup>b</sup> P value was calculated by  $\chi^2$  test, 5 (Impulsivity; never, seldom, sometimes, often, always)  $\times$  2 (Sex; Male, Female)

Subject with missing data were excluded from the analysis.

**Table 3. Japanese adolescentsにおけるAngerの関連要因**

	N	AOR	95% CI	P value*
Sex				0.284
Male	43,733	1.00		
Female	43,195	1.03	0.98 - 1.08	
Grade				<0.001
7th	11,768	1.00		
8th	12,296	1.06	0.96 - 1.17	
9th	11,712	1.01	0.91 - 1.12	
10th	18,736	0.90	0.82 - 1.00	
11th	16,995	0.89	0.81 - 0.98	
12th	15,421	0.80	0.72 - 0.89	
喫煙本数(/day)				<0.001
0	82,416	1.00		
1~10	3,228	1.58	1.42 - 1.76	
11~20	804	1.58	1.30 - 1.92	
21≤	480	2.72	2.17 - 3.42	
飲酒日数(/month)				<0.001
0	72,329	1.00		
1~5	12,339	1.24	1.16 - 1.33	
6~19	1,817	1.62	1.41 - 1.86	
20≤	443	2.65	2.08 - 3.38	
Eating breakfast everyday				<0.001
Yes	73,604	1.00		
No	13,324	1.16	1.09 - 1.24	
クラブ活動への参加				0.736
Yes	60,348	1.00		
No	26,580	0.99	0.94 - 1.05	
大学への進学希望				0.005
Yes	38,854	1.00		
No	48,074	1.08	1.02 - 1.15	
Sleep duration (h/day)				<0.001
5≤	72,546	1.00		
<5	14,382	1.26	1.18 - 1.34	
日常生活を楽しく送れたか				<0.001
more so than usual	31,757	1.00		
same as usual	46,313	1.03	0.97 - 1.09	
less than usual	5,876	1.72	1.58 - 1.88	
much less than usual	2,982	3.66	3.33 - 4.02	
気持ちの落ち込み				<0.001
not at all	19,175	1.00		
no more than usual	28,933	1.56	1.40 - 1.73	
more than usual	26,976	4.26	3.86 - 4.70	
much more than usual	11,844	5.73	5.17 - 6.36	
携帯電話使用時間(h/day)				<0.001
全くなし	12,666	1.00		
<1	29,865	1.01	0.92 - 1.11	
1~2	15,727	1.16	1.05 - 1.29	
2≤	28,670	1.62	1.47 - 1.78	

AOR: adjusted odds ratio, CI: confidence interval.

強いAnger経験の定義: この30日間に自分だけが強い怒りを感じた頻度がnever or seldom or sometimesを"無し", often or alwaysが"有り"とした。

\* P value was calculated by the multiple logistic regression analysis.

objective variable: 強いAngerの経験

independent variables: Sex, Grade, Smoking, Drinking, Eating breakfast everyday, クラブ活動への参加, 大学への進学希望, Sleep duration, 日常生活を楽しく送れたか, 気持ちの落ち込み, 携帯電話使用時間

Subjects with missing data were excluded from the analysis.

**Table 4. Japanese adolescentsにおけるImpulsivityの関連要因**

	N	AOR	95% CI	P value*
Sex				0.818
Male	43,733	1.00		
Female	43,195	0.99	0.94 - 1.05	
Grade				0.144
7th	11,768	1.00		
8th	12,296	1.02	0.92 - 1.15	
9th	11,712	0.97	0.87 - 1.09	
10th	18,736	0.93	0.83 - 1.03	
11th	16,995	0.92	0.82 - 1.02	
12th	15,421	0.90	0.80 - 1.01	
喫煙本数(/day)				<0.001
0	82,416	1.00		
1~10	3,228	1.60	1.44 - 1.78	
11~20	804	1.56	1.29 - 1.88	
21≤	480	3.06	2.47 - 3.80	
飲酒日数(/month)				<0.001
0	72,329	1.00		
1~5	12,339	1.46	1.37 - 1.56	
6~19	1,817	1.98	1.73 - 2.26	
20≤	443	3.36	2.67 - 4.24	
Eating breakfast everyday				<0.001
Yes	73,604	1.00		
No	13,324	1.24	1.16 - 1.33	
クラブ活動への参加				<0.001
Yes	60,348	1.00		
No	26,580	1.12	1.05 - 1.18	
大学への進学希望				0.010
Yes	38,854	1.00		
No	48,074	1.08	1.02 - 1.15	
Sleep duration (h/day)				<0.001
5≤	72,546	1.00		
<5	14,382	1.33	1.25 - 1.42	
日常生活を楽しく送れたか				<0.001
more so than usual	31,757	1.00		
same as usual	46,313	0.95	0.89 - 1.01	
less than usual	5,876	1.41	1.28 - 1.55	
much less than usual	2,982	2.32	2.09 - 2.58	
気持ちの落ち込み				<0.001
not at all	19,175	1.00		
no more than usual	28,933	1.41	1.27 - 1.55	
more than usual	26,976	2.49	2.27 - 2.74	
much more than usual	11,844	3.37	3.04 - 3.72	
携帯電話使用時間(h/day)				<0.001
全くなし	12,666	1.00		
<1	29,865	1.05	0.94 - 1.16	
1~2	15,727	1.32	1.17 - 1.48	
2≤	28,670	2.14	1.93 - 2.37	

AOR: adjusted odds ratio, CI: confidence interval.

強いImpulsivity経験の定義: この30日間に衝動的に行動した頻度がnever or seldom or sometimesを"無し", often or alwaysが"有り"とした。

\* P value was calculated by the multiple logistic regression analysis.

objective variable: 強いImpulsivityの経験

independent variables: Sex, Grade, Smoking, Drinking, Eating breakfast everyday, クラブ活動への参加, 大学への進学希望, Sleep duration, 日常生活を楽しく送れたか, 気持ちの落ち込み, 携帯電話使用時間

Subjects with missing data were excluded from the analysis.



