Table 4. Association between the lifetime experience of suicidal feelings and severity of psychotic-like experiences in Japanese adolescents aged 12–15 years (N = 4894)

	Lifetime prevalence of suicidal [feelings]†		Unadjusted odds ratio			Adjusted odds ratio‡§		
Psychotic-like experiences (PLEs)*	*n*	%	OR	95%	*P*-value	OR	95% CI	*P*-value
No symptom group (n = 4148)	602	14.51	1.00		<0.001	1.00		<0.001
1 symptom group (n = 564)	209	37.06	3.46	2.85–4.18		2.18	1.74–2.74	
2 or more –symptoms group (n = 18)	97	53.30	6.70	4.94–9.07		3.14	2.17–4.53	

*No symptom group = individuals with no PLE; 1 symptom group = individuals with one PLE; 2 or more symptoms group = individuals with two or more PLEs.
†The number of individuals with the lifetime experience of suicidal feelings.
‡Odds ratio adjusted forage, sex, the total score of the GHQ-12, being bullied,
violence from adults in the home, alcohol use, and use of recreational drugs.
§In each section, the missing data have been excluded from the statistical analyzes.

Table 5. Association between deliberate self-harm behaviors and severity of psychotic-like experiences in Japanese adolescents aged 12–15 years (N = 4894)

	Prevalence of self-harm behaviors†		Unadjusted odds ratio			Adjusted odds ratio‡§		
Psychotic-like experiences (PLEs)*	*n*	%	OR	95% CI	*P*-value	OR	95% CI	*P*-value
No symptom group (n = 4150)	150	3.62	1.00		<0.001	1.00		<0.001
1 symptom group (n = 562)	59	10.50	3.12	2.23–4.29		1.68	1.18–2.40	
2 or more symptoms group (n = 182)	41	22.53	7.75	5.28–11.38		3.06	1.96–4.78	

*No symptom group = individuals with no PLE; 1 symptom group = individuals with one PLE; 2 or more symptom group = individuals with two or more PLEs.
†The number of individuals with the experience of deliberate self-harm behaviors in the previous year.
‡Odds ratio adjusted for age, sex, the total score of the GHQ-12, being bullied, violence (torn adults in the home, alcohol use, and use of recreational drugs.
§In each section, the missing data have been excluded from the statistical analyzes.

of PLEs were approximately three times more likely to experience suicidal feelings and self-harm behaviors than those who did not experience PLEs.

When each PLE was analyzed, the prevalence of 'heard voices' was the most frequent (10.0%), followed by 'spied-upon' (7.4%). Compared with these two PLEs, 'thoughts read' and 'special messages' were much less common (1.6% and 0.7%). 'Spied-upon' and 'heard voices' were significantly associated with both suicidal feelings and deliberate self-harm behaviors, after controlling for confounding factors. 'Thoughts read' was significantly associated with suicidal feelings but not with deliberate self-harm behaviors, whereas 'special messages' was not significantly associated with either the feelings or the behaviors. These results suggest that 'heard voices' and 'spied-upon' could be useful markers to identify younger adolescents who are at risk for suicide-related feelings and behaviors.

The risk of suicide behaviors is significantly higher in subjects with psychosis, including schizophrenia, during the early phase of the disease (2, 8). The risk for suicide during the early stage of psychosis may be higher for those who have greater insight about their disease (3, 34). A recent study reported that such insight might begin to significantly elevate the risk of self-harm behaviors in subjects with the first episode of psychosis in the pretreatment phase (3). Insight about the unusual nature of the PLEs could increase the risk of the suicidal feelings/behaviors even for younger teenagers, because of the fear and distress associated with PLEs. Future studies about the relationship of insight and distress are needed to understand the effects.

The association between PLEs and suicidal feelings/behaviors was significant after controlling for anxiety/depression and use of substances. Thus far, psychotic disorders may have been considered less of a contributing factor in suicide in young people compared to mood disorders and substance use disorders (35, 36). In psychological autopsy studies, the information was mostly obtained from family members and other relevant people (7, 35, 36). Subclinical psychotic symptoms or signs which do not manifest in the behaviors of the subjects would be more likely to be overlooked than depression or substance misuse. In the present study, a substantial portion of the subjects with suicidal problems were suffering from PLEs; 306 out of 908 subjects with suicidal feelings (34%) and 100 out of 250 subjects with suicidal behaviors (40%) experienced one or more types of PLEs.

More attention should be focused on subclinical psychotic signs/symptoms in future studies of suicidal problems in young people.

This study had several limitations. First, we could not obtain answers from absent students. Poor mental health status and psychopathology may be more prevalent among frequent or long-term absentees. Second, because we used a self-report questionnaire, there may be more over-reporting and/or under-reporting on certain topics than there would be in an interview-based survey. For these reasons, the estimated prevalence of psychopathology might not be totally precise. Third, we did not ask the participants to give detailed descriptions about the PLEs which they experienced. Therefore, we could not identify possible discrepancies in what subjects perceived as real PLEs. Fourth, sufficient information about confounding factors such as personality (37, 38) and family circumstances (39, 40), which might be associated with suicidal problems, was not available in the present study. Finally, we used a cross-sectional survey, and therefore, we were not able to identify cause and effect relationships between PLEs and other factors. Hence, in the future, follow-up studies will be needed to investigate the nature of the chronological relationships between PLEs and other factors including suicide-related problems.

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Declaration of interest

None.

References

1. Radomsky ED, Hass GL, Mann JJ, Sweeney JA. Suicidal behavior in patients with schizophrenia and other psychotic disorders. Am J Psychiatry 1999;**156**:1590–1595.
2. Palmer BA, Pankratz VS, Bostwick JM. The lifetime risk of suicide in schizophrenia: a reexamination. Arch Gen Psychiatry 2005;**62**:247–253.
3. Harvey SB, Dean K, Morgan C et al. Self-harm in first-episode psychosis. Br J Psychiatry 2008;**192**:178–184.
4. Copas JB, Robin A. Suicide in psychiatric in-patients. Br J Psychiatry 1982;**141**:503–511.
5. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. Br J Psychiatry 1997; **170**:205–228.
6. Hafner H, An der Heiden W. Epidemiology of schizophrenia. Can J Psychiatry 1997;**42**:139–151.
7. Asukai N. Suicide and mental disorders. Psychiatry Clin Neurosci (Suppl.) 1995;**49**:S91–S97.
8. Bertelsen M, Jeppesen P, Petersen L et al. Suicide behavior and mortality in first-episode psychosis: the OPUS trial. Br J Psychiatry (Suppl.) 2007;**191**:S140–S146.
9. van Os J. Is there a continuum of psychotic experiences in the general population? Epidemiol Psichiatria Soc 2003; **12**:242–252.
10. Van Os J, Linscott RJ, Myin-Germeys I, Delespaul P, Krabbendam L. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness–persistence–impairment model of psychotic disorder. Psychol Med 2009;**39**:179–195.
11. Kendler KS, Gallagher TJ, Abelson JM. Lifetime prevalence, demographic risk factors, and diagnostic validity of nonaffective psychosis as assessed in a US community sample. The National Comorbidity Survey. Arch Gen Psychiatry 1996;**53**:1022–1031.
12. Johns LC, Cannon M, Singleton N et al. Prevalence and correlates of self-reported psychotic symptoms in the British population. Br J Psychiatry 2004;**185**:298–305.
13. Scott J, Welham J, Martin G et al. Demographic correlates of psychotic-like experiences in young Australian adults. Acta Psychiatr Scand 2008;**118**:230–237.
14. Laurens KR, Hodgins S, Maughan B, Murray RM, Rutter ML, Taylor EA. Community screening for psychotic-like experiences and other putative antecedents of schizophrenia in children aged 9–12 years. Schizophr Res 2007;**90**:130–146.
15. Laurens KR, West SA, Murray R, Hodgins S. Psychotic-like experiences and other antecedents of schizophrenia in children aged 9–12 years: a comparison of ethnic and migrant groups in the United Kingdom. Psychol Med 2008;**38**:1103–1111.
16. Nishida A, Tanii H, Nishimura Y et al. Association between psychotic-like experiences and mental health status and other psychopathologies among Japanese early teens. Schizophr Res 2008;**99**:125–133.
17. Horwood J, Salvi G, Thomas K et al. IQ and non-clinical psychotic symptoms in 12-year-olds: results from the ALSPAC birth cohort. Br J Psychiatry 2008;**193**:185–191.
18. Poulton R, Caspi A, Moffitt TE, Cannon M, Murray R, Harrington H. Children's self-reported psychotic symptoms and adult schizophreniform disorder: a 15-year longitudinal study. Arch Gen Psychiatry 2000;**57**:1053–1058.
19. Dhossche D, Ferdinand R, Van der Ende J, Hofstra MB, Verhulst F. Diagnostic outcome of self-reported hallucinations in a community sample of adolescents. Psychol Med 2002;**32**:619–627.
20. Costello A, Edelbrock C, Kalas R, Kessler M, Klaric S. NIMH diagnostic interview schedule for children: child version. Rockville, MD: National Institute of Mental Health, 1982.
21. Paykel ES, Myers JK, Lindenthal JJ, Tanner J. Suicidal feelings in the general population: a prevalence study. Br J Psychiatry 1974;**124**:460–469.
22. Goldberg DP, Rickels K, Downing R, Hesbacher P. A comparison of two psychiatric screening tests. Br J Psychiatry 1976;**129**:61–67.
23. Fukunishi I. The assessment of the cut-off point of the General Health Questionnaire (GHQ) in the Japanese version (in Japanese). Clin Psychol 1990;**3**:228–234.

24. Doi Y, Minowa M. Factor structure of the 12-item General Health Questionnaire in the Japanese general adult population. Psychiatry Clin Neurosci 2003;57:379–383.
25. Radovanovic Z, Eric L. Validity of the General Health Questionnaire in a Yogoslav student population. Psychol Med 1983;13:205–207.
26. D'Arcy C, Siddique CM. Psychological distress among Canadian adolescents. Psychol Med 1984;14:615–628.
27. Arakida M, Takahashi S, Aoyagi M, Kanamori M. Examination of mental health status and related factors in junior high school students: a three-year longitudinal investigation (in Japanese). Shouni Hoken Kenkyu 2003;62:667–679.
28. Kaneita Y, Ohida T, Osaki Y et al. Association between mental health status and sleep status among adolescents in Japan: a nationwide cross-sectional survey. J Clin Psychiatry 2007;68:1426–1435.
29. Pedersen W. Does cannabis use lead to depression and suicidal behaviors? A population-based longitudinal study. Acta Psychiatr Scand 2008;118:395–403.
30. King CA, Merchant CR. Social and interpersonal factors relating to adolescent suicidality: a review of the literature. Arch Suicide Res 2008;12:181–196.
31. Swahn MH, Bossarte RM, Sullivent EE. Age of alcohol use initiation, suicidal behavior, and peer and dating violence victimization and perpetration among high-risk, seventh grade adolescents. Pediatrics 2008;121:297–305.
32. O'Connor RC, Rasmussen S, Miles J, Hawton K. Self-harm in adolescents: self-report survey in school in Scotland. Br J Psychiatry 2009;194:68–72.
33. Lataster T, van Os J, Drukker M et al. Childhood victimisation and developmental expression of non-clinical delusional ideation and hallucinatory experiences: victimisation and non-clinical psychotic experiences. Soc Psychiatry Psychiatr Epidemiol 2006;41:423–428.
34. Crumlish N, Whitty P, Kamali M et al. Early insight predicts depression and attempted suicide after 4 years in first-episode schizophrenia and schizophreniform disorder. Acta Psychiatr Scand 2005;112:449–455.
35. Houston K, Hawton K, Shepperd R. Suicide in young people aged 15–24: a psychological autopsy study. J Affect Disord 2001;63:159–170.
36. Shaffer D, Gould M, Fisher P et al. Psychiatric diagnosis in child and adolescent suicide. Arch Gen Psychiatry 1996;53:339–348.
37. Blasco-Fontecilla H, Baca-Gracia E, Dervic K et al. Severity of personality disorders and suicide attempt. Acta Psychiatr Scand 2009;119:149–155.
38. Portzky G, Audenaert K, Van Heeringen K. Suicide among adolescents; a psychological autopsy study of psychiatric, psychosocial and personality-related risk factors. Soc Psychiatry Psychiatr Epidemiol 2005;40:922–930.
39. Fergusson DM, Woodward LJ, Horwood LJ. Risk factors and life processes associated with the onset of suicidal behavior during adolescence and early adulthood. Psychol Med 2000;30:23–39.
40. Agerbo E, Nordentoft M, Mortensen PB. Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case–control study. BMJ 2002;325:74.

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Perspectives in Early Intervention

Psychotic-like experiences (PLEs) and mental health status in twin and singleton Japanese high school students

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Abstract

Aim: Studying what factors and behaviours to work on may be a key to develop the effective prevention of future mental disorder in both high-risk and general young subjects. This study aimed to investigate whether twins are more vulnerable to mental health problems including psychotic-like experiences (PLEs) than singletons and what factors on lifestyle and social environment are associated with poor mental health.

Methods: Subjects comprised 341 Japanese high-school students (173 males and 168 females) including 62 twins. We examined PLEs, general psychological distress, length and regularity of sleep, domestic violence, being bullied and other environmental factors using questionnaires including the 12-item General Health Questionnaire (GHQ-12). The variables were compared between twins and singletons. Whether variables on lifestyle and social environment affect PLEs and GHQ-12 scores were studied by logistic regression.

Results: Significant difference was observed in PLEs and GHQ-12 between twins and singletons. Experiencing PLEs was negatively associated with being a twin (OR = 0.293, 95% CI = 0.101–0.847) and length of sleep (OR = 0.685, 95% CI = 0.519–0.903). GHQ-12 > 4 was significantly associated with irregular sleep schedule (OR = 3.042, 95% CI = 1.818–5.090), being bullied (OR = 3.677, 95% CI = 1.317–10.266) and having no people to confide in (OR = 2.615, 95% CI = 1.249–5.475).

Conclusion: Poor mental health status including experiencing PLEs might be less frequent in twins than in singletons. Problems in sleep length, its schedule and human relationships were significantly associated with mental health in high-school students as we hypothesized. Early identification programmes and mental health education focused on these factors may be helpful.

Key words: GHQ, high-school students, psychotic-like experiences (PLEs), sleep, twin.

INTRODUCTION

Early detection and intervention are thought to improve the course and prognosis of psychosis and other mental disorders.[1,2] They may also be important in light of the cost-benefits of such psychiatric treatment.[3,4] Psychotic-like experiences (PLEs) are subclinical hallucinatory and delusional experiences. PLEs occur not only in subjects with psychotic disorders but also in people in the community who may not be clinically diagnosed with psychoses.[5–7] Studies have observed that a substantial portion (10–40%) of subjects with PLEs develop psychoses and other mental disorders.[8,9] PLEs are therefore considered a good predictor of clinical psychosis.[10,11]

Most forms of psychoses including schizophrenia develop from early teens to late twenties. A recent epidemiological study observed that 75% of adult psychiatric disorders developed by age 25.[12] These suggest that examination of PLEs in teenagers may help the prevention, including early detection/treatment, of psychiatric disorders.

For effective prevention, one of the keys may be to clarify who is at high risk, or in other words, who should be taken care of most carefully. In the present study, we focused on whether twins are more vulnerable to poor status of mental health than singletons. Previous studies have observed that twins may be more susceptible to mental disorders, due to limited blood supply and its effect on neurodevelopment during embryonic period,[13,14] while other studies did not find the difference between twins and singletons.[15,16] Thus, we postulated that twins in their teenage years may be suffering poorer mental status, including experiences PLEs, than singletons.

Another aim of the present study is to investigate what environmental and behavioural factors are associated with poor mental health including PLEs. To study what factors and behaviours to work on may be another key to develop effective prevention, in both high-risk and general young subjects. The associated factors might become a good focus in the intervention and psychological education for the prevention. Previous studies have observed that PLEs may be associated with suicidal feelings and deliberate self-harm behaviours,[17] cannabis use[18] and victimization of bullying.[19] We, in the present study focused on factors including sleep status and sleep-related behaviours, in addition to other variables regarding lifestyle and social environment such as being bullied and having people to confide in, because night sleep was significantly shortened and was irregular in Japanese teenagers in these 40 years.[20]

MATERIALS AND METHODS

Subjects

Subjects comprised Japanese high school students in grade 7, 9 and 11 of a 6-year (grades 7–12) high school in Tokyo. The high school is affiliated with a faculty of education of a university and asked to cooperate with the research and education in the university. The high school recruits and enrols 120 seventh grade students every year, who pass the entrance examinations. The most unique feature of this high school may be that among 120 students, 10–20 pairs of twins are by priority recruited and enrolled every year. A total of 353 students (180 males and 173 females) were enrolled in the grades 7, 9 and 11 of this high school (n = 120, 120 and 113, respectively). Out of 353, 66 were twins (33 pairs, 27 males and 39 females). Among the 33 pairs, 15 pairs were monozygotic twins and 4 pairs were opposite-sex dizygotic twins. Zygosity was not determined in twins in grade 7 (n = 28, 14 pairs).

Questionnaires

The students were requested to fill out a questionnaire regarding mental health status, behaviours, lifestyle and social environment. The questions on mental health status included items on PLEs and the Japanese version of the 12-item General Health Questionnaire (GHQ-12). The questionnaire was basically the same as in our previous studies.[17,21] Questions on length and regularity of night sleep and other issues were added. The survey was conducted in June 2009.

Ethical aspects

The study was approved by the ethical committee of the Graduate School of Education, University of Tokyo, after it was discussed and approved by the research committee of the high school. Written information about the aims and methods of the study was sent to all parents of the students to ask participation in this study. It was clearly written in the information that the participation was voluntary and when the students or parents did not agree, there was absolutely no need to participate. On the day of the survey, classroom instructors distributed the questionnaire with an envelope to the students and explained that: (i) participation was voluntary and anonymous and (ii) answers to the questionnaire absolutely would not be seen by school teachers. The students who did not want to participate in the study were allowed to leave the classroom or turn in a blank paper. The students who consented to the study were asked fill in their school ID, not their names. Finally, the students were instructed to seal the questionnaire in the envelope when they completed the answers. The researchers had no information on the school ID, and therefore the answers were studied and analyzed anonymously, but longitudinal follow-up was enabled.

Analysis of PLEs and GHQ-12

PLEs and GHQ-12 were analyzed in the same manner as in our previous study.[17,21] Briefly described, four questions on PLEs, including: (i)

'Some people believe in mind reading or being psychic. Have other people ever read your mind?'; (ii) 'Have you ever had messages sent just to you through the television or radio?'; (iii) 'Have you ever thought that people are following you or spying on you?' and (iv) 'Have you ever heard voices other people cannot hear?' were analyzed. All answers were made on a four-point scale: 'no', 'maybe', 'yes, once' and 'yes, twice or more'. We defined that each PLE was present when subjects answered 'yes, once' or 'yes, twice or more'. The number of the types of experienced PLEs was designated as 'PLEs score' (with the range of 0–4).

GHQ-12 was answered in a four-point scale with binary scoring (0011). The number of score '1' was totalled and designated as the 'GHQ-12 score', with the range of 0 (best) to 12 (worst). Also, subjects with the GHQ-12 score >4 were considered being at poor mental health status.[22]

Statistical analysis

PLEs, GHQ-12 and variables on lifestyle and social environmental factors, which might have an effect on PLEs and GHQ-12 were statistically analyzed. The variables on lifestyle and social environment included length and irregularity of sleep, use of mobile phones after lights out, drinking alcohol, domestic violence from adults, being bullied and number of people one can confide in. These scores and variables were first compared between twins and singletons, using *t*-test (for GHQ-12 score) or Fisher's exact test. The comparisons were conducted by sex when the sex difference was statistically significance.

We then analyzed relationships between those variables including 'twin or singleton' and PLEs or GHQ-12. Univariate and multivariate logistic regression analyses were conducted. For the multivariate analysis, sex and grade was added as co-variates. Dependent variables were whether GHQ-12 score is ≥4 or not and whether PLEs score is ≥1 or not. Statistical Package for Social Sciences (SPSS Japan Inc., Tokyo, Japan) version 16.0J for Windows was employed for the all statistically analyses. A nominal *P*-value of <0.05 was considered statistically significant.

RESULTS

A total of 350 students (63 twins and 287 singletons) out of 353 (99%) answered the questionnaire. No students and no parents refused consent. Three twin students and no singletons were absent on the day of the study. Among the 350, 9 students (1 twin and 8 singletons) were excluded from the analysis, because of incomplete answers to major questions including PLEs and GHQ-12. Thus, 341 students (62 twins and 279 singletons; 173 males and 168 females) were analyzed in the present study. Among the 341, 62 were twins (24 males and 38 females) and 279 were singletons (149 males and 130 females). Among the 62 twins; 27 were monozygotic and 7 were dizygotic. Zygosity was not determined in the rest of the twins; all of them were in the seventh grade. In the multivariate logistic regression, 327 (60 twins and 267 singletons) students were studied because 14 were excluded due to missing data in the independent variables.

As summarized in Table 1, PLEs were observed in 17.9% of the students. Frequency of students with GHQ-12 > 4 was 36.4% and the GHQ-12 score was 3.1 ± 3.1 (mean ± SD). Distributions of twins and non-twins were not significantly different among the grades 7, 9 and 11 in each sex ($P = 0.60$ in male and $P = 0.19$ in female, Fisher's exact test).

The GHQ-12 scores was higher in females than in males (3.8 ± 3.3 in females vs. 2.5 ± 2.8 in males (mean ± SD), *t*-value = 3.978, $P < 0.001$). Frequency of PLEs tended to be higher in females (21%) than males (14%), while the difference did not reach statistical significance. Comparison between twins and singletons were therefore conducted by sex. As a result, GHQ-12 scores and the frequency of subjects with GHQ-12 score >4 were lower in twins than in singletons, in males (1.4 ± 2.3 and 4% in twins vs. 2.7 ± 2.8 and 30% in singletons, *t*-value = 2.418, $P = 0.021$ and $P = 0.006$, respectively). The difference was not significant in females, while the similar tendency appeared to be observed (2.9 ± 3.0 and 37% in twins vs. 4.1 ± 3.4 and 50% in singletons, respectively). Frequencies of PLEs was lower in twins than singletons, in females (5% in twins vs. 26% in singletons, $P = 0.006$). In males, the difference was smaller than in females (8% in twins vs. 15% in singletons) and did not reach statistical significance. No significant difference was found in frequency of PLEs with distress between twins and singletons in either sex.

Additionally describing frequency of PLEs was 4.2% and 2.6% in male and female monozygotic twins, respectively. None of the dizygotic twins experienced PLEs. GHQ-12 scores and the frequency of subjects with GHQ-12 score >4 were 2.5 ± 2.9 and 8.3% in male and 4.0 ± 3.5 and 53% in female monozygotic twins, respectively. Those were 0 ± 0 and 0% in male and 3.2 ± 2.2 and 40% in female dizygotic twins. No statistical comparison

TABLE 1. The number of subjects by school grade, GHQ-12 scores and PLEs in Japanese high school students ($n = 341$)

	Twins		Singletons		Total		
	Male	Female	Male	Female	Male	Female	All
Number of students	24	38	149	130	173	168	341
7th grade (mean age = 12.3 years)	10	18	48	42	58	60	118
9th grade (mean age = 14.2 years)	8	12	50	44	58	56	114
11th grade (mean age = 16.3 years)	6	8	51	44	57	52	109
GHQ-12 scores (mean ± SD)	1.4 ± 2.3†	2.9 ± 3.0	2.7 ± 2.8	4.1 ± 3.4	2.5 ± 2.8‡	3.8 ± 3.3	3.1 ± 3.1
GHQ-12 scores > 4 (*N* (%))	1 (4%)§	14 (37%)	44 (30%)	65 (50%)	45 (26%)¶	79 (47%)	124
PLEs > 1 (*N* (%))	2 (8%)	2 (5%)††	23 (15%)	34 (26%)	25 (14%)	36 (21%)	61
with distress (*N* (%))	1 (4%)	2 (5%)	16 (11%)	24 (18%)	17 (10%)	26 (15%)	43

†$P = 0.021$ between twins and singletons in males (*t*-test).
‡$P < 0.001$ between males and females (*t*-test).
§$P = 0.006$ between twins and singletons in males (Fisher's exact test).
¶$P < 0.001$ between males and females (Fisher's exact test).
††$P = 0.006$ between twins and singletons in females (Fisher's exact test).
GHQ-12, 12-items General Health Questionnaire; PLEs, Psychotic-like experiences; SD, standard deviation.

TABLE 2. Comparisons of variables related with lifestyle and social environment between twins and singletons

Variable		Twins		Singletons		*P* value†
Number of students		62		279		
Length of sleep (mean ± SD)	Hours	6.9 ± 1.2		7.0 ± 0.7		NS
Irregular sleep schedule	*N* (%)	24	(39%)	129	(46%)	NS
Alcohol	*N* (%)	5	(8%)	33	(12%)	NS
Domestic violence from adults	*N* (%)	4	(6%)	17	(6%)	NS
Being bullied	*N* (%)	3	(5%)	21	(8%)	NS
Nobody one can confide in	*N* (%)	3	(5%)	45	(16%)	0.042
Use of mobile phones after lights out	*N* (%)	13	(21%)	104	(37%)	0.017

†*t*-test for length of sleep and Fisher's exact test for others.
SD, standard deviation; NS, not significant.

was conducted regarding these values, considering the limited sample size.

Table 2 summarizes the variables on lifestyle and social environment, including sleep related variables (such as length, irregularity and use of mobile phones after lights out), victimizations (by domestic violence and bullying), alcohol use and human resource for help-seeking (or number of people one can confide in). Since no gender difference was observed in these variables, comparisons between twins and singletons were conducted without separating males and females. Significant difference was found in 'number of people one can confide in' and 'use of mobile phones after lights out' ($P = 0.042$ and $P = 0.017$, respectively).

Table 3 summarizes the results of univariate and multivariate logistic regression analyses of the association between PLEs and other variables. Univariate analyses showed that risk of experiencing PLEs was associated with being non-twins ($P = 0.009$), shorter sleep ($P = 0.004$), being bullied ($P = 0.042$) and use of mobile phones after lights out ($P = 0.003$). Multivariate analysis showed significant associations between PLEs and being singletons (OR = 0.293, 95%CI = 0.101–0.847, $P = 0.024$) and shorter sleep (OR = 0.685, 95%CI = 0.519–0.903, $P = 0.007$). *P*-value of Hosmer-Lemeshow test was 0.516 that indicated a goodness of fit of the model. Predictive accuracy was 82.0%.

Results of the logistic regressions for the association between frequency of GHQ-12 scores >4 and the other variables are summarized in Table 4. Univariate analyses showed significant associations between GHQ-12 scores >4 and most of the variables ($P < 0.05$); the exceptions were 'alcohol' use and 'domestic violence from adults'. Multivariate analysis showed significant associations between GHQ-12 scores >4 and 'sex' (OR = 3.292, 95%CI = 1.941–5.582, $P < 0.001$), 'school grade' ($P < 0.001$), 'irregular sleep schedule' (OR = 3.042, 95%CI =

TABLE 3. Factors associated with PLEs in Japanese high school students ($n = 327$), analyzed by logistic regression†

Variable	Parameter	Unadjusted odds ratios			Adjusted odds ratios‡		
		OR	95% CI	*P* value	OR	95% CI	*P* value
Sex	Female/male	1.615	0.921–2.831	NS			
School grade				NS			
	9th/7th	0.851	0.414–1.750				
	11th/7th	1.632	0.844–3.157				
Twin	Yes/no	0.269	0.094–0.771	0.009	0.293	0.101–0.847	0.024
Length of sleep	(hours)	0.675	0.516–0.884	0.004	0.685	0.519–0.903	0.007
Irregular sleep schedule	Possibly, yes/no, probably not	1.571	0.901–2.741	NS			
Alcohol	Once or more/not at all	1.277	0.554–2.944	NS			
Domestic violence from adults	Yes/no	1.445	0.508–4.109	NS			
Being bullied	Yes/no	2.472	1.006–6.071	0.042			
Number of people one can confide in	None/one or more	1.052	0.480–2.305	NS			
Use of mobile phones after lights out	Once or more/none	2.331	1.328–4.091	0.003			

†Subjects with missing data were excluded from the analysis.
‡Stepwise logistic regression model.
OR, odds ratio; PLEs, Psychotic-like experiences; 95%CI, 95% confidence interval; NS, not significant.

TABLE 4. Factors associated with GHQ-12 score of >4 in Japanese high school students ($n = 327$), analyzed by logistic regression†

Variable	Parameter	Unadjusted odds ratios			Adjusted odds ratios‡		
		OR	95% CI	*P* value	OR	95% CI	*P* value
Sex	Female/male	2.525	1.602–3.980	<0.001	3.292	1.941–5.582	<0.001
School grade				<0.001			<0.001
	9th/7th	3.525	1.974–6.294		4.446	2.281–8.667	
	11th/7th	2.860	1.589–5.147		3.433	1.748–6.743	
Twin	yes/no	0.498	0.265–0.934	0.028			
Length of sleep	(Hours)	0.645	0.515–0.808	<0.001			
Irregular sleep schedule	Possibly, yes/no, probably not	3.210	2.028–5.082	<0.001	3.042	1.818–5.090	<0.001
Alcohol	Once or more/not at all	1.656	0.839–3.266	NS			
Domestic violence from adults	Yes/no	1.056	0.425–2.623	NS			
Being bullied	Yes/no	3.194	1.354–7.538	0.006	3.677	1.317–10.266	0.013
Number of people one can confide in	None/one or more	2.303	1.242–4.272	0.007	2.615	1.249–5.475	0.011
Use of mobile phones after lights out	Once or more/none	2.353	1.482–3.737	<0.001			

†Subjects with missing data were excluded from the analysis.
‡Stepwise logistic regression model.
GHQ-12, 12-items General Health Questionnaire; OR, odds ratio; 95%CI: 95% confidence interval; NS, not significant.

1.818–5.090, $P < 0.001$), 'being bullied' (OR = 3.677, 95%CI = 1.317–10.266, $P = 0.013$) and 'number of people one can confide in' (OR = 2.615, 95%CI = 1.249–5.475, $P = 0.011$). *P*-value of Hosmer-Lemeshow test was 0.450 that indicated a goodness of fit of the model. Predictive accuracy was 74.0%.

DISCUSSION

Mental health status of the present subjects, measured by GHQ-12 and PLEs, may be comparable with the previous studies in high school students. The mean GHQ-12 score was 3.1 and the frequency of the subjects with GHQ-12 score ≥ 4 was 36.4% in this study. Previous studies in Japanese high school students observed similar levels of the GHQ-12 score (mean = 3.2)[21,22] and the frequency (39.8%).[21] PLEs were experienced in 17.9% of the present subjects (mean age = 14.2). In the previous studies, prevalence of PLEs was 15.2% in Japanese students of junior-high schools (or grades 13–15, mean age = 13.3 years),[21] and 14.7% at the age 11 years[11] and 19.1% in teenagers (mean age = 14 years)[23] from

other populations. Regarding the gender difference, females tended to have PLEs more frequently and higher GHQ-12 score, although the difference in the frequency of PLEs did not reach statistical significance. This may also be consistent with previous studies.[21,24,25]

We hypothesized that twins may have poorer mental health than singletons, due to less favourable environment during embryonic neurodevelopment. Previous studies observed that adult twins were more vulnerable to mental disorders than singletons[13,14] or observed no difference in the vulnerability between twins and singletons.[15,16] In contrast to the hypothesis, twins appeared to be in better mental health status than singletons. GHQ-12 was significantly lower in twins than in singletons, in males. PLEs were less frequent in twins than in singletons in females. Weak but similar tendencies were also observed in females for GHQ-12 and in males for PLEs, while the differences were not statistically significant. A possible explanation for the discrepancy is that twinship may form a positive developmental environment for teenagers. A recent study observed that, according to peers' assessment, twins of early teenage years might be better in socioemotional behaviours including social interaction and obtain more popularity and leadership at school.[26] Twins less frequently had behavioural/emotional disturbance, also according to the teachers' assessment, although parents tended to observe slightly more problems in twin boys than in singleton boys.[27] Another recent study observed that 50% of monozygotic twins and 25% of same-sex-dizygotic twins shared their friends with co-twins.[28] It was also reported that rate of receiving psychiatric treatment is lower (approximately a half) in twins in childhood than expected from the rate in general population, which might be related with availability of psychological support by co-twins.[29] In the present subjects, all pairs of the co-twins were enrolled in the same high school. As shown in Table 2, those who had nobody to confide in were significantly less in twins than in singletons. This might have a favourable effect on forming positive developmental environment and having good mental health status. In conclusion, the present result suggests that teenage twins might be less vulnerable to poor mental health status at the subclinical level, which is measured by GHQ-12 or questions on PLEs, when the co-twins are together grown up and attending the same high school.

It may however be acknowledged that the entrance examination could have an effect on the unexpected result in the comparison between twins versus singletons. Twins in the present study took the same entrance examination for admission to the high school as the singletons did. This might have prior excluded twins with developmental problems or poor mental health from the present sample. Another possibility is that twins with substantially poor mental health status were among those who were not studied. Out of the 66 twins, 3 did not participate in the study and another one was excluded from the analysis due to the missing data. The rate of those who were not studied was 6% in the twins, which may be higher than the rate in the singletons (8 out of 287, 3%).

It might also be noted that frequency of subjects who experienced two or more PLEs was 3% in twins and 5% in singletons (not shown in tables or results). The difference between twins and singletons may not be as large as in the frequencies of those with one or more PLEs or GHQ-12 score of >4. Those with severe mental health, who are really susceptible to mental disorders including psychoses, might not remarkably be infrequent in twins than in singletons. Further studies in larger samples may be recommended for detailed statistical comparison, because the present sample size is limited. In addition, it may be acknowledged that the present result might not be adequate to discuss about the risk for mental disorders of clinical level. For the discussion, what portion of the students with high PLEs or GHQ-12 develops psychoses and other mental disorders should be studied in the follow-up.

We found the association of several variables on lifestyle and social environment, with PLEs and GHQ-12, as summarized in Tables 3 and 4. Those variables include length or irregularity of sleep, being bullied, having people to confide in and school grade, in addition to being twin/singleton and sex, which we discussed above.

Sleep-related variables were associated with both PLEs and GHQs, after adjustment for other variables by multivariate logistic regression analysis; length of sleep (or shorter sleep) with PLEs and irregularity of sleep time with GHQ-12. During the past decades, length of sleep was decreasing by later in the general populations of Japan.[20] The issue may be serious in children and adolescents in the developmental stage.[20] A study in 100 000 Japanese high school students reported that 23.5% of them complained of insomnia.[30] Watching television, playing computer games and use of the Internet at night may be related with the unfavourable sleep behaviours.[31] Poor status of sleep may cause several behavioural and mental health problems. Daytime sleepiness, fatigue and poor concentration might be caused by shortage of sleep in school children.[32,33] Association of anxiety/depression with sleep disturbances was

also observed in children.[34] Attention, injuries and emotional upset may be caused by irregular sleep schedule in adolescents.[35] Consistent with these previous findings, the present study clearly observed the association of shorter sleep and irregular sleep schedule with poor mental health including subclinical experiences of psychosis-like symptoms. Which of these variables is the cause in the association should be investigated in further studies. However, the present result suggests that improvement of sleep and its related behaviours by psychological education or other methods may have a favourable effect on the mental health status in teenagers. Use of mobile phones after lights out may be one of good focus in such education, although the association was not significant in the multivariate logistic regression and further studies are requested.[36]

Being bullied was significantly associated with GHQ-12 in multivariate logistic regression. The variable was also associated with PLEs in univariate logistic regression, while the association was not observed in the multivariate analysis. The association between PLEs and being bullied was observed in previous studies in teenagers.[21,23] Having nobody to confide in was another variable that was significantly associated with GHQ-12 in multivariate logistic regression. While the variable was associated with PLEs in our previous study,[21] the association was not observed in the present study. This might be due to the limited sample size in the present study. Having few people to confide in might be a cause of the poor mental status, but also could be a result of poor mental health. Adolescents may be more reluctant to seek help due to poorer mental status. A previous study investigated adolescents and young adults (aged 16–24) using GHQ and found that a very small portion (<10%) of the subjects with poor mental health consulted their general practitioners.[37] The association of the variable, being bullied and having nobody to confide in, with poor mental health suggests that education and other measures for the improvement of human environment in schools may be a key to good status of mental health in students. Early identification programmes for mental health problems are substantially important for the same reason, as discussed in a previous study.[38]

Limitations and future research

The following limitations may be acknowledged in the present study. First, we used a self-report questionnaire. The information could be less accurate or reliable than in studies by interview-based survey. Second, a portion of the students did not participate in the study. Some of these students could be in bad mental states and the exclusion of these students might have affected the study, as discussed above. Third, the sample size may not be large enough for some of the variables where proportion of the minor answer was very small. Especially, the number of the twins was limited and we did not conduct statistical analyses by zygosity of the twins. This may be further studied in the future. Fourth, this is a cross-sectional study, and therefore causal relationship is not clear when a significant association was observed. Longitudinal studies by follow-up may be required.

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REFERENCES

1. Killackey E, Yung AR. Effectiveness of early intervention in psychosis. *Curr Opin Psychiatry* 2007; 20: 121–5.
2. Cuijpers P, van Straten A, Smits N, Smit F. Screening and early psychological intervention for depression in schools: systematic review and meta-analysis. *Eur Child Adolesc Psychiatry* 2006; 15: 300–7.
3. Mihalopoulos C, Harris M, Henry L, Harrigan S, McGorry P. Is early intervention in psychosis cost-effective over the long term? *Schizophr Bull* 2009; 35: 909–18.
4. Valmaggia LR, McCrone P, Knapp M *et al.* Economic impact of early intervention in people at high risk of psychosis. *Psychol Med* 2009; 39: 1617–26.
5. van Os J. Is there a continuum of psychotic experiences in the general population? *Epidemiol Psichiatr Soc* 2003; 12: 242–52.
6. van Os J, Linscott RJ, Myin-Germeys I, Delespaul P, Krabbendam L. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychol Med* 2009; 39: 179–95.
7. Kendler KS, Gallagher TJ, Abelson JM. Lifetime prevalence, demographic risk factors, and diagnostic validity of nonaffective psychosis as assessed in a US community sample. The National Comorbidity Survey. *Arch Gen Psychiatry* 1996; 53: 1022–31.
8. Yung AR, Phillips LJ, Yuen HP *et al.* Psychosis prediction: 12-month follow up of a high-risk ('prodromal') group. *Schizophr Res* 2003; 60: 21–32.
9. Yung AR, Stanford C, Cosgrave E *et al.* Testing the Ultra High Risk (prodromal) criteria for the prediction of psychosis in a clinical sample of young people. *Schizophr Res* 2006; 84: 57–66.
10. Hanssen M, Bak M, Bijl R, Vollebergh W, van Os J. The incidence and outcome of subclinical psychotic experiences in the general population. *Br J Clin Psychol* 2005; 44: 181–91.
11. Poulton R, Caspi A, Moffitt TE, Cannon M, Murray R, Harrington H. Children's self-reported psychotic symptoms

and adult schizophreniform disorder: a 15-year longitudinal study. *Arch Gen Psychiatry* 2000; **57**: 1053–8.
12. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005; **62**: 593–602.
13. Kläning U, Mortensen PB, Kyvik KO. Increased occurrence of schizophrenia and other psychiatric illnesses among twins. *Br J Psychiatry* 1996; **168**: 688–92.
14. Kläning U. Greater occurrence of schizophrenia in dizygotic but not monozygotic twins. Register-based study. *Br J Psychiatry* 1999; **175**: 407–9.
15. Kendler KS, Pedersen NL, Farahmand BY, Persson PG. The treated incidence of psychotic and affective illness in twins compared with population expectation: a study in the Swedish twin and psychiatric registries. *Psychol Med* 1996; **26**: 1135–44.
16. Kläning U, Laursen TM, Licht RW, Kyvik KO, Skytthe A, Mortensen PB. Is the risk of bipolar disorder in twins equal to the risk in singletons? A nationwide register-based study. *J Affect Disord* 2004; **81**: 141–5.
17. Nishida A, Sasaki T, Nishimura Y *et al*. Psychotic-like experiences are associated with suicidal feelings and deliberate self-harm behaviors in adolescents aged 12–15 years. *Acta Psychiatr Scand* 2010; **121**: 301–7.
18. Hides L, Lubman DI, Buckby J *et al*. The association between early cannabis use and psychotic-like experiences in a community adolescent sample. *Schizophr Res* 2009; **112**: 130–5.
19. Campbell ML, Morrison AP. The relationship between bullying, psychotic-like experiences and appraisals in 14–16-year olds. *Behav Res Ther* 2007; **45**: 1579–91.
20. National Women's Education Center. *Time Spent on Sleep by Sex and Age Group*. [Cited 30 June 2010] Available from URL: http://winet.nwec.jp/toukei/save/xls/L112020.xls
21. Nishida A, Tanii H, Nishimura Y *et al*. Associations between psychotic-like experiences and mental health status and other psychopathologies among Japanese early teens. *Schizophr Res* 2008; **99**: 125–33.
22. Kaneita Y, Ohida T, Osaki Y *et al*. Association between mental health status and sleep status among adolescents in Japan: a nationwide cross-sectional survey. *J Clin Psychiatry* 2007; **68**: 1426–35.
23. Lataster T, van Os J, Drukker M *et al*. Childhood victimisation and developmental expression of non-clinical delusional ideation and hallucinatory experiences: victimisation and non-clinical psychotic experiences. *Soc Psychiatry Psychiatr Epidemiol* 2006; **41**: 423–8.
24. Tait RJ, French DJ, Hulse GK. Validity and psychometric properties of the General Health Questionnaire-12 in young Australian adolescents. *Aust N Z J Psychiatry* 2003; **37**: 374–81.
25. Scott J, Welham J, Martin G *et al*. Demographic correlates of psychotic-like experiences in young Australian adults. *Acta Psychiatr Scand* 2008; **118**: 230–7.
26. Pulkkinen L, Vaalamo I, Hietala R, Kaprio J, Rose RJ. Peer reports of adaptive behavior in twins and singletons: is twinship a risk or an advantage? *Twin Res* 2003; **6**: 106–18.
27. Moilanen I, Linna SL, Ebeling H *et al*. Are twins' behavioural/emotional problems different from singletons. *Eur Child Adolesc Psychiatry* 1999; **8** (Suppl. 4): 62–7.
28. Thorpe K, Gardner K. Twins and their friendships: differences between monozygotic, dizygotic same-sex and dizygotic mixed-sex pairs. *Twin Res Hum Genet* 2006; **9**: 155–64.
29. Paluzny M, Abelson AG. Twins and child psychiatry. *Am J Psychiatry* 1975; **13**: 434–6.
30. Kaneita Y, Ohida T, Osaki Y *et al*. Insomnia among Japanese adolescents: a nationwide representative survey. *Sleep* 2006; **29**: 1543–50.
31. Van den Bulck J. Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. *Sleep* 2004; **27**: 101–4.
32. Gaina A, Sekine M, Hamanishi S *et al*. Daytime sleepiness and associated factors in Japanese school children. *J Pediatr* 2007; **151**: 518–22.
33. Noland H, Price JH, Dake J, Telljohann SK. Adolescents' sleep behaviors and perceptions of sleep. *J Sch Health* 2009; **79**: 224–30.
34. Chorney DB, Detweiler MF, Morris TL, Kuhn BR. The interplay of sleep disturbance, anxiety, and depression in children. *J Pediatr Psychol* 2008; **33**: 339–48.
35. Giannotti F, Cortesi F, Sebastiani T, Ottaviano S. Circadian preference, sleep and daytime behaviour in adolescence. *J Sleep Res* 2002; **11**: 191–9.
36. Van den Bulck J. Adolescent use of mobile phones for calling and for sending text messages after lights out: results from a prospective cohort study with a one-year follow-up. *Sleep* 2007; **30**: 1220–3.
37. Biddle L, Gunnell D, Sharp D, Donovan JL. Factors influencing help seeking in mentally distressed young adults: a cross-sectional survey. *Br J Gen Pract* 2004; **54**: 248–53.
38. Nemeroff R, Levitt JM, Faul L *et al*. Establishing ongoing, early identification programs for mental health problems in our schools: a feasibility study. *J Am Acad Child Adolesc Psychiatry* 2008; **47**: 328–38.

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Psychotic-like experiences are associated with violent behavior in adolescents

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ABSTRACT

Objective: The diagnosis of psychotic disorder is associated with a risk of violence. Psychotic-like experiences (PLEs) in the general population may share an etiological background with psychotic disorders. The present study has evaluated the association between PLEs and violent behavior in adolescents.
Methods: PLEs and violent behavior were assessed using a self-report questionnaire administered to 18,104 Japanese adolescents. Potential confounding factors were also evaluated.
Results: After controlling for the effects of age, gender, GHQ-12 total score, victimization, and substance use, the existence of PLEs was significantly associated with both interpersonal violence (odds ratio (OR) = 1.36, 95% confidence interval (CI): 1.23 to 1.51) and violence towards objects (OR = 1.46, 95%CI: 1.33 to 1.61). The greater the number of such psychotic experiences, the higher the risk of violence. Particular types of PLEs ('spied-upon' and 'voice hearing') are significantly associated with interpersonal violence, while all of the types of PLEs assessed in this study were significantly associated with violence towards objects.
Conclusion: PLEs may be a risk factor for violent behavior in adolescents. Violent acts by individuals with schizophrenia may not be a direct consequence of the disease itself, but may instead share an etiological background with such behavior in the general population.

1. Introduction

Recent studies suggest that positive psychotic symptoms exist on a continuum, with psychotic disorder at one end and non-clinical psychotic-like experiences (PLEs) at the other (Stip and Letourneau, 2009; van Os et al., 2000; Verdoux and van Os, 2002). Indeed, PLEs are a common phenomenon in the general population, including adolescents. For instance, in a large sample of more than 7000 men and women aged between 18 and 64 taken from the general population, van Os et al. (2000) revealed that 17.5% of the participants had reported at least one experience evoking the concept of psychosis. Furthermore, some studies have suggested that PLEs in childhood and adolescence may be risk factors for later psychiatric disorders and harmful behavior, including violence (Chapman et al., 1994; Nishida et al., 2010; Poulton et al., 2000; Mojtabai, 2006).

Violence is one of the most problematic behaviors in adolescence, and is also associated with the diagnosis of a

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psychotic disorder including schizophrenia (Junginger, 1996; Swanson et al., 2006; Walsh et al., 2002; Douglas et al., 2009). However, little is known about the potential mechanisms for the association between psychosis and violence (Foley et al., 2005, 2007). It is possible that violent behavior in individuals with schizophrenia can be explained by the continuum hypothesis (Stip and Letourneau, 2009; van Os et al., 2000; Verdoux and van Os, 2002), in which violence is also associated with non-clinical psychotic-like experiences. It may also be the case that such behavior in individuals diagnosed with psychotic disorders shares an etiological background with those in the general population. It is, therefore, valuable to examine if PLEs are associated with violent behavior in a non-clinical population. It is particularly important to confirm this potential association in adolescents, since this time of life is the peak period for violence (Reiss and Roth, 1993), and the onset of schizophrenia typically occurs after the late teens (Verdoux et al., 1998).

Although some research has revealed that PLEs were associated with violent behavior in the general population (Mojtabai, 2006), to our knowledge, few studies have reported an association between PLEs and violence among adolescents. Moreover, earlier research into the link between PLEs and violent behavior did not distinguish between interpersonal violence and violence towards objects, and nor did it examine if there is any difference between early and late adolescence.

The present study, therefore, aims to examine the contribution of PLEs to the occurrence of violent behavior in adolescents. The two hypotheses we would like to examine are:

1) Whether interpersonal violence and violence towards objects are directly associated with PLEs in adolescents.
2) Whether specific types of PLEs are associated with interpersonal violence and violence towards objects in adolescents.

2. Methods

2.1. Sample and survey procedures

In order to investigate the psychopathology in adolescence and examine its associated factors such as demographics, victimization and help seeking attitudes, we conducted a large community survey in Japan. This report focused on violence and its associated factors in adolescence. Between 2008 and 2009, we recruited students (aged between 12 and 18 years) from 45 public junior high schools (7th–9th grades) and 28 high schools (10th–12th grades) in Tsu City and Kochi Prefecture, Japan. We then conducted a cross-sectional survey of psychopathologies in this sample. The total populations of Tsu City and Kochi Prefecture are approximately 280,000 and 790,000 respectively. Attendance at junior high school is compulsory under the Japanese law, but attendance at high school is not.

After the study was approved by the ethics committees of the Tokyo Institute of Psychiatry, the Mie University School of Medicine and the Kochi Medical School, the principal investigators approached the schools' head teachers about participation in the research. These heads then consulted with teachers and parents.

The teachers at the participating schools were told about the guidelines for the distribution and collection of our questionnaires. They then gave these documents to the students, along with envelopes in which to place them after completion of the task. The teachers also explained: 1) that participation in the study was anonymous and voluntary, and 2) that strict confidentiality would be maintained. In addition, the students were asked to seal the completed questionnaire in the envelope they had been provided with. Each teacher also reported on the total number of present and absent students on the day the survey was administered (including those who had not been in attendance for more than a month). The research team later collected the sealed questionnaires from each school.

2.2. Measures

The questionnaires included items concerning the following: 1) psychopathological and behavioral problems, including PLEs, interpersonal violence and violence towards objects; 2) the Japanese version of the 12-item General Health Questionnaire (GHQ-12); and 3) other variables, including demographic characteristics.

2.2.1. Psychotic-like experiences

Psychotic-like experiences were assessed using five items adopted from the schizophrenia section of the Diagnostic Interview Schedule for Children (DISC-C) (Costello et al., 1985). These items have previously been used in a birth cohort study and are regarded as good predictors of schizophreniform disorder in adulthood (Poulton et al., 2000). The items were as follows: 1) "Some people believe in mind reading or being psychic. Have other people ever read your mind?"; 2) "Have you ever had messages sent just to you through the television or radio?"; 3) "Have you ever thought that people are following you or spying on you?"; 4) "Have you ever heard voices other people cannot hear?"; and 5) "Has something ever gotten inside your body or has your body changed in some strange way?". The participants were told that they should base their answers on whether they had ever experienced these symptoms at any point in their life. Possible responses included: 'no', 'yes, likely', and 'yes, definitely (only once or more than once)'. We defined 'yes, definitely' as the presence of a hallucinatory and delusional experience, and 'no' or 'yes, likely' as no experience. The number of experiences reported by an individual was designated as the 'total PLE score', with a range of 0–5. In addition, the number of delusional experiences reported by an individual was denominated as the 'delusional score of PLE', with a range of 0–4.

2.2.2. Interpersonal violence and violence towards objects

Questions about interpersonal violence and violence towards objects in the previous year were also included in the questionnaire. These two items were: "Have you physically abused someone in your family or your friends?" (for interpersonal violence within the past year) and "Have you been extremely frustrated and damaged something?" (for violence towards objects within the past year). There were two possible responses to these questions: 'yes' or 'no'. There is evidence that self-reports of violence correspond

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reasonably well with administrative records (Crisanti et al., 2005). Suicide was not included in the violent behavior in the present study.

2.2.3. The GHQ-12

The GHQ-12 is one of the most widely used self-report screening tools for non-psychotic psychiatric symptoms, particularly those of anxiety and/or depression (Goldberg et al., 1976). The validity and reliability of the Japanese version of the test have been confirmed (Doi and Minowa, 2003; Fukunishi, 1990). The GHQ was originally applied to adult populations, but was then used and validated for younger groups (Arakida et al., 2003; Kaneita et al., 2007; Radovanovic and Eric, 1983; D'Arcy and Siddique, 1984). A 4-point scale, with binary scoring (0011), which is known as the GHQ method, was used for each of the questions. Responses of '1' were then added together to form the total score, with a range between 0 (best possible) and 12 (worst possible). Individuals with a total GHQ-12 score ≥ 4 were considered to have poor mental health (Arakida et al., 2003; Fuchino et al., 2003; Kaneita et al., 2007). The total GHQ score was demonstrated to be associated with both PLEs (Nishida et al., 2008) and violence (Blitstein et al., 2005), and could be a potential confounding factor influencing the link between PLEs and violence.

2.2.4. Other variables

Violent behavior among a young population might be influenced by other confounding factors, such as victimization and substance use, as indicated in previous studies (Campbell and Morrison, 2007; Lataster et al., 2006; Hovens et al., 1994; Swanson et al., 1990; Spidel et al., 2010). In our questionnaire, we asked the participants about their experiences of being bullied (within the past year), violence from adults at home (within the past month), alcohol use (within the past month), and the use of recreational drugs (lifetime). The items concerning victimization ('being bullied' and 'violence from adults in the home'), alcohol use, and the use of recreational drugs were answered with a 'yes' or a 'no'.

2.3. Statistical analysis

Associations between PLEs and violent behavior in the previous year were analyzed using a logistic regression analysis, adjusted for age, sex, GHQ-12 total score, victimization ('being bullied' and 'violence from adults in the home') and substance use (alcohol use and the use of recreational drugs). In addition, the effect of the total PLE score was also tested. Interpersonal violence and violence towards objects were the dependent variables.

Associations between each of the five PLEs and the two types of violent behavior were examined by comparing individuals who had experienced each type of PLE to those who had not. A logistic regression analysis was again used to control for possible confounding factors. Additionally, in order to evaluate the effects of a combination of delusional and hallucinatory experiences on violence, we conducted another logistic regression analysis, adjusted for the potential confounding factors. ORs for the delusional score of PLE, voice hearing, and the interaction term for both of these factors were calculated through the analysis.

All of the statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 18.0 for Windows (SPSS Inc., Chicago, IL, USA). A two-tailed P-value <0.05 was considered to be statistically significant.

3. Results

3.1. Descriptive statistics

13 of 20 public junior high schools in Tsu City, and 32 of the 118 public junior high schools and 28 of the 36 public high schools in Kochi Prefecture, agreed to participate in the survey. Of all of the students in the relevant classes invited to take part ($n=19,436$), 18,638 were approached at school (798 were absent), of whom 18,250 agreed to contribute to the research. Of these 18,250 subjects, 18,104 (93.1% of all students in the relevant classes) gave analyzable responses. Of these 18,104 participants, 8992 were male (49.7%) and 9112 were female (50.3%). Their ages ranged from 12 to 18, with the mean age being 15.2 ($SD=1.7$). The mean and median of the total GHQ score were 3.53 ($SD=3.15$) and 3.00, respectively.

3.2. Prevalence of PLEs and violent behavior

The prevalence of the five PLEs was as follows: 'thoughts read' was observed in 343 individuals (1.9%), 'special messages' in 133 (0.7%), 'spied-upon' in 1157 (6.4%), 'voice hearing' in 1743 (9.6%), and 'somatic ideation' in 338 (1.9%). In addition, 2611 (14.4%) reported at least one type of PLE. In the previous 12 months, the two types of violent behavior with which we were concerned were reported by 4301 (23.8%) (interpersonal violence) and 6353 students (35.1%) (violence towards objects), respectively.

3.3. Associations between PLEs and violent behavior

The occurrence of at least one type of PLE was associated with an increased prevalence of both interpersonal violence and violence towards objects, even after controlling for age, sex, non-psychotic psychiatric symptoms (the GHQ-12 total score), victimization, and substance use (Table 1). There was no difference between high school (late adolescents, aged 15–18) and junior high school students (early adolescents, aged 12–15) in terms of trends in association between PLEs and violent behavior. Furthermore, the OR (adjusted for sex, age, drug and alcohol usage, violence from adults, being bullied, and GHQ-12 total score) for a one point increase in the total PLE score was 1.15 (95%CI: 1.08 to 1.22; $p<0.001$) for interpersonal violence and 1.28 (95%CI: 1.20 to 1.36; $p<0.001$) for violence towards objects. This indicates that these behaviors were more prevalent in individuals who had experienced a greater number of PLEs. Table 2 sets out the associations between the potential confounding factors and violence. All the factors except for alcohol use were independently associated with both interpersonal violence and violence towards objects. The relationship between alcohol use and interpersonal violence was statistically significant, though the association of alcohol intake to violence towards objects was not.

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Table 1
Associations between violent behaviors in the previous year and the lifetime occurrence of at least one type of PLE.

	Whole sample[a]				Junior high school				High school			
	Unadjusted OR (95%CI)	P	Adjusted OR[b](95%CI)	P	Unadjusted OR (95%CI)	P	Adjusted OR[b](95%CI)	P	Unadjusted OR (95%CI)	P	Adjusted OR[b](95%CI)	P
Interpersonal violence	1.97 (1.81, 2.16)	<0.001	1.36 (1.23, 1.51)	<0.001	1.84 (1.63, 2.07)	<0.001	1.31 (1.14, 1.50)	<0.001	2.05 (1.78, 2.36)	<0.001	1.43 (1.22, 1.67)	<0.001
Violence towards objects	2.32 (2.13, 2.53)	<0.001	1.46 (1.33, 1.61)	<0.001	1.99 (1.80, 2.20)	<0.001	1.43 (1.25, 1.63)	<0.001	2.18 (1.93, 2.46)	<0.001	1.49 (1.30, 1.70)	<0.001
Interpersonal violence and/or violence towards objects	2.36 (2.16, 2.57)	<0.001	1.50 (1.36, 1.65)	<0.001	2.40	<0.001	1.46	<0.001	2.24	<0.001	1.53	<0.001

[a] In each section, the sample size ranged between 17,192 and 17,631 due to the missing data that have been excluded from the statistical analyses.
[b] Odds ratio adjusted for sex, age, drug and alcohol usage, violence from adults, being bullied, and GHQ total score.

3.4. Associations between specific PLEs and violent behavior

The effect of each of the five PLEs was analyzed by a logistic regression analysis. After controlling for age, sex, non-psychotic psychiatric symptoms (the GHQ-12 total score), victimization, and substance use, 'being spied-upon' and 'voice hearing' were significantly associated with interpersonal violence, while 'thoughts read', 'special messages' and 'somatic ideation' were not. All of the assessed PLEs ('thoughts read', 'special messages', 'spied-upon', 'hearing voices', and 'somatic ideation') were significantly related to violence towards objects (Table 3).

3.5. Effects of a combination of delusional and hallucinatory experiences on violence

Table 4 portrays the ORs (adjusted for sex, age, drug and alcohol usage, violence from adults, being bullied, and GHQ total score) for the delusional score of PLE, voice hearing, and the interaction term for both of these factors for violence. The ORs for the interaction term for the delusional score of PLE and voice hearing were 0.72 (95%CI: 0.60 to 0.86) for interpersonal violence and 0.77 (95%CI: 0.64 to 0.93) for violence towards objects.

4. Discussion

The present study has confirmed that PLEs are associated with the occurrence of interpersonal violence and violence towards objects in a large, locally-representative sample of adolescents (n = 18,104). A dose–response association was highlighted between the number of PLEs and the violent behavior; the greater the number of psychotic-like experiences, the higher the risk of the violence. No difference was found between high school (late adolescents, aged 15–18) and junior high school students (early adolescents, aged 12–15) in terms of trends in association between PLEs and violent behavior. With regard to the relationship between other important factors and violent behavior, this research replicated the previous one which demonstrated the significant associations of sex, age, poor mental health, victimization and substance use to violent behavior (Swanson et al., 1990;

Table 2
Associations between violent behaviors in the previous year and the potential confounding factors.

	Interpersonal violence		Violence towards objects		Interpersonal violence and/or violence towards objects	
	Adjusted OR[a] (95%CI)	P	Adjusted OR[a] (95%CI)	P	Adjusted OR[a] (95%CI)	P
Sex[b]	0.50 (0.46, 0.54)	<0.001	0.70 (0.65, 0.75)	<0.001	0.60 (0.56, 0.64)	<0.001
Age[c]	0.77 (0.75, 0.79)	<0.001	0.92 (0.90, 0.94)	<0.001	0.84 (0.83, 0.86)	<0.001
GHQ total score[d]	1.11 (1.10, 1.13)	<0.001	1.21 (1.19, 1.22)	<0.001	1.20 (1.19, 1.22)	<0.001
Being bullied	1.45 (1.27, 1.65)	<0.001	1.15 (1.01, 1.30)	<0.05	1.31 (1.15, 1.49)	<0.001
Violence from adults in the home	3.21 (2.69, 3.82)	<0.001	2.11 (1.77, 2.52)	<0.001	2.63 (2.16, 3.21)	<0.001
Alcohol use	1.70 (1.54, 1.89)	<0.001	1.96 (1.78, 2.15)	<0.001	1.99 (1.81, 2.19)	<0.001
Use of recreational drugs	1.26 (1.05, 1.52)	<0.05	1.15 (0.95, 1.39)	<0.14	1.20 (0.98, 1.47)	<0.08

In each section, the sample size ranged between 17,192 and 17,631 due to the missing data that have been excluded from the statistical analyses.
[a] Odds ratio calculated through the regression analyses conducted to obtain the adjusted ORs presented in Table 1.
[b] Male was used as referent.
[c] ORs were calculated for a one year increase in age.
[d] ORs were calculated for a one point increase in the GHQ total score.

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Table 3
Associations between violent behaviors and specific PLE.

	Interpersonal violence		Violence towards objects	
	Unadjusted OR (95%CI)	Adjusted OR[a] (95%CI)	Unadjusted OR (95%CI)	Adjusted OR[a] (95%CI)
Thoughts read	1.56 (1.24, 1.96)	0.99 (0.76, 1.28)	2.37 (1.91, 2.94)	1.64 (1.29, 2.10)[b]
Special messages	2.45 (1.73, 3.46)	1.29 (0.85, 1.95)	3.24 (2.27, 4.63)	2.03 (1.33, 3.11)[c]
Spied-upon	2.03 (1.79, 2.30)	1.35 (1.17, 1.56)[b]	2.66 (2.36, 3.00)	1.56 (1.36, 1.78)[b]
Hearing voices	1.96 (1.76, 2.17)	1.26 (1.12, 1.42)[b]	2.24 (2.02, 2.47)	1.38 (1.23, 1.54)[b]
Somatic ideation	2.10 (1.68, 2.62)	1.06 (0.82, 1.38)	2.93 (2.34, 3.65)	1.46 (1.13, 1.88)[c]

In each section, the missing data have been excluded from the statistical analyses.
[a] Odds ratio adjusted for sex, age, drug and alcohol usage, violence from adults, being bullied, and GHQ total score.
[b] $p<0.001$.
[c] $p<0.01$.

Blitstein et al., 2005; Spidel et al., 2010). The study also revealed that particular types of PLEs ('spied-upon' and 'voice hearing') are significantly associated with interpersonal violence, while others are not significantly related to this type of violent behavior. On the other hand, all of the types of PLEs assessed in this study were significantly associated with violence towards objects.

These results suggest that PLEs may contribute to violent behavior, and that such behavior in individuals with schizophrenia may be at least partially explained by the continuum hypothesis (Stip and Letourneau, 2009; van Os et al., 2000; Verdoux and van Os, 2002). This is when violent behavior is not directly caused by a psychotic disorder as a discrete entity, but is mediated by the psychotic symptoms which exist on a continuum from normal experiences. In other words, violence in individuals diagnosed with psychotic disorders may share an etiological background with such behavior in the general population. Accordingly, early detection and intervention targeted at PLEs may be needed to prevent the harmful behaviors by adolescents with these experiences.

Mojtabai (2006) suggested that PLEs are associated with interpersonal violence in a dose–responsive manner in the general population. Our results have confirmed that the same association exists in adolescents, even when possible confounding factors are controlled for by conducting a multivariate binary logistic regression analysis.

Table 4
Effects of a combination of delusional and hallucinatory experiences on violence.

	Adjusted OR[a] for interpersonal violence (95%CI)	Adjusted OR[a] for violence towards objects (95%CI)
Delusional score of PLE[b]	1.31 (1.15, 1.50)[c]	1.49 (1.31, 1.70)[c]
Voice hearing	1.34 (1.17, 1.54)[c]	1.33 (1.17, 1.51)[c]
Interaction term for delusional score of PLE and voice hearing	0.72 (0.60, 0.86)d	0.77 (0.64, 0.93)[d]

In each section, the missing data have been excluded from the statistical analyses.
[a] Odds ratio adjusted for sex, age, drug and alcohol usage, violence from adults, being bullied, and GHQ total score.
[b] ORs were calculated for a one point increase in the delusional score of PLE.
[c] $p<0.001$.
[d] $p<0.01$.

Previous studies have reported that a particular sub-group of delusions, which provoke threat and control override characteristics, represents an important risk factor for violence in both the general population and a number of patient groups (Link et al., 1998; Cheung et al., 1997; Swanson et al., 2006). Our data suggests that when it comes to adolescents, this conclusion can only be applied to interpersonal violence, but not to violent behavior towards objects. Moreover, the present study also suggests that subclinical auditory hallucinations may be an important risk factor for the two types of violence in this population. Conceivably, the association between voice hearing and interpersonal violence is mediated by the threat and control override characteristics displayed in the contents of this type of experience. However, the same explanation cannot be applicable to the association between voice hearing and violence towards objects, because all of the other PLEs, including those without threat and control override characteristics, were proved to be significantly associated with this type of violent behavior.

This discrepancy between interpersonal violence and violence towards objects implies that threat and control override characteristics of delusions or hallucinations are not needed to induce violent behavior. This theory could be validated by the findings by Teixeira and Dalgalarrondo (2009) suggesting that delusional patients who are frightened or who have other negative affects related to delusional ideas appear to commit fewer violent acts. If this is the case, then some unknown factors such as accompanying anxiety might determine the significance of each type of PLEs in provoking violence. It may well be the unknown factors that may define the three major roles of psychosis in inducing violence: 1. in focusing (organizing) decision and behavior, giving individuals a clear motivation for violence, 2. in destabilizing (disorganizing) decisions and behavior, interfering with the ability of individuals to manage interpersonal conflicts, and 3. disinhibiting role in violence (Douglas et al., 2009).

Contrary to an indication in a previous study using a resident sample of high security hospital patients (Taylor et al., 1998), a combination of delusional and hallucinatory experiences did not seem more significantly associated with violent behavior than either alone in the community sample of adolescence. The difference in the characteristics of the samples might lead to this discrepancy.

There are several limitations with this research. Firstly, our survey was cross-sectional, meaning that there may be

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some respondents for whom violence occurred before the onset of their PLEs. Accordingly, it is impossible to demonstrate an actual causal relationship between PLEs and violent behavior. In other words, the results in the present study could be interpreted as meaning that violent behavior could predict PLEs. Indeed, Gosden et al. (2005) demonstrated that violence predicts the diagnosis of schizophrenia. Nevertheless, in the questionnaire used in our survey, the participants were told that they should base their answers about PLEs on whether they had ever experienced these symptoms at any point in their life, while information about interpersonal violence and violence towards objects was based on experiences in the previous year. This design of questionnaire could increase the possibility that PLEs temporally precede the occurrence of violent behavior.

Secondly, the two types of violent behavior were only assessed by self-reporting on the part of the participants, and not by informant reports. Self-reported violence may lead to misclassification and an under or over-estimation of the prevalence of these behaviors. Nevertheless, there is evidence that self-reports of violence correspond reasonably well with administrative records (Crisanti et al., 2005), as described in Section 2.2.2. Though Stompe et al. (2004) suggested that the threat/control override factor of delusion was not associated with violence but with severity thereof, we could not re-examine these findings with our data, because we did not evaluate the seriousness of the violent behavior.

Thirdly, as this was a school-based survey, we were unable to obtain answers from absent students. Yet, violent behavior and/or PLEs may be more prevalent among those who are frequently absent from school, as well as those who have been off for a long time. Accordingly, an association between violence and PLEs in this study may well be under or over-estimated.

Fourthly, we did not include a number of relevant factors (i.e. conduct disorder, oppositional defiant disorder, antisocial personality disorder and socioeconomic status) in the potential confounding factors. Though these factors have been demonstrated to be important predictors of violence in psychotic people (Douglas et al., 2009; Coid et al., 2006; Goethals et al., 2008), no assessment was done with regard to these variables in our survey.

In addition, because of the very large sample size, even a small amount of difference could be shown statistically significant. Moreover, we cannot exclude the possibility that some portion of participants may be prodromal for or diagnosed with schizophrenia.

In conclusion, PLEs may predict both interpersonal violence and violence towards objects in adolescents. Of the five types of psychotic-like experiences considered, those of 'being spied-upon' and 'voice hearing' were particularly associated with interpersonal violence, while all of the assessed PLEs were significantly related to violence towards objects. Consequently, early detection and intervention for PLEs may be needed before they lead to harmful behavior. Additionally, violent acts by individuals with schizophrenia may not be a direct consequence of the disease itself, but may instead share an etiological background with such behavior in the general population. Further investigations could be conducted to give a clearer picture of the mechanism which links PLEs to violent behavior in adolescents.

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Contributors

Dr. Y. Kinoshita designed the study, undertook the statistical analysis, and interpreted the data. Drs. Nishida, Sasaki and Okazaki designed the study and wrote the protocol. Drs. Nishida and Shimodera collected the data. Drs. Y. Kinoshita and Furukawa wrote the first draft of the manuscript. Dr. K. Kinoshita managed the literature searches. Drs. K. Kinoshita, Watanabe, Akechi, Oshima and Inoue revised the first draft critically. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflict of interest.

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References

Arakida, M., Takahashi, S., Aoyagi, M., Kanamori, M., 2003. Examination of mental health status and related factors in junior high school students: a three-year longitudinal investigation (in Japanese). Shouni Hoken Kenkyu 62, 667–679.

Blitstein, J.L., Murray, D.M., Lytle, L.A., Birnbaum, A.S., Perry, C.L., 2005. Predictors of violent behavior in an early adolescent cohort: similarities and differences across genders. Health Educ. Behav. 32, 175–194.

Campbell, M.L., Morrison, A.P., 2007. The relationship between bullying, psychotic-like experiences and appraisals in 14–16-year olds. Behav. Res. Ther. 45, 1579–1591.

Chapman, L.J., Chapman, J.P., Kwapil, T.R., Eckblad, M., Zinser, M.C., 1994. Putatively psychosis-prone subjects 10 years later. J. Abnorm. Psychol. 103, 171–183.

Cheung, P., Schweitzer, I., Crowley, K., Tuckwell, V., 1997. Violence in schizophrenia: role of hallucinations and delusions. Schizophr. Res. 26, 181–190.

Coid, J., Yang, M., Roberts, A., Ullrich, S., Moran, P., Bebbington, P., Brugha, T., Jenkins, R., Farrell, M., Lewis, G., Singleton, N., 2006. Violence and psychiatric morbidity in the national household population of Britain: public health implications. Br. J. Psychiatry 189, 12–19.

Costello, E.J., Edelbrock, C.S., Costello, A.J., 1985. Validity of the NIMH Diagnostic Interview Schedule for Children: a comparison between psychiatric and pediatric referrals. J. Abnorm. Child Psychol. 13, 579–595.

Crisanti, A.S., Laygo, R., Claypoole, K.H., Junginger, J., 2005. Accuracy of self-reported arrests among a forensic SPMI population. Behav. Sci. Law 23, 295–305.

D'Arcy, C., Siddique, C.M., 1984. Psychological distress among Canadian adolescents. Psychol. Med. 14, 615–628.

Doi, Y., Minowa, M., 2003. Factor structure of the 12-item General Health Questionnaire in the Japanese general adult population. Psychiatry Clin. Neurosci. 57, 379–383.

Douglas, K.S., Guy, L.S., Hart, S.D., 2009. Psychosis as a risk factor for violence to others: a meta-analysis. Psychol. Bull. 135, 679–706.

Foley, S.R., Kelly, B.D., Clarke, M., McTigue, O., Gervin, M., Kamali, M., Larkin, C., O'Callaghan, E., Browne, S., 2005. Incidence and clinical correlates of aggression and violence at presentation in patients with first episode psychosis. Schizophr. Res. 72, 161–168.

Foley, S.R., Browne, S., Clarke, M., Kinsella, A., Larkin, C., O'Callaghan, E., 2007. Is violence at presentation by patients with first-episode psychosis associated with duration of untreated psychosis? Soc. Psychiatry Psychiatr. Epidemiol. 42, 606–610.

Fuchino, Y., Mizoue, T., Tokui, N., Ide, R., Fujino, Y., Yoshimura, T., 2003. Health-related lifestyle and mental health among inhabitants of a city in Japan (in Japanese). Nippon Koshu Eisei Zasshi 50, 303–313.

Fukunishi, I., 1990. The assessment of the cut-off point of the General Health Questionnaire (GHQ) in the Japanese version (in Japanese). Clinical Psychology 3, 228–234.

Goethals, K., Willigenburg, L., Buitelaar, J., van Marle, H., 2008. Behaviour problems in childhood and adolescence in psychotic offenders: an exploratory study. Crim. Behav. Ment. Health 18, 153–165.

Goldberg, D.P., Rickels, K., Downing, R., Hesbacher, P., 1976. A comparison of two psychiatric screening tests. Br. J. Psychiatry 129, 61–67.

Please cite this article as: Kinoshita, Y., et al., Psychotic-like experiences are associated with violent behavior in adolescents, Schizophr. Res. (2010), doi:10.1016/j.schres.2010.08.028

Gosden, N.P., Kramp, P., Gabrielsen, G., Andersen, T.F., Sestoft, D., 2005. Violence of young criminals predicts schizophrenia: a 9-year register-based followup of 15- to 19-year-old criminals. Schizophr. Bull. 31, 759–768.

Hovens, J.G., Cantwell, D.P., Kiriakos, R., 1994. Psychiatric comorbidity in hospitalized adolescent substance abusers. J. Am. Acad. Child Adolesc. Psychiatry 33 (4), 476–483.

Junginger, J., 1996. Psychosis and violence: the case for a content analysis of psychotic experience. Schizophr. Bull. 22, 91–103.

Kaneita, Y., Ohida, T., Osaki, Y., Tanihata, T., Minowa, M., Suzuki, K., Wada, K., Kanda, H., Hayashi, K., 2007. Association between mental health status and sleep status among adolescents in Japan: a nationwide cross-sectional survey. J. Clin. Psychiatry 68, 1426–1435.

Lataster, T., van Os, J., Drukker, M., Henquet, C., Feron, F., Gunther, N., Myin-Germeys, I., 2006. Childhood victimisation and developmental expression of non-clinical delusional ideation and hallucinatory experiences: victimisation and non-clinical psychotic experiences. Soc. Psychiatry Psychiatr. Epidemiol. 41, 423–428.

Link, B.G., Stueve, A., Phelan, J., 1998. Psychotic symptoms and violent behaviors: probing the components of "threat/control-override" symptoms. Soc. Psychiatry Psychiatr. Epidemiol. 33 (Suppl 1), S55–S60.

Mojtabai, R., 2006. Psychotic-like experiences and interpersonal violence in the general population. Soc. Psychiatry Psychiatr. Epidemiol. 41, 183–190.

Nishida, A., Tanii, H., Nishimura, Y., Kajiki, N., Inoue, K., Okada, M., Sasaki, T., Okazaki, Y., 2008. Associations between psychotic-like experiences and mental health status and other psychopathologies among Japanese early teens. Schizophr. Res. 99, 125–133.

Nishida, A., Sasaki, T., Nishimura, Y., Tanii, H., Hara, N., Inoue, K., Yamada, T., Takami, T., Shimodera, S., Itokawa, M., Asukai, N. and Okazaki, Y., 2010. Psychotic-like experiences are associated with suicidal feelings and deliberate self-harm behaviors in adolescents aged 12–15 years. Acta Psychiatr Scand.

Poulton, R., Caspi, A., Moffitt, T.E., Cannon, M., Murray, R., Harrington, H., 2000. Children's self-reported psychotic symptoms and adult schizophreniform disorder: a 15-year longitudinal study. Arch. Gen. Psychiatry 57, 1053–1058.

Radovanovic, Z., Eric, L., 1983. Validity of the General Health Questionnaire in a Yogoslav student population. Psychol. Med. 13, 205–207.

Reiss, A.J., Roth, J.A., 1993. Understanding and Preventing Violence. National Academy Press, Washington DC.

Spidel, A., Lecomte, T., Greaves, C., Sahlstrom, K., Yuille, J.C., 2010. Early psychosis and aggression: predictors and prevalence of violent behaviour amongst individuals with early onset psychosis. Int. J. Law Psychiatry 33, 171–176.

Stip, E., Letourneau, G., 2009. Psychotic symptoms as a continuum between normality and pathology. Can. J. Psychiatry 54, 140–151.

Stompe, T., Ortwein-Swoboda, G., Schanda, H., 2004. Schizophrenia, delusional symptoms, and violence: the threat/control-override concept reexamined. Schizophr. Bull. 30, 31–44.

Swanson, J.W., Holzer III, C.E., Ganju, V.K., Jono, R.T., 1990. Violence and psychiatric disorder in the community: evidence from the Epidemiologic Catchment Area surveys. Hosp. Community Psychiatry 41, 761–770.

Swanson, J.W., Swartz, M.S., Van Dorn, R.A., Elbogen, E.B., Wagner, H.R., Rosenheck, R.A., Stroup, T.S., McEvoy, J.P., Lieberman, J.A., 2006. A national study of violent behavior in persons with schizophrenia. Arch. Gen. Psychiatry 63, 490–499.

Taylor, P.J., Leese, M., Williams, D., Butwell, M., Daly, R., Larkin, E., 1998. Mental disorder and violence. A special (high security) hospital study. Br. J. Psychiatry 172, 218–226.

Teixeira, E.H., Dalgalarrondo, P., 2009. Violent crime and dimensions of delusion: a comparative study of criminal and noncriminal delusional patients. J. Am. Acad. Psychiatry Law 37, 225–231.

van Os, J., Hanssen, M., Bijl, R.V., Ravelli, A., 2000. Strauss (1969) revisited: a psychosis continuum in the general population? Schizophr. Res. 45, 11–20.

Verdoux, H., van Os, J., 2002. Psychotic symptoms in non-clinical populations and the continuum of psychosis. Schizophr. Res. 54, 59–65.

Verdoux, H., van Os, J., Maurice-Tison, S., Gay, B., Salamon, R., Bourgeois, M., 1998. Is early adulthood a critical developmental stage for psychosis proneness? A survey of delusional ideation in normal subjects. Schizophr. Res. 29, 247–254.

Walsh, E., Buchanan, A., Fahy, T., 2002. Violence and schizophrenia: examining the evidence. Br. J. Psychiatry 180, 490–495.

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日常診療におけるうつ病と痛み

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【要　旨】
痛みは様々な疾患で起こるが、うつ病に関連した痛みは臨床的には見過ごされている。うつ病では痛みの閾値が低下し、普段感じない痛みを感じることがある。痛みは、うつ病の早期発見や治療経過の目安になり、もっと注目すべきである。

◆キーワード
うつ病
痛　み
セロトニン
気分障害
早期発見

はじめに

うつ病は生涯罹患率が5～12％と、最も罹患率の高い身近な精神疾患である[1]。近年のマスメディアの報道なども関係してか、外来受診者の数は増えてはいるものの、未だうつ病患者の大多数は受診をしていない。あるいは、受診をしていても適切な治療を受けられていない状態が続いていると思われる。

本稿で取り上げる痛みは、うつ病の症状の一つでもあるが、うつ病との関連性については、ほとんど一般には認知されていないのが現状である[2]。うつ病では、セロトニンなどの神経伝達物質の機能低下が起こる。セロトニンの機能低下により痛みの閾値が下がるため、痛みを感じやすい体質になることが報告されている。うつ病と痛みとの関連は強いものの、目の前のうつ病患者の多くがうつ病に伴う痛みを自覚していることを、精神科医ですら認知していないことが多い[2]。

また、うつ病に伴う痛みを持つ患者は、まず身体科を受診する。多くの報告を総合すると、身体科の患者の10％程度はうつ病を合併している。うつ病に伴う痛みは、器質的な異常はないか、あっても痛みの所見と合致しない症例でしか検査上見つからない。この場合は放置されるか、痛みのみに対応した不十分な治療が行われることになる。

うつ病に限らず、すべての疾患で早期発見・早期治療が重要であるが、うつ病では治療効果や職業などの心理社会的な要因を考えた場合、特に早期発見と治療が重要である。

若年者においても身体疾患を訴えることが多いが、この中には少なからずうつ病が潜んでいる可能性がある。痛みがうつ病の早期発見の糸口になる可能性を秘めている。

本稿では、うつ病の早期発見のために痛みが持つ重要性と、実際にうつ病患者の痛みあるいは痛みを主訴にしている患者のうつ病を

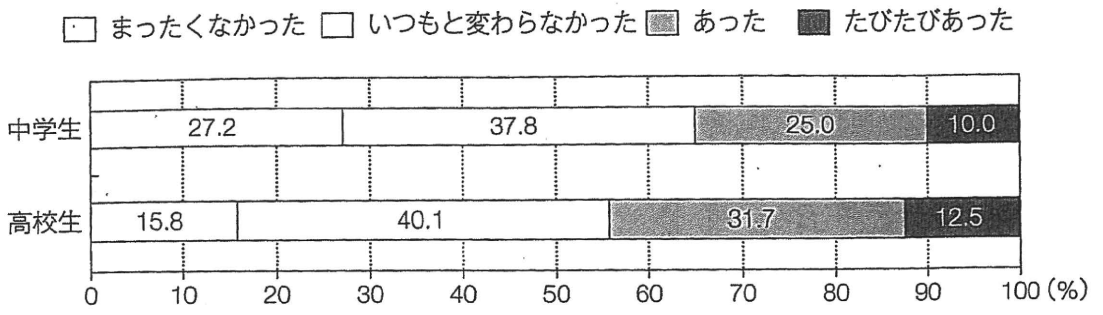

図1 中高生の1カ月における気分の落ち込みの頻度

(文献[3]より)

見落とさないための方策を述べていく。

また、簡略化するために本稿では多くの参考文献の挿入を割愛していることをあらかじめお断りする。

高校生の痛みの頻度と種類から見た痛みの原因

厚生労働科学研究による報告から、中高生に関するデータを紹介する[3]。これらのデータは筆者らも関与したアンケート調査によるもので、中学生が約8000人、高校生が約1万人参加している。精神科医の面接によるものではないことをお断りしておく。

データでは図1のように、気分の落ち込みを自覚する中高生は意外に多いことが判明した(中学生35・0%、高校生44・2%)。また、中学生から高校生にかけて、気分の落ち込みを自覚している生徒は増加していた。

図2は高校生1万人に対する、頭痛や腹痛を主体とした体の不調に関する項目調査の結果である。成人と同様に、頭痛や腹痛の頻度が高い。ここで重要なことは、これらの痛みの多くは身体的な問題によるものではないということである。

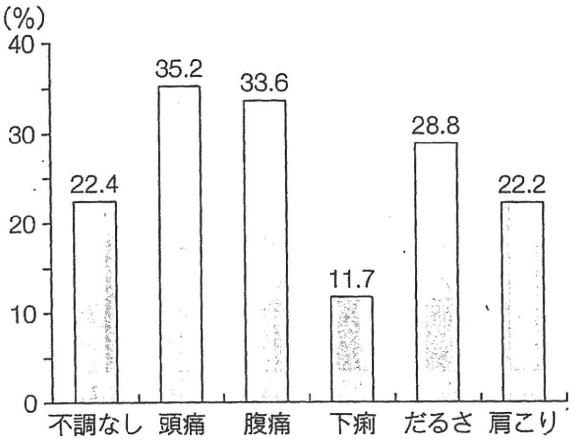

図2 この1カ月の体の不調(高校生1万人調査)

(文献[3]より)

高校生における身体疾患の割合は、成人に比べてきわめて低い。日常生活に困難を及ぼすのは身体疾患ではなく、精神医学的な問題である可能性が高い。したがって、図2における痛みも精神医学的な問題に起因するものである可能性が高い。最も頻度が高く注意を要するのは、うつ病であると思われる。痛みは、うつ病の早期発見に有用である可能性が高い。

うつ病患者の痛みの自覚と医師の認識における大きなギャップ

世界精神保健連盟(World Federation for Mental Health; WFMH)の実施した痛みとうつ病に関する調査を紹介する[2]。この調査は、日本を含めた6カ国で行われた調査である(図3)。日本で実施された調査が最大規模であるが、