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研究分担報告書

児童思春期精神科治療施設の
初回エピソード精神病に対するサービス調査

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研究要旨：精神病性疾患の早期発見と治療に関する取り組みが報告されているが、精神病性疾患群が好発する思春期の治療と支援を担当する治療施設の標準的な治療と支援の実態は明らかでない。本研究の目的は、児童思春期の初回エピソード精神病（First Episode Psychosis：以下 FEP）を発症した場合に受診することが多い治療施設が、患者に提供しうる支援と治療の現状を把握することである。**対象と方法：**2009年12月に全国児童精神科医療施設協議会加盟施設と全国の精神科急性期治療病棟もしくは精神科救急入院料病棟を有する病院 38 施設に児童思春期の FEP 患者に対して提供可能な支援と治療に関してアンケート調査を実施した。これらの 38 施設について児童思春期病棟を有する群（児童思春期病棟群）と一般精神科病棟のみを有する群（一般精神科病棟群）の 2 群間の異同を検討した。**結果：**訪問支援に関して積極的に行う（多少行うを含む）と回答した施設は、児童思春期病棟群で 8 施設（30.8%）で、一般精神科病棟群（9 施設, 69.2%）と比較して有意に少なかった（ $P<0.01$ ）。ケースマネージメントを行うコメディカルスタッフがいると回答した施設は、児童思春期病棟群で 15 施設（60.0%）で、一般精神科病棟群（13 施設, 100.0%）と比較して有意に少なかった（ $P<0.01$ ）。**結論：**FEP 患者の集中治療および継続的支援の観点から、児童思春期病棟を有する病院群におけるサービスの拡充が必要であ

A. 研究目的

近年諸外国において高率に精神病へ移行する可能性のある高リスク群に関する実証的研究が進められ、日本でも一部の地域で思春期から青年期を対象とした治療・支援の実践が報告されるようになった（松本 2009, 森田 2008）。この高リスク群の治療や支援について方法論やエビデンスは十分には確立されておらず、一般臨床に定着させるためには引き続き議論が必要である。しかし明らかな精神病状態に至った FEP (First Episode Psychosis) 患者に関しては精神病状態未治療期間の長さや後の再発回数が長期予後に影響する (Harrison 2002, 山澤 2009) ことが知られている。いわゆる臨界期と呼ばれる時期以降は確実かつ速やかな治療と支援が提供されるべきである。治療ガイドラインでも支援と治療が必要な患者の早期発見と発症後数年に渡る治療継続の重要性が強調され (IEPA Group 2005)、諸外国を中心に一定の指針が示されている (Marshall 2004)。日本では FEP 患者を対象とした標準的な臨床実践が確立されておらず、好発年齢層の初期治療を担うと考えられる入院治療施設の治療と支援の実態は不明である。

本研究の目的は、児童思春期病棟を有する病院群と精神科急性期および救急治療病棟を有する一般の精神科病院群との比較を通して FEP 患者に提供しうる早期支援・治療サービスの実態を把握することである。

B. 研究方法

1) 対象

全国児童精神科医療施設協議会加盟施設 32 施設と全国の精神科急性期治療病棟を有する病院 49 施設、さらに全国の精神科救急入院料病棟を有する病院 50 施設に調査協力を依頼し、2009 年 11 月に調査の主旨に関して協力と同意が得られた 38 施設である。

2) 方法

初回エピソード精神病患者への治療支援モデル (Marshall 2004) を日本にも適応できるよう改変した先行研究 (伊藤 2009) を参考に、医療が提供しうる FEP 患者への治療と支援の時期について以下の 3 項目に分

類し、児童精神科医 3 名を含む計 5 名の専門家の合意のもとで質問項目を作成した。

- (1) 早期発見のための取り組みと迅速な初期評価
評価：早期発見につながる地域の啓発活動、FEP 患者が紹介された時の診療待ち期間
- (2) 集中治療と合併症の発見：自殺の危険性に関する評価と対応、提供可能な治療の選択肢、時間外診療、治療通院中断対策、訪問支援の積極性、時間外支援の実施、ケースマネジメントを行うコメディカルの存在、家族支援の実施
- (3) 治療継続と再発予防：青年期以降の治療継続、復学・就学・就労支援の実施

なお FEP とは精神病前駆状態とは明確に区別され、患者の病状が進展した積極的危機介入を要する段階である。診断を問わず、初診時に知覚・思考・感情・行動などの異常を呈する精神病状態と定義した (Aitchison 2000)。

以上に関してアンケートを当該病棟の病棟医長あてに送付し記入を依頼した。

3) データ分析

回答の得られた 39 施設は①児童思春期病棟を有する病院群 (以下、児童思春期病棟群) 26 施設、②児童思春期病棟を持たない病院群 (以下、一般精神科病棟群) 13 施設の 2 群に分類された。各群の背景を表 1 に示す。得られた回答内容につき 2 群間の検討を行った。有意差の検討には t 検定もしくは χ^2 検定を用いた。統計解析には SPSS 11.0J を使用した。

表 1. 調査対象施設背景

	児童思春期病棟群	一般精神科病棟群
種別	全児協 22 精神科救急 3	精神科急性期 5 精神科救急 8
診療形態	一般精神科病院 12 一般総合病院 3 小児精神科専門病院 3 小児科総合病院 3	一般精神科病院 12 一般総合病院 1

4) 倫理的配慮

本調査は、国立精神・神経センターの倫理委員会の承認を経て実施した。

C. 研究結果 (資料参照)

1) 早期発見のための取り組みと迅速な初期評価

(1) 啓発活動

精神疾患全般の啓発活動を実施していると回答した施設は児童思春期病棟群で 21 施設 (84.0%)、

一般精神科病棟群で 8 施設 (61.5%) であった。統合失調症などの精神病性疾患に関する啓発活動を実施していると回答した施設は児童思春期病棟群で 12 施設 (48.0%)、一般精神科病棟群で 8 施設 (61.5%) であった。

(2) 初診待ち期間

FEP患者が地域の福祉や教育機関から紹介された場合について回答を得た初診待ち期間は児童思春期病棟群で 3.1 (SD = 3.3) 週、一般精神科病棟群で 1.4 (SD = 1.6) 週であった。

「早期発見のための取り組みと迅速な初期評価」については、両群で有意な相違は認められなかった。

2) 集中治療と合併症の発見

(1) 自殺リスクの評価と対処

FEP患者の初診時に自殺の危険性の評価を実施していると回答した施設は、児童思春期病棟群で 12 施設 (48.0%) であるのに対し、一般精神科病棟群で 10 施設 (76.9%) であり、有意ではないものの、有意傾向 ($P<0.1$) を認めた。

患者に自殺の危険性があると判断した場合、患者と家族に対して入院を一般的に推奨すると回答した施設は児童思春期病棟群で 24 施設 (96.0%)、一般精神科病棟群で 12 施設 (92.3%) であった。両群では有意な差を認めなかった。

(2) 提供可能な治療の選択肢

FEP患者へ提供可能な治療選択肢として入院治療中に薬物療法と回答した施設は児童思春期病棟群で 24 施設 (96.0%)、一般精神科病棟群で 13 施設 (100.0%) であった。外来治療中に薬物療法と回答した施設は児童思春期病棟群で 25 施設 (100.0%)、一般精神科病棟群で 13 施設 (100.0%) であった。両群で回答に有意な差を認めなかった。

一方、FEP患者へ提供可能な治療選択肢として入院治療中に認知行動療法と回答した施設は児童思

春期病棟群で 6 施設 (24.0%)、一般精神科病棟群で 7 施設 (53.8%) であった。外来治療中に提供可能な治療選択肢として認知行動療法と回答した施設は 5 施設 (20.0%)、一般精神科病棟 6 施設 (46.2%) であった。入院、外来とも両群で有意差はないものの、有意傾向 ($P<0.1$) を認めた。

(3) 治療中断対策

次に FEP 患者の治療中断の可能性に対する対策をとっていると回答した施設は児童思春期病棟群で 18 施設 (72.0%)、一般精神科病棟群で 10 施設 (76.9%) であった。両群で有意な差を認めなかった。

なお、中断対策の手段として心理教育と回答した施設は全 39 施設中 11 施設 (28.2%)、訪問看護と回答した施設は 8 施設 (20.5%)、電話確認と回答した施設は 6 施設 (15.4%)、福祉教育との連携と回答した施設は 3 施設 (7.7%) と続いた (重複回答あり)。

(4) 4. 訪問支援の積極性

FEP 患者への訪問支援について積極的に行う～多少行くと回答した施設は、児童思春期病棟群で 8 施設 (30.8%) であるのに対し、一般精神科病棟群で 9 施設 (69.2%) であり、有意な差 ($P<0.05$) を認めた。

(5) 時間外支援の実施

FEP 患者への時間外診療・電話対応・時間外訪問診療といった何らかの時間外診療を FEP 患者に実施していると回答した施設は児童思春期病棟群で 20 施設 (80.0%)、一般精神科病棟群で 12 施設 (92.3%) であった。両群で有意な差は認められなかった。

(6) ケースマネジメントを行うコメディカルの存在

FEP 患者のケースマネジメントを行うコメディカルスタッフがいないと回答した施設は、児童思春期病棟群 15 施設 (60.0%) であるのに対し、一般精神科病棟群で 13 施設 (100.0%) であり、両群で有意な差 ($P<0.01$) を認めた。

(7) 家族支援の実施

FEP 患者の家族支援として家族会を開催していると回答した施設は児童思春期病棟群で 11 施設 (44.0%)、一般精神科病棟群で 9 施設 (69.2%) であった。

さらに、家族教育もしくは家族の心理相談を実施していると回答した施設は児童思春期病棟群で 21 施設 (84.0%)、一般精神科病棟群で 10 施設 (76.9%) であった。

「家族支援の実施」に関する項目については、両群で有意な差は認めなかった。

3) 治療継続と再発予防

(1) 青年期以降の治療継続

FEP 患者の青年期以降の治療継続に関して自施設内で移行可能もしくは連携可能病院ありと回答した施設は児童思春期病棟群で 21 施設 (84.0%)、一般精神科病棟群で 13 施設 (100.0%) であった。

(2) 復学・就学・就労支援の積極性

FEP 患者の復学・就学・就労支援に関して積極的に行うもしくは多少行くと回答した施設は児童思春期病棟群で 25 施設 (100.0%)、一般精神科病棟群で 12 施設 (92.3%) であった。

「治療継続と再発予防」に関する質問に対しては、両群で有意な差を認めなかった。

D. 考察

本調査では急性期の青年期から成人期の患者を主に扱う一般精神科病院群との比較により、児童思春期病棟を有する病院群のFEP患者に対するサービス提供の特徴が明らかになった。今回のアンケート調査では、早期発見につながる地域の啓発活動、FEP患者が紹介された時の診療待ち期間、自殺の危険性に関する評価と対応、提供可能な治療の選択肢、通院中断対策、時間外支援、ケースマネジメント、家族支援、訪問支援、青年以降の治療継続、復学・就学・就労支援といったFEP患者に必要と考えられるサービスの構成要素についての質問を実施したが、訪問支援の積極性とケースマネジメントを行うスタッフの存在の2つで、児童思春期精神科治療施設の方が有意に肯定する割合が低かった。さらに自殺の危険性に関する評価、認知行動療法の提供可能性においても同様の傾向を認めた。

本調査の結果からは児童思春期精神科治療施設において訪問支援とケースマネジメントを用いたアウトリーチサービスの概念は十分浸透していないことがうかがえる。近年は諸外国の取り組みにならって入院治療から外来治療、訪問サービスを包括的に評価・統御するケースマネジメントを行うスタッフの育成、訪問看護を中心とした訪問支援サービスの拡大の必要性が指摘されている(原田 2009)。また ACT (包括型地域生活支援プログラム)のような多職種による訪問支援サービスの効果が実証され(伊藤 2008)精神科アウトリーチサービスの重要性が益々強調されるようになった。精神疾患未治療もしくは治療初期にある子どもが生活する家庭や学校、施設は常に専門的な助言を必要としており、アウトリーチサービスは

児童思春期精神科領域でも有用な手法である。本調査に参加した国府台病院からもひきこもり・不登校児を対象にした多職種による包括型地域支援プログラム ACT-J-KIDS の先駆的取り組みが報告されている(宇佐美 2009)。また現在は国が主導して子どもの心の診療拠点病院機構推進事業が試行されている。11 の地域がこれに参加し児童思春期精神科治療施設と地域の連携の在り方が模索されている状況である。このような取り組みが FEP 患者の早期発見・集中治療を念頭に置いたサービスへ展開することが望まれる。

FEP患者の14%が精神病発症後から受診までの間に自殺企図を行っていることが示されている(Barrett2010)。さらにFEP患者の抑うつ状態や希死念慮の合併はその後数年の経過における自殺の危険性を予測する重要な因子とされている(Robinson2010)。児童思春期の自殺率は10~14歳で人口10万人あたり1.0とここ数年間で横ばいであるものの、15~19歳では8.3と年々増加を続けており、特に思春期の自殺対策は国の重要課題として位置づけられ(健やか親子21、第2回中間報告書2010)、普段の臨床で患者の自殺の危険性を念頭に診療することは重要である。本調査では初診時に自殺の危険性の評価を実施していると回答した施設は児童思春期病棟群で約半数にとどまり、一般精神科病棟群に比べてやや少ない傾向にあった。児童思春期においては診察の場で、抑うつ気分や希死念慮を自ら訴えることのできる患者は比較的稀である。治療者の配慮のもと患者が答えやすいような投げかけ方で聞き出していくことが必要になる。例えば患者用の初診時間診票の中に抑うつ気分や希死念慮を確認する質問項目を用意したり、家族がいない場面でさりげなく尋ねてみるなどの工夫が有用である。

さらに本調査ではFEP患者へ提供可能な治療選択肢として認知行動療法と回答した治療施設は児童思春期病棟群で入院および外来とも約20%、一般精神科病棟群に比べてやや少ない傾向にあった。認知行動療法は平成22年度より診療報酬上の加算が認められたばかりである。実際の臨床現場では

治療技法に習熟している医師、臨床心理士や看護師は不足しており、認知行動療法を実施していてもうつ病や不安障害を一般的な対象疾患として扱っていることが多いのが現状である。一般精神科病棟群でも約 50%程度の施設が提供可能と回答したにとどまった。患者と症状や苦悩について詳細なやりとりを行い、患者に症状を認識させて二重見当識と対処行動の獲得をめざす精神療法的アプローチは本邦でも古くから紹介されている（八木 2009）。このアプローチをより構造化したものが認知行動療法である。陽性症状、陰性症状、不安・抑うつ、低い自己評価、対人関係といった治療対象となる領域に標的を設け、認知と認知に伴う感情や行動の修正を行い生活場面で実践させていく技法である（原田 2005）。これにより精神病体験を自らの生き方の中に取りこませて統合型回復スタイルを目指すことを治療の目的としている（Thompson2003）。FEP患者に対しても認知行動療法の症状改善効果は実証的研究により明らかになっており（Tarricr2004）、本邦でもFEP患者を対象にした認知行動療法の実践が紹介されている（井藤 2010）。児童精神科領域でも年長児で病前、病後の認知機能が比較的保たれている症例など一部の症例に対しては転用できる技法だと思われる。

本調査において一般精神科病棟群と児童思春期病棟群のサービスの差異を検討することにより、今後児童思春期精神科医療の立場から FEP 患者の治療と支援を念頭に置いたサービスを提供する場合に拡充すべき課題が一部示唆された。本調査で児童思春期病棟群に含まれる全国児童精神科医療施設協議会加盟施設の統計（全児協統計 2009）では約 8 割の施設において総外来受診者数のうち精神病性疾患が占める割合は 10%以下であり、神経症性疾患群や発達障害群など他に比べると稀な疾患群である。このためか精神病性疾患に特化したサービスに力点が置かれてこなかった可能性があ

る。しかし先駆的な取り組みを見せている英国では児童思春期精神科領域で提供される精神病性疾患の患者へのサービスと青年期から成人期以降のサービスの格差が指摘され（Rutter2008）、早期介入サービス（EIS）と児童思春期精神保健サービス（CAMHS）が相互で知識の共有と交流を深めて連携を図っている（England2009）。本邦でも今後諸外国の取り組みにならって活発に精神病性疾患を中心のテーマに据えつつ思春期精神疾患への早期治療・支援の体制が整備されていくと思われるが、児童思春期精神科領域でも積極的にこれらの知見を取り入れてサービスを充実させていく必要がある。

E. 結論

本調査は入院治療病棟を持つ病棟群を対象にして行った調査であり、診療所や大学病院など外来治療を中心に診療を行っている児童思春期精神科医療機関の実態は一切反映していない。また本調査に参加した精神科救急・急性期治療施設の数も少数であり、これらの精神科急性期医療を提供する治療期間の実態も十分には反映していない。これが本調査の限界である。児童思春期の FEP 患者の治療と支援に関するガイドラインが作成され普及した後に再度の調査が行われることが期待される。

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 2. 学会発表 なし
- H. 知的財産権の出願・登録状況 なし

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表 2：児童思春期病棟群と一般精神科病棟群の比較

1)早期発見のための取り組みと迅速な初期評価	児童思春期病棟群	一般精神科病棟群	p 値
精神疾患の啓発 施設数 (%)	21 (84.0)	8 (61.5)	
精神病性疾患の啓発	12 (48.0)	8 (61.5)	
初診待ち期間 週(SD)	3.1 (3.3)	1.4 (1.6)	
2)集中治療と合併症の発見			
1.自殺リスクの評価と対処			
自殺リスクの判定 施設数 (%)	12 (48.0)	10 (76.9)	
自殺リスク時の入院の提案	24 (96.0)	12 (92.3)	
2.治療介入の選択肢			
入院薬物療法	24 (96.0)	13 (100.0)	
外来薬物療法	25 (100.0)	13 (100.0)	
入院認知行動療法	6 (24.0)	7 (53.8)	*
外来認知行動療法	5 (20.0)	6 (46.2)	*
3.治療中断対策			
治療中断対策あり	18 (72.0)	10 (76.9)	**
4.訪問支援の積極性			
積極的に行う～多少行う	8 (30.8)	9 (69.2)	
5.時間外支援			
何らかの時間外支援の実施	20 (80.0)	12 (92.3)	
6.ケースマネジメント			
ケースマネジメントを行うコメディカルが存在	15 (60.0)	13 (100.0)	**
7.家族支援			
家族会開催	11 (44.0)	9 (69.2)	
家族心理教育もしくは心理相談	21 (84.0)	10 (76.9)	
3)治療継続と再発予防			
青年期以降の治療継続			
自施設移行可能～連携可能病院あり	21 (84.0)	13 (100.0)	
復学・就学・就労支援			
積極的に行う～多少行う	25 (100.0)	12 (92.3)	

*P<0.1,**P< 0.01 χ^2 検定

研究成果の刊行に関する一覧表

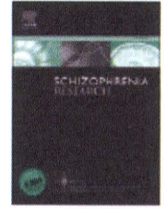
書籍

著者氏名	論文タイトル名	書籍全体の編集者名	書籍名	出版社名	出版地	出版年	ページ
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雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
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Oshima N, Nishida A, Fukushima M, Shimodera S, Kasaiji K, Okazaki Y, Sasaki T	Psychotic-like experiences (PLEs) and mental health status in twin and singleton Japanese high school students.	Early Intervention in Psychiatry 4: 206-213, 2010.	4 (3)	206-213	2010
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III. 研究成果の刊行に関する一覧表



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.

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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

IV. 研究成果の刊行物・別刷

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.

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.

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 sub-clinical 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 Dalgarrondo (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

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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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.

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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 use¹⁸ 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 enrolls 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-variables. 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 \pm 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 \pm 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