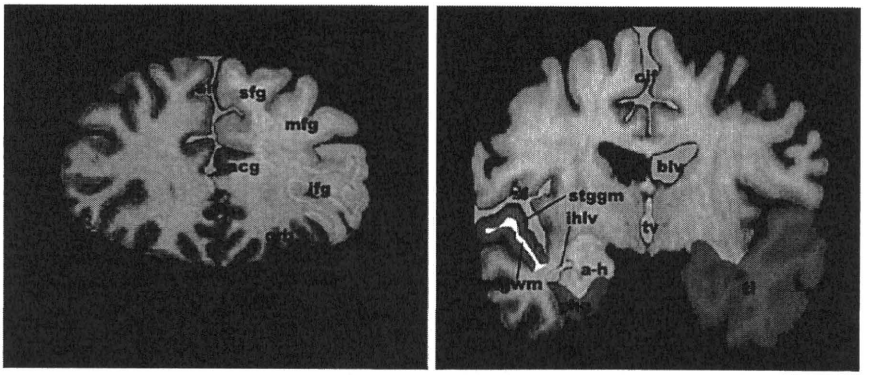


**図1 複数の脳部位の計測値に基づく初回エピソード統合失調症患者と健常者の判別に用いられた関心領域（文献[29]より転載）**
acg, 前部帯状回；a-h, 扁桃体—海馬複合体；aif, 前方部大脳縦裂；blv, 側脳室体部；cif, 中心部大脳縦裂；ifg, 下前頭回；ihlv, 側脳室下角；mfg, 中前頭回；orb, 眼窩前頭回；phg, 海馬傍回；sf, シルビウス裂；sfg, 上前頭回；stggm, 上側頭回灰白質；stgwm, 上側頭回白質；tl, 側頭葉全体；tv, 第三脳室

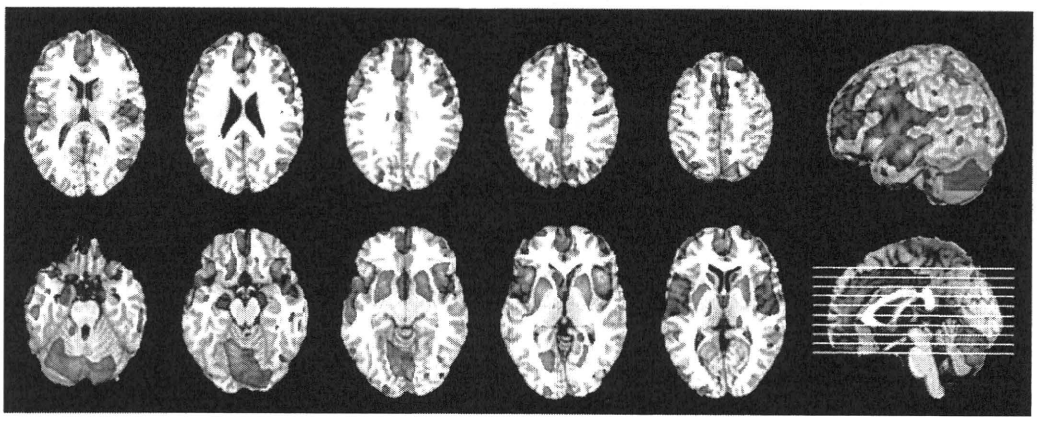

**図2 VBM法と多変量解析による統合失調症患者と健常者の間の判別におけるeigenimage（文献[14]より転載）**

には，統合失調症において報告されている所見と一致する点もあり，脳体積減少などの構造変化を考えるときに，抗精神病薬の影響は無視できないことを示している．もちろん，服薬歴のない前駆期の患者（後に精神病発症に至ったARMS）にも脳構造の変化が認められ，さらに進行するという最近の研究や，薬物療法導入以前の気脳写により，進行性の脳室拡大が報告されていることなどは，抗精神病薬と無関係な脳構造変化の証拠であり，すべてが薬物によって説明できるわけではない．

## IV. 客観的補助診断法としての実用化への試み

MRIは侵襲性が低く，比較的短時間で施行が可能であり，安静を保つだけで被検者に特段の努力を要求せず，再現性の高い豊富な客観的情報が得られるので，精神疾患患者にも施行しやすい検査である．MRIなどの脳構造画像診断を，統合失調症の臨床診断に役立てることは可能であろうか．もしそれを，初回エピソードの，病像が未分化で特異的診断が困難な時期に用いることができれば，その臨床的有用性は高いであろう．またARMSの状態から，近い将来の顕在発症を予測することに役立てば，より有効な早期介入が可能になるかもしれない．

筆者らの施設における統合失調症患者58名（男31，女27），平均年齢25.3歳（18～36歳）のMRI

を，放射線科医が読影した定性的所見では，約7割は異常なしと判定されている．統合失調症において灰白質体積減少がもっとも顕著な脳部位である左上側頭回においても，その測定値をプロットすると大半は健常者の値と重なる．すなわち，MRIで認められる統合失調症患者と健常者の差異は，統計学的比較の結果として検出される軽微なものなので，臨床検査として応用するためには解析法の工夫が必要である．筆者らは，統合失調症における脳形態異常はある程度特徴的な分布を示すので，複数の脳部位の計測値の組み合わせ，あるいは脳全体における形態変化のパターンにより，統合失調症患者と健常者の判別が可能かもしれない，という考えに基づき，客観的補助診断法としてのMRI実用化へ向けた試みを行っているので，以下に簡単に紹介する．

### 1. 関心領域法による統合失調症患者と健常者の判別

主として慢性の統合失調症患者57名(男30，女27)と健常対照者47名(男25，女22)を対象に，乳頭体をよぎる冠状断T1強調画像から，関心領域として大脳縦裂，側脳室体部，側脳室下角，第三脳室，シルビウス裂，上側頭回灰白質および白質，側頭葉全体の面積を計測し，それらの値を用いて健常対照者と統合失調症患者の判別分析を行った[17]．その結果，男性健常者の80%，男性患者の80%，女性健常者の86.4%，女性患者の77.8%が正しく判別された（交差妥当化なし）．

次に，初回エピソードの統合失調症患者34名(男17，女17)と健常対照者48名(男24，女24)を対象に，乳頭体をよぎる冠状断画像だけでなく，脳梁膝前端をよぎる冠状段画像からの関心領域として，上・中・下前頭回，眼窩前頭回，前部帯状回，大脳縦裂を加えて，同様の検討を行った（図1)[29]．交差妥当化後に男性健常者83%，男性患者の65%，女性健常者の83%，女性患者の82%が正しく判別され，慢性期患者に比較して脳構造変化が軽い初回エピソード患者においてもほぼ遜色ない結果が得られた．

### 2. Voxel-based morphometry (VBM) 法による統合失調症患者と健常者の判別

男性健常対照者30名と統合失調症患者30名を対象に，statistical parametric mapping (SPM) とmultivariate linear model (MLM) を用いて，患者と健常者の違いをもっともよく表す灰白質分布パターン（eigenimage）を抽出し（図2)，それによる判別を行った[14]．交差妥当化の結果，健常者の77%，患者の77%が正しく判別された．またそのeigenimageを別の男性健常対照者16名と統合失調症患者16例に当てはめると，健常者の87%，患者の81%が正しく判別された．

## V. 今後の課題

統合失調症の早期病態の解明とより有効な早期介入法の開発が，長期予後改善のためには特に重要である．そのためには，進行性脳構造変化に関連した課題として，(1) 進行性脳病態の成立機序の解明，(2) 早期診断・早期治療による進行性変化の防止と予後改善の可能性，(3) 進行性変化を標的とした治療薬の開発，(4) 臨床診断や治療効果判定の補助的指標としての脳構造画像診断の応用，などについて検討すべきと考えられる．

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## Brain morphologic changes and their clinical implications in schizophrenia

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Studies using structural brain imaging techniques such as magnetic resonance imaging (MRI) have provided a number of important clues to help our understanding of the pathophysiology of schizophrenia. However clinical implications of the MRI findings in schizophrenia are not sufficiently clear. This manuscript summarizes the clinical implications of progressive brain changes in schizophrenia with respect to (1) clinical symptom severity, (2) treatment responsiveness and outcome, (3) relapse, (4) manifestation of overt psychosis, and (5) impact of antipsychotic treatment. Our attempts to apply structural MRI to adjunctive clinical diagnosis of schizophrenia are also described.

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特集 At Risk Mental State(ARMS)

# 統合失調症の早期発見・介入の試み —特殊外来の現状と課題— b．ARMSを対象とした早期介入の実践—CAST*

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**Key Words**：ARMS, early intervention, schizophrenia

## はじめに

近年，統合失調症などの精神病においては，できるだけ早期に治療を開始することにより，臨床症状のより良好な転帰，社会機能低下・認知機能障害の進行の阻止などが期待されており，前駆期から発症後早期に生じる脳体積減少などの神経生物学的変化を抑制できる可能性も示唆されている[1]．そのような背景から精神病に対する早期介入活動が国際的に活発化してきており，わが国においても活動拠点が形成されつつある．富山大学附属病院神経精神科も，精神病の発症リスクが高いと考えられる若者を対象としたConsultation and Support Service in Toyama (CAST)という新たな臨床サービスを立ち上げ，運用している[2]．ちなみに，英語の“cast”には「(ある方向に)向ける」，「投げかける」，「形を作る」をはじめ多くの意味があり，「cast a new light on……新たな光明を投げかける」などと用いられる．本稿ではCASTサービスの概要と現況および今後の課題についてまとめた．

## CASTサービス

CASTは富山大学附属病院神経精神科が富山県心の健康センター(精神保健福祉センター)と協同して，2006年10月から開始した．これは富山大学と富山県の連携事業の一つでもある．原則としてYungらの基準[3]により精神病発症危険状態(at risk mental state；ARMS)と診断された15～30歳の若者を対象としているが，すでに顕在発症している者が対象となることもある．

## サービスの目的

本サービスの主な目的は下記に示すとおりである．

①ARMSが疑われる思春期・青年期の若者やその家族に対して，専門家による相談，診断，治療の機会を提供する．

②すでに精神病を発症している患者に対して，エビデンスに基づいた医療をできるだけ早期に提供する〔精神病未治療期間(duration of untreated psychosis；DUP)の短縮〕．

* Implementation of an early intervention service for at risk mental state—Consultation and Support Service in Toyama (CAST).

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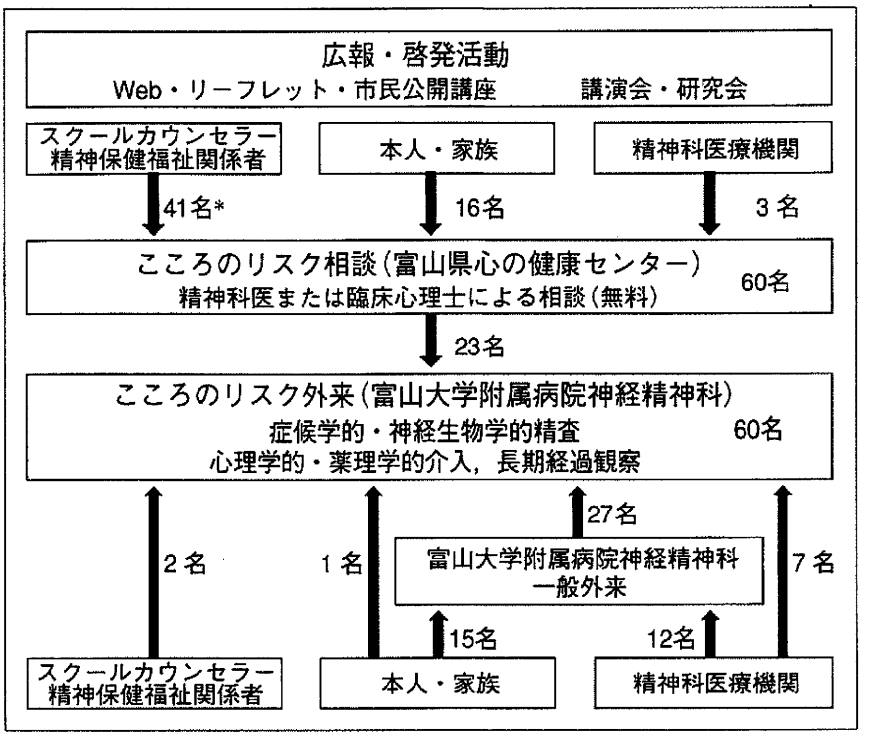


図1 CASTサービスの概要および利用者97名の内訳
＊41名のうち心の健康センターからの紹介が33名

③統合失調症の発症リスクの生物学的基盤の解明に貢献する．

④統合失調症前駆状態の新しくかつよりよい診断および治療法の開発に資する．

## サービスの概要

CASTサービスは，富山県心の健康センターにおいて行われる「こころのリスク相談」と，富山大学附属病院神経精神科に開設した専門外来である「こころのリスク外来」の2つの活動を中心に構成されている[4]（図1）．

### 1．こころのリスク相談

「こころのリスク相談」では，富山大学附属病院神経精神科の医師または心理士が富山県心の健康センターに出向き，事前に電話予約を受けつけた15～30歳の相談者に対して無料で相談業務を行う．予約は毎週1回（半日）2名までとし，本人からの相談だけでなく家族や学校関係者など周囲の人からの相談も受けている．精神科医療機関以外の場所にARMS専門の相談窓口を設け，アクセスを容易にしていることが本サービスの第一の特徴である．これはメルボルンのPersonal Assessment and Crisis Evaluation（PACE）クリニックが，若者の集まりやすいショッピングセンター内に置かれていることを参考にしている．

面接を開始する前に，いくつかの自記式のスクリーニング検査を行っている．前駆状態のスクリーニングとしては，当科で作成したリスクチェック項目（表1）およびPrevention Through Risk Identification, Management, and Education（PRIME）-Screen日本語版[5]を用いている．当科のリスクチェック項目は「自分の考えではない考えがうかんでくる．どうでもよいことが頭にでてきて疲れる」，「物音に敏感になった（掃除機の音，時計の秒針，冷蔵庫の音など）」，「考えが頭の中でまとまりにくい．考えていることが頭の中に収まらず，独り言を言ってしまう」など，日常生活上で体験される前駆期の症状12項目から構成されている．また，前駆期に高頻度に認められる不安，抑うつ[6)~8)]を評価するために，State-Trait Anxiety Inventory（STAI）およびBeck Depression Inventory（BDI）も用いている．生育歴を聴取した際に，幼児期における言葉の発達の遅れ，こだわりなどが認められる場合もあるため，最近ではAutism-Spectrum Quotient-Japanese version（AQ-J）も施行している．面接では相

表1　リスクチェック項目

□自分の考えではない考えが浮かんでくる．どうでもよいことが頭に出てきて疲れる．
□人の話を聞くと遠まわしに自分のことを言っている気がする．
□最近，理由もなく誰かに嫌がらせをされている気がする．
□人の視線を感じて落ち着かなくなる．人の集まる場所では見張られている感じがしてつらい．
□物音に敏感になった(掃除機の音，時計の秒針，冷蔵庫の音など)．
□いつも不安がつきまとい，イライラしてじっとしていられない．自分が抑えられない．
□まわりに誰もいないのに，人の声が聞こえてくることがたまにある．
□考えが頭の中でまとまりにくい．考えていることが頭の中に収まらず，独り言を言ってしまう．
□感情が乏しく，無気力になり，部屋に引きこもるようになった．
□ものごとを繰り返し確認する(ガス，スイッチなど)．以前はスムーズに行っていたことに時間がかかり，生活に支障がでてきた(シャワーや入浴に2時間以上かかるなど)．
□自分も人も信用できない，自分の居場所がない．死んでしまいたい．
□精神科的な病気じゃないか心配だ．

談理由，相談に至るまでの経緯を聞くとともに，これらの検査結果を本人と一緒に見返しながら話を進めていく．ARMSが疑われる場合は，インフォームド・コンセントによる同意を得た後，大学附属病院の担当者にその場で連絡し受診予約を取る．ARMSに該当しないと考えられる場合は，必要に応じて，富山県心の健康センターにおける一般相談や富山大学附属病院を含む精神科医療機関に紹介する．

2．こころのリスク外来

「こころのリスク相談」から紹介された者，ARMSの疑いで他の専門機関から紹介された者，本人・家族が「こころのリスク外来」を希望して受診した者，富山大学附属病院神経精神科一般外来を受診した者の中でARMSと考えられる者を対象に保険診療を行う．ARMSの診断にはComprehensive Assessment of At-Risk Mental State(CAARMS)[9]の日本語版(東北大学の松本らによる)を用いている．臨床症状の詳細な評価，認知機能の評価，磁気共鳴画像(MRI)，事象関連電位(ERP)などの神経生物学的な精査を行い，定期的な通院による経過観察を行う．治療は原則として国際早期精神病協会による臨床ガイドライン[10]の前精神病期における介入に準じて行っている．また「こころのリスク外来」は，一般再来の患者や入院患者の経過中にARMSが疑われた場合に，CAARMSを施行して判定する機能も担っている．

## CASTサービスの現況

CASTサービスが開始された2006年10月から2010年5月までの利用者の内訳を図1に示した．97名の利用者のうち，「こころのリスク相談」を利用した者は60名，「こころのリスク外来」を受診した者は60名であった．「こころのリスク相談」の60名のうち28名はARMSが疑われたが，8名は本人あるいは家族が希望しないなどの理由で「こころのリスク外来」を受診しなかった．また，4名が統合失調症を疑われ「こころのリスク外来」を勧めたが，1名は受診しなかった．したがって，ARMSを疑われた20名と統合失調症を疑われた3名の計23名が「こころのリスク外来」を受診した．「こころのリスク相談」に訪れた相談者の68％(41名)は，スクールカウンセラー・精神保健福祉関係者から紹介されていた．なかでも心の健康センターからの紹介が多く，41名中，33名がセンターの紹介を通じて相談に訪れていた．本人や家族がインターネットやパンフレットなどから「こころのリスク相談」の存在を知り，直接「こころのリスク相談」を利用した者は27％(16名)，精神科医療機関から紹介された者は5％(3名)であった．一方「こころのリスク外来」は，富山大学附属病院神経精神科の一般外来を経由して受診する者が45％(27名)，精神科医療機関から直接紹介された者は11％(7名)であった．家族の勧めで「こころのリスク外来」を直接受診した者は2％(1名)，「スクールカウンセラー・精神保健福祉関係者からの紹介は3％(2名)にとどまった．

1．こころのリスク相談

リスク相談を利用した60名(男性26名，女性34名)の平均年齢は22.4±5.6歳であった．このうちARMS疑いが28名(男性14名，女性14名)，統合失

表2　リスク相談の対象(2006年10月～2010年5月の集計)

| | リスク相談全体 (n=60) | ①ARMS疑い (n=28) | ②統合失調症疑い* (n=4) | ③その他 (n=28) |
|---|---|---|---|---|
| ・男女比(M：F) | 26：34 | 14：14 | 1：3 | 11：17 |
| ・平均年齢(歳) | 22.4±5.6 | 21.4±6.4 | 26.2±5.0 | 22.8±4.6 |
| ・こころのリスク項目** | 5.8±3.3 | 7.4±2.0 | 9.0 | 3.7±3.3 |
| ・STAI STAI－状態不安(総得点) | 59.9±8.8 | 61.5±9.0 | 61.0 | 57.5±8.6 |
| ・STAI－特性不安(総得点)*** | 65.4±8.8 | 69.1±9.2 | 62.0 | 60.8±6.2 |
| ・Beck(総得点) | 22.2±9.5 | 23.8±10.4 | 25.0 | 19.9±8.5 |

＊統合失調症疑い群のスクリーニング検査のデータは1名分のみ，＊＊総得点において①＞③で有意差あり(t=4.384, $p<0.001$)，＊＊＊総得点において①＞③で有意差あり(t=2.574, $p=0.017$)

表3　リスク外来の対象(2006年10月～2010年5月の集計)

| | リスク外来全体 (n=60) | ARMS (n=31) | 統合失調症 (n=12) | その他 (n=17) |
|---|---|---|---|---|
| ・男女比(M：F) | 30：30 | 16：15 | 6：6 | 9：8 |
| ・平均年齢(歳) | 19.9±4.3 | 19.3±4.0 | 21.8±5.3 | 19.9±4.3 |
| ・こころのリスク項目 | 7.6±1.8 | 8.1±2.1 | 6.8±1.7 | 7.4±1.4 |
| ・STAI STAI－状態不安(総得点) | 60.0±8.7 | 60.4±9.8 | 58.4±5.0 | 58.4±7.6 |
| ・STAI－特性不安(総得点) | 65.4±9.9 | 65.5±9.0 | 62.8±9.3 | 66.9±13.4 |
| ・Beck(総得点) | 23.8±9.4 | 22.8±9.3 | 22.5±10.4 | 27.4±9.3 |

調症疑いが4名(男性1名，女性3名)であった(表2)．その他が28名(男性11名，女性17名)であり，その内訳は適応障害疑い7名，不安障害疑い4名，パーソナリティ障害疑い5名，広汎性発達障害疑い3名などであった．現在の一時的な不安を評価するSTAIの状態不安は，総得点により不安のレベルを5段階で評価するものであるが，いずれの群も5段階の中で最も高い「非常に高い」不安レベルを示した．一貫したパーソナリティ特性としての不安，すなわち普段の不安状態を評価するSTAIの特性不安においても，すべての群が「非常に高い」不安レベルを示した．BDIは総得点から「正常」～「重度の抑うつ」の4段階で評価されるが，いずれの群も「中等度抑うつ」レベルを示した．統合失調症疑い群は4名と少ないため，ARMS疑い群とその他群の平均年齢，スクリーニング検査の得点を$t$検定で比較したところ，ARMS群はその他群と比べてこころのリスク項目の得点が有意に高く($p<0.001$)，STAIの特性不安の得点においても有意に高い結果を示した($p=0.017$)(表2)．

2．こころのリスク外来

「こころのリスク外来」を受診した60名(男性30名，女性30名)の平均年齢は19.9±4.3歳であった．このうちARMSの診断基準を満たす者が31名(男性16名，女性15名)，統合失調症と診断された者が12名(男性6名，女性6名)，その他の疾患は広汎性発達障害5名，適応障害2名，スキゾイドパーソナリティ障害2名などの計17名(男性9名，女性8名)であった(表3)．各群の平均年齢には有意差を認めなかった．STAIの状態不安は，ARMS群，統合失調症群，その他の疾患群ともに「非常に高い」不安レベルを示しており，有意な群間差はなかった．また，STAIの特性不安においても，3群とも「非常に高い」不安レベルを示し，有意差はみられなかった．BDIの総得点については，ARMS群と統合失調症群で「中等度の抑うつ」レベル，その他の疾患群で「重度の抑うつ」レベルを示したが群間における有意差は認めなかった(表3)．

ARMSの判定基準を満たした31名のDSM-IV-TRによる診断を表4に示した．ARMSとしての症状のみで，DSM-IV-TRのいずれの診断基準を満たさないものが最も多く6名，次が統合失調型パーソナリティ障害の5名であった．2010年5月31日時点において31名中3名が統合失調症に移行した．2名はDSM-IV-TRの診断に該当しなかった者で，初診日から移行までの期間はそれぞれ，

表4　ARMSの判定基準を満たした31名のDSM-IV-TRによる診断(2006年10月～2010年5月の集計)

| 診断名 | 人数(名) | 統合失調症への移行(名) |
|---|---|---|
| DSM-IV-TRの診断基準を満たさない | 6 | 2 |
| 気分障害 | | |
| 大うつ病性障害 | 4 | |
| 気分変調性障害 | 3 | |
| 不安障害 | | |
| 社交不安障害 | 4 | 1 |
| 強迫性障害 | 4 | |
| 適応障害 | 3 | |
| パーソナリティ障害 | | |
| 統合失調型パーソナリティ障害 | 5 | |
| スキゾイドパーソナリティ障害 | 1 | |
| 不明(評価の途中で通院を中断) | 1 | |

25カ月，0.6カ月であった．1名は社交不安障害を伴い，移行までの期間は5カ月であった(表4)．この3名については，大学進学，送迎する家族の都合など事情は異なるものの，通院を中断していた時期に精神病症状が顕在化したことが共通する特徴としてあげられた．

2010年5月31日時点で治療を継続している者は14名，転院した者が4名，終結した者が4名，中断した者が9名である．治療継続者のうち7名が薬物療法と支持的精神療法，3名が薬物療法に認知行動療法を組み合わせた治療を受けており，4名は非薬物的な治療だけで経過観察されている．抗精神病薬を投与されているのは5名であり，いずれも少量である．今後，治療継続例，中断例，終結例の症状評価などのデータを比較検討する必要があると思われる(表5)．

ARMSとしての経過観察が必要な期間，すなわち高い発症リスクが持続する期間は明らかではないが，経過観察の期間が長いほど精神病へ移行する率が高まる[11)~17)]と考えられるため，今後も注意深く経過を追う予定である．

## まとめと今後の課題

Consultation and Support Service in Toyama (CAST)サービスの利用者の紹介経路をみると，「こころのリスク相談」にはスクールカウンセラーや精神保健福祉関係者など教育・福祉機関から紹介されることが多く，精神科医療機関の多くは「こころのリスク外来」へ紹介している．病院以外に精神病発症危険状態(at risk mental state；ARMS)の専門窓口を設置したことにより，CASTサービスへの紹介経路を広げることに成功したと考えられる．今後は保健所，学校，クリニックなど初期対応に携わる関連機関と連携し，よりアクセスしやすいサービスを提供していくことが課題である．また，心の健康センターや当科のホームページなどからリスク相談やリスク外来の情報を得て直接受診する者も少なからずいるため，さらに広報・啓発活動に力を入れていくことが重要である．また統合失調症においては，患者を支える家族に対する介入により，再発率の低下，再入院率の低下，薬物療法に対するアドヒアランスの向上などが報告されているが[18)]，ARMS患者の家族に対しても，専門知識と問題対処スキルを高めるための心理教育や問題解決アプローチの取得など，慎重な介入を充実させていくことも重要と思われる．さらに，病前の脆弱性と発症前後の生物学的変化を縦断的に検討することを通じて，顕在発症を予測する客観的指標を開発すること[19)]，前駆期により適

表5　ARMSの判定基準を満たした31名の治療内容および経過(2006年10月～2010年5月の集計)

| | 継続(n=14) | 転院(n=4) | 終結(n=4) | 中断(n=9) |
|---|---|---|---|---|
| 薬物療法＋支持的精神療法 | 7名 | 4名 | － | 1名 |
| 抗精神病薬* | 3名(192mg) | － | － | 1名(100mg) |
| その他 | 4名 | 4名 | － | － |
| 薬物療法＋認知行動療法 | 3名 | － | － | 1名 |
| 抗精神病薬* | 2名(131.5mg) | － | － | 1名(75mg) |
| その他 | 1名 | － | － | － |
| 認知行動療法のみ | 1名 | － | 1名 | 1名 |
| 支持的精神療法のみ | 3名 | － | 1名 | 4名 |
| 検査のみ | － | － | 2名 | 2名 |

*(　)内はCP(chlorpromazine)換算による1日の抗精神病薬服用量の平均

した治療法を開発することが今後の課題である．

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*Regular Article*

# Brief PANSS to assess and monitor the overall severity of schizophrenia

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*Aims:* The aim of the present study was to develop a subscale of the Positive and Negative Syndrome Scale (PANSS) that would be brief and sensitive to changes in the clinical features of schizophrenia (i.e. the Brief PANSS, or bPANSS).

*Methods:* The PANSS before and after treatment, and the Clinical Global Impression–Change (CGI-C) was rated for 714 schizophrenia patients. Of these, Clinical Global Impression–Severity (CGI-S) was also evaluated in 30 of these patients. The bPANSS items were extracted from full PANSS items based on the following aims: (i) to develop a brief scale; (ii) to develop a scale sensitive to changes resulting from antipsychotic treatment; and (iii) to reflect the broad spectrum of schizophrenia symptoms.

*Results:* The following six items were extracted to serve as the bPANSS: delusion, suspiciousness, emotional withdrawal, passive/apathetic social withdrawal, tension, and unusual thought content. The coefficients of correlation between the bPANSS and full PANSS before and after treatment were 0.86 and 0.92, respectively (both $P < 0.001$). The coefficient of correlation between the degrees of change in the scores for the bPANSS and the full PANSS was 0.93 ($P < 0.001$), and that between delta bPANSS and CGI-C was 0.73 ($P < 0.001$).

*Conclusions:* bPANSS is able to capture the overall clinical features of schizophrenia within a short assessment period.

**Key words:** Clinical Global Impression, Positive and Negative Syndrome Scale, rating scale, schizophrenia.

THE POSITIVE AND Negative Syndrome Scale (PANSS) was developed by Kay *et al.* for comprehensive assessment of the psychopathology of schizophrenia,[1] and is one of the most widely used scales for schizophrenia in both psychopharmacological studies and clinical trials. This scale consists of a total of 30 items including seven positive syndrome items, seven negative syndrome items, and 16 comprehensive pathological items, and the severity of each item is rated on a scale from 1 (none) to 7 (most severe). It takes at least 30–40 min to assess the overall schizophrenic symptoms using the PANSS.[2]

The PANSS is thus an informative rating instrument for capturing the overall psychopathology of patients with schizophrenia. For repeated evaluation, however, it may be too burdensome for both patients and clinicians. In fact, among the 30 items of the PANSS, there are several symptomatic items that do not change even after pharmacological treatment, considering the natural history of schizophrenia. The aim of the present study was therefore to develop a brief version of the PANSS (bPANSS) to complement the full PANSS.

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More specifically, in the present study, we tried to extract the least possible number of items from the original PANSS as long as, first, they retained sufficient internal consistency and reliability while reflecting the three domains of the original PANSS; second, they correlated with the overall severity of schizophrenia; and third, they were sensitive to changes in overall severity. We expected that such a scale would be useful and meaningful for the follow up of patients with schizophrenia in routine clinical practice. To our knowledge this study represents the first attempt to extract the core items from the total 30 items of the PANSS.

## METHODS

### Ethics consideration

This study was carried out after the approval of the ethics committee of Kochi University and individual attending facilities, in line with the Helsinki Declaration by the World Medical Association and the clinical research guideline defined by the ethics committee at our facilities.

### Subjects

A total of 714 patients (409 men, 305 women) were enrolled as subjects in the present study, and were diagnosed as suffering from schizophrenia based on the criteria of the DSM-IV-TR. These included 684 patients who participated in two multi-center clinical trials comparing a new atypical antipsychotic drug against a classical antipsychotic, and 30 patients who had been hospitalized and treated at Kochi Medical School Hospital. The average age of the patients was 43.8 ± 14.0 years.

### Procedure

These schizophrenia patients were evaluated using the Japanese version of the PANSS,[3,4] Clinical Global Impression–Severity (CGI-S) and CGI-Change (CGI-C).[5] Six hundred and eighty-four patients participating in clinical trials completed the PANSS at study entry and at the end of the trial, while 30 patients completed the PANSS and the CGI-S upon admission and upon discharge from hospital. Moreover, the CGI-C was also implemented at the end of treatment for all patients. The CGI assesses the overall impression of the clinical status of a patient: for the CGI-S, the overall severity of illness was evaluated in terms of seven stages: 1, normal, not at all ill; 2, borderline mentally ill; 3, mildly ill; 4, moderately ill; 5, markedly ill; 6, severely ill; and 7, most extremely ill, while for the CGI-C the degree of change in amelioration was assessed as: 1, very much improved; 2, much improved; 3, minimally improved; 4, no change; 5, minimally worse; 6, much worse; and 7, very much worse.

### Extraction of the items for bPANSS

To extract the items for the bPANSS from the total 30 items of the PANSS, the following criteria were adopted: (i) to develop a scale that would be sensitive to changes resulting from antipsychotic treatment, extracting items with higher Spearman's rank correlation coefficient with the CGI-C as priorities; (ii) to develop a brief scale that can be completed within 10 min (requiring that items be excluded for which the coefficients of correlation with the CGI-S were significantly low, subsequently, no more than eight items were to be extracted from the total 30 items of the PANSS); and (iii) to select at least two items individually from the three domains (positive symptoms, negative symptoms, and comprehensive pathological scales) of the full PANSS to sufficiently reflect the profiles of schizophrenia. The extraction of the bPANSS items was conducted based on the consensus of all authors.

### Validation of the bPANSS

Internal consistency of the bPANSS was examined by calculating the Cronbach's alpha. Concurrent validity of the bPANSS was examined by comparing it with the full PANSS according to the whole subjects and the individual subtypes of schizophrenia.

### Statistical analysis

Statistical analysis was performed using SPSS version 16.0J (SPSS, Tokyo, Japan). For each item of the PANSS, the Spearman's rank correlation coefficients were calculated between the total PANSS score and CGI-S at two points: at study entry and at the end of treatment. Rank correlation coefficients were also calculated between the change in each item of the PANSS between study entry and the end of treatment and the CGI-C.

## RESULTS

### Patient characteristics

Table 1 lists the baseline demographic and clinical characteristics of the patients. The average total PANSS score was 85.1 ± 19.2 at study entry and 74.8 ± 22.8 at the end of treatment. The average CGI-S score was 4.8 ± 1.0 at study entry and 4.0 ± 1.2 at the end of treatment. The average CGI-C score was 2.8 ± 1.4 at the end of treatment.

### Item extraction

Table 2 lists Spearman's rank correlation coefficients between individual PANSS items and the CGI-S at study entry and at the end of treatment, as well as those between changes in each PANSS item score and the CGI-C. Based on the aforementioned selection criteria, a number of items were extracted from the 30 items of the PANSS.

From among the items related to the positive syndrome scale, two items, P1 delusion, and P6 suspiciousness, were selected. These were the top two items with the highest Spearman's rank correlation coefficients relative to the CGI-C, and were considered to be appropriate because their coefficients of rank correlation between the total PANSS score and the CGI-S were maintained to a certain degree. From among the items related to the negative syndrome scale, N2 emotional withdrawal, and N4 passive/apathetic social withdrawal were selected. These were also the top two items having the highest Spearman's rank correlation coefficient relative to the CGI-C, and their coefficients of rank correlation with the CGI-S were also satisfactory. From the comprehensive pathological scale, G4 tension, and G9 unusual thought content, were selected, for reasons similar to those for selection of items from among the positive syndrome scale and the negative syndrome scale. The Spearman's rank correlation coefficient with the CGI-C for G2 anxiety was as high as those for G4 and G9, but the rank correlation coefficient with the CGI-S was only 0.27 at the end of treatment and 0.13 at study entry. Therefore, G2 was not adopted. Based on these considerations, a total of six items (P1, P6, N2, N4, G4, and G9) were therefore extracted as items for the bPANSS.

Table 1. Baseline patient characteristics (mean ± SD)

| | |
|---|---|
| Age (years) | 43.8 ± 14.0 |
| Sex | Male 409, Female 305 |
| Total PANSS score at study entry | 85.1 ± 19.2 |
| Total PANSS score at end of treatment | 74.8 ± 22.8 |
| CGI-S at study entry | 4.8 ± 1.0 |
| CGI-S at end of treatment | 4.0 ± 1.2 |
| CGI-C | 2.8 ± 1.4 |
| Subtypes of schizophrenia | |
| Paranoid type | 249 |
| Disorganized type | 178 |
| Catatonic type | 29 |
| Residual type | 170 |
| Unknown | 88 |

CGI-C, Clinical Global Impression-Change; CGI-S, Clinical Global Impression-Severity; PANSS, Positive and Negative Syndrome Scale.

### Internal consistency of the brief PANSS

The Cronbach's alpha for the bPANSS was 0.67 at study entry and 0.80 at the end of treatment. If we excluded any one of the six items, the Cronbach's alpha was always lower (Table 3).

### Concurrent validity of the brief PANSS

The coefficient of correlation between the bPANSS and the full PANSS was 0.86 at study entry and 0.92 at the end of treatment (both $P < 0.001$), and that between the bPANSS and the CGI-S was 0.64 at study entry and 0.84 at the end of treatment (both $P < 0.001$). Similarly, the coefficient of correlation between the degree of change in the bPANSS score between study entry and the end of treatment (delta bPANSS) and that of the full PANSS score (delta total PANSS) was 0.93 ($P < 0.001$), while delta bPANSS and CGI-C was 0.73 ($P < 0.001$).

### Concurrent validity by schizophrenia subtype

A total of 626 of the 714 subjects for whom the subtypes of schizophrenia had been diagnosed were analyzed. These subjects consisted of 249 with the paranoid type, 178 with the disorganized type, 29 with the catatonic type, and 170 with the residual type. The coefficients of correlation between the bPANSS and the full PANSS, delta bPANSS and delta total PANSS, and delta bPANSS and CGI-C versus subtypes are shown in Table 4. All of these correla-

Table 2. Correlation coefficients

| Item | With CGI-S (at study entry) | With CGI-S (at end of treatment) | Changes with CGI-C |
|---|---|---|---|
| Positive Syndrome Scale | | | |
| **P1: Delusion** | 0.29 | 0.59** | 0.53** |
| P2: Conceptual disorganization | 0.51** | 0.70** | 0.50** |
| P3: Hallucinatory behavior | 0.69** | 0.68** | 0.48** |
| P4: Excitement | 0.62** | 0.75** | 0.45** |
| P5: Grandiosity | 0.60** | 0.36* | 0.24** |
| **P6: Suspiciousness** | 0.40* | 0.58** | 0.55** |
| P7: Hostility | 0.70** | 0.55** | 0.41** |
| Negative Syndrome Scale | | | |
| N1: Blunted affect | 0.27 | 0.65** | 0.37** |
| **N2: Emotional withdrawal** | 0.29 | 0.57** | 0.46** |
| N3: Poor rapport | 0.43* | 0.71** | 0.40** |
| **N4: Passive/apathetic social withdrawal** | 0.38* | 0.56** | 0.46** |
| N5: Difficulty in abstract thinking | 0.18 | 0.56** | 0.34** |
| N6: Lack of spontaneity and flow of conversation | 0.48** | 0.41* | 0.35** |
| N7: Stereotyped thinking | 0.05 | 0.32 | 0.40** |
| General Pathological Syndrome Scale | | | |
| G1: Somatic concern | 0.09 | 0.11 | 0.37** |
| G2: Anxiety | 0.13 | 0.27 | 0.55* |
| G3: Guilt feeling | −0.03 | 0.31 | 0.32** |
| **G4: Tension** | 0.31 | 0.23 | 0.56** |
| G5: Mannerisms and posturing | 0.36 | 0.53** | 0.43** |
| G6: Depression | −0.02 | 0.17 | 0.39** |
| G7: Motor retardation | 0.25 | 0.41* | 0.37** |
| G8: Uncooperativeness | 0.36 | 0.62** | 0.48** |
| **G9: Unusual thought content** | 0.26 | 0.59** | 0.55** |
| G10: Disorientation | 0.49** | 0.38* | 0.20** |
| G11: Poor attention | 0.3 | 0.50** | 0.40** |
| G12: Lack of judgment and insight | 0.52** | 0.53** | 0.48** |
| G13: Disturbance of volition | 0.51** | 0.48** | 0.38** |
| G14: Poor impulse control | 0.37* | 0.41* | 0.40** |
| G15: Preoccupation | 0.27 | 0.49* | 0.40** |
| G16: Active social avoidance | 0.45* | 0.56** | 0.42** |

*$P < 0.05$; **$P < 0.01$.
Bold, extracted item.
CGI-C, Clinical Global Impression–Change; CGI-S, Clinical Global Impression–Severity.

tion coefficients had satisfactorily high values and were highly significant ($P < 0.01$).

## DISCUSSION

The bPANSS, consisting of six items selected from the 30 items of the full PANSS, showed a high correlation with the full PANSS score, being 0.86 at study entry and 0.92 at the end of treatment. Also, the correlation between delta bPANSS and delta total PANSS was 0.93 ($P < 0.001$), while that between delta bPANSS and CGI-C was 0.73 ($P < 0.001$). Furthermore, the correlation between bPANSS and CGI-S was 0.64 at study entry and 0.84 at the end of treatment (both $P < 0.001$). Considering that it takes a short time to complete the six items, it is believed that the requirements of the bPANSS, which is sensitive to changes in psychotic manifestations and also reflects the profile of schizophrenia to a certain extent, have been satisfied.

Attempts to select several items from among the existing clinical rating scales for certain purposes

Table 3. Internal consistency of the brief PANSS (Cronbach's alpha)

| Items | Study entry | End of treatment |
|---|---|---|
| P1, P6, N2, N4, G4, G9 | 0.67 | 0.80 |
| P6, N2, N4, G4, G9 | 0.59 | 0.76 |
| P1, N2, N4, G4, G9 | 0.59 | 0.76 |
| P1, P6, N2, G4, G9 | 0.65 | 0.78 |
| P1, P6, N4, G4, G9 | 0.66 | 0.78 |
| P1, P6, N2, N4, G9 | 0.63 | 0.79 |
| P1, P6, N2, N4, G4 | 0.61 | 0.76 |

PANSS, Positive and Negative Syndrome Scale.

have been reported for a number of scales. For example, Montgomery and Asberg developed the Montgomery and Asberg Depression Rating Scale,[6] which is a representative rating scale for depression consisting of 10 items selected from the Comprehensive Psychopathologic Rating Scale (CPRS), which contains 67 items in all: 40 items for subjective psychopathological symptoms, 25 items for objective psychopathological symptoms, and two items for global rating and assumed reliability.[7] For schizophrenia they also selected 12 items that were the most sensitive to changes resulting from treatment, and they subsequently proposed an acute schizophrenia rating scale (brief CPRS) that was more sensitive to therapeutic response than the Brief Psychiatric Rating Scale.[8]

The six items in the bPANSS and the 12 items in the brief CPRS are shown in Table 5. Ten of the 12 items are related to subjective pathological symptoms in the brief CPRS. This appears to be because the items that respond readily to treatment, such as hallucination and delusion, tend to be measured mainly as subjective pathological symptoms, and the balance of the number of items representing subjective pathological symptoms and objective pathological symptoms is not taken into consideration. In contrast, the items in the bPANSS have been selected from the three psychopathology domains of the original PANSS in a balanced manner. Considering that the correlations of the two selected items within the individual three domains are relatively high ($r = 0.517$–$0.685$), it may be possible to simply select three items instead of six.

Andreasen *et al.* extracted eight of the 30 items of the whole PANSS in order to define remission from

Table 5. Brief PANSS vs brief CPRS

| Brief PANSS | Brief CPRS |
|---|---|
| Positive Syndrome Scale | Subjective items |
| P1. Delusion | 1. Sadness |
| P6. Suspiciousness | 5. Inability to feel |
| | 6. Pessimistic thoughts |
| Negative syndrome scale | 28. Depersonalization |
| N2. Emotional withdrawal | 29. Feeling controlled |
| N4. Passive/apathetic social withdrawal | 30. Disrupted thoughts |
| | 31. Ideas of persecution |
| General Pathological Syndrome Scale | 33. Delusional mood |
| G4. Tension | 36. Other delusions |
| G9. Unusual thought content | 37. Commenting voices |
| | Objective items |
| | 45. Lack of appropriate emotion |
| | 50. Perplexity |

CPRS, Comprehensive Psychopathological Rating Scale; PANSS, Positive and Negative Syndrome Scale.

Table 4. Concurrent validity vs schizophrenia subtype

| | | Correlation coefficient | | | |
|---|---|---|---|---|---|
| Subtype | Subjects ($n$) | bPANSS and total PANSS at study entry | bPANSS and total PANSS at end of treatment | delta bPANSS and delta total PANSS | delta bPANSS and CGI-C |
| Paranoid | 249 | 0.86** | 0.93** | 0.93** | 0.78** |
| Disorganized | 178 | 0.88** | 0.93** | 0.92** | 0.70** |
| Catatonic | 29 | 0.94** | 0.96** | 0.92** | 0.72** |
| Residual | 170 | 0.86** | 0.90** | 0.93** | 0.64** |

**$P < 0.01$.

delta bPANSS, degree of change in the brief PANSS score between study entry and end of treatment; PANSS, Positive and Negative Syndrome Scale.

schizophrenia.[9] A total of three items, delusion (P1), passive/apathetic social withdrawal (N4), and unusual thought (G9), overlapped with those currently selected for the bPANSS. These three items are considered to be essentially important for evaluating both remission from schizophrenia and the response to antipsychotic drugs.

Possible limitations of the present study may include the following. First, most of the study subjects were patients enrolled in two multi-center active-drug-controlled clinical trials of a new atypical antipsychotic drug, for whom CGI-S was not evaluated. In other words, we placed more emphasis on the bPANSS to reflect longitudinal changes in psychopathology, rather than reflecting the cross-sectional severity of schizophrenia. Second, all the subjects were receiving active treatment, and therefore changes due to treatment were unable to be differentiated from those due to the natural course of the disorder.

In contrast, the strengths of the bPANSS may be summarized as follows. First, it is brief and therefore exceedingly less burdensome for both patients and clinicians than the full PANSS. Second, it still covers the three broad domains of psychopathology represented by the original scale in a balanced manner. Third, it has high internal consistency reliability. Fourth, the bPANSS shows satisfactory concurrent validity with the full PANSS and the CGI-S for any of the schizophrenia subtypes. Fifth, the bPANSS is sensitive to changes resulting from treatment.

We therefore conclude that the bPANSS is a useful rating instrument that is easy to administer within a short time and is sensitive to changes in the overall clinical features of schizophrenia. One recommended practical application of the scales would be to administer the full PANSS at baseline and then at extended intervals to gain a comprehensive picture of the psychopathology, while in the meantime repeatedly monitoring the changes in the patients using the bPANSS.

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# Psychotic-like experiences are associated with suicidal feelings and deliberate self-harm behaviors in adolescents aged 12–15 years

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

**Objective:** Psychotic disorders are a significant risk factor for suicide, especially among young people. Psychotic-like experiences (PLEs) in the general population may share an etiological background with psychotic disorders. Therefore, the present study examined the association between PLEs and risk of suicide in a community sample of adolescents.
**Method:** Psychotic-like experiences, suicidal feelings, and self-harm behaviors were studied using a self-report questionnaire administered to 5073 Japanese adolescents. Depression and anxiety were evaluated using the 12-item General Health Questionnaire (GHQ).
**Results:** The presence of PLEs was significantly associated with suicidal feelings (OR = 3.1, 95% CI = 2.2–4.5) and deliberate self-harm behaviors (OR = 3.1, 95% CI = 2.0–4.8) after controlling for the effects of age, gender, GHQ-12 score, victimization, and substance use. Suicidal feelings and behaviors were more prevalent in subjects with a greater number of PLEs.
**Conclusion:** Psychotic-like experiences may increase the risk of suicidal problems among adolescents.

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Key words: psychotic-like experiences; adolescents; community sample; suicide; self-harm behaviors

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**Significant outcomes**

- Psychotic-like experiences are associated with suicidal feelings and deliberate self-harm behaviors among adolescents aged 12–15 years.
- Suicidal feelings and deliberate self-harm behaviors are more prevalent in subjects with a greater number of psychotic-like experiences.

**Limitations**

- This is a cross-sectional study and subjects were recruited from public schools.
- A self-report questionnaire was used to assess the psychotic-like experiences, suicidal feelings, and self-harm behaviors.
- There was a lack of data about confounding factors, such as individual personality and family circumstances.

## Introduction

Risk of suicide is significantly higher for subjects with psychotic disorders when compared to the general population (1, 2). The risk is even more pronounced during the early phase of the disorders (2, 3), with two-thirds of suicides occurring during the first 5 years after diagnosis (4, 5). As the onset of first episode of psychosis usually occurs in young people (6), the risk of suicide may be especially remarkable in young people with the disorders (7, 8).

Psychotic-like experiences (PLEs) are subclinical hallucinatory and delusional experiences. PLEs occur not only in persons with psychotic disorders but also in people in the community who may not have been clinically diagnosed with psychoses (9–11). It may be reasonable to suspect that PLEs might share an etiological background with psychotic disorders (9, 10, 12, 13). Previous epidemiologic studies have reported that PLEs were observed in more than 10% of the general population of adults (10, 11, 13). Although PLEs were originally studied in adult populations (10, 11), recent investigations suggest that PLEs may also frequently occur in children and adolescents (14–17). In longitudinal studies, PLEs in childhood and adolescence were identified as a risk factor for later psychiatric disorders and poor psychosocial outcomes (18, 19). There are few studies that have investigated the relationship of PLEs and the risk for suicide among young people in the community.

### Aims of the study

The present study thus aimed to examine the associations of psychotic-like experiences (PLEs) with suicidal feelings and deliberate self-harm behaviors in a large community sample of adolescents.

## Material and methods

### Sample and survey procedures

In 2006, we recruited subjects (ages 12–15 years) from public junior high schools (7th–9th grade) and conducted a cross-sectional survey of psychopathologies among younger adolescents in Tsu-city, Mie Prefecture, Japan (16). Mie Prefecture is located in the central region of Japan, and Tsu-city is the prefectural capital. The total population of Tsu-city is approximately 280 000. There are 20 public junior high schools (with a total of 7127 students at the time of the survey) and attendance is compulsory, in accordance with Japanese law.

After the study was approved by the ethics committee of Mie University School of Medicine, the principal investigators (A.N. & Y.O.) approached the school principals about participation in the study. The principals then consulted with teachers and parents.

In the participating schools, the teachers were instructed on the guidelines for distribution and collection of questionnaires; then the teachers distributed the questionnaires and the envelopes to the students. The teachers also explained: i) that participation in the study was anonymous and voluntary, and ii) that strict confidentiality would be maintained. In addition, the students were asked to seal the completed questionnaire in the provided envelope. Each teacher also reported the total number of present and absent students (including those students who had been absent for more than a month) on the day of the survey. Research staff collected the sealed questionnaires at each school.

### Measures

The questionnaires included items regarding the following: i) psychopathological and behavioral problems including PLEs, suicidal feelings and deliberate self-harm behaviors; ii) the Japanese version of the 12-item General Health Questionnaire (GHQ-12); and iii) other variables, including demographic characteristics. An expert in child and adolescent psychologist (N.K) and three schoolteachers (including a Japanese language teacher) from the participating schools examined the questions for age appropriate language and reading comprehension.

### Psychotic-like experiences

Psychotic-like experiences were assessed using four items adopted from the schizophrenia section of the Diagnostic Interview Schedule for Children (DISC-C) (20). These items were previously used in a birth cohort study and were good predictors of schizophreniform disorder in adulthood (18). The items were as follows: i) 'Some people believe that their thoughts can be read. Have other people ever read your thoughts?' (thoughts read); ii) 'Have you ever had messages sent especially to you through the television or radio?' (special messages); iii) 'Have you ever thought that people are following you or spying on you?' (spied-upon); and iv) 'Have you ever heard voices that other people cannot hear?' (heard voices). Possible responses included: 'no', 'yes, likely' and 'yes, definitely'. We defined 'yes, definitely' as the presence of a hallucinatory and delusional experience and 'no' or 'yes, likely' as

no experience. The number of present experiences was designated as the 'total PLEs score', with a range of 0–4.

### Suicidal feelings and deliberate self-harm behaviors

Questions about lifetime experiences of suicidal feelings and deliberate self-harm behaviors in the previous year were included in the questionnaire. The item I – 'Have you ever had thoughts that your life is no longer worth living?', included four possible responses ('no', 'probably no', 'possibly yes' and 'yes') (21), and the item II – 'Have you intentionally hurt yourself within the past year?', included two possible responses ('yes' or 'no').

### The GHQ-12

The GHQ-12 is one of the most widely used self-report screening tools for non-psychotic psychiatric symptoms, particularly symptoms of anxiety or depression (22). The validity and reliability of the Japanese version of the GHQ-12 have been confirmed (23, 24). The GHQ was originally applied to adult populations and subsequently used and validated for younger populations (25–28). 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 from 0 (best possible) to 12 (worst possible).

### Other variables

Suicidal problems among young populations might be affected by other confounding factors, such as victimization and substance use, as reported in previous studies (29–32). In our questionnaire, we asked the participants about the experiences of being bullied (within the past year), violence from adults in the home (within the past month), alcohol use (within the past month), and use of recreational drugs (lifetime). The items on victimization ('being bullied' and 'violence from adults in the home') were answered as 'yes' or 'no'. The items on alcohol use and use of recreational drugs were answered as 'not at all' or 'once or more than once'.

### Statistical analysis

Associations between PLEs and the lifetime experience of suicidal feelings or deliberate self-harm behaviors in the previous year were analyzed using 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 use of recreational drugs). 'Suicidal feelings' or 'deliberate self-harm behaviors' were the dependent variables.

Associations between each of the four PLEs (thoughts read, special messages, spied-upon, heard voices), and suicidal feelings or self-harm behaviors were tested by comparing individuals with each PLE to those without that type of PLEs. In addition, the effect of the total PLEs score was tested. Regarding the total PLEs score, scores of 3 and 4 were merged, and the subjects were classified into three subgroups according to Lataster et al. (33): 'no PLEs', '1 PLE' and '2 or more PLEs' groups. For the item about suicidal feelings, the responses on a 4-point scale, were converted into binary scoring (0001) when employed as a dependent variable in logistic regression.

All statistical analyzes were conducted using the Statistical Package for Social Sciences (SPSS), version 15.0 for Windows (SPSS Japan Inc., Tokyo, Japan). A $P$-value $< 0.05$ was considered statistically significant.

## Results

### Descriptive statistics

Fourteen out of the 20 public junior high schools in Tsu-city, with a total of 5335 students, agreed to participate in the survey. On the day of the survey, 205 students (3.8%) were absent (57/205 were long-term absentees); 18 (0.3%) refused to participate; 16 (0.3%) submitted blank questionnaires; and 23 (0.4%) gave all 'yes' answers (apparently frivolous). There were 179 (out of 5073) questionnaires missing data for critical items (PLEs, suicidal feelings, deliberate self-harm behaviors, sex, and age). Finally, we analyzed 4894 questionnaires which represented 92.1% of all junior high school students in the 14 participating schools. The demographics included: students aged 12–15 years [2523 boys (51.6%) and 2371 girls (48.4%), age: 13.3 ± 0.9 years (mean ± SD)]. Table 1 summarizes the GHQ-12 scores for the students by grade. The mean GHQ-12 scores were higher in the upper grades (Table 1).

### Prevalence of PLEs, suicidal feelings, and deliberate self-harm behaviors

The prevalence of the four PLEs was as follows: 'thoughts read' was observed in 76 subjects (1.6%), 'special messages' in 33 (0.7%), 'spied-upon' in 363 (7.4%), and 'heard voices' in 487 (10.0%). The experience of at least one type of PLE was reported by 746 (15.2%); 182 students (3.7%) experienced

two or more symptoms of PLEs. The experience of lifetime suicidal feelings was observed in 908 (18.6%; 337 boys and 571 girls), while the experience of deliberate self-harm behaviors in the previous year was reported by 250 (5.1%; 75 boys and 175 girls).

### Associations between PLEs and suicidal feelings/deliberate self-harm behaviors

The effect of each of the four PLEs was analyzed by logistic regression. After controlling for age, sex, non-psychotic psychiatric symptoms (the GHQ-12 score), victimization, and substance use; suicidal feelings were significantly associated with 'thoughts read', 'spied-upon', and 'heard voices' (Table 2). Deliberate self-harm behaviors were significantly associated with 'spied-upon' and 'heard voices' (Table 3).

The total PLEs score was significantly associated with suicidal feelings and deliberate self-harm behaviors, indicating that suicidal feelings and behaviors were more prevalent in subjects with a greater number of PLEs (Tables 4 and 5).

## Discussion

The current study is the first to investigate and clearly show that PLEs are significantly associated with suicide-related problems in a community sample of younger adolescents. The risk of suicidal feelings and deliberate self-harm behaviors increases when more types of PLEs are experienced. The subjects experienced two or more types

Table 1. Demographic variables, mean General Health Questionnaire (GHQ-12) scores by school grade ($n$ = 4894: males, 2523; females, 2371)

| | No. subjects | | | Age | GHQ-12 score | |
|---|---|---|---|---|---|---|
| School grade | All | Male (%) | Female (%) | Mean | Mean | SD |
| Grade 7 | 1580 | 831 (52.6) | 749 (47.4) | 12.30 | 2.72 | 2.61 |
| Grade 8 | 1645 | 842 (51.2) | 803 (48.8) | 13.29 | 3.15 | 2.79 |
| Grade 9 | 1669 | 850 (50.9) | 819 (49.1) | 14.31 | 3.70 | 2.93 |
| Overall | 4894 | 2523 (51.6) | 2371 (48.4) | 13.32 | 3.20 | 2.81 |

Table 2. Associations between suicidal feelings and 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% CI | $P$-value | OR† | 95% CI | $P$-value |
| Thoughts read ($n$ = 76) | 33 | 43.42 | 3.45 | 2.18–5.46 | <0.001 | 2.47 | 1.40–4.34 | 0.002 |
| Special messages ($n$ = 33) | 12 | 36.36 | 2.52 | 1.24–5.14 | 0.011 | 1.93 | 0.83–4.47 | 0.127 |
| Spied-upon ($n$ = 363) | 173 | 47.66 | 4.69 | 3.76–5.84 | <0.001 | 2.44 | 1.87–3.18 | <0.001 |
| Hearing voices ($n$ = 487) | 203 | 41.68 | 3.74 | 3.07–4.56 | <0.001 | 2.26 | 1.79–2.87 | <0.001 |

*The number of individuals with the lifetime experience of suicidal feelings among those with each PLE.
†Odds ratio comparing the groups with and without PLE.
‡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 3. Associations between deliberate self-harm behaviors and 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 |
| Thoughts read ($n$ = 76) | 10 | 13.15 | 2.88 | 1.47–5.69 | 0.002 | 1.56 | 0.71–3.43 | 0.267 |
| Special messages ($n$ = 33) | 4 | 12.12 | 2.59 | 0.90–7.42 | 0.077 | 1.62 | 0.48–5.50 | 0.439 |
| Spied-upon ($n$ = 363) | 60 | 16.53 | 4.52 | 3.31–6.18 | <0.001 | 1.93 | 1.34–2,77 | <0.001 |
| Hearing voices ($n$ = 487) | 74 | 15.26 | 4.33 | 3.24 –5.78 | <0.001 | 2.32 | 1.67–3.22 | <0.001 |

*The number of individuals with the experience of deliberate self-harm behaviors in the previous year among those with each PLE.
†Odds ratio comparing the groups with and without PLE.
‡Odds ratio adjusted for age, 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.