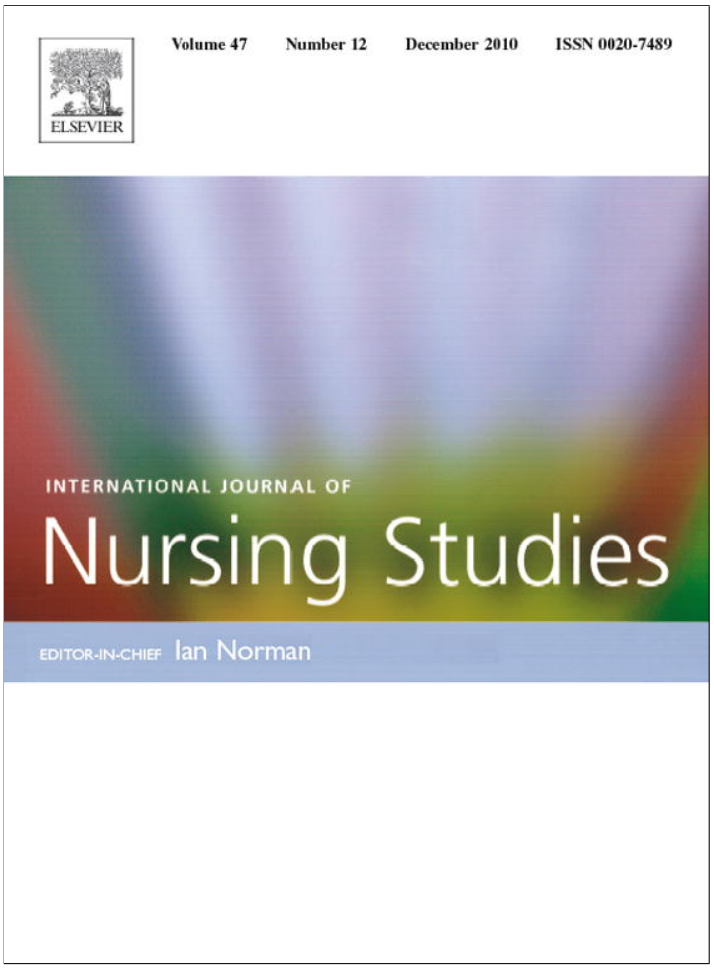
Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.




This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

http://www.elsevier.com/copyright

Author's personal copy

International Journal of Nursing Studies 47 (2010) 1535–1544

Contents lists available at ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/ijns

# Sensitivity and specificity of the Chinese version of the Schizotypal Personality Questionnaire-Brief for identifying undergraduate students susceptible to psychosis

Wei-Fen Ma [a,*], Po-Lun Wu [b], Shu-Ju Yang [b], Kuang-Fu Cheng [c], Hsien-Tsai Chiu [c], Hsien-Yuan Lane [d]

[a] School of Nursing and Nursing Department, China Medical University and Hospital, 91, Hsueh-Shih Road, Taichung 40402, Taiwan
[b] Department of Psychiatry, China Medical University Hospital, Taichung, Taiwan
[c] College of Health Care, Biostatistic and Bioinformatics Center, China Medical University, Taichung, Taiwan
[d] Institute of Clinical Medical Science and Department of Psychiatry, Medical College, China Medical University and Hospital, Taichung, Taiwan

ARTICLE INFO

*Article history:*
Received 17 August 2009
Received in revised form 7 May 2010
Accepted 15 May 2010

*Keywords:*
Chinese version Schizotypal Personality Questionnaire-Brief
Psychosis
Screen
Sensitivity
Specificity

ABSTRACT

*Background:* Early interventions can improve treatment outcomes for individuals with major psychiatric disorders and with nonspecific symptoms but increasingly impaired cognitive perception, emotions, and behaviour. One way used to identify people susceptible to psychosis is through the schizotypal personality trait. Persons with schizotypal characteristics have been identified with the widely used Schizotypal Personality Questionnaire-Brief. However, no suitable instruments are available to screen individuals in the Taiwanese population for evidence of early psychotic symptoms.
*Objectives:* The purpose of this study was to test the sensitivity and specificity of the Chinese version of the Schizotypal Personality Questionnaire-Brief for identifying undergraduate students' susceptibility to psychosis.
*Design:* Two-stage, cross-sectional survey design.
*Setting and participants:* The self-administered scale was tested in a convenience sample of 618 undergraduate students at a medical university in Taiwan. Among these students, 54 completed the scale 2 weeks apart for test–retest reliability, and 80 were tested to identify their susceptibility to psychosis.
*Data collection and analysis:* In Stage I, participants with scores in the top 6.5% were classified as the high-score group ($n = 40$). The control group ($n = 40$) was randomly selected from the remaining participants with scores $<15$ and matched by gender. These 80 students were asked to participate in psychiatric interviews in Stage II. The instrument was tested for reliability using intraclass correlation coefficients and the Kuder-Richardson formula 20. The instrument was analysed for optimal sensitivity and specificity using odds-ratio analysis and receiver operating characteristic curves.
*Results:* The 22-item Chinese version of the Schizotypal Personality Questionnaire-Brief had a 2-week test–retest reliability of 0.82 and internal consistency of 0.76. The optimal cut-off score was 17, with odds ratios of 24.4 and an area under the receiver operating characteristic curves of 0.83. The instrument had a sensitivity of 80.0% and specificity of 85.9% in identifying undergraduate students' susceptibility to psychosis.
*Conclusions:* The Chinese version Schizotypal Personality Questionnaire-Brief is a reliable instrument, but should not be used as a screening tool until its psychometric properties

* Corresponding author. Tel.: +886 4 22053366 7107; fax: +886 4 22053748.
*E-mail addresses:* lhdaisy@mail.cmu.edu.tw (W.-F. Ma), bernardwu71@yahoo.com.tw (P.-L. Wu), baosieax@yahoo.com.tw (S.-J. Yang), kfcheng@mail.cmu.edu.tw (K.-F. Cheng), biostat@mail.cmu.edu.tw (H.-T. Chiu), hylane@gmail.com (H.-Y. Lane).

0020-7489/$ – see front matter © 2010 Published by Elsevier Ltd.
doi:10.1016/j.ijnurstu.2010.05.010

Author's personal copy



have been evaluated in more detail. Other screening tools need to be used in future studies with the CSPQ-B to improve the accuracy of identifying susceptibility to psychosis among young adults.

© 2010 Published by Elsevier Ltd.

**What is already known about the topic?**

- Early interventions may alter the natural course of mental diseases and improve treatment outcomes.
- Schizotypal personality trait is one way that has been used to identify susceptibility to psychosis among adolescents and young adults.
- The Schizotypal Personality Questionnaire-Brief has been used to identify Western populations with schizotypal characteristics, but no suitable instrument exists for screening individuals with schizotypal characteristics in Taiwanese populations.

**What this paper adds**

- The optimal cut-off score of the Chinese version Schizotypal Personality Questionnaire-Brief is 17 with a sensitivity of 80.0% and a specificity of 85.9% for identifying susceptibility to psychosis among undergraduate medical students.
- The Chinese version of the Schizotypal Personality Questionnaire-Brief is a reliable self-report instrument, but not valid for identifying susceptibility to psychosis among Taiwanese undergraduate medical students.

## 1. Introduction

The prevalence of any major psychiatric disorder in Taiwan in survey claims data from Taiwan's National Health Insurance programme was 1.37% (Chien et al., 2004). Before specific psychotic symptoms appear, individuals may experience a period of nonspecific symptoms and growing functional impairment (Yung, 2003), characterised by changes in cognitive perception, emotion, and behaviours (Addington, 2003). For schizophrenia, these changes are shown in personality, mood, behaviour, hygiene, and social withdrawal (Miller et al., 1999; Corcoran et al., 2003). The features of symptoms may also include sleep disturbance, anxiety, social withdrawal, reduced concentration and attention, and depressed mood (Mental Health Evaluation and Community Consultation Unit, 2010), mental states that may characterise individuals at high risk for developing psychosis.

This set of prepsychotic changes may persist for up to 5 years before a clinical diagnosis is made (Yung et al., 2003). Most of the disability produced by psychotic illness develops during the prepsychotic period (Yung and McGorry, 1996; McGorry et al., 2002). Early interventions in this prepsychotic phase could prevent or delay the onset of mental disease, alter the natural course of disease (Yung et al., 1998; McGorry et al., 2002), and improve treatment outcomes (Häfner et al., 2004; Phillips et al., 2005). Finding individuals in the early phase of psychosis is the first step to help them engage in the health service system. Since the peak incidence of illness onset occurs in adolescents and young adults (20–30 years) (Hafner et al., 1994), symptoms of early phase of psychosis should be screened among unselected populations of adolescents or young adults. However, no suitable instruments are available to screen individuals in the general Taiwanese population for evidence of early psychotic symptoms.

The term 'ultra high risk' (Yung et al., 2003) refers to individuals who present subthreshold symptoms that can be regarded as potential risk factors for psychosis, but that psychosis may not convert to full psychosis. Diagnosis of ultra-high-risk status is based on three criteria: attenuated positive symptom syndrome, brief intermittent psychotic syndrome, and genetic risk and recent deterioration syndrome (Yung et al., 2006). These criteria have been used to define three sample groups: one with attenuated psychotic symptoms, one with brief limited intermittent psychotic symptoms, and one with trait and state risk factors, including schizotypal personality disorder (Yung et al., 2003, 2004). This third criterion of ultra high risk was used in the present study to screen young adults' susceptibility to psychosis by identifying them with schizotypal personality trait.

Since schizotypal personality disorder shares some attenuated phenotypic features with the early stage of full psychotic disorders, measures of these two constructs overlap, including perceptual distortion, magical ideation, interpersonal deficits, and odd or eccentric behaviour (Bedwell and Donnelly, 2005; Seeber and Cadenhead, 2005). These features were assessed in this study using the Schizotypal Personality Questionnaire-Brief (SPQ-B, Raine and Benishay, 1995), a convenient self-report instrument. The SPQ-B is a self-administered scale including 22 dichotomous items to assess three dimensions: cognitive-perceptual deficits (8 items), interpersonal deficits (8 items), and disorganisation (6 items). The SPQ-B takes only 2 min to complete (Raine and Benishay, 1995), making it easy to screen for schizotypal personality trait in large community-based samples. Moreover, the SPQ-B has been suggested for use as a screening tool to detect vulnerability to the development of schizophrenia-spectrum disorders among adolescents in the general population (Fonseca-Pedrero et al., 2009).

The SPQ-B has demonstrated adequate reliability and validity (Raine and Benishay, 1995). Higher SPQ-B scores indicate greater cognitive-perceptual deficits, greater interpersonal deficits, and greater disorganisation (Raine and Benishay, 1995). The 2-month test–retest reliabilities for the three subscales ranged from 0.86 to 0.95 among 31 undergraduate students (Raine and Benishay, 1995). The internal reliabilities of these subscales ranged from 0.72 to 0.80 (Cronbach's alphas) among 220 students (Raine and

Author's personal copy



Benishay, 1995) and from 0.69 to 0.77 among 825 undergraduate students (Compton et al., 2009). The Kuder-Richardson formula 20 (KR-20) ranged from 0.73 to 0.64 among 54 participants whose biological relatives had a clinical psychotic disorders (Compton et al., 2007).

Regarding evidence for SPQ-B validity, its construct validity has been supported, e.g., in a sample of 2108 undergraduates (Jahshan and Sergi, 2007). The SPQ-B was found to have a 3-factor structure that explained 35% of the variance in 443 college students in Spain (Mata et al., 2005). However, the 3-factor model for the SPQ-B failed to meet criteria for good fit in another study of 825 students (Compton et al., 2009).

The robustness of the SPQ-B has a few unresolved issues. One is the criterion validity of the 'disorganisation' subscale, which has been shown in some studies (Compton et al., 2007) to be unsatisfactory. To avoid this problem, Compton et al. (2007) suggested using total SPQ-B scores rather than subscale scores. Another unresolved issue is that neither the cut-off score nor the sensitivity and specificity of the SPQ-B are known for identifying young adults' susceptibility to psychosis. Thus, the purpose of this study was to translate the SPQ-B into Chinese (CSPQ-B) and to test its cut-off score, sensitivity, and specificity for identifying susceptibility to psychosis among undergraduate Taiwanese students.

## 2. Methods

### 2.1. Design and participants

A two-stage, cross-sectional survey design was used to test the CSPQ-B. In Stage I, participants completed the self-report CSPQ-B. In Stage II, participants' CSPQ-B scores were used to select top-scoring candidates for psychiatric interviews. The participants were recruited by convenience from second-year undergraduate students at a medical university in Taiwan by distributing questionnaires in classes. Criteria for inclusion in the study were (1) age 18–35 years old, (2) ability to verbally communicate, and (3) consent to participate. Of 650 undergraduate students who agreed to participate and returned questionnaires, 32 (4.92%) had missing data and were not included in the analysis. Thus, 618 undergraduate students completed the CSPQ-B.

### 2.2. Instruments

Data were collected from participants using two instruments: a demographic data sheet and the CSPQ-B.

#### 2.2.1. Demographic data sheet

A demographic data sheet was used to collect information on participants' gender, birth date, name, contact telephone number, and the date they filled out the questionnaire.

#### 2.2.2. CSPQ-B

The 22-item English version of the SPQ-B was translated by the authors into Mandarin Chinese as the CSPQ-B. Both the original English and Chinese versions were given to 3 bilingual experts with a cover letter asking them to rate the semantic and cultural equivalence of each item. The experts were also encouraged to write suggestions for improving each item to make it more suitable for young adults in Taiwan. The experts, who were Chinese-English speakers familiar with Taiwanese culture, included one nurse with an MS degree, one doctoral student in education psychology with a specialty in instrument measurement, and one clinical psychiatrist who was also a professor at the medical university. Items on the CSPQ-B were rated for semantic and cultural equivalence using a 5-point Likert scale ranging from 1 (very inappropriate) to 5 (very appropriate). For each item, the acceptable average score was $\geq$3.

The CSPQ-B was back-translated from Mandarin Chinese to English by a doctoral student in education who is fluent in both languages. The equivalence in meaning between items in the original and back-translated English questionnaires was evaluated by three doctoral students in nursing in the USA. Equivalence in meaning was rated on a 5-point Likert scale ranging from 1 (not even close) to 5 (very similar). For each item, the acceptable average score was $\geq$3.

### 2.3. Data collection and ethical considerations

Before data were collected, the study was approved by the Institutional Review Board at the study site (DMR96-IRB-15). Confidentiality of participants' demographic data, CSPQ-B scores, and psychiatric interview results was protected by coding all data. The master list of coded demographic data and that of the CSPQ-B scores and interview results were stored in separate locked file cabinets accessible only to the principal investigator. The master lists identifying the data were destroyed after data had been coded. Data were collected during two stages (screening and identification) from April 2007 to September 2007. The study protocol is shown in Fig. 1.

#### 2.3.1. Stage I: screening

The researchers explained to students the study purpose, data collection procedures, potential risks and benefits of participation, participants' right to decide at any time not to participate, their right not to return the questionnaire, and the measures by which their identities would be protected. All participants signed an informed consent. Participants then finished and returned the questionnaire. From this pool of subjects, 60 were randomly selected by computer programme from identity numbers in the database to retake the CSPQ-B 2 weeks later to evaluate its test–retest reliability. Of these 60 subjects, 54 finally completed the CSPQ-B.

#### 2.3.2. Stage II: identification of participants susceptible to psychosis

In Stage II, selected students were assigned to be interviewed by psychiatrists. Psychiatric interviews had three possible outcomes: psychotic, potentially psychotic, and probably normal. Students classified as psychotic and potentially psychotic were identified in this study as susceptible to psychosis. Their classifications are presented in Table 2.

Author's personal copy



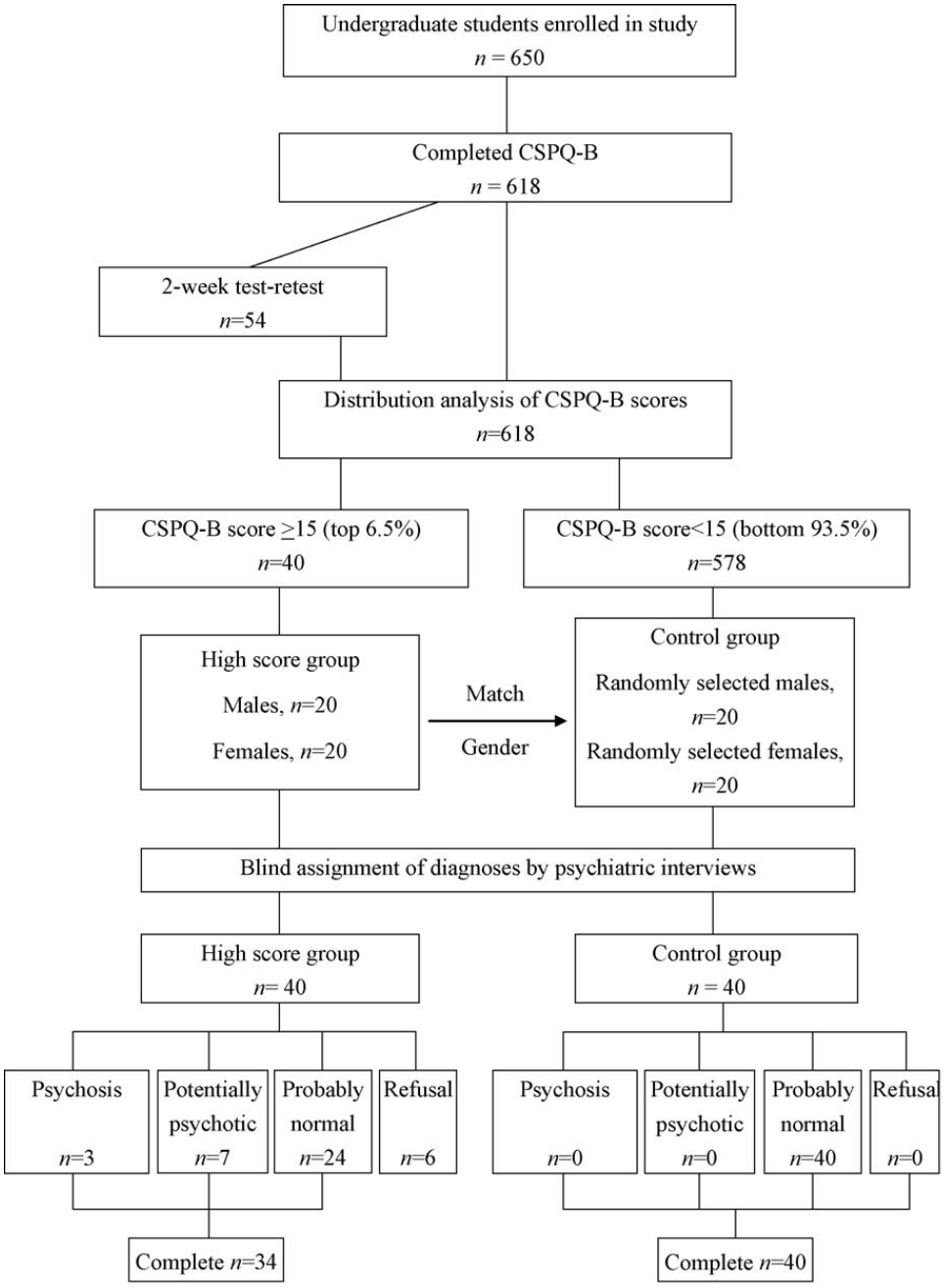



**Fig. 1.** Study protocol.

The CSPQ-B scores for the study sample are shown in Table 1. The threshold for students most susceptible to psychosis in this study was predefined as a cut-off point of 5%. Since less than 5% of the student sample had CSPQ-B scores of 16, the next lower CSPQ-B score (15) was considered the cut-off for the high-score group. This cut-off score was attained by 40 participants (6.5%), including 20 men and 20 women. From the remaining participants ($n = 578$), another 40 students with CSPQ-B scores $<15$ were randomly selected and designated as the control group. Students in the control group were matched by gender to avoid its influence as a confounder. Thus, 20 men (10.2%) were randomly selected from the remaining 196 male students, and 20 women (5.2%) were randomly selected from the 382 remaining female students. First, students with CSPQ-B scores $<15$ were randomly sampled; second, data for male and female students were separated; and finally, a row of identity numbers was randomly selected from the database using the SPSS programme.

Each of the 40 students in the high-score group and 40 students in the control group was assigned to be interviewed by a psychiatrist in a quiet school classroom on a weekday evening after classes. The students were interviewed using the structured clinical interview from the *Diagnostic and Statistical Manual of Mental Disorders-IV* (SCID) (American Psychiatric Association, 1995). Students

Author's personal copy



**Table 1**
CSPQ-B scores for the study sample ($N = 618$).

| Score | $n$ | % | $n \geqq$ the score | % of sample $\geqq$ the score |
|---|---|---|---|---|
| 0.00 | 6 | 1.0 | 618 | 100.00 |
| 1.00 | 10 | 1.6 | 612 | 99.03 |
| 2.00 | 36 | 5.8 | 602 | 97.41 |
| 3.00 | 39 | 6.3 | 566 | 91.59 |
| 4.00 | 58 | 9.4 | 527 | 85.28 |
| 5.00 | 49 | 7.9 | 469 | 75.89 |
| 6.00 | 63 | 10.2 | 420 | 67.96 |
| 7.00 | 58 | 9.4 | 357 | 57.77 |
| 8.00 | 67 | 10.8 | 299 | 48.38 |
| 9.00 | 46 | 7.4 | 232 | 37.54 |
| 10.00 | 42 | 6.8 | 186 | 30.10 |
| 11.00 | 28 | 4.5 | 144 | 23.30 |
| 12.00 | 39 | 6.3 | 116 | 18.77 |
| 13.00 | 19 | 3.1 | 77 | 12.46 |
| 14.00 | 18 | 2.9 | 58 | 9.39 |
| 15.00[a] | 14 | 2.3 | 40 | 6.47 |
| 16.00 | 8 | 1.3 | 26 | 4.20 |
| 17.00 | 8 | 1.3 | 18 | 2.91 |
| 18.00 | 2 | 0.3 | 10 | 1.62 |
| 19.00 | 6 | 1.0 | 8 | 1.29 |
| 20.00 | 1 | 0.2 | 2 | 0.33 |
| 22.00 | 1 | 0.2 | 1 | 0.16 |

[a] Threshold score, i.e., this score and higher scores were attained by 5% of participants.

were assessed for positive symptoms, negative symptoms, and functioning, such as quality of their student work. Each student needed 30–60 min to complete the interview.

Students were interviewed by two well-trained psychiatrists blinded to the students' group (high-score or control) before the interviews. For the first 5 students, psychiatrists' interrater reliability was evaluated, with an interrater agreement of 100% for outcomes. After the first 5 students, every student was interviewed by one of the two psychiatrists based on the available schedule arrangement. Psychiatrists were asked to return interview outcomes to the principal investigator. All interviews were completed within 3 months after the screening process had been completed.

### 2.4. Data analysis

Sample characteristics were analysed by descriptive statistics. Test–retest reliability was analysed by intraclass correlation coefficients (ICCs) (Armstrong, 1981) for total items. Internal consistency reliability was examined by the KR-20 because of dichotomous items (Streiner and Norman, 1995). The CSPQ-B sensitivity, specificity, and cut-off scores were determined by odds-ratio (OR)-based analysis and receiver operating characteristic (ROC) curve analysis.

To establish the diagnostic accuracy of these parameters, the results of SCID-interviews were transformed into a dichotomous outcome variable. The outcome classification used was 'psychotic' or 'potentially psychotic' (classified as 1) versus 'probably normal' (classified as 0). The sensitivity (true positive) means participants' CSPQ-B scores were above the chosen cut-off point and their SCID-interview resulted in the judgement of 'psychotic' or potentially psychotic'. In contrast, the specificity (true negative) means participants' CSPQ-B scores were below the chosen cut-off point and their SCID-interview resulted in the judgement 'probably normal'.

The OR is a population measure of associations between two binary variables, with values of OR farther from 1.0 in a given direction representing stronger association (Agresti, 2002). The ROC curve shows how severe the trade-off is between sensitivity and specificity for a test and can be

**Table 2**
Classification of SCID-interview outcomes.

| Classification | Clinical criteria by SCID-interviews |
|---|---|
| Psychosis[a] | With threshold characteristics of psychotic disorders, such as schizophrenia, affective disorders, schizoaffective disorders |
| Potentially psychotic[a] | With subthreshold characteristics of any psychotic symptoms, including positive symptoms, negative symptoms, and impairment functions<br>With threshold characteristics of any anxiety disorders<br>With prodromal symptoms that may include sleep disturbance, anxiety, social withdrawal, reduced concentration and attention, and depressed mood (Mental Health Evaluation and Community Consultation Unit, 2010) |
| Probably normal | Did not meet the threshold or subthreshold for any psychotic disorders such as schizophrenia, affective disorders, schizoaffective disorders<br>Did not meet the subthreshold for any psychotic symptoms<br>Did not meet the threshold characteristics of any anxiety and mood disorders |

[a] Defined as susceptibility for psychosis in this study.

Author's personal copy



used to help decide where the best cut-off point should be. The overall accuracy of a test can be described as the area under the ROC curve (AUC) (Fletcher and Fletcher, 2005); the larger the area, the better the test. The sensitivity and specificity of the CSPQ-B scores for each possible cut-off point were analysed according to their relative AUC. The confidence intervals (CI) for sensitivity, specificity, and AUC were calculated according to Wilson (1927). All statistical analyses were performed on a personal computer with the statistical packages SPSS for Windows (Version 13.0, SPSS, Chicago) and SAS for Windows (Version 9.2, SAS Institute Inc., Cary, NC).

## 3. Results

### 3.1. Participant characteristics and distribution of CSPQ-B scores

Participants' mean age was 20.08 (SD = 0.98) years. Their mean CSPQ-B score was 7.72 (SD = 4.04, range = 0–22), and the median score was 7. CSPQ-B scores for the 25th, 50th, and 75th percentiles were 5.0, 7.0, and 10.0, respectively, with a skewness of 0.56 and kurtosis of 0.20. The sample was predominantly female ($n = 402$, 65%). Male students scored significantly higher than females on the total CSPQ-B ($t = 2.37$, $p = 0.018$, CI = 0.14–1.47) and disorganisation subscale ($t = 2.50$, $p = 0.013$, CI = 0.07–0.62).

### 3.2. Reliability of CSPQ-B

The 2-week test–retest reliability of the CSPQ-B for 54 students was ICC = 0.82, with CI = 0.68–0.89. Internal consistencies (KR-20) for the cognitive-perceptual deficits, interpersonal deficits, and disorganisation subscales were 0.67, 0.73, and 0.70, respectively, and 0.76 for 22 scale items among 618 undergraduate students.

### 3.3. Interview outcomes

In the high-score group, 6 participants (15%) refused to be interviewed by psychiatrists. Two refused because of difficulty arranging a time for the interview. Two refused without giving any reason. One refused because his/her parents did not approve. One refused and mentioned already having an appointment with a psychiatrist for assessment. In the control group, all 40 participants accepted interviews by psychiatrists and all were classified as probably normal.

Of the 34 students in the high-score group who were interviewed by psychiatrists, 24 were classified as probably normal. Of the remaining 10 students, 3 persons were classified with psychosis, including schizophrenia ($n = 2$) and bipolar disorder ($n = 1$). The remaining 7 students were classified as potentially psychotic. These 7 students were identified as close to having generalised anxiety disorder ($n = 2$), panic disorder ($n = 1$), social phobia ($n = 1$), and 3 had psychotic symptoms but not a full-blown psychotic disorder or other psychiatric disorder. The scores of high-score students who completed and refused interviews are compared in Table 3.

### 3.4. CSPQ-B cut-off score, sensitivity and specificity

The OR, sensitivity, and specificity for different cut-off points among college students are presented in Table 4, and the ROC curves for different cut-off points are presented in Fig. 2. The optimal cut-off score was 17 because it was associated with the largest OR (24.4; CI = 4.5–134.1) and AUC value (0.830; CI = 0.692–0.967) among the 74 interviews. The CSPQ-B score of 17 had a sensitivity of 80.0% (CI = 0.490–0.943) and a specificity of 85.9% (CI = 0.754–0.924) for identifying susceptibility to psychosis among participants. On the other hand, the results show that 8 students were correctly identified and 9 students were falsely identified as susceptible to psychosis.

## 4. Discussion

### 4.1. Main findings

Agreement between the CSPQ-B-based and SCID-interviews is indicated by the OR and AUC value. The cut-off CSPQ-B score of 17 had a sensitivity of 80.0% and a specificity of 85.9% for identifying susceptibility to psychosis among college students. The sensitivity and specificity of the CSPQ-B are lower than those reported for other psychosis-screening scales. For example, the Youth Psychosis at Risk Questionnaire (Ord et al., 2004) was shown to have a sensitivity of 98.4%, but that instrument has 92 items, making it inconvenient for screening large populations. An ideal screening test should take only a few minutes to perform (Fletcher and Fletcher, 2005). This characteristic along with low risk and cost are strengths of the CSPQ-B.

The low sensitivity may be due an insufficient sample size to evaluate the diagnostic accuracy of the CSPQ-B. The

**Table 3**
Comparison of scores among high-score students who completed and refused interviews ($n = 40$).

| | Interview | $n$ | Range | Median | Mode | Mean | $t$ |
|---|---|---|---|---|---|---|---|
| CSPQ-B total | Completed | 34 | 15–22 | 16.5 | 15 | 16.67 | −.99 |
| | Refused | 6 | 15–19 | 15.5 | 15 | 16.00 | |
| Cognitive-perceptual subscale | Completed | 34 | 3–8 | 5 | 5 | 5.50 | .26 |
| | Refused | 6 | 4–7 | 5.5 | 5 | 5.67 | |
| Interpersonal subscale | Completed | 34 | 4–8 | 7 | 8 | 6.73 | .19 |
| | Refused | 6 | 6–8 | 7 | 7 | 6.83 | |
| Disorganised subscale | Completed | 34 | 2–6 | 4 | 4 | 4.52 | −2.21* |
| | Refused | 6 | 2–5 | 3.5 | 3 | 3.50 | |

* $p < 0.05$.

Author's personal copy



**Table 4**
OR, AUC, sensitivity, and specificity with different cut-off points of CSPQ-B scores among college students ($N = 74$).

| SPQ-B Score (cut-off: ≧) | OR (95% CI) | AUC (95% CI) | Sensitivity (95% CI) | $N_{11}$ | Specificity (95% CI) | $N_{10}$ | False positive (95% CI) | $N_{00}$ | False negative (95% CI) | $N_{01}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | N.A. | 0.703 (0.643–0.764) | 1.000 (0.722–1.000) | 10 | 0.406 (0.295–0.529) | 26 | 0.594 (0.471–0.705) | 38 | 0.000 (0.000–0.278) | 0 |
| 11 | N.A. | 0.734 (0.673–0.796) | 1.000 (0.722–1.000) | 10 | 0.469 (0.352–0.589) | 30 | 0.531 (0.411–0.648) | 34 | 0.000 (0.000–0.278) | 0 |
| 12 | N.A. | 0.750 (0.688–0.812) | 1.000 (0.722–1.000) | 10 | 0.500 (0.381–0.619) | 32 | 0.500 (0.381–0.619) | 32 | 0.000 (0.000–0.278) | 0 |
| 13 | N.A. | 0.773 (0.712–0.835) | 1.000 (0.722–1.000) | 10 | 0.547 (0.426–0.663) | 35 | 0.453 (0.337–0.574) | 29 | 0.000 (0.000–0.278) | 0 |
| 14 | N.A. | 0.813 (0.753–0.872) | 1.000 (0.722–1.000) | 10 | 0.547 (0.426–0.663) | 40 | 0.453 (0.337–0.574) | 24 | 0.000 (0.000–0.278) | 0 |
| 15 | N.A. | 0.813 (0.753–0.872) | 1.000 (0.722–1.000) | 10 | 0.625 (0.503–0.733) | 40 | 0.375 (0.267–0.498) | 24 | 0.000 (0.000–0.278) | 0 |
| 16 | 13.1 (2.5–68.3) | 0.783 (0.642–0.924) | 0.800 (0.490–0.943) | 8 | 0.766 (0.649–0.853) | 49 | 0.234 (0.148–0.351) | 15 | 0.200 (0.057–0.510) | 2 |
| 17 | 24.4 (4.5–134.1) | 0.830 (0.692–0.967) | 0.800 (0.490–0.943) | 8 | 0.859 (0.754–0.924) | 55 | 0.141 (0.076–0.246) | 9 | 0.200 (0.057–0.510) | 2 |
| 18 | 15.0 (3.0–74.3) | 0.719 (0.553–0.885) | 0.500 (0.237–0.763) | 5 | 0.938 (0.850–0.975) | 60 | 0.063 (0.025–0.150) | 4 | 0.500 (0.237–0.763) | 5 |
| 19 | 6.4 (1.2–34.8) | 0.619 (0.466–0.771) | 0.300 (0.108–0.603) | 3 | 0.938 (0.850–0.975) | 60 | 0.063 (0.025–0.150) | 4 | 0.700 (0.397–0.892) | 7 |
| 20 | N.A. | 0.516 (0.494–0.537) | 0.000 (0.000–0.278) | 0 | 0.969 (0.893–0.991) | 62 | 0.031 (0.009–0.107) | 2 | 1.000 (0.722–1.000) | 10 |
| 21 | N.A. | 0.508 (0.493–0.523) | 0.000 (0.000–0.278) | 0 | 0.969 (0.893–0.991) | 63 | 0.031 (0.009–0.107) | 1 | 1.000 (0.722–1.000) | 10 |
| 22 | N.A. | 0.508 (0.493–0.523) | 0.000 (0.000–0.278) | 0 | 0.984 (0.917–0.997) | 63 | 0.016 (0.003–0.083) | 1 | 1.000 (0.722–1.000) | 10 |

N.A.: non-available or unstable estimate (OR > 999.999 or OR < 0.001). CI: confidence interval. OR=$(N_{11}N_{00})/(N_{10}N_{01})$. $N_{11}$: number of correctly identified; $N_{00}$: number of correctly identified; $N_{10}$: number of falsely identified; $N_{01}$: number of falsely identified. Sensitivity (true positive) = $N_{11}/(N_{11}+N_{01})$; specificity (true negative) = $N_{00}/(N_{10}+N_{00})$; false positive = 1 − specificity; false negative = 1 − sensitivity.

broad confidence interval of the OR also indicates the sample size was too small to identify susceptibility to psychosis among participants. One possible reason is that the prevalence of major psychotic disorders among this study sample was 0.49% (3 of 618 college students were diagnosed with psychosis), which is much lower than the reported 1.37% prevalence in Taiwan (Chien et al., 2004). This difference may be explained by our prevalence not including 6 high-score students who refused to be interviewed. Their CSPQ-B subscale scores did not differ in range, median, mode, and mean (except for the disorganised subscale) from scores of the 34 high-score students who were interviewed. Of these 6 participants, some might have been classified after interviews as psychotic or potentially psychotic and identified as susceptible to psychosis.

Another possible reason for the low sensitivity is that major psychiatric disorders have low prevalence in the general population (Klaassen et al., 2006), making it difficult to conduct a screening study with adequate sample size. Dubben (2009) stated the valueless of involving large samples in screen studies for sufficient power to detect a disease with low specific mortality. However, early interventions are certainly advisable for young adults at early psychosis (Phillips et al., 2005; Klaassen et al., 2006). In addition, the CSPQ-B is designed to identify susceptibility to psychosis among college students by focusing on individuals with both major psychiatric disorders and potential psychosis, such as anxiety disorders or subthreshold characteristics of any psychotic disorder. The health status of patients with psychotic and potentially psychotic mental illnesses can be improved by some psychosocial interventions (Bechdolf et al., 2005), which increases the importance of screening for patients with mental illness.

Another explanation for the low sensitivity of the CSPQ-B might be uncertainty in its psychometric properties. The SPQ-B has been reported to have good fit for a 3-factor structure (Mata et al., 2005; Fonseca-Pedrero et al., 2009), but not in another study (Compton et al., 2009). Furthermore, the discriminative and criterion-related validity of the SPQ-B were not supported (Compton et al., 2007). This uncertainty about the psychometric properties of the SPQ-B may have compromised the accuracy of the CSPQ-B in identifying susceptibility to psychosis in our study sample. Therefore, the psychometric properties (particularly criterion-related and construct validity) of the CSPQ-B need to be evaluated in more detail before it can be used to identify susceptibility to psychosis among Taiwanese undergraduate students.

This study raises two issues of ethical concern. One issue is the social stigma of mental illness in the recruiting process. Mental illness negatively impacts not only those afflicted in Chinese society but also others (Ma et al., 2010), e.g., family, friends, and colleagues. Indeed, the phenomenon of social stigma posed a challenge for researchers in recruiting patients with mental illness in Singapore to an intervention programme (Chong et al., 2004). To limit the effects of social stigmatisation in identifying susceptibility to psychosis among study populations, we carefully choose neutral words in the screening process and clearly

Author's personal copy



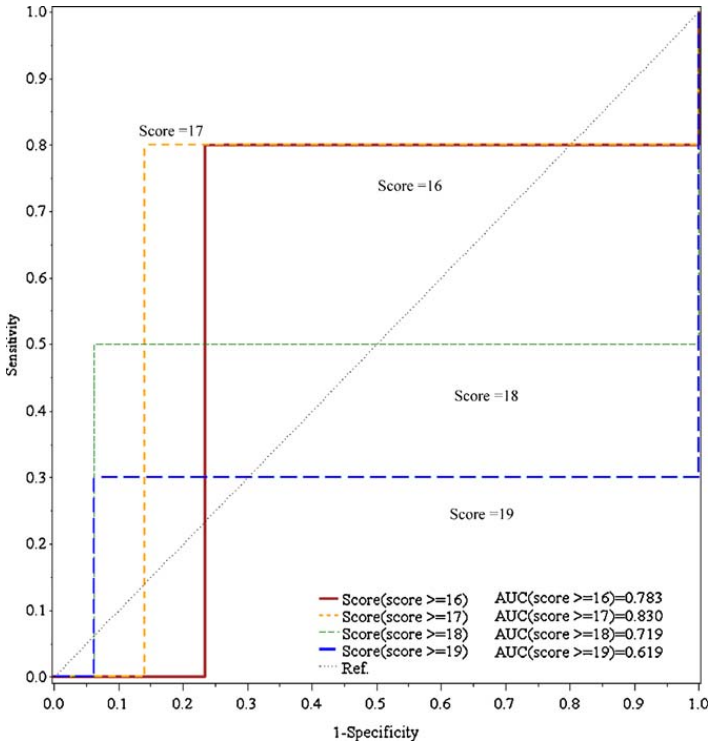



**Fig. 2.** ROC curve for different cut-off points.

explained the study purpose and participants' rights in the interview process. For example, we described the scale as 'a personality measure' to avoid illness-related words. We also avoided schizo-related words by explaining the scale as measuring three dimensions (cognitive perception, personal relationships, and organisation).

The other issue is the high proportion of false positives at the cut-off score of 17. A false positive test on the CSPQ-B would likely cause psychological distress for college students, whereas a true negative would have no benefit. Thus, these CSPQ-B outcomes would greatly limit the usefulness of the test. Under these conditions, the CSPQ-B cannot be recommended as a screening tool by mental health care providers to identify susceptibility to psychosis among Taiwanese young adults. Moreover, other screening tools need to be used in future studies with the CSPQ-B to improve the accuracy of identifying susceptibility to psychosis among young adults.

### 4.2. Limitations and suggestions for future research

This study and its findings have some limitations. The main limitation of the study is its questionable external validity due to the small sample. In addition, the sensitivity and specificity were not assessed on an independent sample and the psychometric properties of the CSPQ-B are unknown. These issues limit the validity of the CSPQ-B for identifying susceptibility to psychosis among study populations. Another limitation is that 15% of the high-score group refused psychiatric interviews in the identification stage, which likely influenced the accuracy of the cut-off score. In addition, the CSPQ-B was tested on undergraduate students; therefore, more evidence is needed before it can be used on other Taiwanese populations.

In our study, males had a significantly higher mean CSPQ-B score than females. In a similar study, undergraduate Spanish males had higher total scores, interpersonal factor scores, and disorganised factor scores than their female counterparts, whereas females had higher scores in the cognitive-perceptual domain (Mata et al., 2005). Future studies are needed to determine if males and females need different cut-off scores. In addition, the psychometric validity needs to be evaluated in different populations.

### 4.3. Conclusions and clinical implications

This study showed the CSPQ-B is a reliable self-report instrument, but not valid for identifying susceptibility to psychosis among Taiwanese undergraduate medical students. This study provides guidance for future research on the CSPQ-B, which might be used by mental health care providers with other instruments to identify susceptibility to psychosis among college students. Moreover, the CSPQ-B should not be used as a screening tool until its psychometric properties have been evaluated.

## Acknowledgements

The study was supported by research grant from China Medical University (CMU95-200 and CMU96-224) and of National Science Council (NSC-98-2314-B-039-017-MY2), Taiwan.

*Contributions*: Study conception and design was by: Wei-Fen Ma, Kuang-Fu Cheng, & Hsien-Yuan Lane. Data

Author's personal copy



collection: Wei-Fen Ma, Po-Lun Wu, & Shu-Ju Yang, data analysis: Wei-Fen Ma, Kuang-Fu Cheng, & Hsien-Tsai Chiu, and critical revision of the manuscript were by Wei-Fen Ma, Po-Lun Wu, Shu-Ju Yang, Kuang-Fu Cheng, Hsien-Tsai Chiu, & Hsien-Yuan Lane.

*Conflict of interest*: Six authors are included and report no competing interests.

*Funding*: Funding for this study was supported by research grants CMU95-200 and CMU96-224 of China Medical University and NSC-98-2314-B-039-017-MY2 of National Science Council, Taiwan. The China Medical University and National Science Council had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

*Ethical approval*: The study was approved by the Institutional Review Board at the China Medical University Hospital before data were collected (DMR96-IRB-15).

## Appendix A

精神分裂人格量表簡述中文版本 (Chinese version of the Schizotypal Personality Questionnaire-Brief)

1 人們發現我是淡漠、疏離的。(People sometimes find me aloof and distant.)
2 我感覺到有特殊外力或是旁人的力量出現。(Have you ever had the sense that some person or force is around you, even though you cannot see anyone?)
3 我有出現不尋常的慣性言行與習慣。 (People sometimes comment on my unusual mannerisms and habits.)
4 我感覺到他人能夠知道我在想什麼。(Are you sometimes sure that other people can tell what you are thinking?)
5 我會注意到針對我的特殊暗示。(Have you ever noticed a common event or object that seemed to be a special sign for you?)
6 人們會認為我是很奇怪的。(Some people think that I am a very bizarre person.)
7 即使和朋友在一起，我也保持警戒。(I feel I have to be on my guard even with friends.)
8 人們會發現我是不明確、難以捉摸的人。(Some people find me a bit vague and elusive during a conversation.)
9 我經常察覺潛在的威脅。(Do you often pick up hidden threats or put-downs from what people say or do?)
10 我感到人們都在注意我。(When shopping do you get the feeling that other people are taking notice of you?)
11 與不熟的人相處，我會感到不自在。(I feel very uncomfortable in social situations involoving unfamiliar people.)
12 我相信占星術、幽浮、超能力、第六感。(Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense?)
13 我會以不尋常之方式來使用文字。(I sometimes use words in unusual ways.)
14 我不讓他人了解我。(Have you found that it is best not to let other people know too much about you?)
15 我常隱藏在幕後。(I tend to keep in the background on social occasions.)
16 我會因為遙遠的聲音而分心。(Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?)
17 我不讓他人佔便宜。(Do you often have to keep an eye out to stop people from taking advantage of you?)
18 我較無法與他人親近。(Do you feel that you are unable to get "close"to people?)
19 我是個古怪、獨特的人。(I am an odd, unusual person.)
20 對我而言，清楚溝通是件困難的事情。(I find it hard to communicate clearly what I want to say to people.)
21 我不容易輕鬆自在地與他人談話。(I feel very uneasy talking to people I do not know well.)
22 我傾向將自身的感受留給自己。(I tend to keep my feelings to myself.)

The Chinese version of the Schizotypal Personality Questionnaire-Brief was translated from the Schizotypal Personality Questionnaire-Brief (Raine and Benishay, 1995).

Raine, A., Benishay, D., 1995. The SPQ-B: a brief screening instrument for schizotypal personality disorder. Journal of Personality Disorders. 9, 346–355.

## References

Addington, J., 2003. The prodromal stage of psychotic illness: observation, detection or intervention? Journal of Psychiatry & Neuroscience 28, 93–97.
Agresti, A., 2002. Categorical Data Analysis, 2nd ed. Wiley, New Jersey.
American Psychiatric Association, 1995. Structured Clinical Interview for DSM-IV. Washington, DC, Author.
Armstrong, G.D., 1981. The intraclass correlation as a measure of interrater reliability of subjective judgments. Nursing Research 17, 314–320.
Bechdolf, A., Ruhrmann, S., Wagner, M., Kühn, K.U., Janssen, B., Bottlender, R., Wieneke, A., Schulze-Lutter, F., Maier, W., Klosterkötter, J., 2005. Interventions in the initial prodromal states of psychosis in Germany: concept and recruitment. British Journal of Psychiatry 187 (Suppl. 48), s45–s48.
Bedwell, J.S., Donnelly, R.S., 2005. Schizotypal personality disorder or prodromal symptoms of schizophrenia? Schizophrenia Research 80, 263–269.
Chien, I.C., Chou, Y.J., Lin, C.H., Bih, S.H., Chou, P., 2004. Prevalence of psychiatric disorders among national health insurance enrollees in Taiwan. Psychiatric Services 55, 691–697.
Chong, S.A., Lee, C., Bird, L., Verma, S., 2004. A risk reduction approach for schizophrenia: The Early Psychosis Intervention Programme. Annals Academy of Medicine Singapore 33, 630–635.
Compton, M.T., Chien, V.H., Bollini, A.M., 2007. Psychometric properties of the Brief Version of the Schizotypal Personality Questionnaire in relatives of patients with schizophrenia-spectrum disorders and non-psychiatric controls. Schizophrenia Research 91, 122–131.
Compton, M.T., Goulding, S.M., Bakeman, R., McClure-Tone, E.B., 2009. An examination of the factorial structure of the Schizotypal Personality Questionnaire-Brief (SPQ-B) among undergraduate students. Schizophrenia Research 115, 286–289.
Corcoran, C., Davidson, L., Sills-Shahar, R., Nickou, C., Malaspia, D., Miller, T., McGlashan, T., 2003. A qualitative research study of the evolution of symptoms in individuals identified as prodromal to psychosis. Psychiatric Quarterly 74, 313–332.
Dubben, H.H., 2009. Trials of prostate-cancer screening are not worthwhile. The Lancet Oncology 10, 294–298.
Fletcher, B.H., Fletcher, S.W., 2005. Clinical Epidemiology: The Essentials. Lippincott Williams & Wilkins, Philadelphia.
Fonseca-Pedrero, E., Paino-Pineiro, M., Lemos-Giraldez, S., Villazon-garcia, U., Muniz, J., 2009. Validation of the Schizotypal Personality Questionnaire-Brief Form in adolescents. Schizophrenia Research 111, 53–60.
Hafner, H., Maurer, K., Loffler, W., Fatkenheuer, B., an der Heiden, W., Riecher-Rossler, A., Behrens, S., Gattaz, W.F., 1994. The epidemiology of early schizophrenia. Influence of age and gender on onset and early course. British Journal of Psychiatry 164 (Suppl. 23), 29–38.
Häfner, H., Maurer, K., Ruhrmann, S., Bechdolf, A., Klosterkötter, J., Wagner, M., Maier, W., Bottlender, R., Möller, H.J., Gaebel, W., Wölwer, W., 2004. Early detection and secondary prevention of psychosis: facts and visions. European Archives of Psychiatry and Clinical Neuroscience 254, 117–128.

Author's personal copy



Jahshan, C.S., Sergi, M.J., 2007. Theory of mind, neurocognition, and functional status in schizotypy. Schizophrenia Research 89, 278–286.

Klaassen, M.C., Nieman, D.H., Becker, H.E., Linszen, D.H., 2006. Is there any point in detecting high risk factors prior to a first psychosis? Dutch Journal of Psychiatry 48, 467–476.

Ma, W.F., Huang, X.Y., Chang, H.J., Yen, W.J., Lee, S., 2010. Impact of Taiwanese culture on beliefs about expressing anxiety and engaging in physical activity: a discursive analysis of the literature. Journal of Clinical Nursing 19, 969–977.

Mata, I., Mataix-Cols, D., Peralta, V., 2005. Schizotypal Personality Questionnaire-Brief: factor structure and influence of sex and age in a nonclinical population. Personality and Individual Differences 38, 1183–1192.

McGorry, P.D., Yung, A.R., Phillips, L.J., 2002. Closing in": what features predict the onset of first episode psychosis within a high-risk group? In: Zipursky, R.B. (Ed.), The Early Stages of Schizophrenia. American Psychiatric Press, Washington, DC, pp. 3–31.

Mental Health Evaluation Community Consultation Unit, 2010. Early Identification of Psychosis: A Primer. Available at: http://www.health.gov.bc.ca/library/publications/year/misc/Psychosis_Identification.pdf (accessed 15 October 2009).

Miller, T.J., McGlashan, T.H., Woods, S.W., Stein, K., Driesin, N., Corcoran, C.M., 1999. Symptom assessment in schizophrenic prodromal states. Psychiatry Quarterly 70, 273–287.

Ord, L.M., Myles-Worsley, M., Blailes, F., Ngiralmau, H., 2004. Screening for prodromal adolescents in an isolated high-risk population. Schizophrenia Research 71, 507–508.

Phillips, L.J., McGorry, P.D., Yung, A.R., McGlashan, T.H., Cornblatt, B., Klosterkotter, J., 2005. Prepsychotic phase of schizophrenia and related disorders: recent progress and future opportunities. British Journal of Psychiatry 187, s33–s44.

Raine, A., Benishay, D., 1995. The SPQ-B: a brief screening instrument for schizotypal personality disorder. Journal of Personality Disorders 9, 346–355.

Seeber, K., Cadenhead, K.S., 2005. How does studying schizotypal personality disorder inform us about the prodrome of schizophrenia? Current Psychiatry Reports 7, 41–50.

Streiner, D.L., Norman, G.R., 1995. Health Measurement Scales: A Practical Guide to Their Development and Use, 2nd ed. Oxford University Press, Oxford.

Wilson, E.B., 1927. Probable inference, the law of succession, and statistical inference. Journal of the American Statistical Association 22, 209–212.

Yung, A.R., 2003. Commentary: the schizophrenia prodrome: a high risk concept. Schizophrenia Bulletin 29, 857–863.

Yung, A.R., McGorry, P.D., 1996. The prodromal phase of first-episode psychosis: past and current conceptualizations. Schizophrenia Bulletin 22, 353–370.

Yung, A.R., Phillips, L.J., McGorry, P.D., McFarlane, C.A., Francey, S., Harrigan, S., Patton, G.C., Jackson, H.J., 1998. Prediction of psychosis: a step towards indicated prevention of schizophrenia. British Journal of Psychiatry 172, 14–20.

Yung, A.R., Phillips, L.J., Yuen, H.P., Francey, S.M., McFarlane, C.A., Hallgren, M., McGorry, P.D., 2003. Psychosis prediction: 12-month follow up of a high-risk ("prodromal") group. Schizophrenia Research 60, 21–32.

Yung, A.R., Phillips, L.J., Yuen, H.P., McGorry, P.D., 2004. Risk factors for psychosis in an Ultra High Risk group: psychopathology and clinical features. Schizophrenia Research 67, 131–142.

Yung, A.R., Standford, C., Cosgrave, E., Killackey, E., Phillips, L.J., Nelson, B., McGorry, P.D., 2006. Testing the Ultra High Risk (prodromal) criteria for the prediction of psychosis in a clinical sample of young people. Schizophrenia Research 84, 57–66.