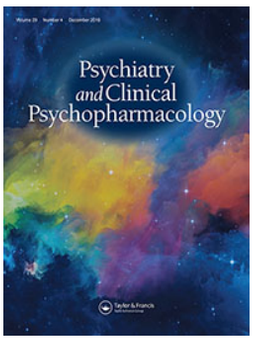

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Establishing the cut-off score for aggression on the Brief Psychiatric Rating Scale-Excited Component (BPRS-EC) in schizophrenia patients

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ABSTRACT

OBJECTIVE: We aimed to present the scalability and cut-off score for the presence of aggression on the Brief Psychiatric Rating Scale-Excited Component (BPRS-EC) in schizophrenia patients.

METHODS: From the Research on Asian Psychotropic Prescription Patterns for Antipsychotics, 1,438 Asian patients with schizophrenia were recruited in present study. The Mokken analysis was used to evaluate scalability of the BPRS-EC. The receiver operating characteristic (ROC) curve was used to establish the optimal cut-off score for the presence of aggression on the BPRS-6 in schizophrenia patients.

RESULTS: The Mokken model presented that the scalability of the BPRS-EC was considered to have a strong "unidimensionality" (coefficient of scalability = 0.57). The ROC curve showed that, with the cut-off score of 5, the total score on the BPRS-EC distinguished the absence and presence of aggression in schizophrenia patients.

CONCLUSION: The BPRS-EC can be used as a supplementary scale for evaluating aggression in patients with schizophrenia.

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KEYWORDS
Aggression; Brief Psychiatric Rating Scale-Excited Component (BPRS-EC); schizophrenia; excitement; hostility; uncooperativeness

Introduction

It has been demonstrated that schizophrenia is associated with an increased risk of aggressive behaviours towards others. Additionally, being male, of young age, and a substance user have been proposed as risk factors for aggressive behaviour in patients with schizophrenia [1]. In terms of evaluating aggression, similar to the Positive and Negative Syndrome Scale-Excited Component [2], the Brief Psychiatric Rating Scale-Excited Component (BPRS-EC) [3] consists of excitement, hostility, and uncooperativeness items. However, to our knowledge, the clinimetric properties and cut-off score for the presence of aggression on the BPRS-EC remain unclear in patients with schizophrenia. Thus, using data from the Research on Asian Psychotropic Prescription Patterns for Antipsychotics (REAP-AP) [4,5], we aimed to evaluate the psychometric properties and cut-off score for aggression on the BPRS-EC in Asian patients with schizophrenia.

Methods

Study overviews and subjects

As previously described in the REAP-AP study [4,5], from March 2016 to June 2016, 3,744 patients with schizophrenia were recruited from 71 centres in 15 Asian countries/areas (Bangladesh, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam). The institutional review boards of Taipei City Hospital, Taipei, Taiwan (#TCHIRB-10412128-E) and other centres approved the survey protocol and informed consent for REAP-AP. The English versions of the case report forms and psychometric scales were used, as recruitment of study participants occurred in different countries with different native languages. To increase the consistency of data collection and schizophrenia diagnosis among the survey centres, a conference meeting was held before the survey initiation. In the present study, only data from

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the study participants who met the inclusion criteria were used. Participants were required to have a diagnosis of schizophrenia, based on the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) [6], use antipsychotic and/or other psychotropic medications, and have completed the BPRS-18 [7].

BPRS-EC, BPRS-18, and definition of aggression

According to the definition of Huber et al. [3], the BPRS-EC and BPRS-18 were rated using a 7-point Likert scale (1 [absent] to 7 [very severe]). The psychometric properties of the BPRS-18 were previously confirmed [8]. Moreover, according the definition of Siever [9], the presence of aggression was defined as any "hostile, injurious, or destructive behavior."

Statistical analyses

In the statistical analyses, the Mokken scale analysis [10] was used to measure the scalability of the BPRS-EC. In the Mokken analyses, the coefficient (H) of homogeneity (or scalability) indicated the contribution degree of each item to the overall measurement of aggression severity in schizophrenia patients. Based on the definition of Sijtsma and van der Ark [11], $0.30 \leq H < 0.40$ constitutes a weak scale, $0.40 \leq H < 0.50$, and $H \geq 0.50$ a strong scale. In addition, the association between the BPRS-EC and BPRS-18 total scores was determined using the Pearson correlation. Statistical significance was set at $P < 0.05$ (two-tailed) in all tests. Furthermore, exploratory receiver operating characteristic (ROC) curve analyses were conducted to establish the optimal cut-off score for the presence of aggression on the BPRS-EC in schizophrenia patients. As described elsewhere [12], the ROC curve analyses were developed from the signal-detection theory and were frequently used in biological and behavioural studies [13]. To calculate overall predictor performance, the sensitivity and specificity of all possible threshold levels were considered to determine the optimal cut-off score, one that generated the lowest number of false positives and negatives. The Mokken scale analysis was conducted using R version 3.4.3 (https://www.r-project.org/) and the Pearson correlation and ROC curve analyses were conducted using SPSS version 24 (IBM Co., Armonk, NY, USA).

Results

Four hundred Indian, 261 Indonesian, 98 Japanese, 299 Malaysian, and 380 Taiwanese individuals comprised the participants in the present study. The mean (standard deviation [SD]) age was 39.9 (12.5) years. More than half of the subjects were male ($n = 830$, 57.7%), had more than 10 years of disease duration ($n = 788$, 54.8%), were enrolled as outpatients ($n = 774$, 53.8%), and were of normal weight ($n = 749$, 52.1%). Moreover, 36.4% of participants had untreated psychosis of less than 3 months in duration ($n = 524$). The mean (SD)

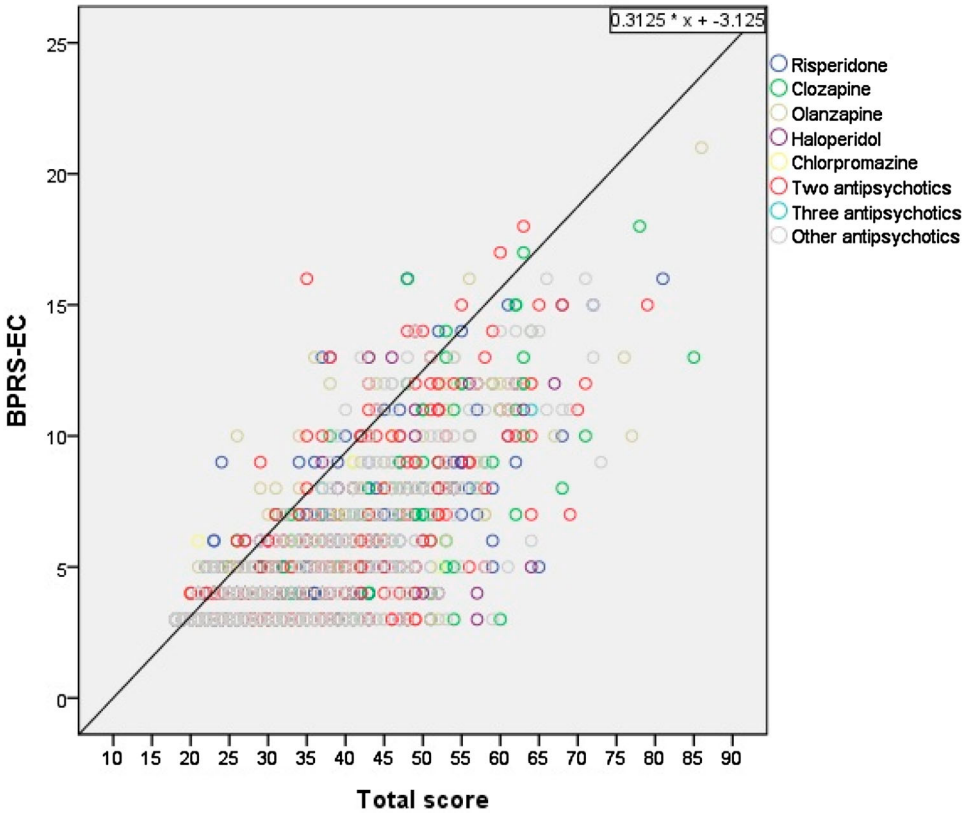

Figure 1. Correlation between the Brief Psychiatric Rating Scale-Excitement Component (BPRS-EC) and BPRS-18 total scores in the Research on Asian Psychotropic Prescription Patterns for Antipsychotics (REAP-AP) ($n = 1,438$)

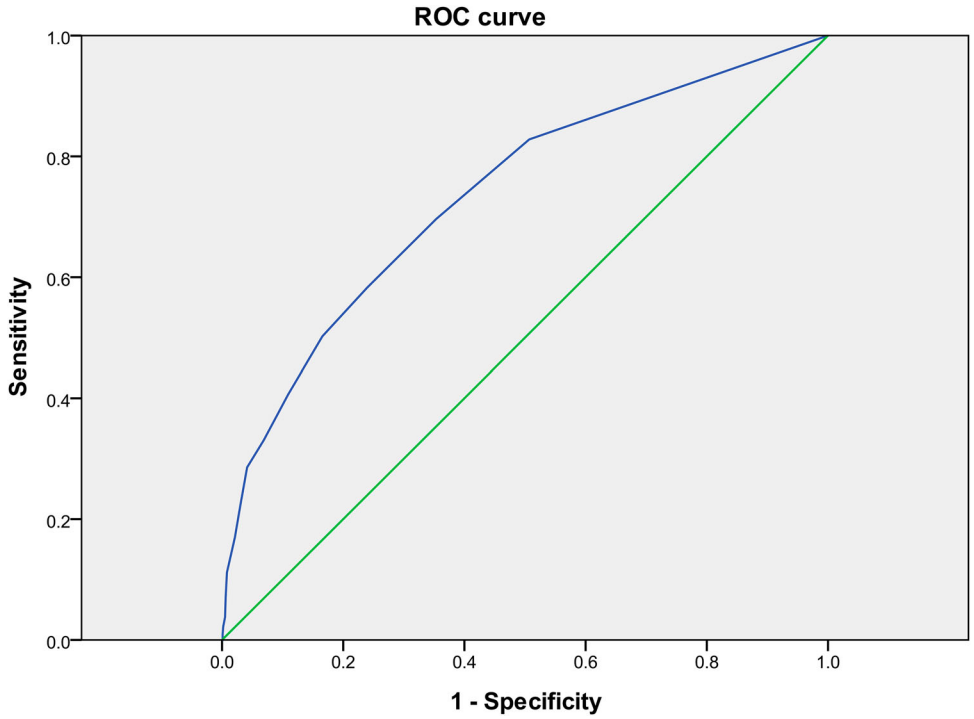

Figure 2. ROC curve for the performance of Brief Psychiatric Rating Scale-Excited Component (BPRS-EC) in distinguishing between schizophrenia patients with and without aggression. ROC curve, receiver operating characteristic curve.

chlorpromazine equivalent dose of antipsychotics used was 501.5 (396.5) mg/day. Approximately one-third of participants ($n = 448$) presented aggression, as the mean (SD) total score on the BPRS-EC was 5.4 (3.1).

In terms of the scalability of the three items of the BPRS-EC, the coefficient of homogeneity for the total score on the BPRS-EC was 0.57. Furthermore, the scalability coefficients for excitement, hostility, and uncooperativeness items were 0.53 0.58, and 0.59, respectively. Thus, the scalabilities for the total score on the BPRS-EC and all the items were considered to have a strong unidimensionality. Additionally, as shown in Figure 1, the BPRS-EC total score was significantly correlated with the BPRS-18 total score ($r = 0.754$, $P < 0.0001$).

As shown in Figure 2, using the optimal cut-off score of 5, the total score on the BPRS-EC optimally distinguished the presence or absence of aggression with a sensitivity of 69.8% and specificity of 64.6% in the ROC curve (area under curve = 0.780, $P < 0.0001$).

Discussion

The scalabilities for the total score and all items of the BPRS-EC were considered to have a strong unidimensionality (coefficient of scalability = 0.57). Moreover, with the cut-off score of 5, the total score on the BPRS-EC was able to differentiate the presence or absence of aggression in patients with schizophrenia (sensitivity = 69.8%, specificity = 64.6%). The total score of 5 on the BPRS-EC indicates that at least two items are considered to be at a mild level or higher, or one item is considered to be mild among all the BPRS-EC items including those assessing excitement, hostility, and uncooperativeness. Therefore, it can be speculated that with the cut-off score of 5, the total score on the BPRS-EC can be a tool used to detect aggression in patients with schizophrenia. Although schizophrenia is associated with an increased risk of aggressive behaviour, the DSM-5 criteria for schizophrenia [6] and the Clinician-Rated Dimensions of Psychosis Symptoms Severity (CRDPSS) [14] do not include any items directly representing aggressive behaviours. Hence, our findings partly support that the BPRS-EC can be used as the supplementary scale for the DSM-5 criteria of schizophrenia and the CRDPSS.

Our present study has several limitations. First, inter-rater reliability was not evaluated. Second, the REAP-AP is not longitudinal, but a cross-sectional survey; thus, we cannot evaluate the longitudinal consistency of the total score on the BPRS-EC. However, despite the limitations, the present study has a virtue of reporting the scalability and cut-off score for aggression on the BPRS-EC in Asian patients with schizophrenia. It is expected that with the cut-off score of 5, the total score on the BPRS-EC can be used to detect aggressive behaviour in clinical practices and clinical trials.

Disclosure statement

No potential conflict of interest was reported by the authors.

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