Comparison of the Clancy Autism Behavior Scale (CABS) and Autism Behavior Checklist (ABC) for Autism

Kunyi Lan[1] ; Jiajia Liu[1*] PhD

[1] School of Nursing, Peking University, Beijing, 100191, China

Introduction

➤ **Autism spectrum disorder (ASD)** is a group of neurodevelopmental disorders characterized by impairments in social interaction and repetitive and stereotyped behaviors. To make early detection of individuals with ASD, caregiver-report instruments remain an efficient and adaptable option for the preliminary assessment.

➤ The diagnostic validations of caregiver-report instruments have not been investigated for ASD in China. And it remains unclear whether the current cut-off values of screening instruments are suitable for accurate assessment.

Objective

To compare the caregiver-report assessments obtained from the Clancy Autism Behavior Scale (CABS) and Autism Behavior Checklist (ABC) with the diagnosis of ASD made by psychiatrists and to study the psychometric properties of these two popular instruments as screening tools of ASD[1,2].

Methodology

Step 1: Data Collection
Participants: Outpatient children from Peking University Sixth Hospital
Sample Size: 158

Measurements:
Assessed by caregiver → ABC   CABS
Assessed by psychiatrist → CARS

Step 2: Data Analysis

CARS	CABS	ABC
ROC	AUC	Youden index
Cut-off value	Sensitivity	Specificity
+LR	PPV	NPV

➤ The combined estimates of **sensitivity and specificity, Youden index, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (+LR) and negative likelihood ratio (-LR)** were calculated respectively[3,4].

➤ The discriminant power of the two instruments in differentiating people with ASD from those without was presented graphically using the receiver operating characteristic (ROC) curve and the area under the curve (AUC)[5].

➤ The Youden index-based optimal cut-off values as well as their corresponding sensitivity and specificity were also calculated according to ROC curves. All P values reported are two-sided and significant at the 5% level ($P<0.05$)[6,7].

Results and Discussion

➤158 children who met the study criteria were included in this study, and 59 children were identified as ASD through scores of the CARS and clinical diagnoses by the psychiatrist. The median age of children with ASD and children without ASD was 48.0 (IQR=22.0) months and 49.0 (IQR=26.0) months, respectively; 82% were males and the sex ratio was 5.6:1 (male: female), with gender information missing in six cases.

➤Among the 59 children with ASD, the sex ratio was 4.5:1 (male: female) (with gender information missing in two cases). After statistical comparison, there was no significant difference of the demographic features between the ASD and No ASD groups.

1. Psychometric properties of the CABS and the ABC

➤ As screening instruments, the ABC demonstrated better sensitivity than the CABS (78.0% vs. 44.1%) to correctly identify children with ASD, while the CABS presented better specificity than the ABC (69.7% vs. 54.5%).

➤ As shown in Table 1, the Youden index, PPV, NPV and +LR/-LR of the ABC had shown a better performance than the CABS for screening[8].

Table 1 The psychometric properties and performance of the CABS and the ABC

Instruments	Sensitivity	Specificity	Youden Index	PPV	NPV	+LR/-LR
CABS Cut-off = 14	0.441	0.697	0.138	0.464	0.676	1.454/0.803
ABC Cut-off = 53	0.780	0.545	0.325	0.505	0.806	1.715/0.404

Notes: Youden index =sensitivity+specificity-1; LR (+) =sensitivity/1-specificity; LR (-) =1-sensitivity/specificity
Abbreviation: CABS, Clancy Autism Behavior Scale; ABC, Autism Behavior Checklist

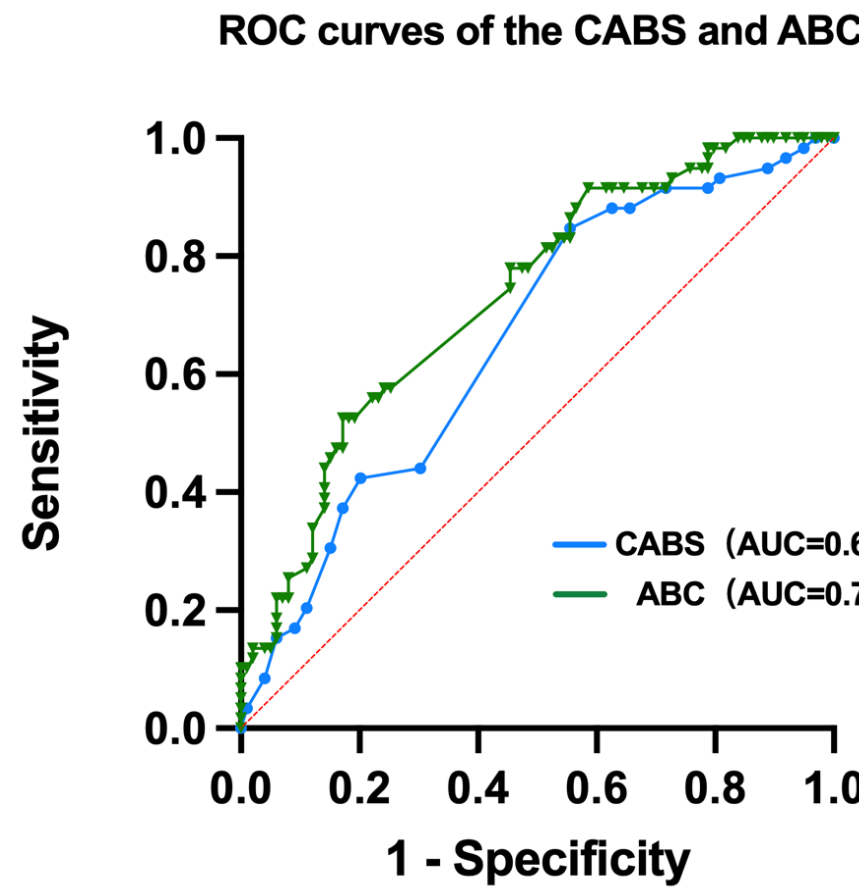## 2. Analysis of receiver operating characteristic (ROC) curves of the CABS and the ABC

ROC curves of the CABS and ABC
CABS (AUC=0.659)
ABC (AUC=0.728)

Table 2 The receiver operating characteristic (ROC) curves and the area under the curve (AUC) of the CABS and the ABC

Instruments	AUC	SE	95%CI	Z statistic	P
CABS	0.659	0.043	0.580-0.732	3.674	<0.001
ABC	0.728	0.040	0.652-0.796	5.656	<0.001

Abbreviation: CABS, Clancy Autism Behavior Scale; ABC, Autism Behavior Checklist; SE: standard error; CI: confidence interval

3. The Youden index-based optimal cut-off values of the CABS and the ABC

As shown in Table 3, using the maximum of Youden's index, the optimal cut-off value of the CABS is 13, the optimal cut-off value for ABC is 62.

Table 3 The Youden index-based optimal cut-off values of the CABS and the ABC

Instruments	Associated criterion	Optimal cut-off values	Youden index	Sensitivity	Specificity
CABS	>12	13	0.292	0.848	0.444
ABC	>61	62	0.354	0.525	0.828

Notes: Youden index =sensitivity+specificity-1
Abbreviation: CABS, Clancy Autism Behavior Scale; ABC, Autism Behavior Checklist

Conclusion

Both instruments have acceptable psychometric properties in ASD assessment. Compared to the CABS, the ABC has higher sensitivity to screen individuals with ASD and appears to be more appropriate to be used as a screening instrument of ASD for caregivers in domestic and clinical settings. The current cut-off value of CABS is ideal but the cut-off value should be decrease to receive a better testing accuracy for ABC.

References

1 Clancy H, et al. The Diagnosis of Infantile Autism. *Developmental Medicine & Child Neurology*. 1969;11(4):432-442. doi:10.1111/j.1469-8749.1969.tb01461.x

2 Krug DA,et al. BEHAVIOR CHECKLIST FOR IDENTIFYING SEVERELY HANDICAPPED INDIVIDUALS WITH HIGH LEVELS OF AUTISTIC BEHAVIOR. *J Child Psychol & Psychiat*. 1980;21(3):221-229. doi:10.1111/j.1469-7610.1980.tb01797.x

3 Bojdani E. Essential Epidemiology: An Introduction for Students and Health Professionals, Third Edition. *Yale J Biol Med*. 2017;90(2):345.

4 Youden WJ. Index for rating diagnostic tests. *Cancer*. 1950;3(1):32-35.

5 Charman T, et al. Efficacy of three screening instruments in the identification of autistic-spectrum disorders. *The British Journal of Psychiatry*. 2007;191(6):554-559. doi:10.1192/bjp.bp.107.040196

6 Bantis LE, et al. Construction of confidence intervals for the maximum of the Youden index and the corresponding cutoff point of a continuous biomarker. *Biometrical Journal*. 2019;61(1):138-156. doi:10.1002/bimj.201700107

7 Wang YY, et al. Comparing Screening Abilities of the 33-Item Hypomania Checklist (HCL-33) and the 33-Item Hypomania Checklist External Assessment (HCL-33-EA) for the Detection of Bipolar Disorder. *Front Psychiatry*. 2021;12:518722 doi:10.3389/fpsyt.2021.518722

8 Sun X, et al. Comparison between a Mandarin Chinese version of the Childhood Autism Spectrum Test and the Clancy Autism Behaviour Scale in mainland China. *Res Dev Disabil*. 35, 1599–1608 (2014).

UNIVERSITY OF MINNESOTA
Driven to Discover®