



**UNE MESURE RAPIDE D'ÉVALUATION DES TROUBLES
DU SPECTRE AUTISTIQUE CHEZ DES ENFANTS À
HAUT RISQUE AU DÉPARTEMENT DE PSYCHOLOGIE
DE L'HÔPITAL POUR ENFANT N 1**

*QUICK ASSESSMENT OF THE RISK OF AUTISM
SPECTRUM DISORDERS AMONG HIGH-RISK
CHILDREN IN THE PSYCHOLOGY DEPARTMENT OF
CHILDREN'S HOSPITAL 1*

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ABSTRACT

Objective: The Vietnamese community has become increasingly concerned about Autism Spectrum Disorders (ASD) but professional resources are lacking. Indeed, a new form of assessment is needed to properly evaluate this risk. The goal of this study was to evaluate two such tools: the Modified Checklist for Autism in Toddlers (MCHAT) and the Social Attention and Communication Study (SACS). This evaluation helped us create a new tool designed to quickly and effectively assess the risk of ASD among high-risk children.

Methods: A total of 82 high-risk children were assessed for ASD by using the MCHAT combined with the SACS for clinical observation. The diagnosis was then confirmed based on DSM-IV TR criterion. Scores from the MCHAT were calculated and observations from the SACS were analyzed to create a shorter tool, named the Tool for Quick Assessment of Risk of Autism.

Results: The Tool for Quick Assessment of Risk of Autism was created by choosing 14 questions from the MCHAT combined with clinical observations regarding 4 symptoms from the SACS. The criteria chosen all had good psychometric properties. Some factors impacted the caregiver's assessment such as questionnaire structure and content; cultural differences; the caregiver's psychological condition and education level.

Conclusion: The new tool (Tool for Quick Assessment of Risk of Autism) promises to shorten the time to assess ASD in high-risk children.

Key words: autism, ASD, quick assessment, MCHAT, SACS, high-risk, sensitivity, specificity, Positive Predictive Value (PPV).

RESUME

Objectif : La communauté vietnamienne est devenue de plus en plus préoccupée par les troubles du spectre autistiques (TSA), mais les ressources professionnelles sont manquantes. En effet, de nouvelles formes d'évaluation sont nécessaires pour évaluer correctement ce risque. L'objectif de cette étude porte sur l'évaluation de eux de ces outils :the Modified Checklist for Autism in Toddlers (MCHAT) et le Social Attention and Communication Study (SACS).

Matériel et méthodes : un total de 82 enfants à haut risque pour des Troubles du spectre autistique ont été évalués par le MCHAT et le SACS. Le diagnostic a été confirmé sur la base des critères du DSM-IV. Les scores du MCHAT ont été calculés et les observations du SACS ont été analysées pour créer un outil d'évaluation plus court, intitulé Outil pour l'Evaluation Rapide du Risque d'Autisme.

Résultats : L' Outil pour l'Evaluation Rapide du Risque d'Autisme a été crée à partir de 14 questions du MCHAT et de l'observation clinique issue de 4 symptômes du SACS. Les critères choisis présentent tous de bonnes propriétés psychométriques. Certains facteurs impactent l'évaluation de l'aidant tels que la structure du questionnaire et son contenu, les différences culturelles, l'état psychologique de l'aidant et le niveau d'éducation.

Conclusion: Ce nouvel outil (Outil pour l'Evaluation Rapide du Risque d'Autisme) promet de réduire le temps d'évaluation des enfants à haut risque de Troubles du Spectre Autistique.

Mots clefs : autism, troubles du spectre autistique, evaluation rapide, MCHAT, SACS, haut risque, sensibilité, spécificité, Valeur Predictive Positive (VPP)

INTRODUCTION

Recently there has been a growing interest for Autism Spectrum Disorder (ASD), a developmental disorder diagnosed in young children, in Vietnam. In Hanoi, the number of children diagnosed with ASD at the National Hospital of Pediatrics in 2009 was four times greater than in 2007. In 2012, in Ho Chi Minh City's (CHI) Psychology Department at the Children's hospital, the number of diagnosed children increased six-fold compared to 2005. Moreover, the age of initial diagnosis has decreased, from 4 years old in 2005 to 3 years old in 2010. There is currently a three-month waiting list for assessment concerning developmental problems, which explains why we need to find ways to speed up this process.

Several assessment tools for formal diagnosis of ASD are commonly recommended : the Autism Diagnostic Interview-Revised (ADI-R), the Autism Diagnostic Observation Schedule-Generic (ADOSG), the Childhood Autism Rating Scale (CARS), the Gilliam Autism Rating Scale (GARS), the Pervasive Developmental Disorder Screening Test (PDDST) Stages 2 and 3; of which, ADI-R and ADOS are popularly considered "gold standard" instruments (Gupta, 2004; Johnson & Myers, 2007; Zager, 2005). All of these instruments require extensive training and experience as well as a one to two-hour assessment period. Needless to say, all of these tools cannot be used during the first assessment step of such an overcrowded children's department.

Aside from these formal diagnostic tools, quick assessment tools already exist, such as the Autism Behavior Checklist (ABC), the Autism Screening Questionnaire (ASQ), the Pervasive Developmental Disorder Screening Test (PDDST) Stage 1, the Social Communication Questionnaire (SCQ), the Screening Tool for Autism in Two-year-olds (STAT), the Checklist for Autism in Toddlers (CHAT)(Gupta, 2004), and the Social Attention and Communication Study (SACS) (Barbaro & Dissanayake, 2010).

Each of the 4 former tools has more than 40 items, requiring an assessment time that is not compatible with our department. The STAT, for example, takes 20 minutes to administer and has 15 items, which is too long. The CHAT seems applicable because of its simplicity but does not have good specificity and sensitivity (cited Gupta, 2004), but its modified version, the MCHAT, is popularly recommended and has promising results (Johnson & Myers, 2007; Zager, 2005).

The MCHAT, based on Baron Cohen, Allen and Gillberg's Checklist for Autism in Toddlers (CHAT), is designed to screen the risk for ASD in children from 16 to 30 months of age based on observation of their behavior. It is also recommended as a routine screening tool for healthy children at specific ages. The checklist includes 23 "Yes"/"No" questions answered by primary caregivers. If the child fails "2 out of the 6 risk items" or "any 3 items", he is at risk for ASD. The main purpose of the MCHAT is to identify at-risk children as soon as possible. Therefore, it is designed to have high sensitivity which means there will most probably be a certain amount of false positives. To reduce this effect, a follow-up interview questionnaire was created for the experts interviewing the caregivers about "failed" questions, to make sure that they understood and answered them correctly (Diana L. Robins, Deborah Fein, & Barton, 1999a, 1999b).

The MCHAT has been used in our department for years because of its advantages such as simplicity, lack of cost, and preexisting Vietnamese translation. However, practical values of the MCHAT have not been fully evaluated with respect to our environment. According to the authors (Robins et al., 1999a), the MCHAT is a parent-report tool commonly used for general population, while in our department, experts use it as a tool for interviewing and observing high-risk children.

Hence, this tool is not adapted to our assessment context and needs to be revised for use in a high-risk population.

Robins and her team used the MCHAT to screen ASD in 1,293 children from 18 to 30 months of age (Diana L. Robins, Deborah Fein, Marianne L. Barton, & Green, 2001); 1,122 of which were healthy children coming for a routine check-up at 18 months of age or 24 months. The rest were sent from Early Intervention Centers. Cases which had significant scores after the first two steps were assessed directly by experienced experts to make a diagnosis based on the DSM IV - TR. Results showed that after Step 1, if the child “failed 2 risk questions”, the sensitivity was 95%, the specificity was 98%, the positive predictive value (PPV) was 64%. When applying the “failed any 3 questions” criteria, values were 97%, 95%, and 36%, respectively. After step 2, the results were 95%, 99%, and 79% for the former criteria, and 97%, 99%, and 68% for the latter.

Another study using the MCHAT to screen the risk for ASD in 6,600 children was carried out by Pandey et al. (2008). In this study, authors evaluated the PPV of the checklist when applying it to children 16 to 24 months old (younger toddlers) and 24 – 30 months old (older toddlers) as well as in low and high-risk groups. Evidence showed that the PPV in the low-risk, younger group was 28% and 61% in the older group; while in high-risk group, these numbers were 79% and 74%, respectively.

Kleinman et al. (2008) used this same tool to screen about 3,800 children aged 16 to 30 months, some of which were high risk. Nearly one third of these children were screened a second time when they were 42 – 54 months of age. The PPV reported was 36% after step 1 and 74% after step 2. The results did not differ greatly between the first and the second screening. In low-risk groups, the PPV was 11% after step 1 and 65% after step 2. These results were higher in the high-risk source: 60% and 76%, respectively. This study did not detail its findings concerning sensitivity and specificity.

In China, Wong et al. studied children ranging from 18 to 78 months of age (Wong et al., 2004). The study compared the MCHAT step 1 (caregivers self-evaluated their child) with the observation of 4 clinical symptoms from the DSM-IV criteria. Results showed that the MCHAT step 1 (failed 2 out of 7 key questions) had 93% sensitivity and 77% specificity while clinical observation criteria (failed 2 out of 4 symptoms) had 73% sensitivity and 91% specificity. In addition, authors also recommended revising this tool for it to be used in countries with a different language or cultural context.

In a recent study carried out in Singapore (Koh et al., 2014), the values for the MCHAT step 1 were evaluated by screening 580 high-risk children who were 18 – 48 months old. It revealed that among the 18 – 30 months age group, the MCHAT had 75% sensitivity with the “fail 2 key items” criteria and 89% with the “fail any 3 items” criteria, the specificity was 78% and 59%, respectively, and the PPV was 61% and 49%. In the 30 to 48 months old age group, the criteria “fail 2 key items” had 53% sensitivity, 92%, specificity and 78% PPV; while the criteria “fail any 3 items” had 76%, 72%, and 60%, respectively.

In Vietnam, Nguyen Thi Huong Giang and Tran Thu Ha used the MCHAT to screen 6,583 children aged 18 to 24 months in Thai Binh Province. The study revealed that the sensitivity and specificity of the checklist were 74% and 99%, respectively (Giang, Ha, & Chau, 2009).

Contrary to the MCHAT that is primarily a mix of interview and self-assessment, the SACS is a tool used by psychologists to screen ASD among children at the hospital for routine health check at a primary care level. It is mostly based on the observation of abnormal social behaviors and communication. The number of symptoms checked ranges from 10 to 16 depending on assessment age. The assessment is done when the child is 8, 12, 18, and 24 months of age. Risk of ASD will be assessed based on key and extra items, as well as the age of the child. The child is considered at risk of ASD when he fails 2 key items at 8 months, and 3 items when he is more than one year old. Extra items are only monitored if the child is considered to be at risk.

Barbaro and Dissanayake (2010) administered the SACS to 20,770 children at primary health organizations in Victoria, Australia. 11 to 15 symptoms were assessed depending on the

corresponding age group and approximately 240 nurses were trained for these specific assessments. Children who were considered at risk for ASD were referred to experts to confirm the diagnosis. Evidence showed that the estimated sensitivity of SACS ranged from 69 to 84%, the specificity ranged from 99.8 to 99.9%, and the PPV was 81% (Barbaro & Dissanayake, 2010). This study also identified the most important items in the assessment of children aged 24 months for ASD: pointing, eye contact, showing, and pretend play.

The MCHAT and SACS are easy to use and completed fairly quickly but are mostly used in general population. The MCHAT is based on the caregiver’s report and is highly sensitive but not specific enough, while the SACS mostly requires direct observation, making it highly specific but lacking in sensitivity. The idea of this study was to explore two questions: first, can the MCHAT be used as a self – report inventory for caregivers given our conditions? Second, can we create a tool that can help increase the speed of the assessment but still keep the number of false negatives as low as possible, while using both the MCHAT and the SACS?

METHOD

Participants

The study was carried out at Children’s Hospital 1, in their Psychology Department. From January to March 2014, 82 children who were initially identified as having speech and/or language disorders, developmental delays, (suspected) autism, and abnormal behaviors were recruited.

Inclusive criteria:

- Children aged 18 to 48 months
- At least a 36 week gestation period

Exclusive criteria:

- Children in an emergency situation
- Children having already been in an intervention program for disabled child for more than 2 months.

The mean age was 28.73 months (SD = 7.76), with children aged 16 to 46 months. More than 80% of them were under 36 months of age. There were 82.9% of boys, and 17.1% girls. 61% of patients came from Vietnamese provinces and the rest lived in districts of Ho Chi Minh City. The most common complaint was language delays (87.8%), while (suspected) autism only represented 5%.

Among the 82 caregivers who answered the revised MCHAT, 68 of them were mothers (82.9%). Nearly 9% of the MCHAT answers had only primary school education; 25% had middle school education; and approximately 38% had gone past high school.

About 88% of children (n = 72) had normal motor development and 12% presented delayed walking; while nearly 77% had language delays.

About 70% children were diagnosed with ASD (typical autism and autism Not Otherwise Specified), while the rest were diagnosed with developmental delays or language disorders.

Measures

Interview: The MCHAT which was translated into Vietnamese by its authors and uploaded on the official website (Robins).

Observation: Only 8 easy-to-perform items from the SACS were chosen: (1) pointing, (2) eye contact, (3) waving, (4) pretend play, (5) turning to name call, (6) joint attention, (7) imitation, and (8) social smiling.

Procedure

A pilot study was carried out in order to revise the original translated MCHAT making it more suitable to the local language and culture. Aside from changing some terms, we also changed the answer structure from Yes/No to a 4-point scale: Never, Seldom, Often, and Very often to increase accuracy. We also asked caregivers to talk about their own feelings.

In the official study, 82 caregivers answered the MCHAT questions themselves. Then, they were interviewed about failed items or items that were suspected to be incorrect. Next, the examiner clinically assessed the child based on chosen SACS items. Finally, the child was evaluated comprehensively to confirm diagnosis based on DSM-IV TR criteria.

Data analysis

SPSS software version 20.0 and Excel 2010 were used for analysis. The sensitivity, specificity, and PPV were calculated step by step: (i) caregivers' self-evaluation, (ii) expert's follow-up interview, and (iii) expert's observation using SACS symptoms.

Using these results, key questions and symptoms were chosen to make a new tool that could help reduce assessment time. The sensitivity, specificity, and PPV of this tool were also calculated to choose the best cut-off point for each assessment step.

Informed consent and ethics committee approval

The study was approved by the Institutional Review Board of Children's Hospital 1, Ho Chi Minh City, Vietnam. A caregiver's consent form was obtained before interviews.

RESULTS

Caregiver's ability to complete MCHAT without assistance

Of the 82 caregivers in the study, only 22 (26.83%) could answer all 23 questions, 7 were not able to answer any of the checklist questions (8.54%) and the rest were able to answer more than half of the checklist (more than 12 questions).

Epidemiology factors significantly affected the caregivers' ability to complete the MCHAT on their own. Besides those who could not read and write, those who had an education level under sixth grade could not complete the checklist either. Also, caregivers who lived in provinces had more difficulty during the assessment than those from Ho Chi Minh City. Table 1 shows that there were statistical differences in the caregivers' ability to complete the test alone depending upon education level and place of residence.

Table 1: Epidemiology factors affecting the caregivers' ability to complete the revised MCHAT

		Caregivers' ability to complete the revised MCHAT (n)		P value
		< 13 answers	≥ 13 answers	
Education level	Grade 1 – 5	4	3	0.001
	Above grade 5	3	72	
Place of residence	Provinces	7	43	0.039
	Ho Chi Minh city	0	32	

Stratification of places of residence showed that among caregivers who lived in provinces, there were still statistical differences concerning the ability to complete the test because of education level (table 2). This means a level of education under sixth grade was a factor that negatively affected the ability to fill out the assessment.

Table 2: Comparison of level of education of caregivers and the ability to complete revised MCHAT

	Caregivers' ability to complete revised MCHAT (n)		P value
	< 13 answers	≥ 13 answers	
Grade 1 – 5	4	2	0.002
Above grade 5	3	41	

Identification of key questions

Because only 25% of caregivers could complete the MCHAT alone, identification of key questions had to be based on interview results. As we can see in table 3, more than 50% of caregivers answered "abnormal" to 14 questions including 2, 5, 6, 7, 8, 9, 10, 13, 14, 15, 17, 19, 21 and 23. Furthermore, most of these questions could help differentiate autistic children and non-autistic children because they had a P- value <0.05 (except questions 4, 5 and 9).

Table 3: Comparison of abnormal items between ASD and Non-ASD children based on caregivers' interviews

No.	Abnormal items	ASDs (N=63) n (%)	Non – ASDs (N=19) n (%)	P value
1	Question 9	54 (85.71)	8 (42.11)	0.365
2	Question 7	50 (79.37)	4 (21.05)	0.000
3	Question 17	49 (77.78)	4 (21.05)	0.000
4	Question 15	45 (71.43)	3 (15.79)	0.005
5	Question 6	45 (71.43)	3 (15.79)	0.006
6	Question 10	44 (69.84)	3 (15.79)	0.001
7	Question 21	43 (68.25)	1 (5.26)	0.000
8	Question 23	43 (68.25)	5 (26.32)	0.038
9	Question 13	41 (65.08)	4 (21.05)	0.004
10	Question 19	41 (65.08)	4 (21.05)	0.036
11	Question 14	41 (65.08)	1 (5.26)	0.063
12	Question 5	40 (63.49)	4 (21.05)	0.072
13	Question 2	36 (57.14)	2 (10.53)	0.047
14	Question 8	35 (55.56)	3 (15.79)	0.014
15	Question 12	25 (39.68)	1 (5.26)	0.061
16	Question 4	21 (33.33)	1 (5.26)	0.031
17	Question 1	13 (20.63)	1 (5.26)	0.628
18	Question 22	13 (20.63)	1 (5.26)	0.115
19	Question 18	6 (9.52)	1 (5.26)	0.649
20	Question 20	6 (9.52)	0 (0.00)	0.130
21	Question 11	5 (7.94)	0 (0.00)	0.309
22	Question 3	5 (7.94)	0 (0.00)	0.53
23	Question 16	3 (4.76)	1 (5.26)	1.00

Identification of key observation symptoms

Based on clinical observations, we found that the most common abnormal symptoms were weak eye contact (87%), no pretend play (79%), and no pointing with pointer finger (77%), while no social smile was the least common symptom (58%). Be that as it may, all of the 8 SACS symptoms can help differentiate autism from non-autism symptoms, as proven by P-values < 0.05.

Table 4: Comparison of abnormal items between ASD and Non-ASD children based on clinical observations

No.	Abnormal symptoms	ASD n/answers (%)	Non ASDs n/answers (%)	P value
1	Eye contact	55/63 (87.30)	5/19 (26.32)	0.000
2	Pretend play	49/62 (79.03)	4/18 (22.22)	0.000
3	Pointing	49/63 (77.78)	4/19 (21.05)	0.000
4	Respond to name call	48/63 (76.19)	3/19 (15.79)	0.000
5	Waving	43/60 (71.67)	3/12 (25.00)	0.006
6	Joint attention	42/63 (66.67)	1/19 (5.26)	0.000
7	Imitation	41/63 (65.08)	4/19 (21.05)	0.001
8	Social smile	37/63 (58.73)	4/18 (22.22)	0.008

Optimal cut-off point for differentiation of autism versus non-autism

After data analysis, we decided to choose 14 questions to which more than 50% of caregivers answered “abnormal” to find the optimal cut-off point. The sensitivity, specificity, and PPV of cut-off criteria were calculated and presented in table 5.

Table 5: Values of 14 - question – MCHAT by criteria

MCHAT Criteria (14 questions)	Sensitivity	Specificity	PPV
1 abnormal item	0.98	0.21	0.81
2 abnormal items	0.97	0.47	0.86
3 abnormal items	0.95	0.63	0.89

We also chose 8 SACS symptoms from the clinical observation to identify the most appropriate way to proceed in clinical practice (see table 4 for clinical symptoms, their frequencies). We worked step by step for each observation based on frequency, removing the least frequent symptom each time. The sensitivity, specificity, and PPV by cut-off criteria were calculated for each step.

Table 6: Values of new checklist by number of observed symptoms and criteria

Observed symptoms	Sensitivity	Specificity	PPV
Criteria: Fail 1 symptom			
1, 2, 3, 4, 5, 6, 7, 8	0.97	0.47	0.86
1, 2, 3, 4, 5, 6, 7	0.97	0.47	0.86
1, 2, 3, 4, 5, 6	0.97	0.53	0.87
1, 2, 3, 4, 5	0.97	0.53	0.87
1, 2, 3, 4	0.97	0.53	0.87
1, 2, 3	0.95	0.53	0.87
1,2	0.94	0.58	0.88
Criteria: Fail 2 symptoms			
1, 2, 3, 4, 5, 6, 7, 8	0.89	0.58	0.88
1, 2, 3, 4, 5, 6, 7	0.89	0.68	0.90
1, 2, 3, 4, 5, 6	0.89	0.68	0.90
1, 2, 3, 4, 5	0.89	0.68	0.90
1, 2, 3, 4	0.89	0.79	0.93
1, 2, 3	0.79	0.84	0.94
Criteria: Fail 3 symptoms			
1, 2, 3, 4, 5, 6, 7, 8	0.79	0.74	0.91
1, 2, 3, 4, 5, 6, 7	0.78	0.74	0.91
1, 2, 3, 4, 5, 6	0.78	0.84	0.94
1, 2, 3, 4, 5	0.76	0.84	0.94
1, 2, 3, 4	0.75	0.89	0.96

DISCUSSION

Can the MCHAT be used as a self – report questionnaire for caregivers?

The results showed that the MCHAT was hard to put into place given our conditions.

First, the ability to complete the MCHAT alone was limited. The pilot study showed that we needed to change words and restructure the questionnaire before using it in our cultural context, as similar studies had shown before (Koh et al., 2014 and Wong et al., 2004). Despite this effort, only 26.83% of caregivers were able to answer all 23 questions. This result was much lower than in Koh et al.'s study in Singapore (56.3%).

Secondly, data analysis showed that education levels and place of residence significantly affected the caregivers' ability to complete the MCHAT. Caregivers who had a level of education under grade 6 and/or lived in provinces often struggled with the assessment process. We should bear in mind that in this study, more than 60% of patients came from provinces. Therefore, using the MCHAT as a self-report inventory may not be ideal.

Last but not least, asking caregivers about their feelings in the pilot study seemed to show that psychological issues might affect the accuracy of each answer. Fear of having an autistic child could explain why caregivers provided false information to the researcher. Directly observing caregivers interacting with their child revealed differences between what caregivers had stated and how their child actually behaved. They seemed to have trouble recognizing that certain characteristics were linked to autism: "I agree that my kid is not the same as other kids but I do not think that he is like autistic children. I read that children with autism do not play with others, but my child does ...", "When I ask him to do that at home, he does it immediately. Perhaps he is afraid of the doctor and that is why he isn't listening... I do not think that my kid is autistic". This denial helps protect caregivers from the psychological trauma that is brought on by such a diagnosis. This kind of behavior is also mentioned in detail on popular websites about autism ("Autism & Your Family," ; "Living with autism,"). Also, caregivers' reactions were similar to what has been described in the famous Klubler Ross model concerning the 5 stages of grief: denial, anger, bargaining, depression, and acceptance (Ross, 1997); of which, denial is often the first psychological manifestation when a person receives unexpected bad news.

Although the MCHAT was revised, there are still many challenges that prevent it from being used as a self-report tool for caregivers in our conditions.

Can we create a tool that combines parts of the MCHAT and the SACS for quick assessment?

Our new tool includes 14 MCHAT questions for the interview and 4 SACS symptoms for observation with criteria considered abnormal « if 2 of any questions/symptoms » are failed. This combination makes the tool easier to use by reducing quantity of items as well as by using only one cut-off. Result analysis showed that this tool had 97% sensitivity, 47% specificity, and 86% PPV when interviewing caregivers and 89% sensitivity, 79% specificity, and 93% PPV when observing clinically symptoms.

Concerning the interview component, our tool achieved higher sensitivity but lower specificity than that of the Koh and Wong study. Indeed, in this study, (Koh et al., 2014), sensitivity was at 94% for the "abnormal at 3/23 questions failed" criteria, 76% for "abnormal at 2/6 key questions" failed criteria, and 81% for "2/7 best questions failed" criteria if administered to children under 30 months of age. Those numbers were lower when considering children aged 30 to 48 months. The Chinese study (Wong et al., 2004) showed that sensitivity was 84% for the "abnormal at 6/23 questions failed" criteria, and 93% for "abnormal at 2/7 best questions failed". The specificity in the Koh study ranged from 59% to 90% depending on criteria and age group. In the

Wong study, specificity was at 77% for "abnormal at 6/23 questions" criteria, and 85% for "abnormal at 2/7 best questions" criteria. Furthermore, PPV of our tool was higher than any criteria Koh's (49% - 75%) and Wong's (74% - 79%) studies.

For the observation part, we used 4 key symptoms for assessment: eye contact, pointing, response to name call, and pretend play while Wong et al. (2004) chose eye contact, pointing, pretend play, and gaze monitoring. We both applied "abnormal when 2/4 symptoms" criteria to identify a risk for ASD. Our tool achieved higher sensitivity and PPV but lower specificity than those of the Wong study (74%, 91%, and 85%). Compared to the Australian SACS study (Josephine Barbaro & Dissanayake, 2010) which assessed more than 10 symptoms and had 69 – 84% sensitivity, 99.9% specificity, and 81% PPV, our tool had lower specificity but higher sensitivity and PPV and assessed fewer symptoms.

In conclusion, the new tool that was created by reducing the number of MCHAT questions and assessing only 4 clinical symptoms from the SACS helped increase the speed of assessment while achieving acceptable sensitivity and specificity.

Limitations

We do not yet know if this tool can be used in conditions that are unlike those of our department. Although the study proved that it could help reduce time for assessing autistic risk among high-risk children in the Psychology Department of Children's Hospital 1, there are still other issues that must be considered thoroughly before it can be applied elsewhere.

This study was implemented in Children's Hospital 1, a tertiary pediatric hospital and one of the very few hospitals that are capable of assessing autistic children in the south of Vietnam; therefore, prevalence of the disease is much higher than in other hospitals and in the community. This high prevalence could explain the PPV in this study, which is higher than that of other studies. It is also important to note that there has been no official report about the prevalence of autism in Vietnam as of yet.

Also, because of the small study sample size, the values of this new tool could not be categorized by age group as in other studies.

Conclusion

The study showed that using the MCHAT as a self – report questionnaire for caregivers were not suitable, especially if they came from provinces and/or if they only had a primary school education. It is also important to consider adapting the questionnaire structure to the cultural context and caregiver's psychological conditions.

The new tool included 14 MCHAT questions and 4 SACS observation symptoms that demonstrated promising values. Using the criteria "abnormal if 2/14 items failed" had sensitivity, specificity, and PPV of 97%, 47%, and 86%, respectively, while the "abnormal if 2/4 observation symptoms" criteria had 89% sensitivity, 79% specificity, and 93% PPV.

Because it would be difficult to use the MCHAT as a self – report tool for caregivers, we used this new tool to interview them and observe the child directly. When the child presented abnormal criteria, he was sent to another doctor to confirm the diagnosis and to begin an early intervention program with special educators at the same time.

These promising results need to be generalized, so it is important that this tool be applied and routinely evaluated in other settings that have similar conditions. Also, caregivers' psychological conditions when the risk of autism is being assessed for their child can affect the accuracy of the test results, and this impact needs more research to be fully understood.

CONFLICT OF INTEREST

There was no conflict of interest for the authors, including any financial, personal or other relationships with people or organizations that could inappropriately influence the study results.

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