



Hong Kong Brief Cognitive Test (HKBC) Development and Clinical Use

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Supported by DH Chen Foundation

Ms Daphne Law and Ms Janna Ng helped in the project



Screening tests for cognitive assessments

- **Many existing cognitive tests for screening.**
 - E.g. Mini – Mental State Examination, MoCA
- **The MMSE has many limitations, e.g. the MMSE have few items on assessing executive function impairment.**



- **It was also insensitive for screening patients with mild cognitive impairment who have poor memory or cognitive function for their age without any significant functional impairment**
- **Needs to purchase MMSE since it is patented**



- **The Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005) is a brief screening tool for detection of mild cognitive impairment (MCI) and can be used to assess impairment in various cognitive domains in the individual**
- **However, performance on the MoCA and MMSE is strongly influenced by the educational level of the subjects**
- **MoCA is difficult for some older adults with low educational level**
- **Anxiety in taking tests in older adults**



- **Several versions of scoring systems in HK for the MoCA with different cut-off scores and adjustment of educational level**
- **At least 5 existing Chinese versions of the MoCA in China with widely varying cut-off scores and adjustment of educational level**



- **MoCA basic has been developed recently for use in people with low educational level**
- **However, the Chinese version of the MoCA basic in China was affected by educational level and had 3 different cut-off scores to adjust for educational level**



- **There exists a strong need to develop a new cognitive test for the assessment of elderly with low educational level**
- **The use of an informant questionnaire (IQ) to screen for cognitive impairment is also reported to be useful, e.g., the AD8 (Galvin et al., 2005)**
- **Informant questionnaires are relatively free from the effect of educational influence, can be very useful**
- **But the presence of a reliable informant is required and an informant may not be available at times in clinical settings.**



Objectives

- **To develop and validate a new cognitive test for detection of cognitive impairment in Chinese older people, as cognitive tests developed in western countries may not be suitable since older adults in Hong Kong have a low educational level.**



Methods

- **The new cognitive test was developed based on review of the literature, as well as the views of an Expert panel.**
- **Pilot study with 80 informants and subjects (major NCD and mild NCD patients + normal)**
- **Some items modified according to the subjects' response**

Hong Kong Brief Cognitive Test (HKBC)

Form 1

香港簡易認知評估

姓名：_____

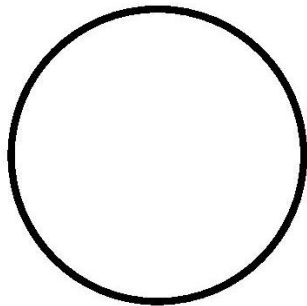
年齡：_____ 性別：男 / 女

教育：_____年

日期：_____

1. 即時記憶	請讀出以下詞語，再請測試對象重複講出，第一次答案全對給 1 分					分數 ____/1	
		垃圾桶	三文治	飛機	學校		
	第一次						[] 正確詞
	第二次						不計分
第三次							
2. 時事知識	請講出香港現任特首的名字 (香港以外地方，可問現任國家領導人的名字)					____/1	
3. 時間定向	[] 月		[] 星期幾		[] 季節		
	地方定向		[] 地區 [] 醫院 / 大廈 / 街道 / 中心名稱				____/2
4. 動作模仿及記憶	能模仿三次正確動作 (拳頭 - 手的邊 - 手心) [1 分]					[]	
	自己能做三次正確動作 [1 分]					[]	____/2
5. 語言流暢	一分鐘能講出的動物數量 [] 動物數量					____/4	
	動物數量：5-9 [1 分]，10-13 [2 分]，14-16 [3 分]，17 或以上 [4 分]						
6. 延遲記憶		垃圾桶	三文治	飛機	學校	____/8	
	自然記憶						
	類目提示 (見表一)						
自然記憶每個正確詞語 [2 分]，類目提示每個正確詞語 [1 分]，共 8 分							
7. 畫鐘	請在圖形裏面寫上所有數字，再畫兩枝指針，時間顯示為八點二十分 (如未能成功填上所有數字或數字分佈不平均，請用背面已填上數字的鐘面)					____/2	
	正確數字與分佈 [1 分]，正確時間 [1 分]						
讀時間	指着紙張背面下方的時鐘，請測試對象講出時間					____/1	
8. 命名與功能	指着紙張背面的物件，請測試對象講出物件的名稱及功能 [] 正確名稱					____/4	
	正確名稱 [2 分]，正確功能 [2 分] (見表二) [] 正確功能						
9. 近期記憶	請講出最近一個月內在香、中國或外國發生的一件新聞					____/2	
	詳細講述 [2 分]，簡單講述 [1 分]						

總分：____/30



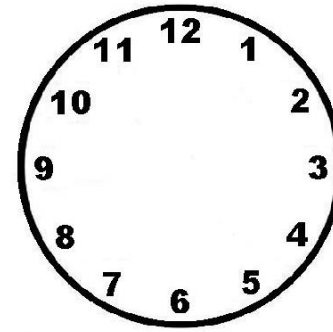
(表一)

類目提示	
垃圾桶	家居用品
三文治	食物
飛機	交通工具
學校	建築物

(表二)

名稱	功能
鈕 / 鈕扣	扣住件衫 / 衣服
單車輪 / 單車轆	(轉動來) 令單車行 / 行走 / 向前行 / 移動

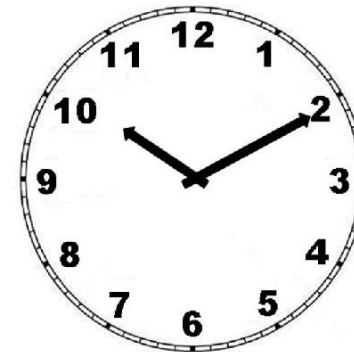
7. 畫鐘



8. 命名與功能



7. 讀時間



	Optimal Cut-off Score
Normal Subject	≥ 22
Mild Neurocognitive Disorder	17 - 21
Major Neurocognitive Disorder	≤ 16

Reference:

Chiu, H. F., Zhong, B. L., Leung, T., Li, S. W., Chow, P., Tsoh, J., Yan, C., Xiang, Y.T. & Wong, M. (2018). Development and validation of a new cognitive screening test: The Hong Kong Brief Cognitive Test (HKBC). *International journal of geriatric psychiatry*



Hong Kong Brief Cognitive Test

The test includes a number of cognitive domains: immediate recall/attention, delayed recall, recent memory, orientation, frontal lobe function test, general knowledge, visuo-spatial construction and executive function and language.



- **Immediate and delayed recall of 4 items**
- **Recent memory tested by recent news item**
- **Orientation for time and place**
- **Verbal fluency of animals in 1 minutes**
- **Naming and function of a button and a bicycle tyre**



Frontal lobe function is assessed by the Luria test. The subject is asked to imitate 3 hand motions (fist-edge-palm) performed by the examiner. This is repeated for 2 more times. The subject is then required to perform the hand motions on his/her own for 3 times. Executive function is assessed by a 1-minute Verbal fluency test for animals.



Visuospatial function is assessed by the Clock test which consists of clock-drawing, clock-setting and clock-reading. First, the subject has to put down the numbers in a pre-drawn circle, and then put down the clock hands to indicate 8:20. If the subject cannot write the numbers, the subject will be provided with a pre-drawn clock with numbers, and the subject is asked to indicate 8:20 by putting down the clock hands. The last part of the test is to ask the patient to read the time on a pre-drawn clock indicating 10:10.



- **Three groups of subjects aged 65 or above and their informants were recruited**
 - normal older people recruited in elderly centres
 - people with Mild NCD (Neurocognitive Disorder)
 - people with Major NCD (Neurocognitive Disorder)
- **All subjects evaluated by a psychiatrist**



- **Clinical diagnosis of Major NCD and Mild NCD according to DSM-5 were made by experienced psychiatrists. All subjects, as well as informants of major NCD subjects gave written consent.**
- **The new brief cognitive test HKBC, Montreal Cognitive Assessment (MoCA) and Mini Mental State Examination (MMSE) were administered to the subjects.**



- **The performance of the new cognitive test, HKBC, in differentiating subjects with Major NCD, Mild NCD and normal elderly were compared with the clinical diagnosis, MoCA and the MMSE.**



Results

- **In total, 359 subjects were recruited, with 99 normal controls, 132 subjects with major NCD and 128 with minor NCD.**
- **Inter-rater reliability (N=32, ICC=0.989, P<0.001), test-retest reliability (N=33, ICC=0.832, P<0.001) after 6 weeks, of the HKBC are good. The internal consistency of the new cognitive test was satisfactory, Cronbach alpha of 0.786.**



- **The mean MMSE, MoCA and HKBC scores showed significant differences among the 3 groups of subjects. In the ROC curve analysis of the HKBC in differentiating normal subjects from those with cognitive impairment (Mild NCD + Major NCD), the area under the curve (AUC) was 0.955 with an optimal cut-off score of 21/22.**



Education effect on the new test

- We dichotomized the educational level into less educated (years of education 0 - 6 years) and better educated (years of education 7 or more years) groups. As shown in Table 1, there was some evidence of education effect on the score of the new test, because, within the Major NCD and normal groups, less educated subjects had statistically significant lower test scores than better educated subjects (P=0.013 and P=0.033)**




	AUC	Optimal cut-off score	SEN	SPE
HKBC	0.955	≤21	0.90	0.86
0-6 years	0.957	≤21	0.92	0.80
	0.957	≤20	0.85	0.88
7 or more years	0.947	≤21	0.83	0.93
	0.947	≤22	0.89	0.86
MMSE	0.904	≤25	0.83	0.84
MoCA	0.913	≤19	0.80	0.86

Table 2: Distinction between normal and cognitive impairment (Major NCD + Mild NCD)



- **Corresponding diagnostic results for the two educational groups were presented in Table 2. From the result, we examined the effect of adding one point to the test scores of the less educated group in screening the normal and cognitively impaired subjects. However, there was no significant improvement in the AUC because AUC difference between the original and the education adjusted cut-off scores was statistically insignificant ($Z=0.14$, $P=0.8849$)**

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- **Table 3 showed the performance of the HKBC in distinction between Major NCD and Mild NCD subjects (optimal cut-off score 16/17) as well as between normal and Mild NCD subjects (optimal cut-off score 21/22). Similar cut-off scores could be applied for the 2 educational groups.**



Discussion and Conclusions

- **We have developed a brief cognitive instrument useful for cognitive screening in populations with low educational level. Its advantages include the short time of administration (7 minutes), minimal educational bias, and good psychometric properties.**
- **In comparison with the MMSE and MoCA, its performance as a screening instrument for subjects with cognitive impairment is superior.**



Discussion and Conclusions

- In the development of the HKBC, we have taken the following factors into considerations. To decrease the influence of educational level on the test, use of paper and pencil tests are minimized. Further, in our clinical experience, subtraction is difficult for some illiterate older people and this is not included in the new cognitive test.**



Discussion and Conclusions

- **Limitations of study: small sample size, convenience sample**
- **Further cross-validation studies involving a larger number of subjects are required.**

Received: 8 October 2017 | Accepted: 28 January 2018

DOI: 10.1002/gps.4883

RESEARCH ARTICLE

WILEY International Journal of
Geriatric Psychiatry

Development and validation of a new cognitive screening test: The Hong Kong Brief Cognitive Test (HKBC)

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Document



The paper on HKBC was reviewed in the Current Opinion in Psychiatry September 2019 issue.

“Dementia care in low and middle-income countries”

Rated as Of Outstanding interest.



Further progress

Several studies using HKBC are conducted in China

A study to examine the HKBC scores in different stages of dementia

<http://www.psychiatry.cuhk.edu.hk/HKBC>