

## ABSTRACT

**Objective:** Some studies found that autistic spectrum disorder (ASD) associated memory deficits were related to frontal lobe dysfunctions, e.g., ineffective organization strategy for memory. Yet, the memory profile of ASD remains inconclusive. The present study aims to examine the memory profile of ASD children based on the information processing model and its association with their organization strategies adopted, and to explore the effect of ‘voiced’ (with explicit instruction) and ‘unvoiced’ (without instruction) experimenter-provided organization cueing on memory retrieval. The neuro-physiological basis underlying their memory process was also explored using electroencephalographic (EEG) coherence.

**Method:** Twenty-three children with high-functioning ASD and 39 normal children (NC) aged 5 to 14 years were recruited. In experiment 1, their memory was assessed with the Hong Kong List Learning Test (HKLLT), a memory test of disorganized (DIS) and semantically organized (ORG) words. In experiment 2, their memory of abstract geometric figure (Rey-O) and nameable object (Object Recognition Test, ORT) was tested. The objects in the ORT were presented in DIS or ORG manner. While semantic cue was given explicitly in the HKLLT, it was delivered implicitly in the ORT. In experiment 3, EEG theta coherences connecting anterior, temporal and posterior brain regions were recorded before and during the ORT.

**Results:** ASD children showed frontal-lobe-related memory problems, with encoding and retrieval deficits, and vulnerability to interference. Their memory deficits were associated with ineffective use of organization strategies. Hyper-coherence at inter-hemispheric anterior-posterior connections and lesser reduction in intra-left anterior coherence correlated with their poorer recognition. Explicit cueing has enhanced semantic clustering and delayed recall of words. Yet, the effect of ‘unvoiced’ cueing was subtle, with a trend of improving severer memory impairment and suppressing excessive coherence.

**Conclusion:** The present study revealed specific memory deficits profile of ASD children associated with ineffective use of organization strategies. Together with their deviated EEG coherence pattern, it has implicated that the memory deficits associated with ASD was possibly subserved by dysfunctional cooperation in frontal and frontal-posterior cortical regions. The potential benefits of explicit cueing and subtle effect of implicit cue on memory performance and neural functional cooperation in ASD were discussed.

## 摘要

目的：有研究顯示自閉症兒童的記憶問題源於前額葉運作失調，尤其與資訊組織策略欠效率有關，但這說法尙未有定論。本研究旨在根據資訊處理模型來評定自閉症兒童的記憶功能缺損狀況，探討組織策略如何影響自閉症兒童的記憶能力，並探索“公開”（給予口頭指示）與“暗示”（沒有口頭指示）的類別提示對記憶的影響。本研究亦利用腦電同步指數來反映大腦於記憶不同組織程度的資訊時的腦電運作情況。

方法：被試分別為23位及39位，5至14歲，智力正常的自閉症及發展正常的兒童。實驗一利用香港文字記憶學習測試來評定被試的記憶，當中要求他們先後記著散亂（隨機排列）或已組織（按類別排列）的意思相關詞。實驗二則要他們記憶抽象圖案及散亂或經組織的具體物件圖像。實驗一的類別提示是“公開”的，而實驗二則是“暗示”的。實驗三是測量被試於圖像記憶過程中，連繫著大腦前方，近耳旁兩側及後方 $\theta$ 波段的腦電同步指數，並探討它們與記憶及組織策略的關係。

結果：自閉症兒童呈現受損的記憶編碼及提取過程，和易受干擾的現象。這都是常見於大腦前額葉功能受損的病人的記憶問題。自閉症兒童的記憶問題與組織能力不足相關。大腦兩側的前—後腦腦電同步指數過高，或是左腦前方的指數下降不足，都與較差的物件記憶相關。“公開”組織提示有助提升語意組織策略及自行回憶的文字。相比之下，“暗示”提示的效果較不顯著，只有局部改善了物件記憶較差的兒童及稍稍壓制了過高的前—後腦腦電同步指數。

總結：本研究發現為自閉症兒童呈現獨特的記憶功能缺失，及與其相關的組織策略不足。融合異常的腦電同步狀況，初步反映自閉症兒童的大腦前額葉及額葉與後方大腦部位的功能性合作異常情況，很可能是造成他們記憶問題的根源。最後亦討論了“公開”組織提示於改善記憶表現的潛在效益，及“暗示”提示於提升記憶力及調整異常腦電同步的隱藏果效。