

聽覺行為異常篩檢量表

簡介及施測說明



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大綱

- 從不同 CAPD 定義觀點解讀 CAPD 行為篩檢量表
- CAPD 行為表徵的意涵
- CAPD 共病
- 介紹不同的 CAPD 行為篩檢量表/問卷
- CAPD 行為觀察與診斷測驗的相關性文獻分享
- 婦聯聽健版本的CAPD 行為篩檢量表

APD means different things to different people

(Jerger, 2009)

CAPD results from deficits in the **perceptual processing of auditory stimuli** in the CANS.

These neurobiological deficits manifest **primely (if not solely) in the auditory modality.**

(ASHA, 2005)

Central Auditory Processing

CAP 的本質是聽覺

高層次的認知神經處理以由上而下的方式影響基本的聽覺技巧，因此CAP必須將此效應納入考量

British Society of Audiology

(BSA, 2011)

- A neurodevelopment disorder **with a significant, dominant cognitive influence.**
- Lower cognitive performance tended to score lower on tests of auditory perception
- Attention deficits tended to affect auditory test performance

篩檢量表目的

For what are we screening?

- Benefit the individuals being examined
- 找出風險族群？Should this individual be referred for a diagnostic assessment?
- Highlight concerns about a child
- Provide a measure of impact in the quantified measures of functional listening ability
- Supplement and contextualize the behavioral findings after a diagnostic assessment for CAPD has been completed
- 不同年齡層對照常模？

AAA APD Consensus Conference recommended
“the development and validation of screening
questionnaires for school age children based on
accepted psychometric principles with clear defined
pass/refer criteria”

“Generally have **poor specificity**, tend
to **over-refer**, and have **not** been
validated”

(AAA, 2010)

“A carefully constructed parent/caregiver
evaluation (e.g., a questionnaire) be a
sensitive screening instrument for CAPD

(BSA, 2011)

CAPD行為表徵

Behavior characteristics

- 在競訊、噪音或迴響環境下聽取困難 Difficulty understanding spoken language in competing messages, noisy backgrounds, or in reverberant environments
- 聽錯、誤解訊息 Misunderstanding messages
- 回應不一致或不適當 Inconsistent or inappropriate responding
- 經常要求重複、說『蛤』或『什麼』 Frequent requests for repetitions, saying “what” and “hun” frequently
- 在口語溝通情境下需要較長的時間回應 Taking longer to respond in oral communication situations
- 無法專注 Difficulty paying attention
- 容易分心 Being easily distracted
- 遵循複雜聽覺指令有困難 Difficulty following complex auditory directions or commands
- 判斷音源困難 Difficulty localizing sound
- 學習歌曲或童謠困難 Difficulty learning songs or nursery rhymes
- 音樂及歌唱能力不佳 Poor musical and singing skills
- 閱讀、拼字及學習困難 Associated reading, spelling, and learning problems

(AAA,2010)

如何將這些困難表現分類？

- 不利情境中的聽取
- 聽錯、漏聽
- 不符期待的回答或回應
- 反應時間較長
- 容易分心、無法專注
- 找不到音源
- 學習：音樂、歌曲、閱讀、拼字

涉及哪些聽覺處理？ (ASHA, 1996)

- 聽覺分辨 Auditory discrimination
- 聽覺型態辨識 Auditory pattern recognition
- 聽覺時序處理 Temporal processing
- 聲源定位與辨位 Localization and lateralization
- 在競訊中的聽覺表現 Performance with competing acoustic signals
- 在降階訊號中的聽覺表現 Performance with degraded acoustic signals

聽覺分辨 Auditory discrimination

- The ability to analyze and extract fine acoustic differences
 - Frequency、Amplitude、Time
- 影響
 - 安靜或噪音中的字詞辨識及語言理解
 - 聽覺閉鎖能力
 - 雙耳分離、統整
 - 雙耳互動
 - 形態辨識

韻律缺失 Prosodies deficit

- Using prosodic features of the signal
- Predominantly right hemisphere function
- Temporal patterning 時間型態測驗
- 影響閱讀、音韻及拚字技巧、做筆記、排序、聽覺注意、工作記憶和問題解決

有哪些特定的聽覺缺失？ Identify specific auditory deficits

- 聽覺分辨 Auditory discrimination
- 雙耳處理 Binaural processing
- 時序處理 Temporal processing
 - 時間解析 Temporal discrimination/ resolution
 - 時間順序 Temporal ordering
 - 時間統整 Temporal integration
 - 時間遮蔽 Temporal masking

聽覺解碼缺失 Auditory decoding deficit

- 聽覺閉鎖 Auditory closure
 - breakdown in the intrinsic redundancy of the CANS
 - deficits in temporal processing
- 利用降階的言語測驗來評估
- Create secondary difficulties in communication skills
- 左半腦功能異常（初級聽覺皮質 A1）

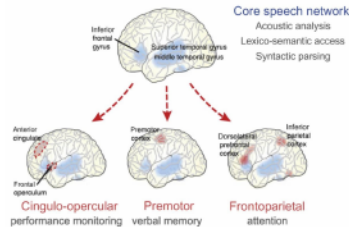
整合缺失 Integration deficit

- Recognize and utilize multi sensory gestalt patterns quickly and efficiently
- Inefficient communication across the corpus callosum
- Excessive left ear suppression on dichotic listening tests
- Deficits in binaural separation or binaural integration tasks
- Poor scores of pattern tests in verbal report condition only
- 接收及表達語言、視動、視聽
- 不是每個孩子都受惠於視覺線索，特別是有整合缺失的兒童

聽覺任務

Auditory tasks

- Activate auditory and **nonauditory** areas of the brain
- 包括注意、執行控制、工作記憶、語言處理及動作計劃...



行為反應

Behavioral response

- 刺激--反射
- 制約--反應
- 認知能力的影響
 - 注意、記憶、IQ、執行控制、意願...
- 氣質
- 語言能力
- 執行--動作能力

共病

Comorbidity

- Comorbidity is the result of the complex organization of the brain that is **temporally** coupled across the cortex, modalities, and hemispheres.
- The brain's organization is predominantly **non-modular** and non-exclusively segregated.
- Neurons in so-called auditory areas may respond primarily, although **not exclusively to auditory stimuli**.
- Auditory neurons in the cerebrum exhibit interconnectedness with a variety of neurons in other nonauditory areas of the brain, including the limbic system, cingulate gyrus, hippocampus, and the frontal lobe.
- 因為與高階認知、語言及溝通功能共用神經基底，所以可能同時發生異常，但**非**為其他異常的結果。

噪音中聽取困難

Difficulty hearing in noise

- SNHL
- ANSD
- CAPD
 - A symptom of auditory closure deficit
 - A dysfunction in the processes of binaural separation and integration
- ADHD
- Aging

聽覺注意

Auditory attention

- 警鈴大作依然聞風不動的嬰兒
- 聽檢中不配合的孩童
- 認知的需求
- 有效的過濾器

<https://youtu.be/vyJG698U2Mvo>



ADHD

注意力不足過動症

- 兒童期最常發生的神經行為異常 (Barkley, 1998)
 - 台灣盛行率 9.02% (只有 1.62% 接受診斷)
 - 全球盛行率為 4-12%
- 三種亞型：注意不足 inattention、過動 hyperactivity-衝動 impulsivity 及混合型
- 診斷依據：行為表現 (DSM-5)
- 行為抑制異常 Behavioral regulation disorder
- 動機缺失 Motivational deficit

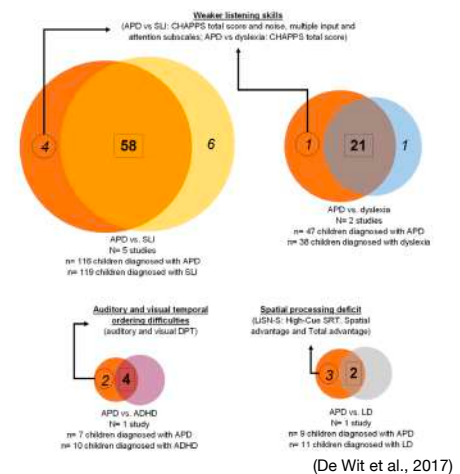
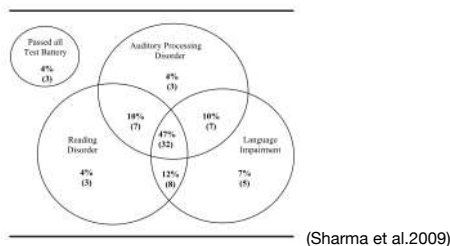
學習障礙 Learning Disability

- Many of the auditory responsive and interconnected areas support **attention, executive control, and motor regulation** and are implicated in the underlying pathophysiology of ADHD.
- The **corpus callosum** has been reported to be smaller in children with ADHD relative to normal controls.
- Sowell et al. (2003) reported abnormal morphology and reduced size of the frontal cortices of children and adolescents with ADHD.

- 表現與胼胝體缺損者有許多相似之處。
- 推論可能起因於髓鞘發展遲緩 (Musiek, Gollegly & Baran, 1984)
- 相對於中樞神經系統的其他部位，胼胝體高度的髓鞘化以維持功能表現
- 影像學證據：學障及注意力缺損兒童的後胼胝體區較小
- 間接證據：切除幼貓的胼胝體，變得比較好動，要多花兩倍的嘗試才達成設計任務得到食物酬賞。

語言與閱讀障礙 Language Impairment & Reading Disorder

- There are no widely recognized “gold standards” for identifying
- Auditory attention and/or memory



聽覺處理範疇問卷 Auditory Processing Domains Questionnaire, APDQ

- O'Hara, 2006
- 早期稱作 The Listening Questionnaire, TLQ
- 52題, 4分量表
- 聽覺處理31題
 - Targeted Auditory Processing 18題 (auditory decoding)
 - Adjusted auditory processing 13題 (3 speech prosody & 5 auditory integration)
- 注意力10題 (6題 inattentive from DSM-IV)
- 語言11題 (表達、接收溝通技巧及閱讀、寫作學業表現)
- 7-17歲 家長或教師填寫

APDQ (O'Hara & Me

Table 1. Factor analysis loadings with oblique rotation and Kaiser normalization. Loadings are shown only for loadings greater than 0.35.

Question (abbreviated)	Original scale direction	Factor analysis results		
		AP	Lang	ATT
1 Listens attentively in noisy groups or classroom	AP, ATT	0.88		
4 Hears your words accurately when attention is quiet	AP	0.92*		
5 Hears your words accurately when attention is loud	AP	0.86		
9 Understands speakers in noisy noise	AP	0.88		
10 Listens accurately to competing speakers	AP	0.79		
11 Listens accurately while doing something else	AP	0.82		
12 Listens accurately without visual cues	AP	0.87		
13 Listens accurately while doing a related visual task	AP	0.71		
15 Avoids distractions when listening	AP	0.55		
18 Listens long periods without fatigue or fatigue	AP	0.61		
21 Hears speakers clearly accurately from behind	AP	0.62		
22 Does not say "what" when conversing in quiet	AP	0.76		
23 Does not say "what" when conversing in noise	AP	0.75		
27 Answers questions promptly in noise	AP	0.75		
36 Readily follows temporal and directions	AP, Lang		0.51	
32 Understands fast talking or foreign speakers	AP	0.55		
33 Understands soft spoken and high speed speakers	AP	0.62		
34 Listens accurately on phone	AP	0.60		
35 Hears speakers clearly accurately when it's far away	AP	0.60		
38 Distinguishes accurately between similar sounding words	AP	0.60		
37 Understands instructions of other attention (noise)	AP	0.86		
39 Can speak correctly with phrases	AP	-0.50	0.90*	
40 Can read new words phonetically	AP	-0.31	0.82*	0.32*
43 Knows how to use directions	AP	0.62		
44 Readily follows musical pitch and rhythm patterns	AP	0.40	0.87*	
46 When speaking talks expressively	AP	0.54*		
49 Hears speakers' emphasis and other voice cues	AP	0.57*		
51 Does not need "help" more controls at school and home	AP	0.39	0.63*	-0.31*
52 Does not need speakers to talk more slowly	AP	0.62*		
6 Listens carefully to important information	ATT	0.42*	0.38	
14 Avoids distractions when working or doing	ATT	0.38*	0.32	
17 Can study without fatigue or forgetting	ATT	0.52*	0.06	
20 Concentrates easily on low interest but important tasks	ATT	0.40*	0.33	
24 Attends to details - avoids careless errors when studying	ATT	0.30*	0.33	
28 Readily ignores tasks	ATT	0.48*	0.24	
31 Not forgetful	ATT	0.64*	0.31	
7 Understands spoken instructions (quiet)	Lang	0.87*		
16 Understands written instructions	Lang	0.61	0.62*	
19 Explains things better during conversations	Lang	0.52		
25 Understands and uses longer sentences	Lang	0.70		
26 Answers questions promptly (quiet)	Lang	0.60*		
33 Understands strong expressions	Lang	0.51		
35 Uses new words correctly	Lang	0.71		
41 Reads stories at an 18 rate like age	Lang	0.89		
48 Understands spoken without reading (single words)	Lang	0.87		
50 Speaks fluently without many pauses or "uh"	Lang	0.80	-0.35*	
1 Pays attention to speakers in quiet classrooms	Off scale comparisons	0.56		
8 Understands spoken instructions (noise)	Off scale comparisons	-0.89		

*Indicates the scale a factor is assigned to instead of the original scale.
 Indicates the scale a factor is assigned to in addition to the original scale.
 Indicates the scale a factor was originally assigned to but was not assigned to by the factor analysis.

Fisher 聽覺問題檢核表

Fisher’s Auditory Problems Checklist, 1976

- 25題是非問題檢核
- 13 個範疇
- 5-11歲兒童
- 美國教育聽力師最常使用的量表
- 6 items removed (Tomblin,2014)

Categorical representation of items on Fisher's Checklist

Category	Item number(s)
Acuity	1 and 2
Attention	3, 4, and 5
Attention span	6, 7, and 8
Figure ground	9
Discrimination	10 and 11
Short-term memory	12 and 13
Long-term memory	14
Sequential memory	15 and 16
Comprehension	17, 18, and 19
Speech and language problems	20 and 21
Auditory-visual integration	22
Motivation	23
Performance	24 and 25

Note: Numbers in the item number(s) column represents the question's number in Fisher's Checklist where the category is found.

Fisher 聽覺問題檢核表

Fisher’s Auditory Problems Checklist, 1976

聽覺問題檢核表
Fisher's Auditory Problem Checklist

姓名 _____ 性別 _____ 學校 _____ 年級 _____
填表人 (家長/老師) _____ 完成日期 _____ 年 _____ 月 _____ 日

孩子是否曾有以下的問題？有的請打勾。

1.	有聽力損失
2.	耳朵曾感染或發炎
3.	超過一年以上的時間無法注意或聆聽教學內容
4.	無法仔細聆聽指令--常常需要重複地教學
5.	每天至少說「Y?」、「?」和「什麼?」5次以上
6.	無法注意太長的聽覺訊息
7.	注意力時間太短 (注意長度 _____ 0-2 分鐘 _____ 2-5 分鐘 _____ 5-15 分鐘 _____ 15-30 分鐘)
8.	做白日夢，注意力容易做轉移，或不守會
9.	容易做背景聲音分散注意力
10.	聲音正確有困難
11.	對於聲音的區別有困難
12.	容易忘記剛剛才聽過的詞

計分與常模

- 72分為切分點
- 聽覺環境相關的題目太少
- 得分 32-72%的兒童中出現異常的比例高於 75% (Strange et al., 2009)

Number of items not checked _____ x 4 = _____

Normative data grade score _____

_____ WHL _____ Below Cut off Score _____ SD below mean

Normative Data for Fisher's Auditory Problems Checklist:

Group	Approximate Age Range	Mean
Kindergarten	Age 5.0 - 5.11	92%
First	Age 6.0 - 6.11	89.8%
Second	Age 7.0 - 7.11	87.6%
Third	Age 8.0 - 8.11	85.6%
Fourth	Age 9.0 - 9.11	86.9%
Fifth	Age 10.0 - 10.11	87.4%
Sixth	Age 11.0 - 11.11	86.0%
Total Group N=280		86.8%
Cut off Score Suggesting Need for Further Evaluation		72.0%

SD = 18.2

One SD Below Group Mean 68.6%

Two SD Below Group Mean 50.4%

Three SD Below Group Mean 32.2%

Items Assessing APD using Jack Katz's Classification:

DEC: 5,10,11,17,18,21,24

TFM: 6,7,9,12

CRS: 15

INT: 22

CHAPS

Children's Auditory Performance Scale

- 早期稱為CHAPPS, Smoski 1987
- 共有36題, 李克特7分量表
- 美國第二常用的CAPD篩檢表
- 與同儕相較在安靜、理想、噪音及多音源 multiple inputs情境下的聽覺行為
- 聽覺記憶順序 auditory memory sequencing
- 聽覺注意區間 auditory attention span
- 總分 < -11

兒童聽覺表現評分表 範例

Children’s Auditory Performance Scale, CHAPS

填答者： _____ 關係： 父聲 / 教師 / 其他 _____

說明：請回答所有的問題，將孩子與其他相似年齡及背景的孩子做比較，不要以嚴正的聽覺狀況做回答，例如：在某個程度上所有八歲的孩子在吵雜的房間裡，都會有聽及理解上的困難，那表示對所有的孩子來說這都是不佳的聽覺環境，然而，有些孩子在同樣的環境中，比起其他孩子有更佳的適應，你必須判斷這孩子是否在某一個我們所提到的聽覺環境中都比其他孩子有更多的困難，請用下列的方式記錄你的判斷，圈出每一題的數字。

反應選項	很少困難	差不多	有一點困難	有困難	明顯的困難	極度困難	完全無法理解
評分	+1	+0	-1	-2	-3	-4	-5

● 聆聽條件——聽覺環境 (跟相似年齡與背景的孩子做比較)

在一個有背景噪音的環境裡聽聲音，像是：電視、音樂、有人在說話、小孩子在遊戲等等，孩子在以下狀況會有聽及理解的困難。

1. 當孩子注意時.....	+1	+0	-1	-2	-3	-4	-5
2. 問孩子問題時.....	+1	+0	-1	-2	-3	-4	-5
3. 給孩子簡單指令時.....	+1	+0	-1	-2	-3	-4	-5
4. 給孩子複雜的多項指令時.....	+1	+0	-1	-2	-3	-4	-5
5. 當孩子不注意時.....	+1	+0	-1	-2	-3	-4	-5
6. 當孩子正在做其他活動，例如：畫畫時.....	+1	+0	-1	-2	-3	-4	-5
7. 當孩子和一群孩子一起聽時.....	+1	+0	-1	-2	-3	-4	-5

多重輸入

Multiple inputs

● 聆聽條件——多重輸入 (跟相似年齡與背景的孩子做比較)

除了聽覺之外，同時有其他形式的輸入 (例如：視覺、觸覺等)，孩子在以下狀況會有聽及理解的困難。

1. 同時聆聽及注視說話者的臉.....	+1	+0	-1	-2	-3	-4	-5
2. 聽的同時有其他人大聲讀出閱讀材料.....	+1	+0	-1	-2	-3	-4	-5
3. 聽的同時有人提供視覺提示 (如示範畫畫或在黑板上寫下資訊)	+1	+0	-1	-2	-3	-4	-5

聽覺記憶與注意

● 聆聽條件——聽覺記憶/聽度（跟相似年齡與智商的孩子做比較）

需要回憶口語訊息時，孩子會有以下的困難。

1. 立即的記憶訊息，如語詞、拼字、數字等.....	+1	+0	-1	-2	-3	-4	-5
2. 立即回憶簡單指令.....	+1	+0	-1	-2	-3	-4	-5
3. 立即回憶多重指令.....	+1	+0	-1	-2	-3	-4	-5
4. 能依序回憶訊息.....	+1	+0	-1	-2	-3	-4	-5
5. 要求記憶困難語詞、拼字、數字等（一小時以上）.....	+1	+0	-1	-2	-3	-4	-5
6. 要求記憶困難簡單指令.....	+1	+0	-1	-2	-3	-4	-5
7. 要求記憶困難多重指令.....	+1	+0	-1	-2	-3	-4	-5
8. 要求記憶困難 24 小時之後.....	+1	+0	-1	-2	-3	-4	-5

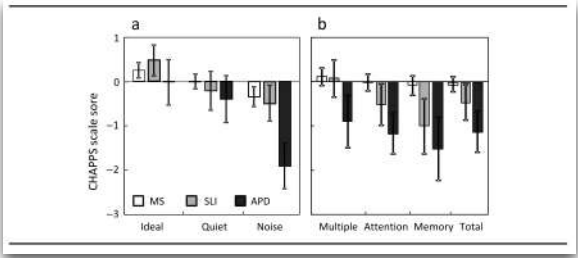
● 聆聽條件——聽覺注意強度（跟相似年齡與智商的孩子做比較）

需要孩子延長聆聽的時間，孩子會有注意力的困難，也就是孩子注意覺醒說過的話。

1. 當聆聽時間少於 5 分鐘.....	+1	+0	-1	-2	-3	-4	-5
2. 聆聽時間約 5 至 10 分鐘.....	+1	+0	-1	-2	-3	-4	-5
3. 聆聽時間超過 10 分鐘.....	+1	+0	-1	-2	-3	-4	-5
4. 在安靜的房間中聆聽.....	+1	+0	-1	-2	-3	-4	-5
5. 在吵雜的房間中聆聽.....	+1	+0	-1	-2	-3	-4	-5
6. 在早上聽到的第一件事.....	+1	+0	-1	-2	-3	-4	-5
7. 在晚餐前聽到的最後一件事.....	+1	+0	-1	-2	-3	-4	-5
8. 房間內有其它造成分心的視覺刺激.....	+1	+0	-1	-2	-3	-4	-5

譯自 Children's Auditory Processing Scale(CHAPPS)

• MS=Mainstream School



(Ferguson et al., 2010)

兒童居家聽覺困難檢核表

Children's Children's Home Inventory for Listening Difficulties, CHILD)

- Anderson and Smaldino, 2000
- 15題, 8分量表
- 3-12歲家長填/ 7-12歲兒童填寫
- 五個面向

Listening Situation Breakdown				Total	Average
Type of Situation	Add together the responses to the following question numbers:				
Quiet	1 + 2 + 3 + 15 =	+	+	+	
Noise	5 + 9 + 12 + 14 =	+	+	+	
Distance	7 + 11 + 13 =	+	+	+	
Social	5 + 9 + 11 =	+	+	+	
Mixtur	4 =				

1. 在安靜的環境裡，你通常能和聽者在一起看書或是聊天，知道書裏面或是聽者說話，而他們正在那裡說話，這時你可以聽清楚並了解他們在說什麼嗎？	2. 假如有人一起吃飯，有人大聲說話或聽者說話或問問題，你能夠聽清楚並了解他們在說什麼嗎？	3. 假如自己的房間被聲音吵醒，聲音和聽者說話或不注意的話，你聽不清楚或問問題，你可以聽清楚並了解他們在說什麼嗎？	4. 你通常能完成別人的任務，如果沒有字樣，你能夠聽清楚並了解他們在說什麼嗎？	5. 假如一個朋友在房間裡，你聽不到他在說什麼或一些事情，會他幫你說話，你能夠聽清楚並了解他們在說什麼嗎？	6. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	7. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	8. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	9. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	10. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	11. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	12. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	13. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	14. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？	15. 你通常能完成別人的任務，如果沒有字樣，你通常能聽清楚並了解他們在說什麼嗎？
1. 聽	2. 聽	3. 聽	4. 聽	5. 聽	6. 聽	7. 聽	8. 聽	9. 聽	10. 聽	11. 聽	12. 聽	13. 聽	14. 聽	15. 聽

教育聽覺檢核表

Listening Inventory for Education-Revised ,LIFE-R

- Anderson and Smaldino, 1999
- Student Appraisal of Listening Difficulty, 2011
- Child self-report
- 15題，5分量表
- 非特定給CAPD

教室內的聆聽環境	總是困難	有時困難	沒有困難
1. 老師在教室前面說話	10	7	5
2. 老師在教室後面說話	10	7	5
3. 老師在教室中間說話	10	7	5
4. 老師在教室後面說話	10	7	5
5. 老師在教室後面說話	10	7	5
6. 老師在教室後面說話	10	7	5
7. 老師在教室後面說話	10	7	5
8. 老師在教室後面說話	10	7	5
9. 老師在教室後面說話	10	7	5
10. 老師在教室後面說話	10	7	5
11. 老師在教室後面說話	10	7	5
12. 老師在教室後面說話	10	7	5
13. 老師在教室後面說話	10	7	5
14. 老師在教室後面說話	10	7	5
15. 老師在教室後面說話	10	7	5

目標教育風險篩檢工具

Screening Instrument for Targeting Educational Risk ,SIFER

- Anderson, 1989
- 共有 15 題, 李克特5分量表
- 學業成就 academics、注意力 attention、溝通 communication、教室參與 class participation、在校行為 school behavior
- 有3個版本：學前、學齡、Secondary
- Pass、at risk/ marginal、fail

SIFER

	良好	→	差不多	→	薄弱	
1. 與其他同學相比，孩子的基礎知識理解程度如何？(如：顏色、形狀等)	5	4	3	2	1	學術 預備 能力
2. 孩子能夠理解兩個指令嗎？	5	4	3	2	1	
3. 和同學相比，孩子是否很容易參與團體活動？	5	4	3	2	1	
4. 和同學相比，在教室大團體活動中孩子很容易分心嗎？	5	4	3	2	1	注意 力
5. 和同學相比，孩子的注意力時間長度如何？	5	4	3	2	1	
6. 在小團體活動或從故事時間，孩子是否能維持良好的注意力？	5	4	3	2	1	
7. 和同學相比，孩子的詞彙及語言使用的技巧如何？	5	4	3	2	1	
8. 和同學相比，孩子是否清楚事件的相關程度？	5	4	3	2	1	溝 通
9. 和同學相比，孩子的整體語言清晰度如何？	5	4	3	2	1	
10. 孩子是否能經常適當的答覆問題(使用口語或手勢)？	5	4	3	2	1	校 室 參 與
11. 孩子是否能經常在團體討論中分享自己的看法？	5	4	3	2	1	
12. 孩子是否能經常參與同學的團體活動或遊戲？	5	4	3	2	1	
13. 孩子是否能以可被接受的社交方式參與遊戲(如輪流、分享)？	5	4	3	2	1	
14. 孩子是否能熟練的以口語或手語有效的溝通？	5	4	3	2	1	
15. 孩子是否能經常感覺受挫，甚至有時會情緒失控？	5	4	3	2	1	社 交 行 為

TAPS-R

- Live-voice test (無視覺線索)
- 聽覺短期記憶 auditory short-term memory 與工作記憶 working memory
- 7個子測驗 + Hyperactivity Index Scale Questionnaire
 - Auditory Number Memory-Forward
 - Auditory Number Memory-Reversed
 - Auditory Sentence Memory
 - Auditory Word Memory

與其他問卷比較

TABLE 3. Comparison of questionnaire scores (mean, SD, and range) in the study for the three groups of children with respect to the TD group

Measure	TD	AP-	AP+	F Test, <i>p</i>
ECLIPS				
SAP	11.36 (2.65) 4 to 14	4.83 (2.35)*** 2 to 11	5.42 (3.87)*** 0 to 13	24.57, <i>p</i> < 0.001
U/L/L	11.57 (2.63) 7 to 15	5.65 (3.11)*** 2 to 13	4.25 (2.22)*** 1 to 8	27.40, <i>p</i> < 0.001
MAA	12.07 (2.81) 5 to 16	5.70 (2.42)*** 2 to 13	6.50 (2.50)*** 3 to 11	28.84, <i>p</i> < 0.001
PSS	12.36 (3.23) 6 to 15	7.57 (2.91)*** 4 to 15	7.58 (3.61)*** 4 to 15	11.36, <i>p</i> < 0.001
EAS	11.71 (3.65) 5 to 14	7.65 (3.26)** 2 to 14	7.25 (3.88)** 2 to 14	7.12, <i>p</i> < 0.01
Total	11.00 (2.83) 5 to 14	5.17 (2.44)*** 2 to 12	5.00 (3.62)*** 2 to 13	21.02, <i>p</i> < 0.001
FAPC	17.50 (1.77) 15 to 19	10.88 (4.25)** 6 to 17	12.17 (4.97)* 3 to 19	6.92, <i>p</i> < 0.01
TEAP	3.38 (6.65) -12 to 9	-11.31 (7.32)*** -23 to 0	-10.25 (5.74)*** -22 to -5	16.93, <i>p</i> < 0.001
LIFE	9.75 (4.33) 6 to 19	15.50 (3.43)* 11 to 22	14.75 (4.07)* 8 to 22	6.73, <i>p</i> < 0.01

There were no statistically significant differences between the AP- and AP+ groups.
p* < 0.05; *p* < 0.01; ****p* < 0.001.
AP, auditory processing; EAS, Environmental & Auditory Sensitivity; ECLIPS, Evaluation of Children's Listening and Processing Skills; FAPC, Fisher's auditory problem checklist; LIFE, Listening Inventory for Education; U/L/L, Linguistic/Literacy/Laterality; MAA, Memory & Attention; PSS, Pragmatic & Social Skills; SAP, speech & auditory processing; TD, typically developing; TEAP, Teacher's Evaluation of Auditory Performance.

(Barry et al., 2015)

兒童聽覺及處理技巧評量

Evaluation of Children's Listening and Processing Skills, ECLIPS

- Barry & Moore, 2014 (源自英國)
- 共38題, 6-11歲 parent-report measure
- Speech & Auditory Processing
- Memory & Attention
- Language, Literacy & Laterality
- Pragmatic & Social Skills
- Environmental & Auditory Sensitivity

聽覺行為量表

Scale of Auditory Behavior, SAB

- Schow et al., 2007
- 12題, 5分量表
- 8-12歲兒童
- 46分為通過標準, 低於 35分
- 聽覺分辨、注意、記憶、理解、背景噪音、聽覺辨位、回應速度及疲勞
- 含在MAPA-2 (Multiple Auditory Processing Assessment-2)

觀察/評量者

Subjectivity and biases

- Broad, unclear, misleading, or inappropriate nature of the questions used (Schow & Seikel, 2007)
- Estimates of severity are inherently imprecise
 - respondents's personal interpretation of an item's meaning
 - ability to reliably gauge severity
 - possible desire for some sort of diagnosis

行為觀察與診斷測驗的相關性

- 不是越多聽覺困難行為就會達到CAPD診斷標準 (Barry et al., 2015)
- Only weak to moderate relationships (Wilson et al., 2011; Tomlin et al., 2015)
- 噪音情境中的表現分數與低通、雙耳異訊數字/句子測驗無顯著相關
- 短期與工作記憶相關的測驗與雙耳異訊數字DD及頻率型態測驗FPT相關
- 與認知缺失的相關性較高 (Tomlin et al., 2015)

婦聯聽健版本_2025持續修訂中

聽覺行為異常檢核表

個案姓名：_____ 出生日期：_____ 性別：_____ 填表日期：_____

就學就業情形：□就學(學校_____，____年級) □待業 □就業中(職業_____)

□退休 □家管

轉介來源：□本人 □家長/監護人 □班級導師 □特教/資源班老師 □聽力師 □治療師 □醫師

□其他：_____

填表人：□本人 □家長/監護人 □班級導師 □特教/資源班老師 □聽力師 □治療師 □醫師

□其他：_____

聯絡電話：_____ 聯絡人：□可填表人 □其他：_____

第一部分：個案如果有下列問題，請填寫您所知道的相關資訊

➢ 是否有聽力損失？

□否

□疑似但尚未經過正式評估

□是，確診年齡_____歲；□左耳_____分貝，右/無聽覺輔具，□右耳_____分貝，左/無聽覺輔具

➢ 學齡前是否經常發生中耳炎（至少3次或3次以上）？□否，□是，最近發生時間_____歲

➢ 是否有注意力相關問題？

□否

□疑似但尚未經過正式評估

□是，確診結果_____，□接受療育中

➢ 是否有語言發展相關問題？

□否

□疑似但尚未經過正式評估

第二部分：請比較個案與同儕在下列情境的行為，如果個案較常發生就打✓

勾選欄位	題目
	1. 在安靜環境中，說話者語音清晰，別人都能專注聆聽，但他/她總是分心。
	2. 在安靜環境中，說話者語音清晰，他/她一開始還能專心聽，但聽幾句話之後就分心了。
	3. 在安靜環境中，說話者語音清晰，大家都專注聆聽，突然有其他聲音出現，別人能很快重新專注聽原來的說話聲，但他/她却分心了。
	4. 在日常安靜情境中，經常無法將聽過的口頭指令按照順序做出來或複述一遍。
	5. 聽人家說話時，環境中同時有非語言的背景噪音，例如音樂、器具運作的聲音，雖然背景噪音不是特別大，但卻經常無法聽清楚說話內容。
	6. 聽人家說話時，環境中同時有其他語言的背景噪音，例如：電視、影片播放的語音，雖然背景噪音不是特別大，但卻經常無法聽清楚說話內容。
	7. 公共廣播系統的內容(例如：學校、賣場、車站的廣播)，別人都聽得懂，但他/她經常無法聽懂。
	8. 在四音韻重的地方(例如：體育館、教堂、挑高的空間)，說話者語音清晰，別人都聽得懂，但他/她經常無法聽懂。
	9. 在日常安靜情境中聆聽語速快的人聲或廣播節目(例如：縮時影音短片)，別人都聽得懂，但他/她經常無法聽懂。
	10. 經常會聽錯發音相近的字詞。
	11. 經常會聽錯語詞的聲調，例如：把「眼鏡」聽成「眼睛」，或無法分辨「家」和「夾」。
	12. 講話的四聲調不標準，或者唱歌經常走音。
	13. 經常聽不出語氣所隱含的意思，例如：聽不出生氣、嘲笑等語氣。
	14. 別人說話以後，他/她會常說「給」或「你說什麼」，或請對方再說一次。
	15. 語言困難：無法理解別人的語言聲調和空間，或者無法理解別人的空間用語言聲調描述

選用/排除的向度

- 聽覺注意（安靜、時間、分心度、類別
 - 主題背景（非語音、語音、迴響
 - 聽覺分辨（降階、時間處理、頻率解析
 - 時序處理
 - 時序型態
 - 語音韻律、音韻覺識
 - 雙耳統整、分離
 - 雙耳互動（音源
 - 組織統整
- 學業成就
 - 語言理解能力

What is APD?

Dillon et al.(2012) argue that rather than defining a single disorder, the term APD should be viewed as an umbrella term for a range of different AP deficits that ultimately affect ability to understand spoken language.

中樞聽覺處理測驗類別

- 單耳低冗贅測驗
- 雙耳異訊語音測驗
- 時序處理測驗
- 雙耳互動測驗

雙耳異訊類型測驗

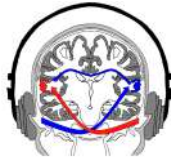
Dichotic Listening Tests



Steven & Davis

1938 聲學心理學家

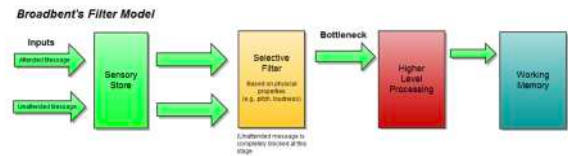
- The simultaneous stimulation of both ears, but with a different stimulus in each ear
- Stimulus parameters: word length、familiarity、intelligibility



Broadbent

1954 英國心理學家

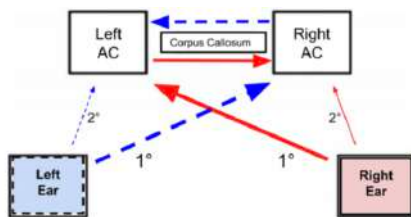
- Dichotic digit test
- 提出早期注意力過濾理論，全有或全無
- 無法解釋雞尾酒效應



Kimura

1961

- Ear dominance effect



Why test Dichotic listening?

- 20%-50% of children referred for listening difficulties showed deficits on dichotic tests (Moncrieff, 2006)
- Significant correlation between dichotic processing and learning disabilities (Ayres, 1977)
- Reading disabilities
- Older adults
 - 30% show a dichotic processing issue (Weighing et al., 2006)
 - Decline in left ear performance with age

Corpus Callosum



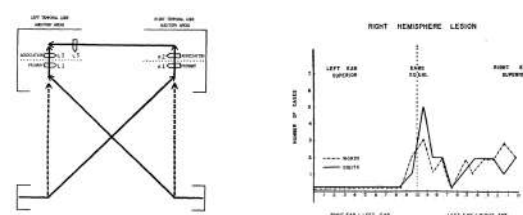
- Trunk of the corpus callosum contains auditory fibers
- Splenium
- A linear increase in callosal area from 4 through 18 years of age (Giedd et al., 1996)
- Right hemisphere lesion (temporal lobe)
- Callosal lesions yield large intramural asymmetries in dichotic performance
- Split-brain
- Multiple sclerosis



Paradoxical ipsilateral extinction

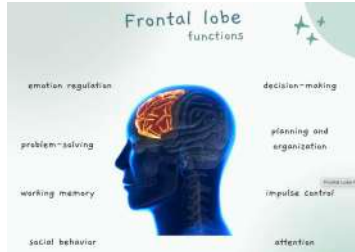
Spark et al., 1970

- Dichotic performance is worse in the ear ipsilateral to the cortical lesion



Frontal Lobe

- Left frontal lobe lesion
- Inhibitory feedback system



Modulating attention

注意力調控

- Cognitive control abilities
- Executive function

Binaural interference

- A patient performs better with one ear amplified than two (Jerger et al., 1993)
- It is estimated approximately 6% of older adults experience binaural interference (Allen et al., 2000)

Binaural integration

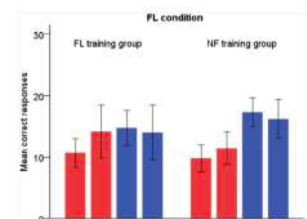
- Attending and repeating back both left and right ear dichotic stimuli
- Free recall, free report
- Divided attention, non forced (NF) attention

Binaural Separation

- Attending to only a single ear and repeating back what is heard while ignoring the other ear
- Directed attention, directed report
- Forced left (FL) or Forced right (FR)

What happens during the left ear directed-attention task?

- Cognitive conflict
- Reaction time



Normal maturational time course

- Adult like performance usually is not seen until 10 years of age

雙耳異訊數字測驗

Dichotic Digits Test (Musiek, 1983)

- Two separate digit pairs are presented simultaneously to the ears
- Typically employs a verbal report mode
- Patients are asked to repeat all four digits
- Are encouraged to guess even if they are not completely sure of all numbers heard
- Three practice trials / 20 test trials
- Generally recommended presented at 50 dB SL re: PTA or SRT
- It can be presented at MCL / intramural presentation levels are within 5-10 dB

Dichotic Digits Tests

(Musiek, 1983)

- 50 dB sensation level (SL) or MCL
- 正常聽力成人常模為90%的正確率
- 輕度至中度聽損則下降至80%正確率
- Sensitivity : 70-90%
- Specificity : 80-90%



DD 計分標準

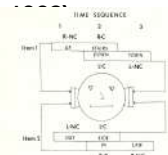
Musiek et al., 1991

- 分耳計分
- 異常標準：任一耳或雙耳低於常模
- 周邊聽力正常的成人常模為每耳90%正確率
- 輕度至中度聽損成人常模降為每耳80%正確率
- Sensitivity 70%-90%, specificity 80%-90% (Hurley & Musiek, 1997)
- May be more dependent on working memory than some other dichotic tests

同調號疊詞測驗

Staggered Spondaic Word Test (Katz, 1953)

- A measure of binaural integration
- Verbal response mode
- Two different spondee words are presented to each ear, one spondee occurs first and the other spondee overlaps in time with the second syllable of the first spondee
- A total of 40 spondee pairs
- Generally recommended presented at 50 dB SL re: PTA or SRT



SSW 計分標準

- 原設計者有一套繁複的計分方式
- 簡單的方式是使用分耳計算正確率：周邊聽力正常的成人常模為左耳90%、右耳88%的正確率
- 誤分方式計算：說錯一個字或漏掉一個字都被當作是錯誤
 - 倒返 reversal：4個字都有說出來（可以有一個錯音），但以錯誤的次序說出來
 - 校正後誤分 corrected errors：將總合誤分減去字詞辨識誤分

誤分類型

情境誤分

- 右耳先聽到
 - 右耳非競R-NC、右耳競訊R-C、左耳競訊 L-C、左耳非競L-NC
- 左耳先聽到
 - 左耳非競L-NC、左耳競訊L-C、右耳競訊R-C、右耳非競R-NC
- 原始分數：八大類的情境誤分名稱相同的誤分相加 (4類)
- 總合誤分：左耳原始分數+右耳原始分數

SSW計分

右耳先	A	B	C	D	T P Q (註)	錯誤字數
題號	右耳非競	右耳競訊	左耳競訊	左耳非競		
1	座	位	號	站	T P Q	
3	歌	星	聲	光	T P Q	
37	河	流	平	行	T P Q	
39	開	心	花	生	T P Q	
誤分總計						

左耳先	E	F	G	H	T P Q (註)	錯誤字數
題號	左耳非競	左耳競訊	右耳競訊	右耳非競		
2	道	歡	謝	意	T P Q	
4	牛	羊	皮	毛	T P Q	
38	地	震	帶	動	T P Q	
40	泥	人	猴	形	T P Q	
誤分總計						

分耳原始分數

1. 原始分數				
情境	右耳非競	右耳競訊	左耳競訊	左耳非競
總誤分				
2.5* 原始誤分(%)				
兩耳之 原始誤分(%)				
合計之 原始誤分(%)				

倒返現象

- 真倒返 True reversal：四個字都正確，但順序不對
- 可能倒返 Probable reversal：以不正確順序說了四個字，有一個說錯
- 問題倒返 Questionable reversal：以不正確順序說了三個字，有一個漏了
- 倒返總合 maximum reversal：以上三種倒返的總合

先耳效應與次序效應

- 相差大於等於5便是有顯著效應
- 調整後誤分：將先耳與次序效應納入考量

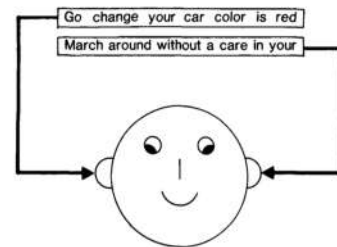
PAGE 1					PAGE 2				
1A	B	C	D	Reversals	1E	F	G	H	Reversals
11	CLIP	light	light	3	11	light	light	light	4
12	light	light	light	3	12	light	light	light	2
13	light	light	light	3	13	light	light	light	1
14	light	light	light	3	14	light	light	light	2
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194	light	light	light						

雙耳異訊句子辨識

Dichotic Sentence Identification (Fifer et al., 1983)

- A nonverbal response mode
- Two separate sentences are presented to each ear that are several orders of approximation away from conversational English.
- The sentences are printed on a response board next to a number, and the patient's task is to indicate which numbers correspond to the two sentences they heard. (Binaural integration)
- Onsets and offsets of the two sentences are aligned with an accuracy of 100 sec
- Each sentence pair is randomly chosen from among the 10 seven-word, third-order synthetic sentences
- 正式測驗有90題

DSI



第三級合成句

Third-order synthetic sentences

Table 1. The 10 third-order synthetic sentences used in the DSI test

DSI Synthetic Sentences
1. Small boat with a picture has become
2. Built the government with the force almost
3. Go change your car color is red
4. Forward march said the boy had a
5. March around without a care in your
6. That neighbor who said business is better
7. Battle cry and be better than ever
8. Down by the time is real enough
9. Agree with him only to find out
10. Women view men with green paper should

DSI 計分方式

- Minimally affected by peripheral hearing loss
- 如果只訂單耳作答則為 binaural separation mode (Jerger et al., 1994)
- Generally recommended presented at 50 dB HL or 50 SL re: PTA
- 10 monaural practice trials, a total of 5 in each ear and 20 dichotically presented trials
- 16% Interaural difference

Interpretation

- Comparing **binaural integration** and **binaural separation** response modes can yield information regarding which mechanisms are contributing to an **interaural asymmetry** on dichotic testing
 - Speech understanding ability (SU)
 - Left ear deficit (LED)
 - Task demands (TD): increased cognitive demands (greater attention)
 - Interaction effect (IE)

Development of new Dichotic Tests

- 數位與人工智慧科技及語音編輯軟體
- 建立常模
- 信度及效度
- 計分方式：
 - Interaural difference may controls for some within subjects variables
 - Not control for any interactive effects between cognition and central auditory dysfunction
- Ceiling effects can be reduced by using dichotic filtered words

Threshold of interference

Bergman et al., 1987

- Using sentence-level dichotic materials
- Attended ear use 20 dB SL re: sentence threshold
- 對側競訓耳一開始給非常低的音量，然後慢慢增加到受測者低於66%正確率
- Much smaller in individuals with lesions of the central nervous system

謝謝聆聽

