

# Evidence based practice: current evidence

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# Topics to be discussed

- A review of currently available evidence
- Translating research from Western societies to the local context



# A review of currently available evidence



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# Adult hearing aid use



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# Evidence for amplification in adults (Humes et al., 2012)

- RCTs are rare (one published), the use of control groups has been rare.
- Similar study samples: older adults with mild-to-severe sloping SNHL with bilateral HA and frequency-gain characteristics verified via REM.
- Overall, positive “benefaction”, frequent usage, and speech-understanding significantly improved.
- RCT和使用對照組是罕見的。
- 類似的研究樣本：
  - 輕度至重度傾斜SNHL的老年人
  - 通過REM驗證頻率增益
  - 使用雙側HA
- 總體而言，正面的“受益”，經常使用和言語理解明顯改善。



# Gaps in evidence for amplification in adults (Humes et al., 2012)

- Randomized control trials (RCTs) with placebo control needed.
- Existing data on **outcomes cannot be easily generalized** to other populations:
  - Young or middle-aged adults
  - Other than mild-to-severe sloping SNHL
  - Non-standard protocols (e.g., without REM)
  - Monaural fits
- 隨機對照試驗 (RCT) 需要安慰劑對照。
- 現有數據不能輕易地推廣到其他人羣：
  - 年輕或中年
  - 輕度至重度傾斜以外的 SNHL
  - 非標準選配 (例如, 沒有用 REM)
  - 單側使用助聽器



# Adult CI use



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# Evidence for CI in adults (Dowell, 2012)

- Highly significant improvements in auditory skills, particularly for **speech perception**.
- Improvements in auditory skills are generally **reduced**:
  - Congenital deafness
  - Longer duration of hearing loss
  - Older
- 顯著改善聽覺能力，特別是言語感知。
- 以下情況會降低聽覺能力的改善：
  - 先天性耳聾
  - 聽力損失時間較長
  - 年長





# Gaps in evidence for CI in adults (Dowell, 2012)

- What are the benefits of **binaural hearing** for CI users including how best to combine **HAs with CIs** and **when to recommend bilateral CI**; more research needed in this area.
- A large proportion of **unexplained variance in outcomes** and further work is needed to identify aspects of **central auditory function and cognitive skills** that affect results
  - Care should be taken in subject selection
- 雙耳聽力對CI用戶有什麼好處，包括如何最佳地將HA與CI相結合，何時推薦雙側CI;在這方面需要更多的研究。
- 不明原因的差異可能來自中樞聽覺功能和認知的不同
  - 應該在選擇受試者時留意



# Evidence for bilateral CI in adults

- Inconsistency in quality of available evidence
- Crathorne et al., (2012)
  - Clinically effective but unlikely cost-effective.
- Van Schoonhoven et al (2013)
  - Pooling of data not possible due to heterogeneity of studies.
  - All showed benefits in
    - Localization over unilateral CI
    - Speech perception in noise under certain conditions and several self-reported measures.
  - No benefit in speech perception in quiet
- 現有證據質量不一致
- Crathorne等（2012）
  - 臨床有效但不可能具有成本效益。
- Van Schoonhoven等（2013）
  - 由於研究性質差異，不可能匯集數據。
  - 都顯示了好處
    - 比單側CI定位更好
    - 在某些噪聲環境下的語言感知和自我評估比較好。
  - 在安靜環境的語言感知沒有好處



# Adult aural rehabilitation



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# Evidence for aural rehabilitation (Chisolm et al., 2012)

- Short-term improvement in
  - Speech understanding with individual auditory perceptual training
  - Self-perceived participation restriction with group AR.

## • 短期改善

- 個人聽覺感知訓練對言語理解
- 小組形式的聽力復康訓練減少自我參與限制。



# Gaps in evidence for aural rehabilitation (Chisolm et al., 2012)

- Long term outcomes need to be established.
- Individual differences in needs for and response to interventions need to be determined
  - Careful examination of individual data may allow conclusions about the effect of intervention on individuals to be made.
- 需要建立長期成果。
- 需要確定個人對干預措施的需求和回應的差異
  - 仔細檢查個人數據可使我們更瞭解對干預對個人的影響。



# Pediatric hearing aid use



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# Evidence for directional microphones and digital noise reduction hearing Aids for children (McCreery et al., 2002)

- Moderate level of evidence
- Digital noise reduction not found to improve or degrade speech understanding
- Directional mic resulted in improved speech recognition in controlled optimal settings
  - Additional research needed to determine the effectiveness in everyday listening environments
- 中等程度的證據
- 沒有發現降噪改善或降低語音理解
- 方向性麥克風在受控的最佳測試環境中改善語音識別
  - 需要額外的研究來確定日常環境的聆聽有效性



# Evidence for frequency lowering amplification for school-age children (McCreery et al., 2002)

- Methodological limitations preclude strong conclusions
- Findings were generally positive across frequency-lowering strategies and outcomes
- Additional high-quality research is needed
- 研究方法上限制了結論強度
- 各種移頻策略校果，一般都是正面的
- 需要進一步的高質量研究





# Cochlear implantation in children



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# Evidence for CI in Children (Tobey et al., 2012)

- Children aged 2 -12 years can attain **open-set speech perception**, sometimes as early as **12 months post CI**.
- Performance varied, particularly relative to
  - Chronologic age at implantation
  - Duration of CI use
  - Duration of deafness
  - This variability decreases with increasing listening experience with the device
- 2-12歲的兒童可以達到開放式言語感知，有時甚至早於使用CI後12個月。
- 表現各異，特別是由於其他因素的差異：
  - 植入年齡
  - CI使用時間
  - 耳聾持續時間
  - 隨著CI使用的時間增加，這種差異會降少。



# Evidence for CI in mainland China



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# Evidence for CI in mainland China (Chen & Wong, 2017)

- **Speech perception** 言语感知

X. Q. Chen et al. (2010); Y. Chen et al. (2016); Liu et al. (2015); and Zheng et al. (2011)

- **Tone perception** 声调感知

Y. Chen et al. (2014); Han et al. (2009); A. Li et al. (2014); Xu et al. (2011); and Zhou et al. (2013)

- **Factors influencing CI outcomes** 影响因素

X. Q. Chen et al. (2010); Y. Chen et al. (2016); Liu et al. (2015); Y. Chen et al. (2014); Y. Chen et al. (2015); Liu et al. (2013); and Zhou et al. (2013)



# Tone perception 音调分辨

- In quiet (1 to 3 years of CI use)

宁静环境 (1-3年的使用)

M平均= 67% to 82%, chance=50% (Y. Chen et al., 2014; Han et al., 2009; A. Li et al., 2014; Xu et al., 2011; Zhou et al., 2013)

- Long-term tone perception in quiet (>5 years of CI)

宁静环境 (超过五年的使用)

M平均=81%, chance=25% (Tao et al., 2015)

- In noise possible but age of CI and duration of CI use required not given (Mao & Xu, 2016)

噪声环境应该可以



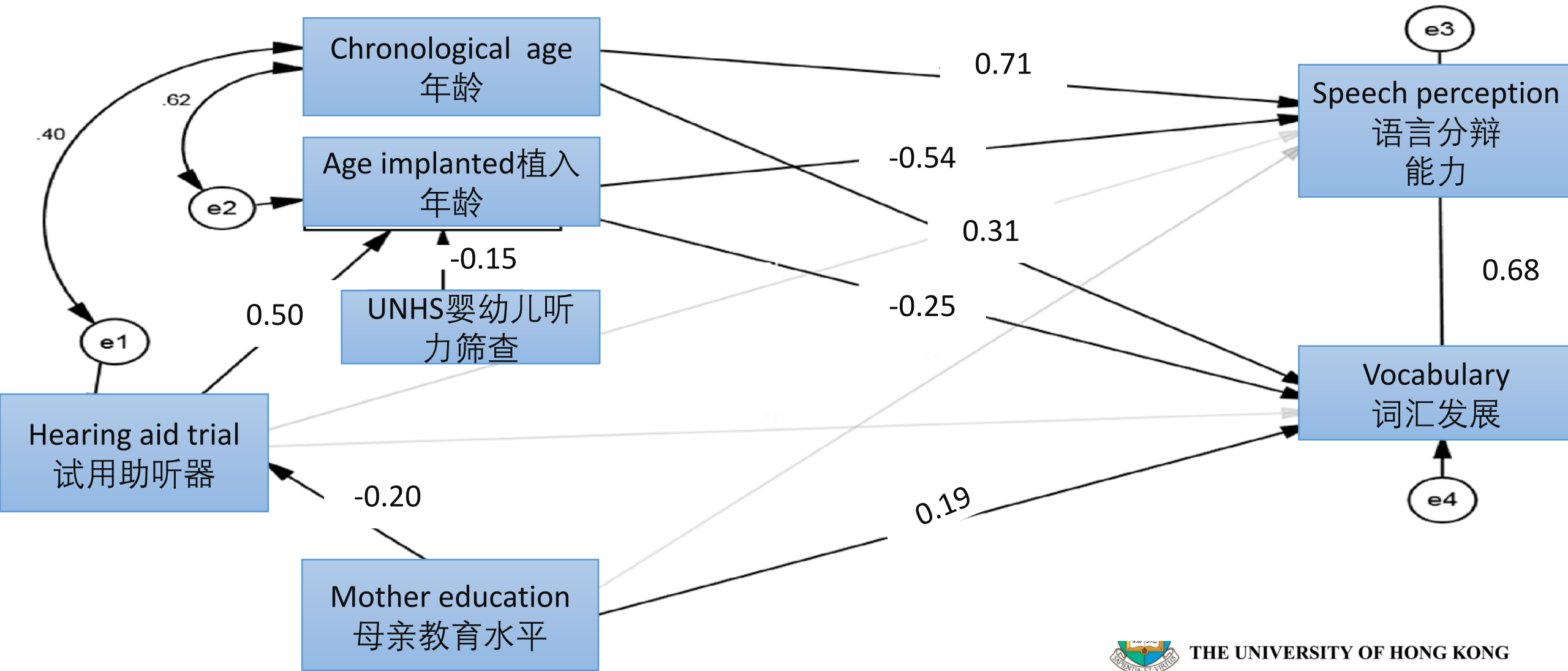
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# Tracking progress 进程(Chen & Wong, 2017)

Skills技能	3	6	12	24	48
Major improvement in <b>prelingual</b> auditory skills 语前听能	√				
Able to identify some <b>closed-set words</b> 封闭项词语识别		√			
Emerging ability to identify <b>closed-set vowels &amp; consonants</b> 封闭项元音和辅音识别			√		
Able to <b>derive meaning</b> from closed-set sentences in quiet and in noise 在宁静和噪声中明白封闭项语句内容			√		
Emerging ability to <b>identify lexical tones</b> above chance level 识别音调			√		
Major improvement in <b>open-set word</b> recognition 开放项词语识别				√	
High level of <b>open-set word</b> recognition skill 开放项词语识别					√

# Factors influencing vocabulary outcomes with CI (Chen, Wong et al. 2015) 影响因素



# Gaps in evidence for CI in children Ci科研的缺口 (Tobey et al., 2012)

- Inconsistent reporting of key demographic variables (i.e., auditory history, CI device etc.) and methodology – more consistent reporting is needed
- Guidelines for performance appropriate assessment batteries needed for consistent monitoring of performance over time and across test sites.
- 不一致的受試者特性（如聽覺史，CI設備等）和研究方法的匯報
  - 需要更一致的匯報
- 適當和一致的評估的工具，用於長遠追蹤和監控CI的效用





# Evidence for bilateral CI in children 雙側CI的驗證 (Sparreboom, 2010)

- Low level of evidence
  - Improved speech perception in quiet and noise.
  - Localization results were less consistent.
  - No data on audiologic, speech production, or educational outcomes available
- 低水平的證據
  - 改善了在安靜和噪聲環境的語音感知。
  - 本地化結果不太一致。
  - 沒有關於聽覺，語音發展或教育成果的數據



# Factors resulting in better outcomes in children aged 0-3 影響結果的因素 (CAHE review team)

- Consistent and robust evidence showing better outcomes with :
  - Early detection and intervention
  - Later onset HI
  - Mainstream education consistently better speech and language outcomes than those in special education
- 一致和有利的證據證明正面的效用：
  - 早期檢測和干預
  - 後期HI發病
  - 在主流教育中的兒童（與特殊教育相比，言語和語言成績持續更好）



# Auditory-verbal therapy (AVT) (Kaipa, et al., 2016)

- Help children with HI beyond 3 y.o. to develop age appropriate language skills
- Can recognize words accurately even in noise
- Can be successfully mainstreamed
- Limited evidence
- 幫助超過3歲的孩子發展適齡的語言發展
- 即使在噪音中也能準確識別字詞
- 可以成功的進入主流教育
- 可是現在的證據有限



# Auditory vs auditory + visual mode of communication in children aged 0-3 只用聽力和聽力加視覺溝通的比較(CAHE review team)

- A few studies to empirically compare outcomes in children exposed to either
- None compared with random assignment or children exposed to both modes
- 只有少量的研究比較了暴露於這兩種干預方法的結果
- 沒有研究比較隨機分配或暴露於兩種模式的兒童



# Factors not likely to influence outcomes of children aged 0-3 這些因素不影響0-3歲兒童的結果(CAHE review team)

- Intensity of intervention
- Therapist experience
- Educational placement (public vs. private)
- Educational placement (home vs. centre)
- Place of residence
- Family functioning
- Maternal employment
- Paternal compliance
- 干預強度
- 治療經驗
- 教育安置（公共和私人）
- 教育安置（家庭與中心）
- 居住地
- 家庭功能
- 孕產婦就業
- 父系合規



# Problems with current evidence 現有證據的有限性

- Mostly **low to moderate level research** → need for high level evidence
  - Current evidence may not address **pediatric population** – not generalized to others
  - Sometimes **difficult to evaluate whether results were valid** due to missing methods info
  - **Lab studies** does not necessarily inform clinical or real life significance
  - **Effectiveness** of treatment on an individual is not well-established
- 大多數低到中等水平的研究，需要高水平的證據
  - 目前的證據可能不涉及兒童 - 不能推廣到其他人群
  - 由於缺少研究方法的信息，有時難以評估結果是否有效
  - 實驗室研究並不一定反映著臨床或現實生活的意義
  - 治療對個體的有效性尚未明確



Translating research from Western  
societies to the local context  
使用西方社會研究結果時要考慮的  
因素



# Factors to consider when translating research from Western societies to the local context

## 使用西方社會研究結果時要考慮的因素

- Language differences
- Cultural differences
- Acoustic environment
- Healthcare infrastructure
- Finances
- Ethnic differences
- 語言差異
- 文化差異
- 聆聽環境
- 醫療基礎設施
- 財政
- 民族特徵





# Prevalence of otitis media (Acuin & World Health Organization, 2004)

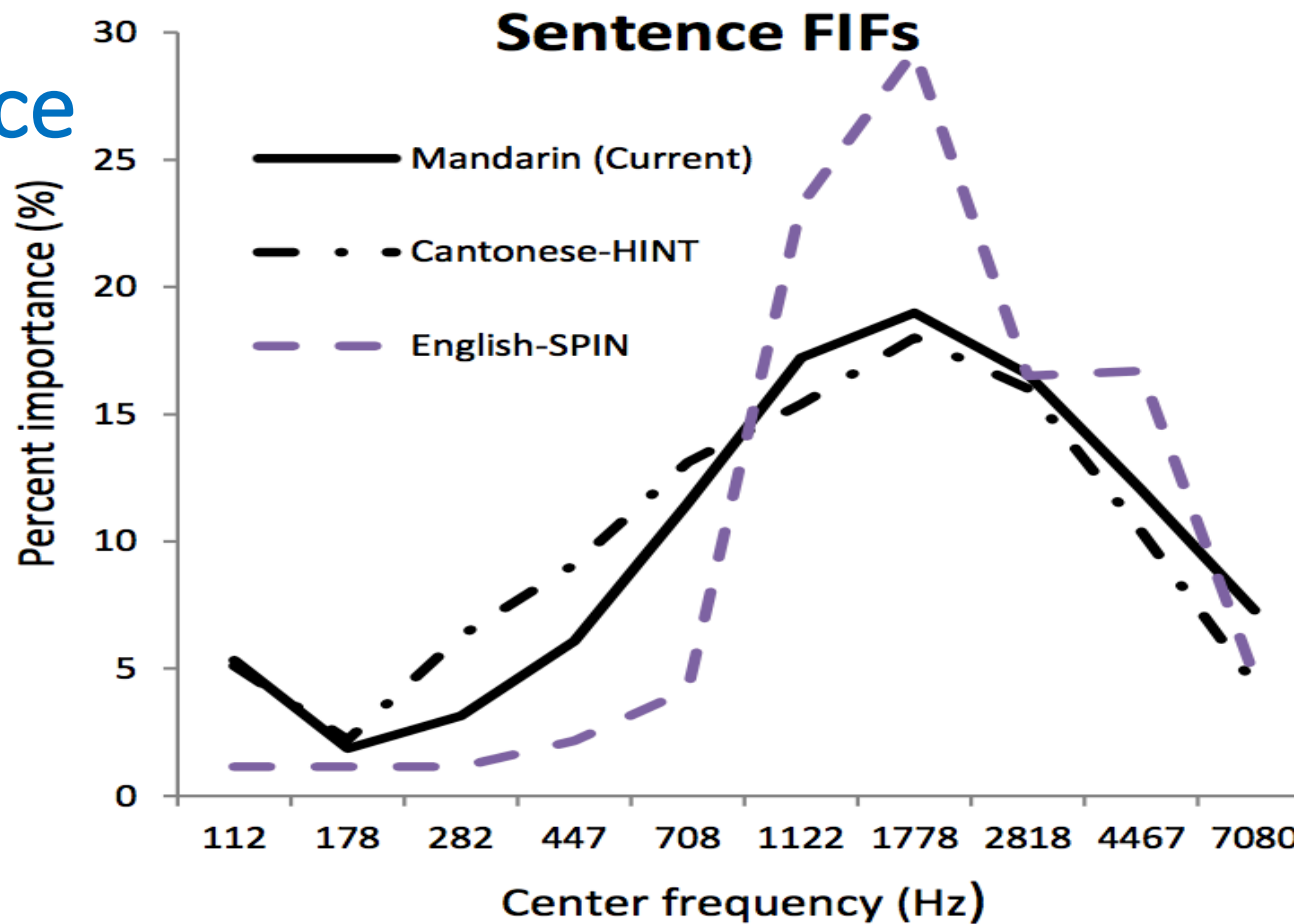
<u>Group</u>	<u>Populations</u>
Highest (>4%) – urgent attention needed to deal with a massive public health problem	Tanzania, India, Solomon Islands, Guam, Australian Aborigines, Greenland
High (2–4%) – avoidable burden of disease must be addressed	Nigeria, Angola, Mozambique, Republic of Korea, Thailand, Philippines, Malaysia, Vietnam, Micronesia, China, Eskimos
Low (1–2%)	Brazil, Kenya
Lowest (<1%)	Gambia, Saudi Arabia, Israel, Australia, United Kingdom, Denmark, Finland, American Indians



# Frequency importance functions

## 頻率重要性功能

(Kuo, 2013)

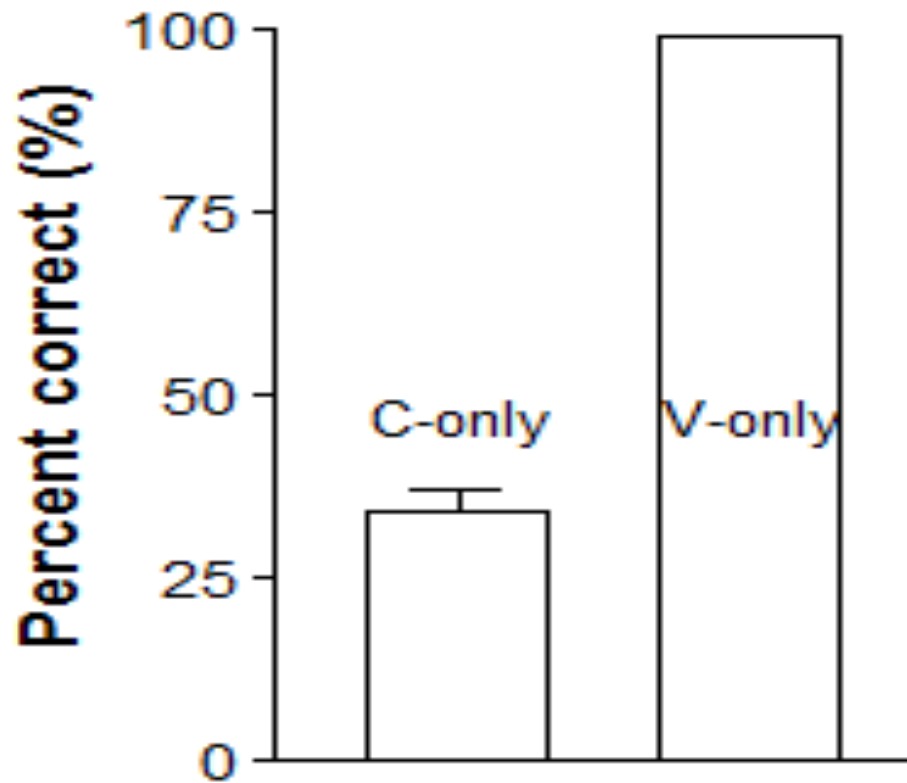


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# Isolating the effects of consonants and vowels

## 隔離輔音和元音的效果



1. The contribution of vowel on sentence recognition is three times that of consonants (99% vs 34%) ;
2. Compared to a ratio of 2:1 in English

Chen, F., Wong, L. N., and Wong, Y. W. (2013). "Assessing the perceptual contributions of vowels and consonants to Mandarin sentence intelligibility," *J. Acoust. Soc. Am.* 134, EL178–EL184.



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# Which interventions should I choose for adults? 我應該為成年人選擇哪些干預措施？

## According to level of evidence

- +++ HA use in mild to severe sloping SNHL
- +++ CI to improve speech perception
- ++ Short-term benefit from aural rehabilitation
- + HA use in young and middle age adults
- + HA use in mild hearing loss
- + Bilateral CI

## Uncertain benefit

? Long-term benefit of aural rehabilitation



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# Which interventions should I choose for children? 我應該為兒童選擇哪些干預措施？

## According to level of evidence

- +++ Early intervention
- +++ Later onset of hearing loss
- +++ Mainstream education
  
- ++ CI
- ++ Directional microphone
  
- + Bilateral CI
- + Frequency lowering

## Uncertain benefit

- ? Noise reduction
- ? Auditory vs auditory + visual mode of communication



# Summary

- Essential to practice with evidence in order to ensure best outcomes
- We should use evidence that are relevant, valid and significant
- Many audiological studies are of low level evidence and should not be used as if they are strong evidence
- Care should be used when translating research from Western societies to the local context
- 為了確保最佳結果，臨床工作必須用實證引導
- 我們應該使用相關，有效和重要的實證
- 許多聽力學研究知有低水平的證據，不應該被當做作好的證據使用
- 應該謹慎使用西方社會的研究



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