

Interactions of Perceptual, Cognitive and Social Factors as Adult Communicators Age: Implications for Everyday Life and Hearing Rehabilitation

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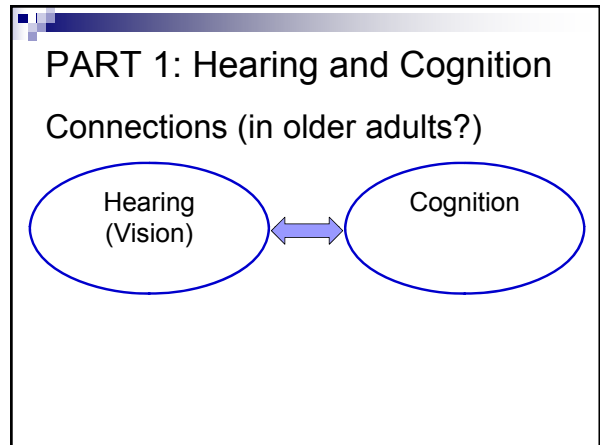



Perspective of an Older Adult who Lives with Hearing Loss

*“When you are hard of hearing you struggle to hear;
 When you struggle to hear you get tired;
 When you get tired you get frustrated;
 When you get frustrated you get bored;
 When you get bored you quit.”*

-- I didn't quit today.”

- ## Outline
- Part 1:
 - Auditory and cognitive aging
 - how hearing loss aggravates cognitive problems and might help cognitive health
 - Part 2:
 - Ageist stereotypes, stigma, self-efficacy
 - how these psychosocial factors could be incorporated into rehabilitation to improve outcomes

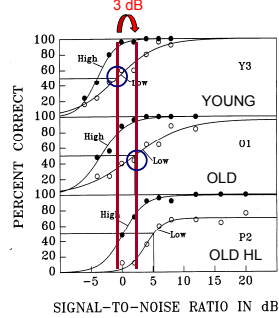


- ## Speech Understanding in Noise
- Little problem in ideal listening conditions
 - Quiet
 - One talker
 - Familiar person, topic, situation
 - Simple task, focused activity
 - Difficulty in challenging listening conditions
 - Noise
 - Multiple talkers
 - Strangers, accents, new topic, novel situation
 - Complex task, many concurrent activities
 - Fast pace
 - **Hearing aid**
 - **Avoid by withdrawal from social interaction!**
- 

Speech Perception in Noise Test

(Pichora-Fuller, Schneider, Daneman, JASA, 1995)

- 8 lists of 50 sentences
 - Half low-context
John did not talk about the feast.
 - Half high-context
The wedding banquet was a feast.
- Repeat last word of sentence
(Sometimes also recall)
- Vary S:N
 - + 15 dB S:N in quiet home
 - - 2 dB S:N in subway/aircraft
- **Old need 3 dB better S:N**
- **Context helps**



Age Group	Context	Signal-to-Noise Ratio (dB)	Percent Correct
YOUNG	High	-5	~80
	Low	0	~80
OLD	High	0	~80
	Low	3	~80

Prevalence of Hearing Loss in Older Adults

- Audiometry** (e.g., Plomp, 1978; Moscicki et al., 1985; Willott, 1991)
 - 65 years: 24%
 - 70 years: 30%
 - 75 years: 50%
 - 57-89 years: 83%
- 75% of people with hearing loss are > 75 years old
- Average first time hearing aid user ~ 70 years
- Self-report** (e.g., census data, questionnaires)
 - Under-estimates objective measures
 - 65 years: 10-20%
 - 80+ years: 25-30%
 - Frail: >80%

Audiograms and Age (ISO 7029)

- HF audiometric threshold elevation
 - OHC (also noise-induced hearing loss)
 - Endocochlear potentials ~ stria vascularis
- Neural – loss of synchrony (Mills, Schmeidt, Schulte, & Dubno, 2006)

Speech as a Signal: Temporal Cues

Sound Waves

[æ p l s l e m ə n s ə n t f ɛ r i z]

- Syllabic patterns**
 - prosody (speech rate, rhythm)
- Onsets/offsets or gaps/durations**
 - phonemic contrasts (*apple – al*)
- Synchrony/periodicity cues**
 - fundamental frequency & harmonic structure (voice pitch, quality)

Speech, Spatial & Qualities of Hearing Scale (SSQ; Gatehouse & Noble, 2004; Bahn, Singh, Pichora-Fuller, JAAA, in press)

Older "normal" vs HL Older vs Younger Adults

Older "normal" hearing for age with clinically normal audiograms up to 4 kHz (N = 48; average age ~ 70 years)

SSQ and Behavioural Hearing Tests: Not Significantly Correlated

SSQ Items with Largest Age-related Differences

Category	Item	Young - Old score (10-point scale)
Speech	#9 Ignore interfering voice of different pitch	1.9
	#12 Following conversation switching in a group	1.6
	#8 Ignore interfering voice of same pitch	1.5
Spatial	#7 Conversation in echoic environment	1.7
	#5 Talking with a person in continuous noise	1.6
Qualities	#13 Identify vehicles approaching/receding	1.5
	#2 Sounds appearing jumbled	1.8

Possible cognitive factors in aging

- Knowledge is preserved and context is helpful

BUT Processing is less efficient

- Working memory
- Speed of processing
- Attention

- **All are reasonable cognitive consequences if sensory (or motor) abilities are reduced**

Puzzles about Aided Hearing vs Listening

1. Even if audiograms and fittings are similar, some people understand speech better than others (and some benefit more from hearing aids....)
 - Audibility accounts for a lot, but not all variability
 - What else is important?

Working Memory

Working memory



- System responsible for the **PROCESSING** and temporary **STORAGE** of information
 - during the performance of all complex cognitive tasks, including comprehension
 - assumed to have a **limited capacity that must be shared between processing and storage** (Baddeley, 1976)

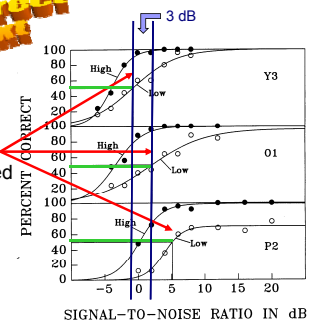
Memory and Listening Effort

S:N for 50% correct in low context

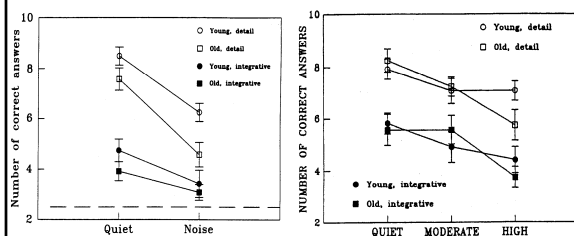
- **Effortful listening zone**

- Low-context and high-context curves separated

- Everyone “thinks harder” in this zone than in easy S:N conditions

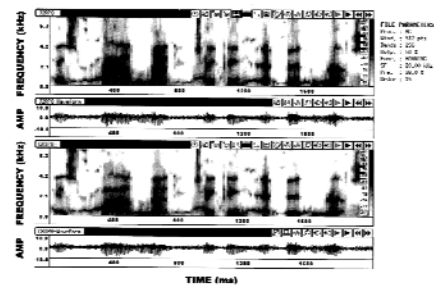


Noise and Discourse Comprehension (Schneider, Daneman, Murphy, Kwong See, 2000)

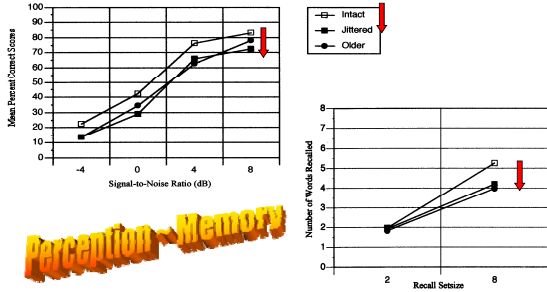


Spectrograms for Jittered and Intact Sentence in Babble

Pichora-Fuller et al., Hearing Research, 2007



Effect of Simulated Auditory Aging on Working Memory Span



Inter- & Intra-individual Differences

- INTER:** Individuals differ in WM capacities



- INTRA:** Allocation of capacity resources to processing vs storage varies with task demands



Are Older Adults Special?

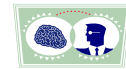
- Audibility** (audiogram) is primary but not a special aging factor (Humes, 2003, JAAA 2007)

If audibility factor is minimized

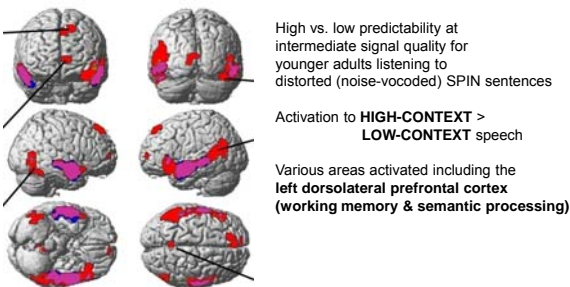
- Age-related auditory temporal processing** issues emerge
 - Especially in **challenging listening conditions**
 - Complex speech (e.g., sentences)
 - Complex backgrounds (e.g., competing talkers)
- Critical age differences when conditions become challenging
 - Older listeners need 2-3 dB better S:N** than younger listeners
- Cognitive factors important in challenging conditions!!!**
 - Regardless of age
 - Regardless of audiogram

Cognitive Neuroscience of Aging

- Same performance achieved with different processing**
- More widespread activation ~ brain reorganization
 - Young brain activity more lateralized
 - Old brain activity more distributed
- Deterioration or compensation?
- HAROLD:** Hemispheric asymmetry reduction in older adults (Cabeza, 2002)
- PASA:** Posterior-anterior shift in aging (Davis, Dennis, Daselaar, Fleck & Cabeza, 2008)

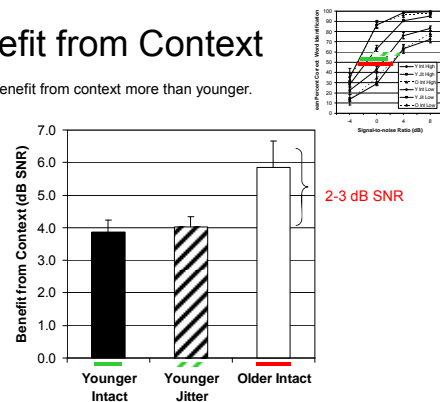


Context, Intelligibility & Brain Activation (Oleser, Wise, Dresner & Scott, 2006)



Benefit from Context

Older benefit from context more than younger.



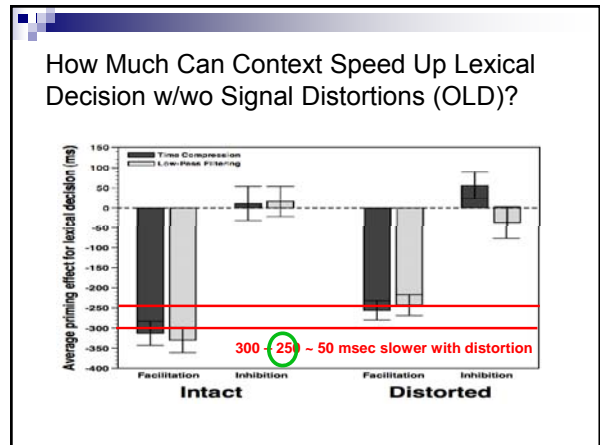
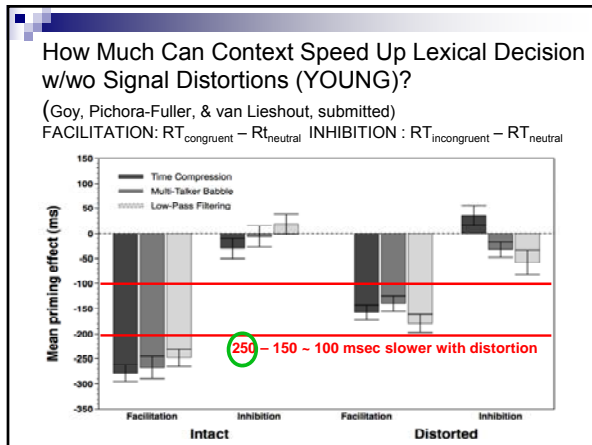
Bottom-Up & Top Down Processing

- As listening becomes effortful
 - Bottom-up processing less efficient
 - Top-down processing more necessary
- Bottom-up (ear to brain)
 - Analysis of acoustic signal
 - Better signal (faster)
 - Poorer signal (slower)
- Top-down (brain to ear)
 - Priming
 - expectations facilitate recognition (faster)
 - Disambiguation
 - knowledge constrain alternatives (slower)
 - Repair
 - Fill in gaps or correct errors (slower)

Puzzles about Aided Hearing vs Listening

- Even if people do well on word recognition, they may complain that it is *effortful* to listen
 - How many ways can one get the word right?
 - How is speed of word access related to accuracy?

Speed of Lexical Processing



Speed of Processing

- Signal:
 - Faster if intact
 - Slower if distorted and/or noisy
- Context:
 - Faster if congruent semantic context
 - Slower if incongruent context

Advantages of Eye-tracking

Ben-David, Chambers, Daneman, Pichora-Fuller, Reingold, Schneider, JSHLR, 2011

- On-line measure
- No interruption of the signal (vs gating)
- Reveals alternatives considered by the listener during processing
- Fine grained measures
 - Continuous sampling over time as speech unfolds

Participants and Conditions – Accuracy HIGH and matched!

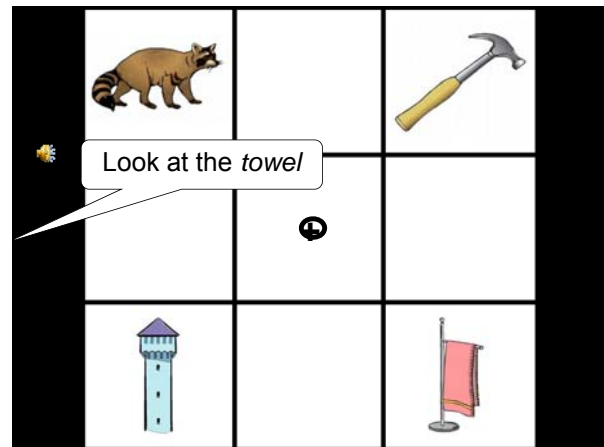
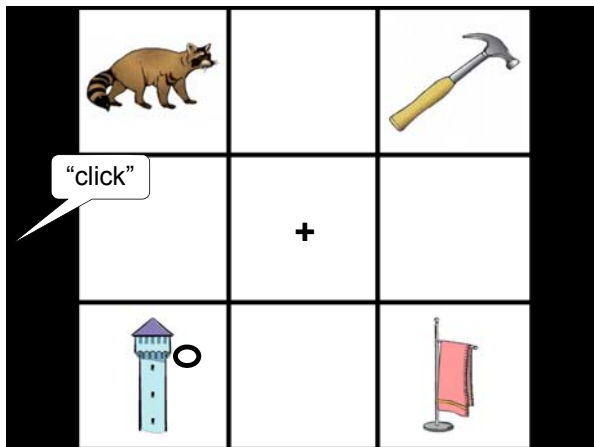
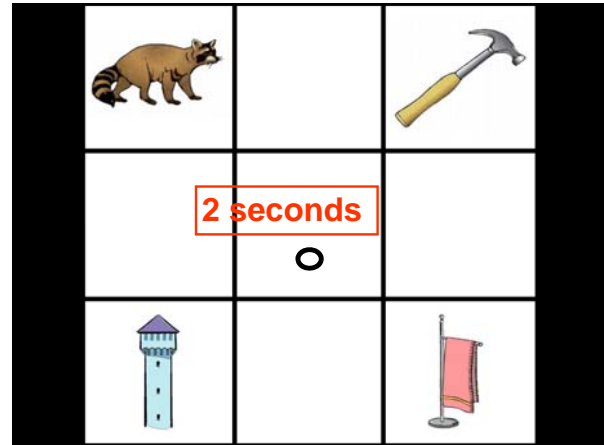
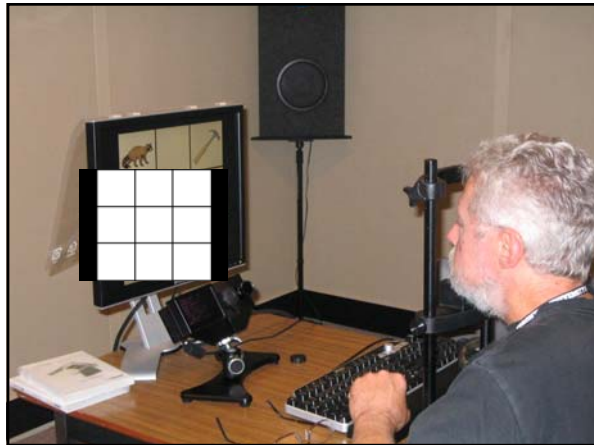
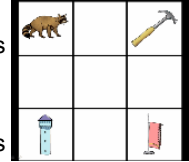
	Quiet	Noise
Older adults	98.4%	83.4%
Younger adults	98.4%	82.2%

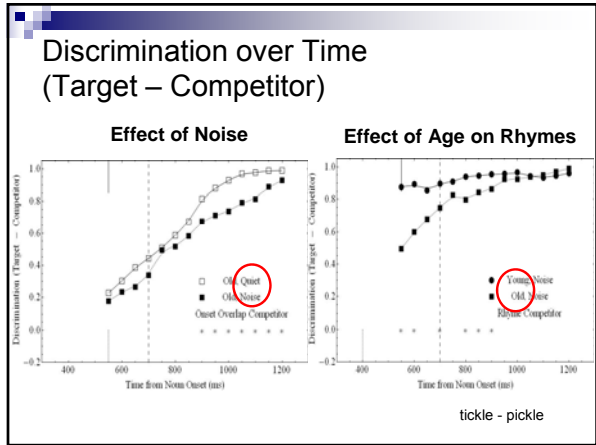
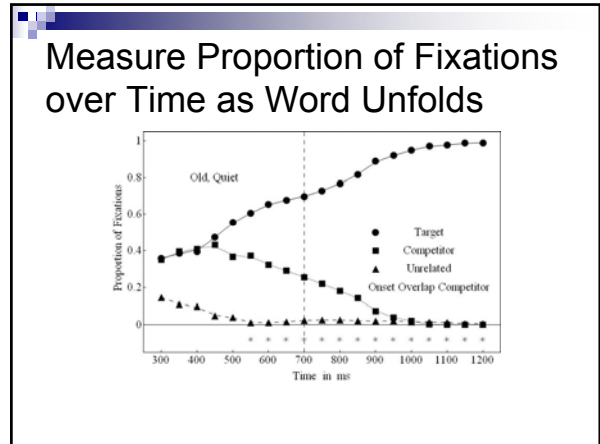
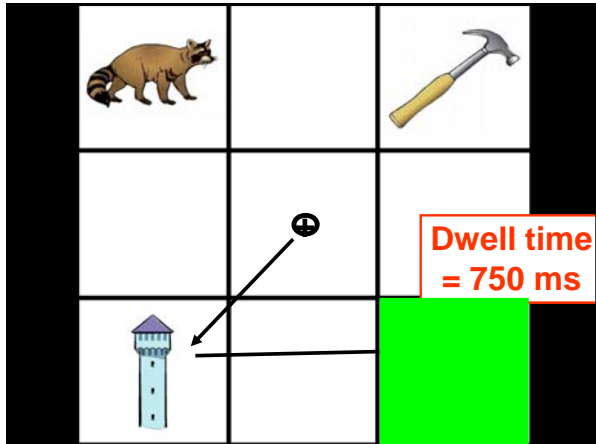
- Participants tested for hearing and vision – normal
- SNR by age: 0 dB SNR for older vs -4 for younger
 - No age differences in accuracy

Visual Displays

(following Allopenna, Magnuson & Tanenhaus, 1998)

- 16 experimental displays, 4 items each:
 - Target (*towel*) and competitor (*tower*) shared phonological onsets.
 - 2 phonologically unrelated nouns (e.g., *hammer* and *raccoon*)
- 16 filler displays:
 - 4 phonologically unrelated nouns
- Half trials in a quiet block, half in noise
- Also rhyme competitors (common offsets)





Processing information changes

- Processing is slowed
 - Perception
 - Cognition
- Performance varies with time/timing of task components

Slowing

Is timing slowed depending on signal and context

Puzzles about Aided Hearing vs Listening

3. Even if clinical speech in noise test results are similar, performance in realistic situations varies

- How does the task influence performance?
- How does the background interfere with a foreground?
- How does knowledge of the environment or signal influence performance?

Attention

Condition 1: Real Separation

0%

"Ready **Charlie**, go to blue 1 now"

■

100%

"Ready **Hopper**, go to white 2 now"

■

0%

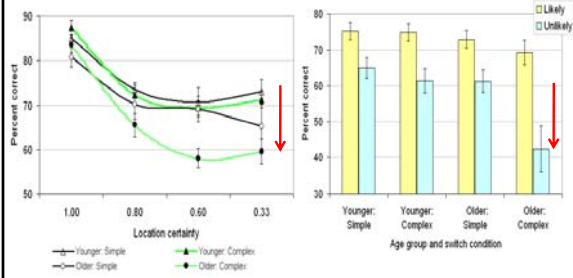
"Ready **Baron**, go to green 8 now"

■

Ready **Baron**, go to [colour] [number] now

- Callsigns = Charlie, Hopper, Baron, etc.
- Probability of target at the centre location (1.0, 0.33)
- Task: Identify colour and number with target callsign

Task Complexity Hurts Older Adults if Target at Unlikely Location



Conclusions

- Word recognition achieved in various ways
 - Depends on environment, person, task factors
- When accuracy high, other factors important
 - Working memory ~ processing demands
 - Spatial attention ~ processing demands
 - Speed of processing
- Effects driven by balance of bottom-up (signal-driven) AND top-down (knowledge-driven) processing
- Older use signal less but knowledge more

Cognition & HA Benefit Correlated

- Landmark 2003 studies (Gatehouse et al.; Humes; Lunner)
 - Those with higher cognitive function
 - do better with complex, fast-acting signal processing
 - Those with lower cognitive function
 - do less well with such complex devices
 - Cognition matters in challenging conditions

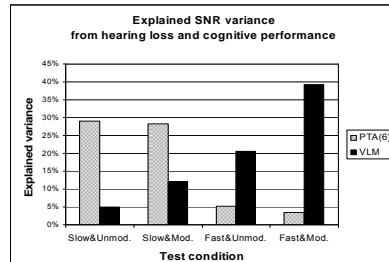
Why?

- How measure cognitive status?
 - To predict or guide treatment (HA fitting, training)
 - As a new outcome measure



Lunner & Sundewall-Thorén, JAAA 2007

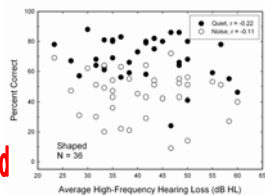
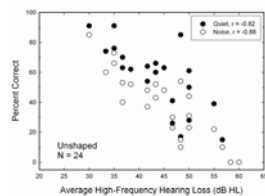
N = 32 experienced HA users
Replicates earlier studies (Gatehouse et al. 2003, 2006) with sentence tests



Cognition Important when Processing Fast and Ecology Demanding

Controlling Audibility (Humes, JASA 2002, JAAA 2007)

- Audibility is main factor for UNAIDED measures of speech (in noise)
- Aided (or amplified to 4 kHz): other factors account for over half of variance: age, central processing (SNR), and cognitive factors (memory)



Cognition Important when Audibility Good

News Breaking Headlines

General Benefits from HA

- Davis (IJA, 2003)
 - Population study in UK
 - Those with poorer cognitive function (reading working memory – phonological memory, semantic long-term memory) show greater overall benefit from HAs (aided – unaided score on FAAF 4-alternative word in noise test) (worse unaided performance on speech in noise test)

Speech in Noise Baseline

News Breaking Headlines

General Benefits from HA

- Humes (Trends in Amplification, 2003)
 - N = 134 older adults over 1 year post fitting
 - Outcomes:
 - Speech recognition
 - HA usage (hours)
 - Subjective benefit and satisfaction
 - All three related to cognitive measure (verbal IQ)
 - Positively with speech recognition and benefit and satisfaction
 - Negatively with HA usage
 - HAs used more by those less able to compensate

HA use greater if less cognitively able

News Breaking Headlines

Why does cognition relate to HA benefit?

- Speech in noise performance w/o HA
- Ability to evaluate and react to performance of HA
- Lunner (IJA, 2003)
 - N=72: Higher cognitive function (control for age, HL) (reading working memory and verbal information processing speed) correlated with speech recognition in noise (w/wo HA) **Speech in Noise**
 - N = 17: Higher vs lower cognitive groups tested – higher better reporting processing effects of experimental aid could impact learning to use HA

Awareness of Processing Differences

News Breaking Headlines

Outcomes

- Sarampalis, Kalluri, Edwards, & Hafter (JSHLR, 2009)
 - Noise-reduction algorithms in hearing aids
 - **Normals**: no effect of NR on word recognition, but positive effect on amount remembered and on secondary visual task
- Sarampalis, Nooraei, Kalluri, & Edwards (AAA, 2009)
 - Directional microphone
 - **HJ**: those with cognitive benefits did better on speech in noise with vs without directional microphone, but some showed neither type of benefit

Benefit from HA Features ~ Cognition

News Breaking Headlines

Candidature

- Foo, Rudner, Rönnerberg, Lunner (JAAA, 2007)
 - 32 habitual HA users tested on new compression fitting
 - Two cognitive measures and **NEW** HA fittings (reading working memory span and visual letter monitoring) RWMS better than VLM in predicting performance on speech in noise sentence tests (Hagerman and HINT sentences)

Cognition Important when HA New

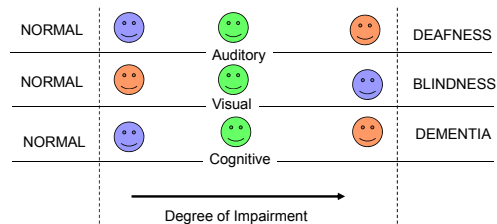
News Breaking Headlines

Outcomes: Working memory and acclimatization

- Rudner, Foo, Rönnerberg, Lunner (SJP, 2009)
 - N=32 experienced HA users
 - Half given 9 week experience with one modified compression algorithm
 - Half given 9 week experience with another
 - Initial performance with new algorithm
 - predicted by working memory
 - After experience, performance with learned algorithm
 - not predicted by working memory,
 - but it did predict performance with untrained new algorithm
 - Mismatch hypothesis: Explicit working memory relevant only when the incoming signal is mismatched to expectation (e.g., new vs learned)

Cognition Important when HA Processing Changed (not Learned Already)
Ease of Listening Model

Doing the math in the clinic? in life?



Cognitive Impairment

- Canadian Study of Health and Aging (Ebly et al., 1994)
 - Dementia
 - 75-84 years: 15%
 - 85-89 years: 23%
 - 90-94 years: 40%
 - > 95 years: 58%
 - Of adults 75-84 years old living in community
 - 15% have dementia

Hearing Loss Associated with Dementia

- Gold, Lightfoot & Hnath-Chisolm (1996)
 - 27 of 30 (90%) patients with Alzheimer's had hearing impairment (pure-tone screen & HHIE)
- Uhlmann et al. (1989)
 - Case-control study with 100 pairs
 - Prevalence of hearing loss significantly higher in those with Alzheimer's-type dementia
 - Hearing loss significantly correlated with MMSE
- Lin et al. (2004)
 - Dual sensory loss associated with greatest odds for cognitive decline and for functional decline on five everyday activities over a period of four years

Hearing Loss Can Impair Performance on Any Task Using Auditory Stimuli

- Weinstein & Amsel (1986)
 - N=30 institutionalized elders with senile dementia
 - 10 of 30 reclassified to less severe category of dementia when retested with amplification
 - (83% had hearing loss > 25 dB HL, significantly higher than comparison sample w/o dementia)

“Central Auditory” (Speech in Noise) Problems May PRECEDE Dementia

- Longitudinal epidemiological studies
 - Gates et al. (1996)
 - N > 700, speech in competing speech test (SSI-ICM) in those without stroke, dementia, or HL (PTA 40 dB HL)
 - MMSE administered 2, 4, 6 years later
 - Those with low scores on SSI-ICM were 6-12 times more likely to develop clinical dementia
 - Gates et al. (2002, 2008)
 - Similar results for longer follow-up period (3-12 years)
 - Lin, F. R., Metter, E. J., O'Brien, R. J., Resnick, S. M., Zonderman, A. B., & Ferrucci, L. (2011). Hearing loss and incident dementia. *Archives Neurology*, 68(2), 214-220.

Mild Cognitive Impairment

(e.g. Troyer & Murphy, 2007)

- Active lifestyle ~ risk of future dementia
 - Cognitive engagement
 - Tasks involving problem-solving, decision-making, learning, remembering new information
 - Social interaction
 - Rich social stimulation and active social network
 - Participating in group activities and interactions
 - Physical activity
 - Some activities are done in groups, with music
- Enriched environments
- Group interventions
- Communication-related disorders???

Cognitive Benefits of Better Hearing

Arlinger, Lunner, Lyxell, & Pichora-Fuller, SJP, 2009

- Older adults using hearing aids have better emotional and social well-being and greater longevity (Appolonio et al., 1996; Cacciatore et al., 1999; Naramura et al., 1999; Seniors Research Group, 1999)
- Reduced rate of decline in scores on a cognitive screening test over a six-month period following intervention with hearing aids (Allen et al., 2003)
- Slower cognitive decline in Alzheimer's cases with better hearing (Peters, Potter, & Scholer, 1988; Wahl & Heyl, 2003)
- Hearing aid use reduced problem behaviours judged by caregivers of adults with dementia (Palmer et al., 1998)

Good Hearing Health Could Promote Good Cognitive Health



PRESERVE

- communication and social interaction
- stave off social isolation
- slow cognitive decline



Promote Healthy Lifestyles

PART 2: Hearing and Social-Emotional Factors in Aging

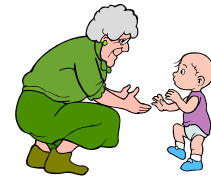
Everyday Life and Socio-emotional Factors....

- Positivity and self-regulation in aging
- Stress
- Stigma and Stereotype Threat
- Self-efficacy



What Happens as a Person Ages?

- Positive Change?
- Negative Change?

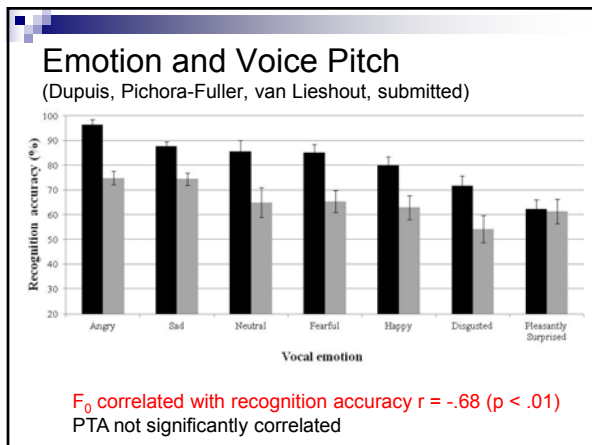
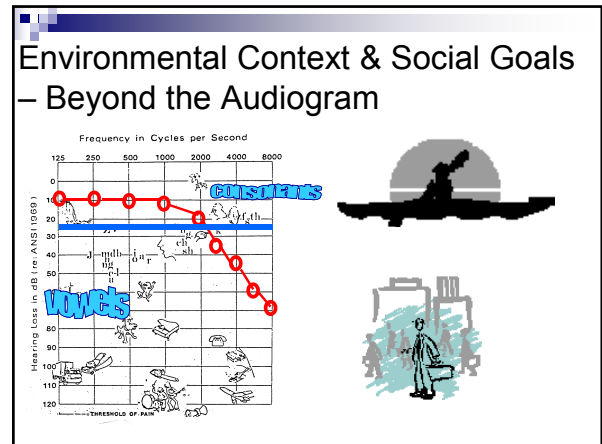
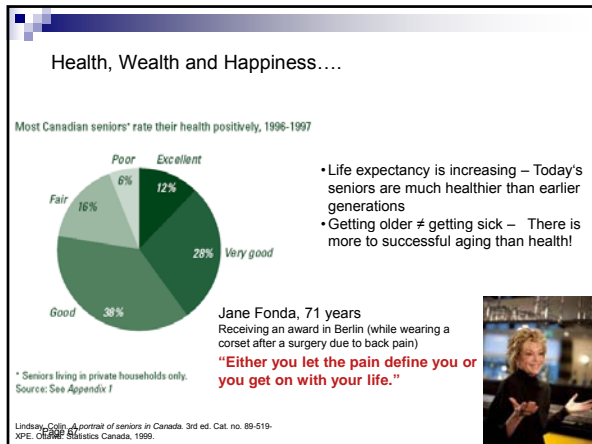


What is THE issue?

- What do older adults want?
- What do older adults need?
- How do their needs differ from younger adults?
- How much do their needs depend on hearing?

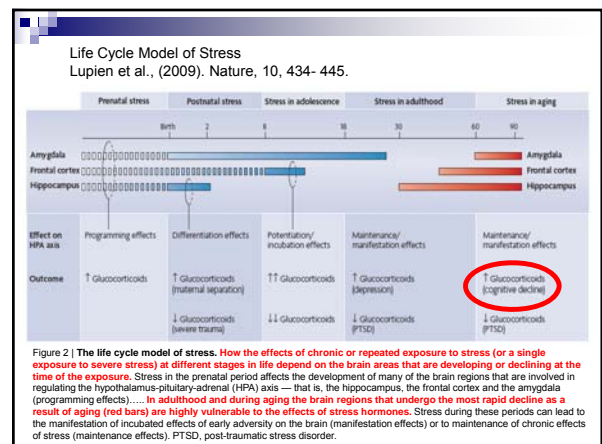
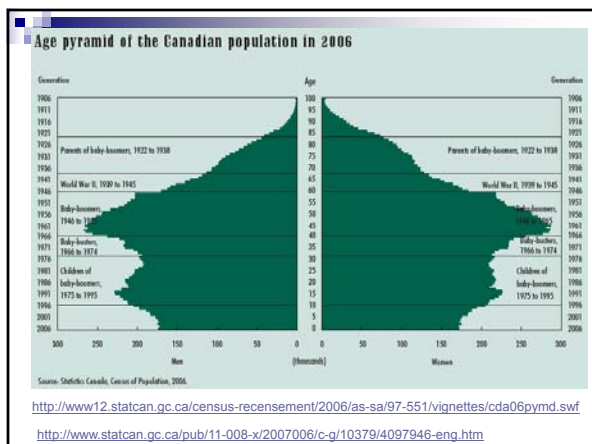
What about hearing?

- Does hearing loss mean something different depending on the person's age?
- Does using a hearing aid mean something different depending on a person's age?
- Does gender matter?
- Who is your most ideal client?
- Who is your least ideal client?



Changes in Life Events Scaling across 30 Years

Life Event	1965		1995	
	Rank	LCU	Rank	LCU
Death of spouse	1.	106	1.	110
Divorce	2.	73	2.	88
Marital separation from mate	3.	65	4.	79
Detention in jail or other institution	4.	63	7.	75
Death of a close family member	5.	63	3.	92
Major personal injury or illness	6.	53	10.	77
Marriage	7.	50	19.	50
Being fired at work	8.	47	5.	79
Marital reconciliation with mate	9.	45	13.	57
Retirement from work	10.	45	10.	54
Major change in the health or behaviour of a family member	11.	44	14.	56
Pregnancy	12.	40	9.	66
Sexual difficulties	13.	39	21.	45
Gaining a new family member (e.g., through birth, adoption, older moving in, etc.)	14.	39	12.	57
Major business readjustment (e.g., merger, reorganization, bankruptcy, etc.)	15.	39	10.	62
Major change in financial state (e.g., a lot worse off or a lot better off than usual)	16.	38	12.	56
Death of a close friend	17.	37	8.	70
Changing to a different line of work	18.	36	17.	51
Major change in the number of arguments with spouse (e.g., either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)	19.	35	18.	51
Taking out a mortgage or loan for a major purchase (e.g., for a home, business, etc.)	20.	31	23.	44
Foreclosure on a mortgage or loan	21.	30	11.	61
Major change in responsibilities at work (e.g., promotion, demotion, lateral transfer)	22.	29	24.	43
Son or daughter leaving home (e.g., marriage, attending university, etc.)	23.	29	22.	44
Trouble with in-laws	24.	29	25.	38
Outstanding personal achievement	25.	28	29.	37
Spouse beginning or ceasing work outside the home	26.	26	20.	46



Health is...



“...the capacity of people to adapt to, respond to, or *control* life’s challenges and changes.”
(Frankish et al., 1997)

Stress Communication

Self-presentation & Stereotypes

(Jake Harwood; Mary Lee Hummert, Angie Williams & Jon Nussbaum)



- **“SOCIAL OCTOPUS”**
- Self-censorship to minimize problems
 - Whether youth or elder
- Present as being competent member of advantaged group
 - Teens want to appear older
 - Elders want to appear younger
- **Gain/maintain control of self/other**

Ageist Stereotypes?



Stereotype Threat



- Risk of confirming a negative stereotype of a group with which one identifies
 - Self or other stereotype
(Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological Review*, 115, 336-356.)
 - Reduced walking speed
(Bargh, J.A., Chen, M., & Burrows, L. (1996). The automaticity of social behaviour: Direct effects of trait concept and stereotype activation on action. *Journal of Personality and Social Psychology*, 71, 230-244.)
 - Working memory
(Hess, T.M., Hinson, J.T., & Hodges, E.A. (2009). Moderators of and mechanisms underlying stereotype threat effects on older adults' memory performance. *Experimental Aging Research*, 35, 153-177.)
 - Hearing thresholds
(Levy, B. R., Slade, M. D., & Gill, T. (2006). Hearing decline predicted by elders' age stereotypes. *Journal of Gerontology B-Psychological Sciences*, 61, 82-87.)

Attribution

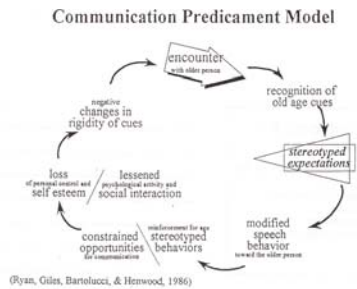
- In-group
 - Negative behavior ~ situation
 - Positive behavior ~ person
- Out-group
 - Negative behavior ~ person
 - Positive behavior ~ situation
- “Anti-aging” vs “pro-age”
- Stigma of HL + stigma of aging

Age = Hearing Loss?

- hearing problems may exacerbate communication problems accelerating psychosocial declines in older adults
- age-related stigmatization and low self-efficacy may exacerbate poor perceptual and cognitive performance

Predicament Model

- Ageist stereotypes fuel communicative incompetence.
- Dependent behaviours are reinforced and independent behaviours are ignored by nurses in residents of care facilities (Margaret Baltes).



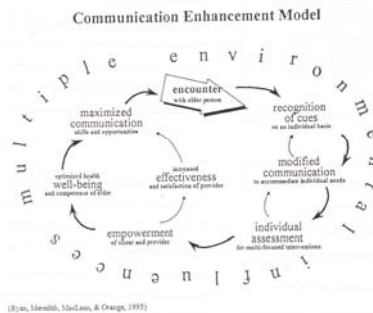
- Ryan EB, Giles H, Bartolucci G, Henwood K. Psycholinguistic and social psychological components of communication by and with the elderly. *Language and Communication* 1986;6:1-24.

How ageist are we?

- Hearing aid companies?
- Hearing care providers?
- Other health providers?
- Others in the public (banking, shopping)?

Enhancement Model

- Ageist stereotypes fuel communicative incompetence.
- Dependent behaviours are reinforced and independent behaviours are ignored by nurses in residents of care facilities (Margaret Baltes).

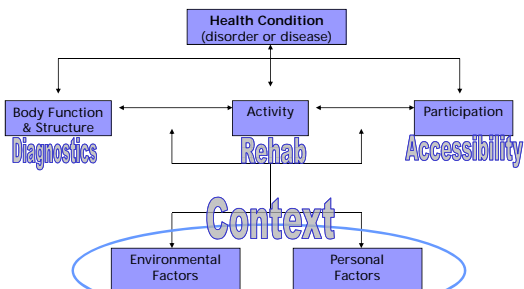


- Ryan EB, Meredith SD, Maclean MJ, Orange JB. Changing the way we talk with elders: Promoting health using the Communication Enhancement Model. *International Journal of Aging and Human Development* 1995;41:89-107.

To talk to the family or not to talk to the family?

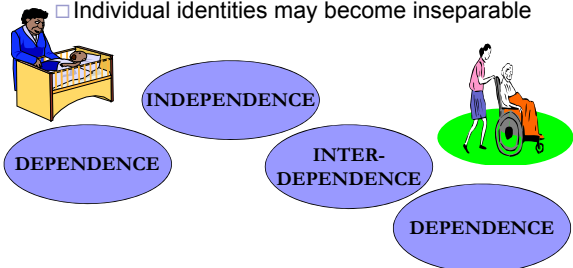
- Privacy, autonomy, control
 - addressee
- Acceptance vs denial
 - intergenerational solidarity
- Family needs
- Support!

World Health Organization International Classification of Functioning (ICF, 2001)



Inter-dependence

- Close relationships
 - Individuals strongly defined by relationships
 - Individual identities may become inseparable



Family

- Spouse, adult children, grandchildren
 - Support: predispose, enable and reinforce
- “Sandwich generation”
 - “Mom are you going to be like grandma when you get old?”
 - “When I get old.....”

Care & Contexts

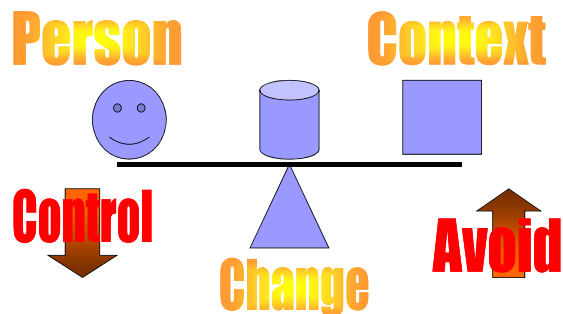
- Independent living (family vs alone)
- Home care
- Peer and self help groups
- Adult day care
- Residential care
 - Graduated care
 - Levels of care (independence >> dependence)
- Hospital to hotel-like?

Starting and Adhering to Rehab

Social Factors Related to Effort?

- Stereotype threat
 - Stigma (self and other)
- Stress (Sonia Lupien)
 - Novelty
 - Unpredictability
 - Threat to self
 - Sense of loss of Control
- Coping/Support/Control-Avoid
- Self-efficacy

Balancing the Person-Environment Fit



Responses: Control & Avoid Situation

(Pichora-Fuller & Schow, 2001)

The Noisy Restaurant

- Defining goals
 - Most important:
 - Intimacy with partner
 - Least important:
 - Interactions with staff
- Challenges
 - Background noise
 - Distractions/interruptions
- Supports
 - Choice of location
 - Technology
 - Behaviours of HOH person
 - Behaviours of partner



Relationships of Person-World

- **Inter-Personal Relationships**
 - Family members (inter- & intra-generational)
 - Co-workers
 - Service providers (teachers, health professionals)
 - Pets
- **Person-Place Relationships**
 - Home (private, institutional)
 - School (daycare to university)
 - Workplace (office, factory, store)
 - Public facilities (theatre, transportation, bank)

Ecological Approach

- **Designing interventions for the individual.....**
.....so the person can achieve his/her goals in his/her social and physical contexts
- Finding how to re-connect the person with hearing loss to his/her world.
- Achieving balance in person-context fit.

Stigmatization by Self and Other

- Denial of hearing loss
- Adherence to treatments

Fear of Aging related AR Questionnaires for Non-HA users (but not for HA users)

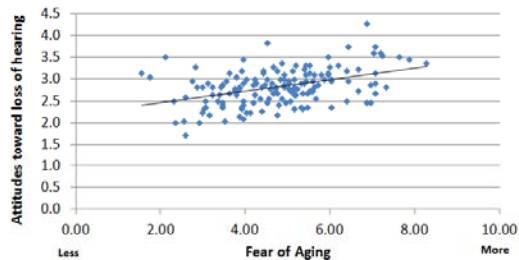
Attitudes

- ALHQ, $r = .39, p < .01$
- ECHO, $r = -.26, p < .01$
- APHAB, $r = .23, p < .01$
- HHIE, $r = .23, p < .01$

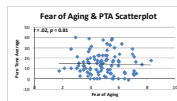
Abilities and Self-efficacy

- SSQ, $r = -.24, p < .01$
- MARS-HA, $r = -.25, p < .01$
- LSEQ, $r = -.23, p < .01$

Fear of Aging x Attitudes toward loss of hearing



N = 156, age ≥ 55 years
r = 0.43, p < 0.0005

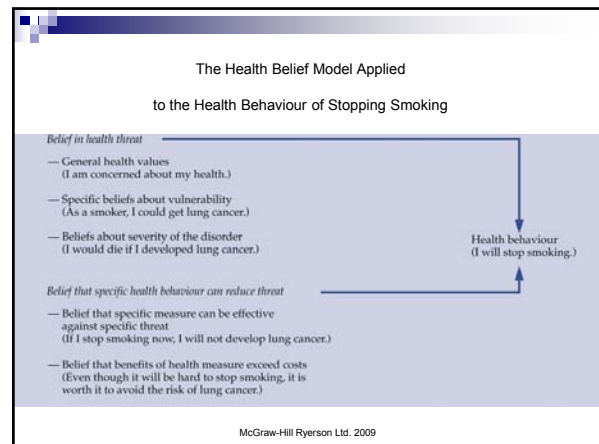
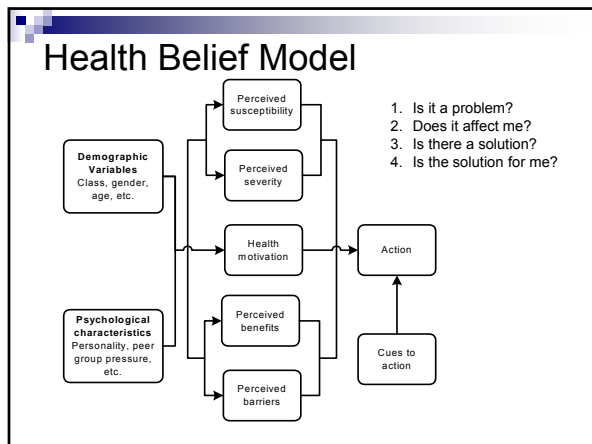


■ The Health Belief Model

- Enables us to understand why people practice health behaviours
- Also predict circumstances under which health behaviours may change

■ Self-Efficacy

- Belief that one is able to control one's practice of a particular behaviour
- An important determinant of the practice of health behaviours



- ## Self-Efficacy Theory
- Belief, or domain-specific confidence, individuals have in their abilities to accomplish a set of skills to achieve a certain behavior, including health behaviors (Bandura, 1989, 1997)
 - Not general self-confidence or self-esteem
 - Domain-specific self-confidence

- ## Why Is Self-Efficacy Important?
- Patients with high self-efficacy beliefs for skills needed to manage a health condition:
 - Increased compliance with treatment/management recommendations
 - Improved subjective and objective outcomes
 - Higher health-related quality of life
 - Persevere in face of difficulty
 - Put forth greater effort in managing condition

- ## Self-efficacy in Audiology
- Balance dysfunction/falls (Tinetti et al., 1990)
 - Hearing conservation
 - Hearing protective devices (Lusk and colleagues, 1999, 1997; Melamed et al., 1996)
 - Hearing aid intervention (Smith & West, 2006 AJA; Seminars in Hearing; West & Smith 2007 IJA)
 - Communication strategies training (Jennings, 2007)
 - Tinnitus management (Smith & Fagelson, 2008)

- ## Self-efficacy in ARHL
- Smith, S.L. & West, R.L. (2006a). The application of self-efficacy principles to audiologic rehabilitation: a **tutorial**. *American Journal of Audiology*, 15, 46-56.
 - Smith, S. L. & West, R. L. (2006b). **Hearing aid** self-efficacy of new and experienced hearing aid users. *Seminars in Hearing*, 27, 325-329.
 - Smith, S. L., Pichora-Fuller, M.K., Watts, K. L., & La More, C. (online April 2011). Development of the **Listening Self-Efficacy Questionnaire (LSEQ)**. *International Journal of Audiology*.

Self-Efficacy & Speech Perception

- Improve speech perception as target of audiologic rehab
- Individuals' self-efficacy (confidence) in their abilities to understand speech in everyday listening situations may play be an important factor related to speech perception in listeners with hearing loss
- Listening self-efficacy
 - beliefs individuals have in their current abilities to listen to and understand speech in a variety of listening situations

Measuring Self-efficacy

- Individuals' perceptions of their current abilities
- Questionnaire
 - in the specific domain of interest

Development of the Listening Self-Efficacy Questionnaire (LSEQ)

- LSEQ items to target a variety of listening situations
 - Specific, real-world listening situations commonly encountered
 - Less demanding (e.g., 1:1, quiet settings)
 - Demanding (e.g., multiple talkers, competing noise)
- Reviewed several available questionnaires
 - HHIE (Ventry & Weinstein, 1982)
 - APHAB (Cox et al., 1995)
 - SSQ (Gatehouse & Noble, 2004)
- Common clinic complaints

Development of the Listening Self-Efficacy Questionnaire (LSEQ)

- Bandura's guidelines (2001)
- Wording of the item
 - "I can"
 - Void of healthcare jargon
 - No multi-barreled items
- 0-100% response scale, 10-unit intervals that reflect gradations of certainty in ability

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Cannot do this at all Moderately certain I can do this I am certain I can do this

- Practice items not related to domain of interest
- 33 items

Methods: Materials and Procedures

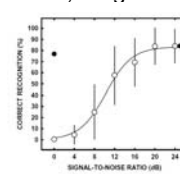
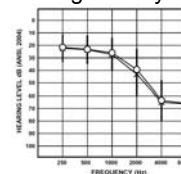
- Comprehensive audiologic evaluation
 - Pure-tone audiometry
 - NU No. 6 in Quiet (2 presentation levels)
 - 80- and 104-dB SPL (PTA, re: 500, 1000, 2000 Hz, < 40 dB HL)
 - 90- and 114-dB SPL (PTA > 40 but < 60 dB HL)
 - Words-in-Noise (WIN) test

(Wilson, 2003; Wilson, Abrams, & Pillon, 2003; Wilson & Burks, 2005)

 - NU No. 6 words presented in a six-talker multitalker babble paradigm
 - 24 to 0 dB S/N, in 4-dB decrements
 - Babble 80- or 90-dB SPL (re: PTA)
 - Speech ranged (104- to 80-dB SPL or 114- to 90-dB SPL)
 - scored in terms of the 50% point threshold (Spearman-Kärber)
- LSEQ and APHAB

Methods: Participants

- Inclusion/Exclusion (normative population):
 - Listeners with sufficient SNHL to report listening difficulties
 - No prior history of hearing-aid use
 - Word recognition scores > 40%
- N=169
 - Mean age 65.9 years (SD = 6.7, range 55-85)



Results: Construct Validity

- Factor analysis (subscale structure)
- Criteria
 - Factor had to explain 5% of variance or more
- 15 items were deleted
- 3-factor solution account for 74.5% of the variance
 1. Directed Listening (31.0%)
 2. Complex Listening (30.5%)
 3. 1:1 in Quiet Listening (13.0%)

Directed Listening in Quiet Subscale

- 8 items
- Item examples
 - I can understand while at a medical appointment.
 - I can understand a lecture in a small, quiet room.

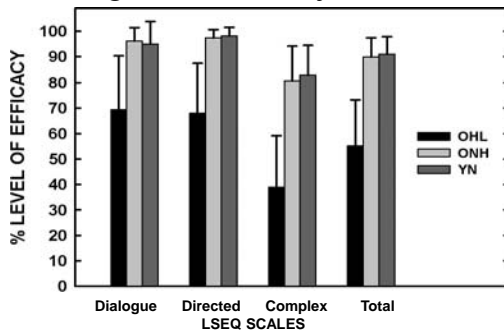
Complex Listening Subscale

- 8 items
- Item examples
 - I can understand conversation on a cell phone while in a noisy background.
 - I can understand conversation while a person is speaking from another part of the house.
 - I can understand one-on-one conversation when several conversations are going on at the same time.

1:1 Dialogue in Quiet Subscale

- 2 items
 - I can understand one-on-one conversation in a **quiet** place.
 - I can understand one-on-one conversation in a **quiet** place when unable to see the speaker's face.

Listening Self-efficacy



Intervention Techniques

- Explicitly teaching about stereotype threat
- Blurring inter-group boundaries
- Positive role models
- Reshaping views
- Modifying performance expectations
- Making achievements salient

Self-Efficacy Theory

Individuals make judgments about their self-efficacy beliefs through 4 sources of information

1. Mastery experiences
 - Practicing to achieve success
2. Vicarious experiences
 - Reference to observations of others
3. Verbal persuasion
 - Positive feedback from others
4. Physiologic and affective states
 - Reduce anxiety, stress, negative emotions

Mastery

- Practice, role play
- Set realistic goals
- Grade tasks with easier before harder
- Break complex into component tasks
- Review tasks simpler to more complex

Vicarious Experience

- Model skills
- Teach skills to significant other
- Practice/role play in groups
- Video self-model or peer model

Verbal Persuasion

- Give appropriate feedback
- Recruit social support
- Didactic training

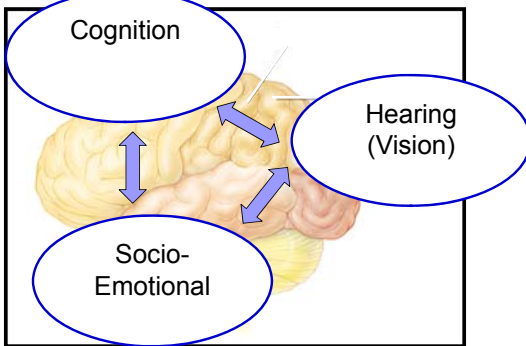
Physiologic and Affective States

- Allow ample time
- Optimize environment
- Take breaks to manage stress
- Focus on simpler tasks
- Use calm, reassuring feedback
- Minimize fatigue (nutrition?)

Summary

- Multiple levels
 - Behavioural (what person does)
 - Cognitive (what person thinks)
 - Affective (what person feels)
- Self and other
- Predisposing – Enabling - Reinforcing

More Connections?



Age = Hearing/Memory Loss?

- Hearing and/or memory problems may exacerbate communication problems and accelerate psychosocial declines
- Age-related stigmatization and low self-efficacy may exacerbate poor hearing and cognitive performance
.....and participation in everyday life
.....and success in rehabilitation