Baby Boomers: Audiometric & Rehabilitative Considerations

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Who are Baby Boomers?

- Born in the two decades post World War II
  - 1946 to 1964
  - 43-61 years old in the present day
- American term
  - large generation of about 75 million Americans
- Similar large post-war generations in Europe

Some Characteristics…

- Baby boomers want it all *
  - electronic gadgets
  - entertainment systems
  - sporty cars, trucks and motorcycles,
    - from their "Born in the USA" to their Grateful Dead
- Independent
- Sociable
- Active and noisy lifestyles

* http://hear-it.org

Hearing Loss in Baby Boomers

- 20.4% have some degree of hearing loss (HL)
  - 16 million Americans
- 26% more HL loss than previous generations
  - National Health Interview Survey (National Center for Health Statistics)
- Trend towards more HL earlier in life
  - Prevalence of hearing impairment nearly doubled 1965 -1994
    - Research out of University of California, San Francisco

http://hear-it.org

Relevance for Audiologists

- The baby boom generation is coming of age
  - changes makeup of senior population
- Demands creative clinical solutions and individualized services
  - for hearing losses and communicative deficits
- Audiologists at forefront
  - delivering much-needed clinical services

Factors that influence communication, health, and disability in aging adults

- Generalized physical changes
- Age-related Hearing Loss (ARHL)
- Cognitive aging
- Health Promotion

Generalized Physical Changes in Aging

- Changes in organ systems occur gradually
- Body Configuration & Composition
- Appearance
- The Skin

Age-related Hearing Loss (ARHL)

- **Anatomical and physiological changes**
  - Degeneration of elastic fibers
    - Collapsed ear canals
    - Impacts type of materials used in hearing aids
  - Earcanal glands lose secretory ability; hair follicles increase in thickness and length
    - Cerumen harder, impacted

Age-related Hearing Loss (ARHL)

- **Anatomical & physiological changes**
  - Thinning of surface epithelium
    - Canal trauma
    - Cerumen removal
    - Ear impressions

Age-related Hearing Loss (ARHL)

- **A&P changes: Pinna/Auricle**
  - Squamous cell carcinomas
    - Postero-superior (♂), closer to earcanal (♀)
  - Excessive hair growth
  - Enlargement of pinna
  - Changes in physical properties of skin
  - Chondrodermatitis
  - Basal cell carcinomas

Age-related Hearing Loss (ARHL)

- **A&P changes: Middle Ear**
  - Tympanic Membrane: stiffer, thinner, less vascular
  - I.M. and I.S. joints: arthritis, thinning, calcification
  - Muscles & ligaments: atrophy, fibers degenerate
  - Ossification of the ossicles
  - Eustachian Tube: cartilage calcification; muscle atrophy
  - **Minimal impact on hearing sensitivity**
    - age effects in E.T. dysfunction studies
    - acoustic immittance and reflex tests

Age-related Hearing Loss (ARHL)

- **A&P changes: Inner Ear**
  - Organ of Corti degeneration
  - Degeneration of Spiral Ganglion Cells
  - Presbycusis

Age-related Hearing Loss (ARHL)

- A&P changes: Inner Ear
  - **Organ of Corti degeneration**
    - Histopathological changes - impacts transduction
    - Loss of cochlear hair cells
    - Effect on PT hearing
    - Effect on OAEs

Age-related Hearing Loss (ARHL)

- A&P changes: Inner Ear
  - **Degeneration of Spiral Ganglion Cells**
    - Ganglion cell loss increases with age
      - 30 000 to 40,000 (young adults)
      - less than 20,000 (81-90 year olds)
    - Effect on Pure-tone thresholds
    - Effect on Speech recognition

Age-related Hearing Loss (ARHL)

- A&P changes: Inner Ear
  - **Presbycusis**
  - 6 types (Schuknecht & Gacek, 1993)
    - 1. Sensory
    - 2. Neural
    - 3. Strial
    - 4. Cochlear Conductive
    - 5. Mixed
    - 6. Intermediate
  - Types show specific audiogram changes (Weinstein,2000),
  - Cannot identify type of presbycusis from audiometric findings alone

Age-related Hearing Loss (ARHL)

- **A&P changes: Brainstem and Cortex**
  - Neuronal atrophy (overall loss of neurons)
    - Central auditory nervous system in particular
  - Brainstem – age-related changes at all levels
  - Cortex:
    - Cell loss greatest in superior temporal gyrus (auditory) compared to neighboring cortical areas

Age-related Hearing Loss (ARHL)

- Heritability and gene analysis
  - KCNQ4 (BBC, 2006)
    - University of Antwerp Human Mutation study
  - Rb1 (Chen et al., 2005)
    - Howard University Medical School

Cognitive aging

- Memory
- Learning Capacity
- Intelligence
- Motivation
- Comprehension
- Processing speed

Cognitive aging

- Memory
  - Sensory, Primary, Secondary
  - Minimize influence on audiologic tasks
    - Weinstein (2000), Table 3-10
- Learning Capacity
  - Does not decline with age
  - Amount of effort to learn changes with age
    - Tips for overcoming learning barriers for adults with hearing loss

Cognitive aging

- Intelligence
  - Crystallized intelligence
    - Experience – knowledge acquired early in life
    - Stable or increases through adulthood
  - Fluid intelligence
    - Brain's ability to reorganize data into new pathways (dependent on integrity of the CNS)
    - Declines with aging

Health Promotion

- Health Promotion part of Healthy People 2010
- Individual lifestyle choices linked to hearing loss
  - Noise
  - Tobacco, Alcohol and other drugs
  - Exercise - physical activity and fitness
  - Nutrition
- Role of audiologists
  - Education, organization, environmental, economic

Health Promotion

- Aldosterone (hormone) (Robert D. Frisina)
  - Levels decrease with age
  - Influences potassium levels in inner ear
- Folic Acid (a B vitamin) (Durga et al., 2007)
  - Supplement slowed the decline in hearing of the speech frequencies

Health Promotion

- Exercise (Kramer et al.,2003)
  - Impacts cognitive abilities - people 55+ years
  - increased physical activity benefits women more than men
  - Interaction of fitness with age
- Noise (Kujawa & Liberman, 2006)
  - Linked to presbycusis
  - Counsel to avoid synergistic effects

Audiometry & Communication

- Expectations from cross-sectional and longitudinal research
  - Behavioral tests of hearing
  - Evoked potential tests of auditory function
- Test modifications to optimize performance
- Effects of hearing loss for baby boomers

Behavioral tests of hearing

- Pure-Tone thresholds
  - Prevalence of HI
    - 31% (Framingham Study) to 45.9% (Beaver Dam study)
  - Baltimore Longitudinal study
    - Rate of HL increased starting at age 40-50 years
  - Clarity Baby Boomer study (2006)
    - 53% reported at least mild hearing loss

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Behavioral tests of hearing

- Speech Audiometry
  - 66 to 75% of boomers report difficulty with understanding speech (Clarity, 2006)
  - Factors to consider when evaluating speech understanding in this population:
    - Peripheral hearing, cognitive status, central auditory function, environmental factors, self perception of hearing handicap (Weinstein, table 5-7)

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Objective tests

- OAEs
  - Total # SOAEs observed decreased with age
  - Conflicting results re: effect of age on DPOAE
- Impedance
  - No age effects noted on tests of:
    - Static compliance, tympanometry, acoustic reflex
  - Small age-effect for acoustic reflexes (elevated) with broadband noise stimulus

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Test modifications to optimize performance

Behavior	Test Modification
Slowed response Time	- Slow down rate of tonal presentation allowing the patient's pace to dictate the interstimulus interval.
Memory Decline	- Repeat & simplify instructions. - Use gestures to supplement voice when instructing. - Allow opportunity for practice. - Provide frequent conditioning/ reconditioning trials. - Provide verbal reinforcement.
Movement Deficits	- Evaluate different strategies for responding before test initiated. - Select response strategy that is the most natural and reflexive. - Do not change response behavior too often.
Failing Attention	- Take a break during the session if fatigue begins to set in. - Sessions should be short, no longer than 45 to 60 minutes.

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Weinstein, 2000
Table 5-6

Test modifications: Case History

- 1. Rationale for visit
- 2. Lifestyle choices
- 3. Client's attitude to HL
- 4. Identify specific communication difficulties
- 5. Perceived impact of HL -functional status
- 6. Etiology – auditory and nonauditory factors
- 7. Medications, Supplements, Nutrition
- 8. Psychosocial impact of HL
- 9. **What should audiologist's attitude be?**

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Effects of hearing loss for baby boomers

- 23% : affecting their success in the workplace
- 25%: affecting their earning potential
- 40% said it has affected their home life
- 65%: have trouble hearing the television
- 57% of those with a hearing loss have difficulty hearing on a cell phone

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Communication Solutions

- Boomers reluctant to admit the impact of hearing loss even though they might admit to communicative difficulties in different situations
- Boomers are not seeking solutions for hearing loss
  - Only 26% had hearing tested
  - Of those with severe HL, only 42% wear aids

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Audiologic Rehabilitation (AR)

- Boomers need more than diagnostic services
- Holistic approach
  - Audiometry
  - Communicative ability
  - Psychosocial behavior
  - Emotional health

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AR considerations

- Amplification and ALDs
- Needs-based AR services
- Components of AR program

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Amplification and ALDs

- Amplification options
  - Hearing aids and cochlear implants
    - Cosmetic, technology, choices
  - Assistive Device options
    - 4% boomers w/ hearing loss use ALD at work
    - 25% felt ALD might be helpful at work
    - Variety of technologies
    - Variety of styles and options

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ALD styles and options (amplifiers)

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Amplification and ALDs

- **Cell Phones**
  - 79% boomers reporting have a cell phone
  - 57% have difficulty hearing with cell phone
  - Blame is spread: 30% due to hearing
  - Technology improvements - features not sound quality
  - 17% boomers aware of devices that can help one hear better with the cell phone

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Needs-based AR services

- Why do we need to conduct AR evaluation?
  - Emotional response to HL
  - Communication environments
  - Communication priorities
  - Realistic goals
- Comprehensive, individualized evaluation
  - self-report, questionnaires/scales

Needs-based AR services

- Screening Tools:
  - Self Assessment of Communication
  - Significant Other Assessment of Communication
  - Hearing Handicap Inventory for Elderly-screen
- Intermediate length questionnaires
  - Hearing Handicap Scale
  - Denver Scale of Communication Function
  - McCarthy-Alpiner Scale of Hearing Handicap
- Diagnostic Tools:
  - Hearing Performance Inventory
  - Communication Profile for the Hearing Impaired (CPHI)

Components of AR program

- Communication strategies training
- Speechreading
- Family involvement
- Counseling – personal, social factors

Communication Strategies

- Used to modify conversational interactions
- Repair strategies
  - Used by HI talker following communication breakdown
- Facilitative strategies
  - Used by HI individual to influence talker, structure of message, environment, self

Communication Strategies

- Training in groups, at home (interactive CD)
- Communication Strategies Training
  - Clinician models strategies; Clients role-play
  - Videotaped/Computer-based programs
    - "Conversation Made Easy" – CD ROM format
    - LACE: Listening & Communication Enhancement
  - Continuous discourse tracking
  - Drill activities

Family Involvement & Counseling

- Family Involvement in AR
  - To promote compliance in program
  - Individualism vs. collectivism
  - Motivation and support
- Counseling
  - Counseling fundamental to AR
  - Assist Emotional Reactions to HL
  - Means to address Defense Mechanisms
  - Multimedia Hearing Handicap Inventory (MHHI)
    - www.Ph.D.msu.edu/hearing

Approaches to clinical service delivery

- Baby boomers are first generation to notice hearing loss while still in their 40s and 50s
  - redefines what it means to have hearing loss
- Role of audiologists influenced by
  - changing health care environment
  - lifestyle differences in the current and upcoming older generations
  - importance of empowerment for this population

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