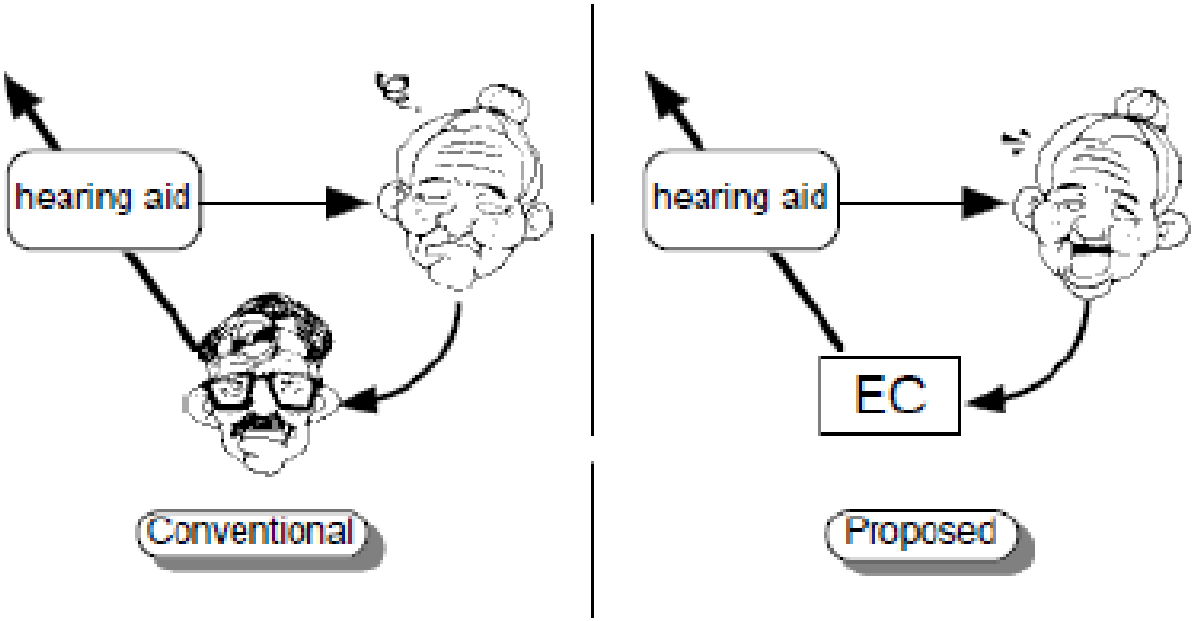
Reis et al (2001)



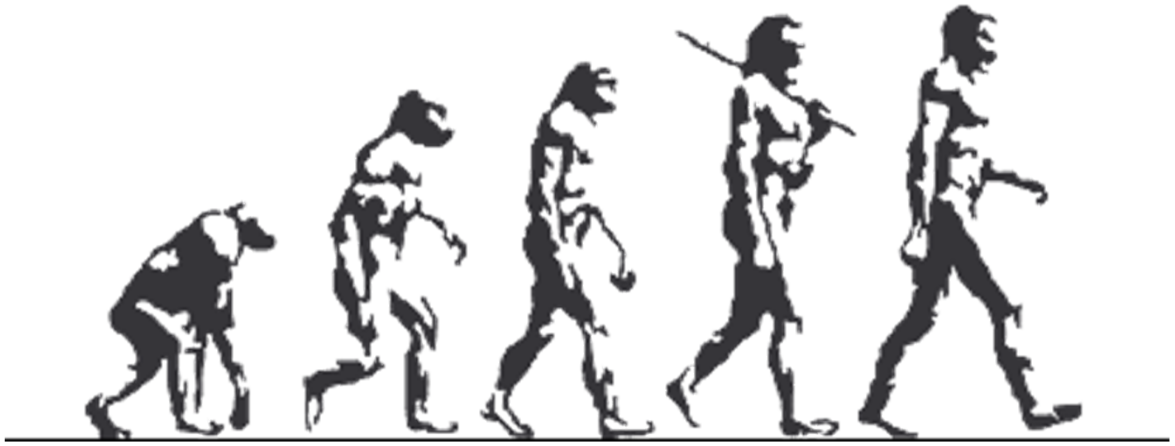
Practice Trends: Hearing Health Care or Consumer Electronics?

Amyn M. Amlani, PhD

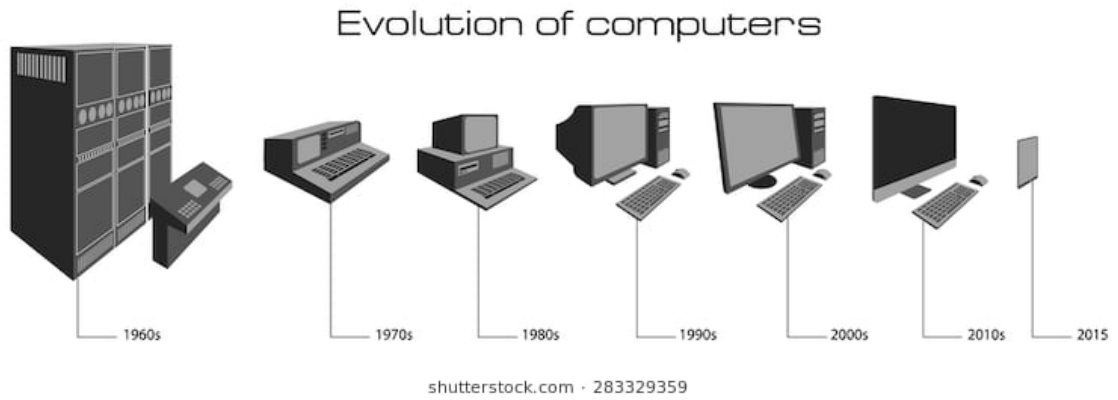
Presented at ADA Audacity, Orlando, Florida, *24 October 2018*

Disclosures

- Financial relationship(s)
  - Employee of the University of Arkansas for Medical Sciences
  - Co-Founder – Hearhero
  - Senior Consultant - Otolithic Consulting
- Non-financial relationship(s)
  - Section Editor - Economics, Hearing Health Technology Matters



https://www.rooshv.com/the-theory-of-evolution-does-not-apply-to-modern-human-beings




The Board of Trustees of the
University of Cincinnati
on the recommendation of the Faculty of the
Graduate School
of the University, does hereby confer upon
Shanna Marie Mortensen
the degree of
Doctor of Audiology


HEARING STYLES THROUGH THE YEARS
THE GAY 90's (at right) brought huge hats and trumpets—but you still couldn't hear well!
EVEN IN THE LATE 1930's, with the advent of the electronic age, your first vacuum tube hearing aid (above) was as bulky as an oversized camera.
BY 1875 (above), women were wearing bonnets—and speaking tubes were the thing.
AND NOW, truly effortless, better hearing at its best. This young lady is wearing Sonotone's fashionable "Movable Ear" with an "Out-A-Sight" eartip — nobody knows she's deaf!
JUST 100 YEARS AGO—in the 1850's before the Civil War—deafened persons were trying to hear with clumsy, unsatisfactory devices such as the folded horn shown above.


Programs
My Programs
All-Around
Restaurant
Traffic
Outdoor
My Devices
TV
Mini Mic
Download on the App Store

https://www.audiologyengine.com/disruptive-forces-future-of-audiology

https://www.zuelligpharma.com/solutions/patientcare

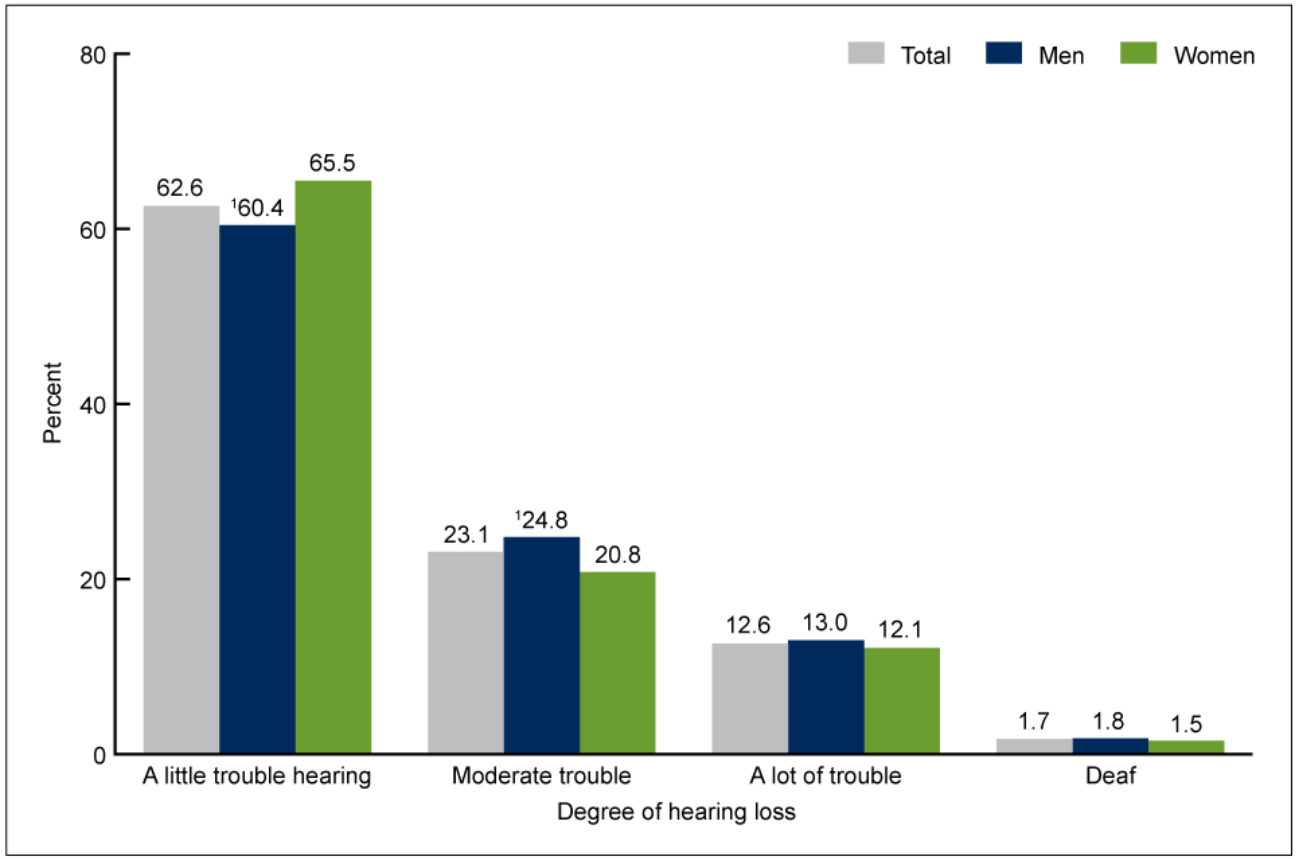
Essentially No Service-Related Metrics Exist… Assume that Service Can be Measured by Treatment

Country	Hearing loss prevalence (% of HI in population)	Adoption rate (% of HI with HAs)	Bilateral rate (% of HA owners w/ 2 HAs)
Germany	12.1%	34.9%	75%
France	9.3%	34.1%	70%
UK	9.7%	42.4%	61%
Italy	11.7%	25.2%	57%
Switzerland	8.0%	41.4%	72%
USA	10.6%	30.2%	72%

Table 2. Hearing loss prevalence, adoption rates, and bilateral rates.

Hougaard et al (2016) - EuroTrak

Figure 2. Degree of self-reported hearing loss among men and women who had any trouble hearing without a hearing aid: United States, 2014



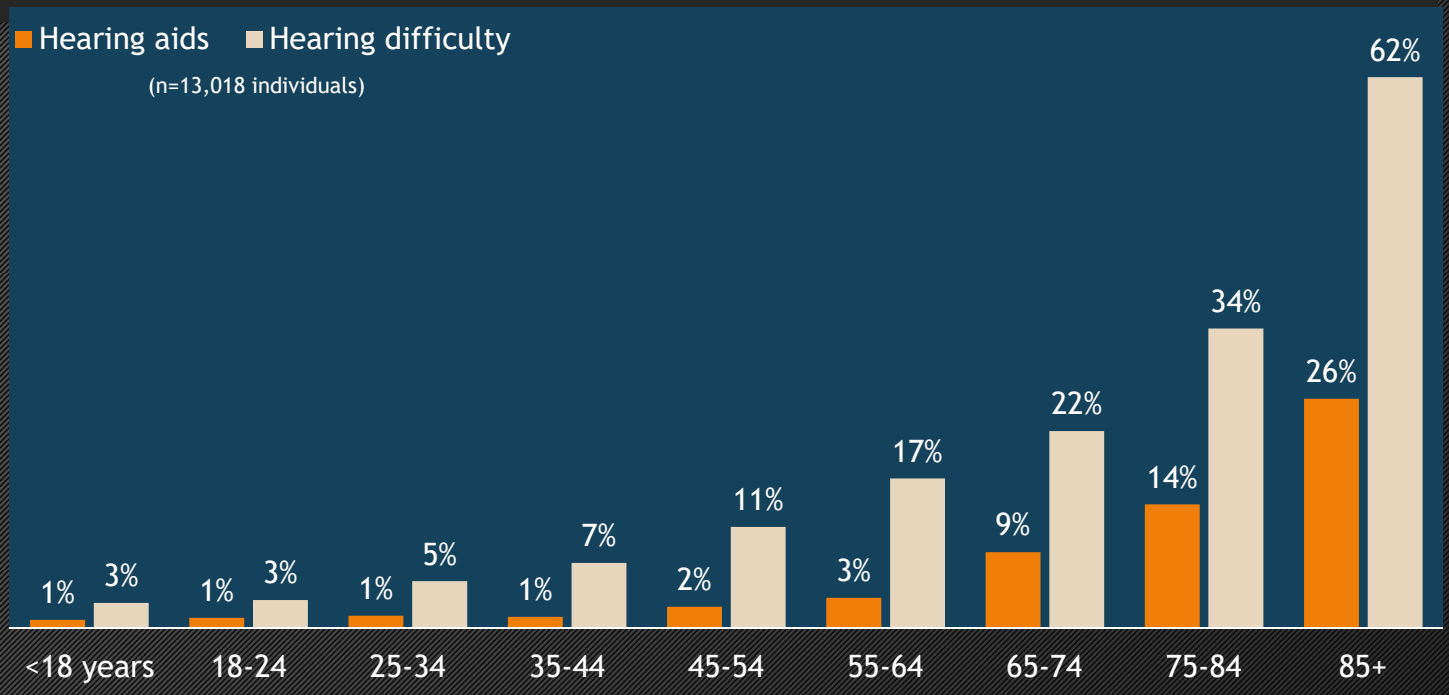
[1]Significantly different from women within the same hearing category ($p < 0.05$).
SOURCE: CDC/NCHS, National Health Interview Survey, 2014.

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

National Center for Health Statistics

Zelaya et al (2015)

Hearing Difficulty & Hearing Aid Rates by Age Group



Age Group:	*34 and under*	*35-64*	*65+*
Adoption Rates:	*31%*	*20%*	*40%*

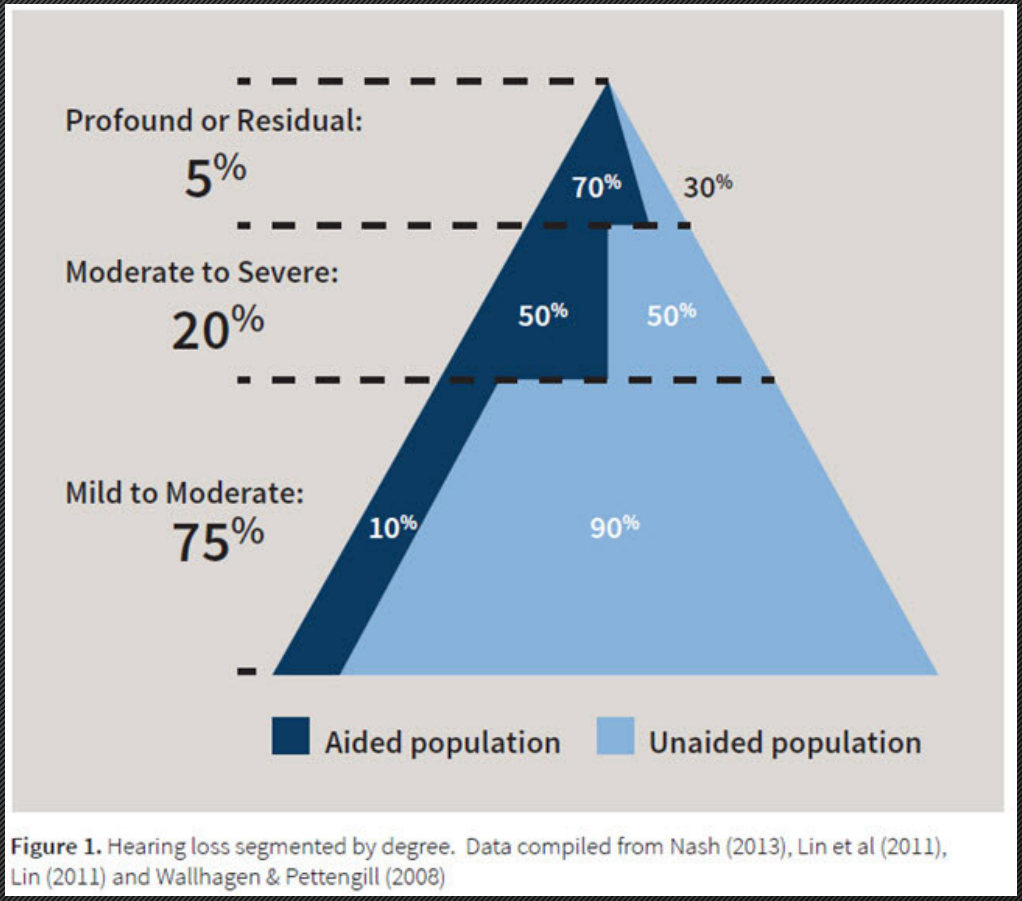
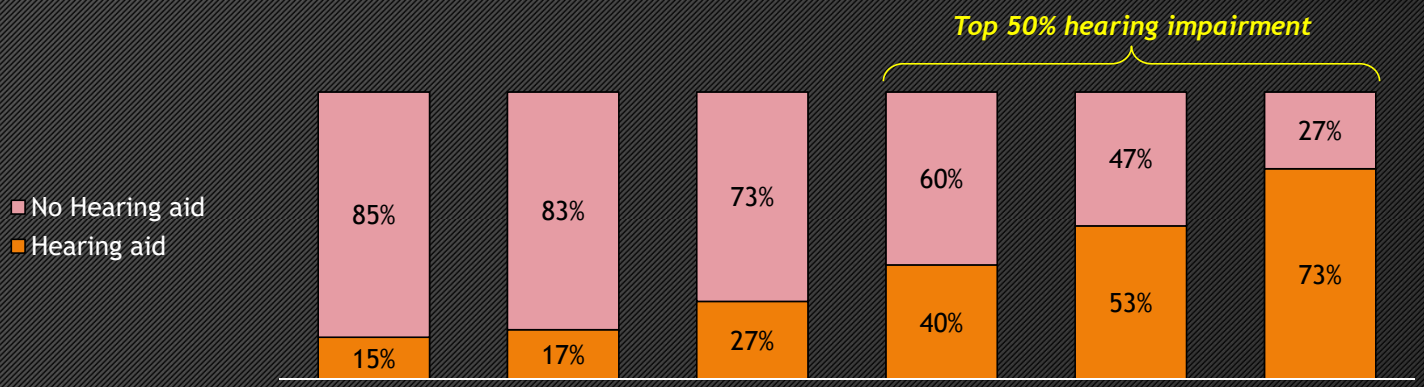


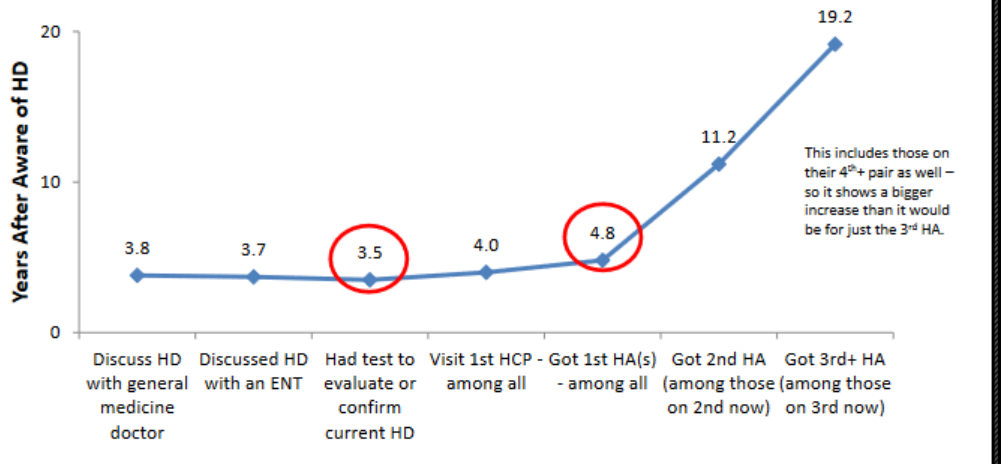
Figure 1. Hearing loss segmented by degree. Data compiled from Nash (2013), Lin et al (2011), Lin (2011) and Wallhagen & Pettengill (2008)

Greater the Impaired Hearing, Higher the Adoption Rate

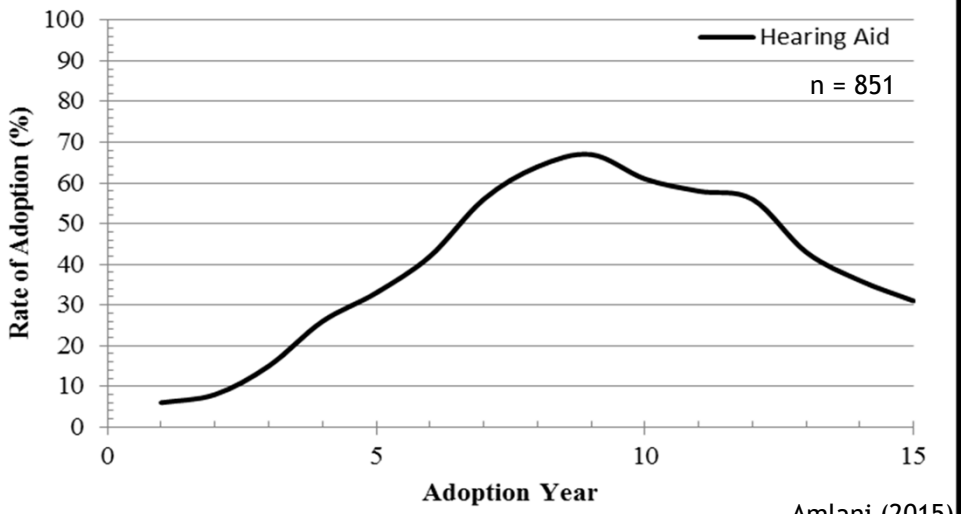


Degree of hearing impairment	low ← 6-tiles of equal size → high					
Sample size	1,773	1,772	1,745	1,730	1,823	1,666
% Female	40%	43%	44%	47%	47%	56%
Age (median)	51 years	60 years	63 years	65 years	66 years	73 years

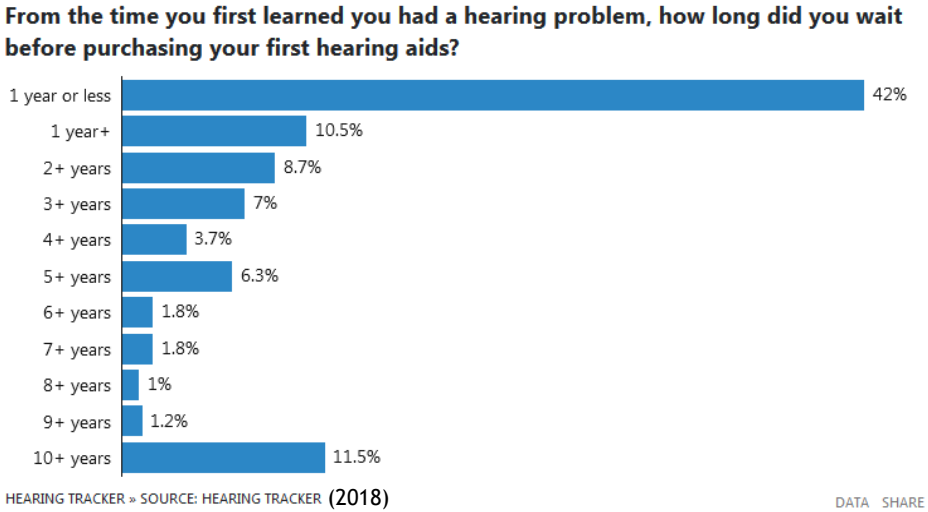
EuroTrak pooled data GER, FRA, UK, 2009, 2012, 2015.
HA-non-owner, n=6,168
HA-owner, n=4,341



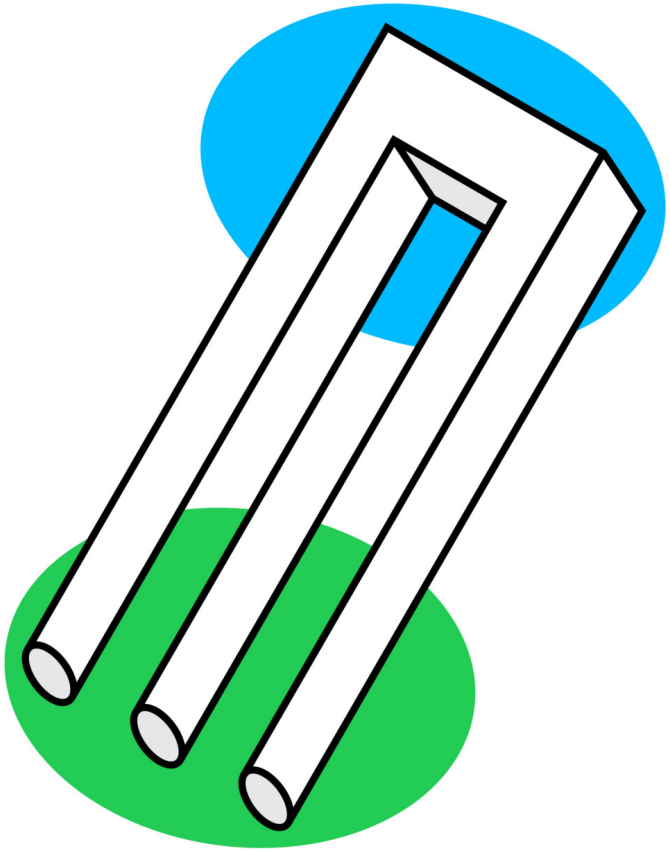
Abrams & Kihm (2015)



Amlani (2015)

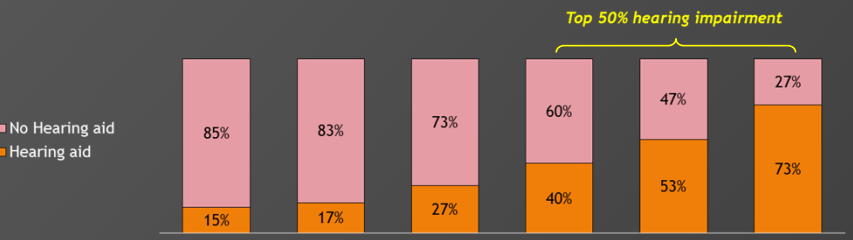


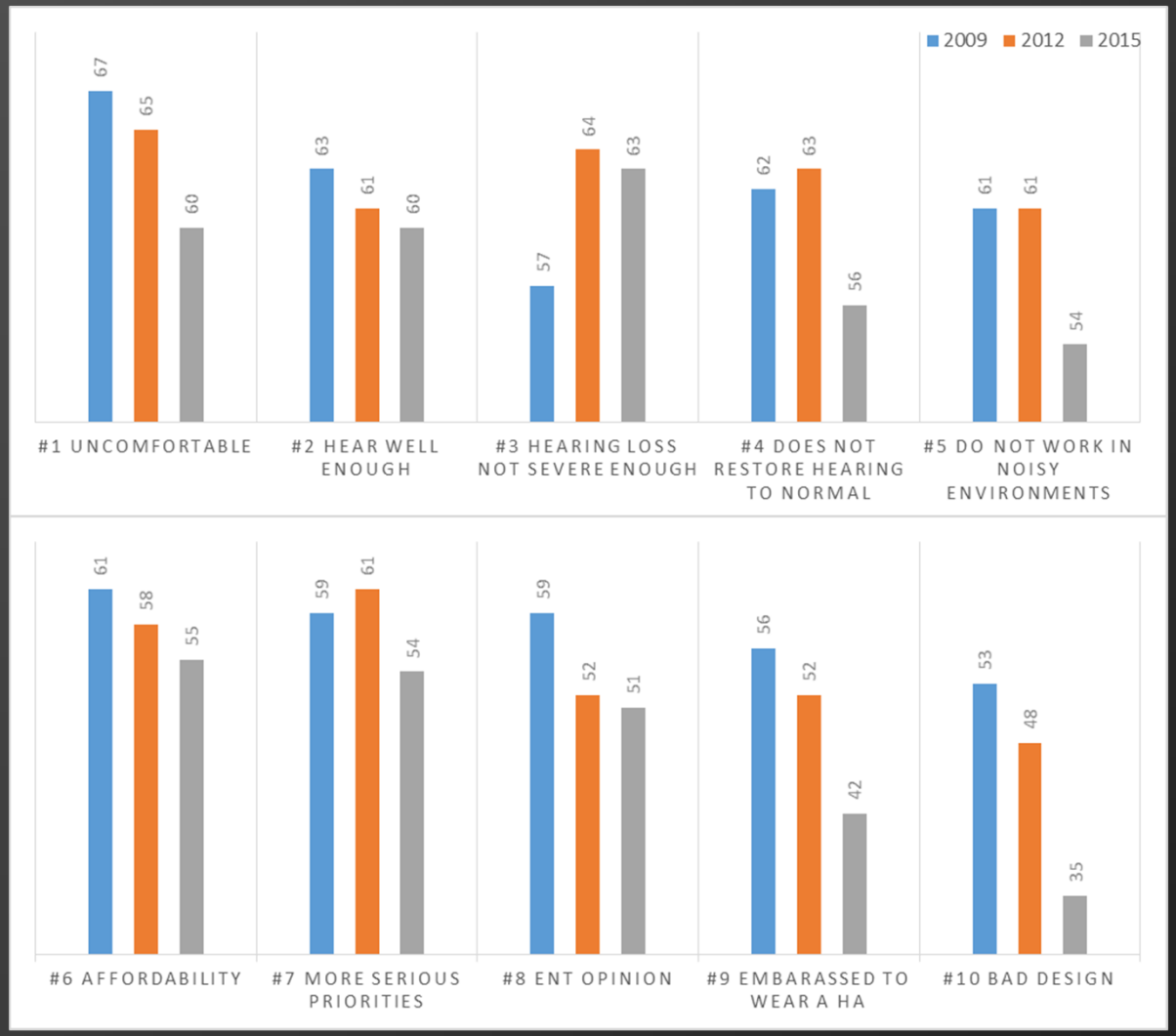
(2018)



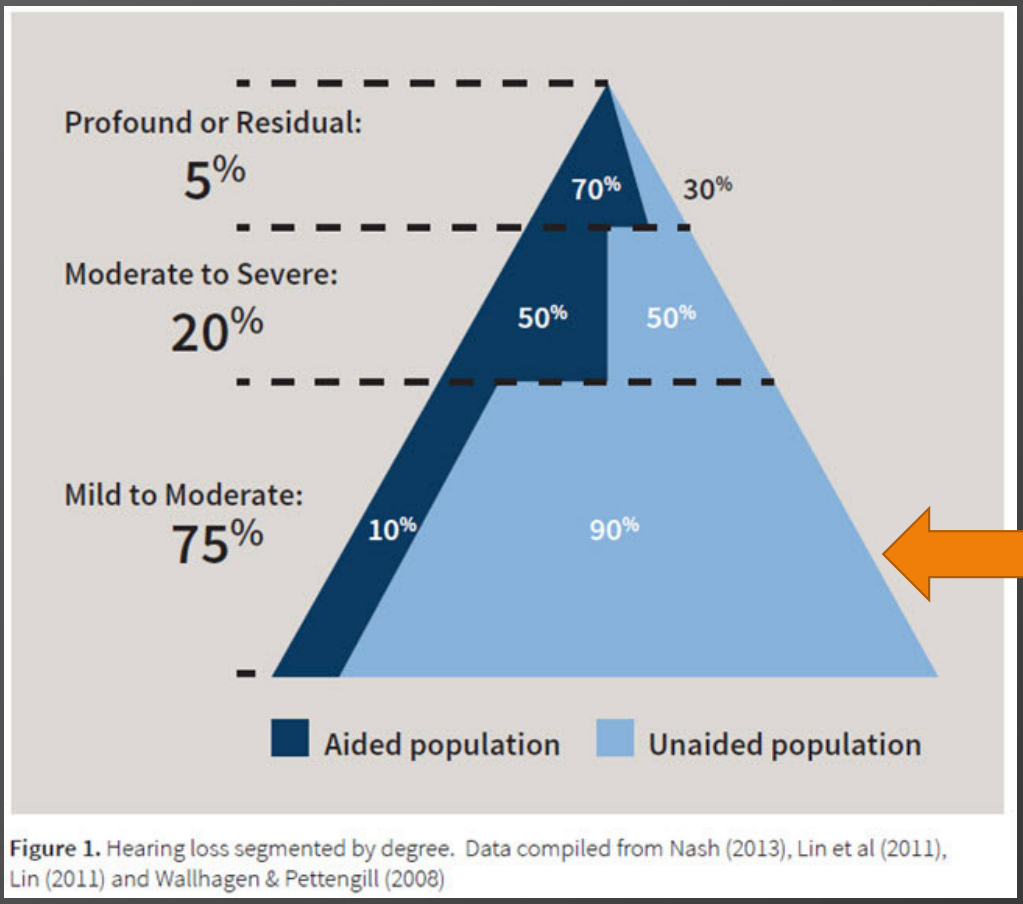
Impossible Trident
D.H. Schuster (1964)

Top 10 Reasons for Hearing Aid Non-Adoption by Impaired Listeners in Top 50%





EuroTrak data pooled from GER, FRA, UK
N by year = 716/713/603



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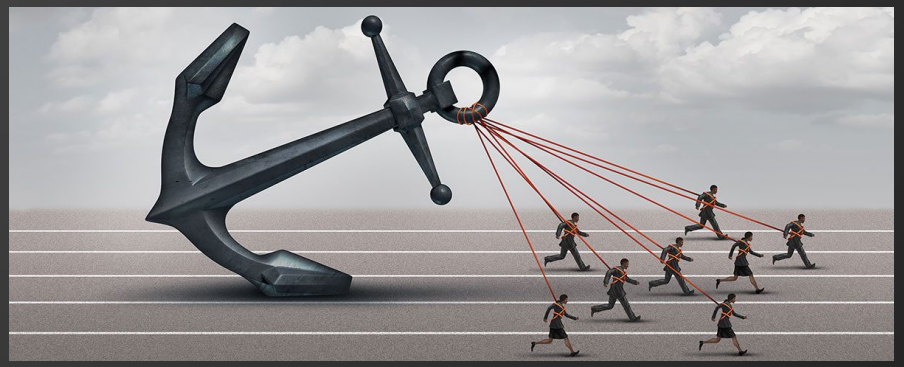
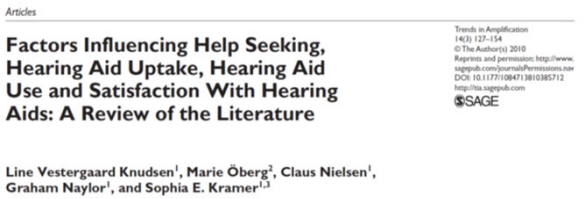
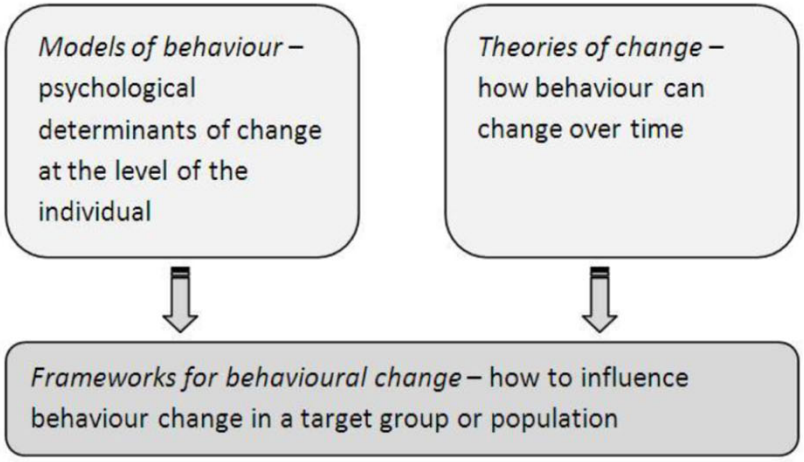




Systematic Reviews

Figure 1. Models of behaviour and theories of change provide the foundations for frameworks of behaviour change interventions



Sweeney (2009)

Models/Theories of Health Behavior

Transtheoretical Model

Prochaska et al. (1983) *J Consult Clin Psychol*

Example

Precontemplation - I am not ready for hearing aids at this time.

Contemplation - I have been thinking that I might need hearing aids.

Preparation - I have started to seek information about hearing aids.

Action - I am ready to get hearing aids if they are recommended.

Maintenance - I am comfortable with the idea of wearing hearing aids.

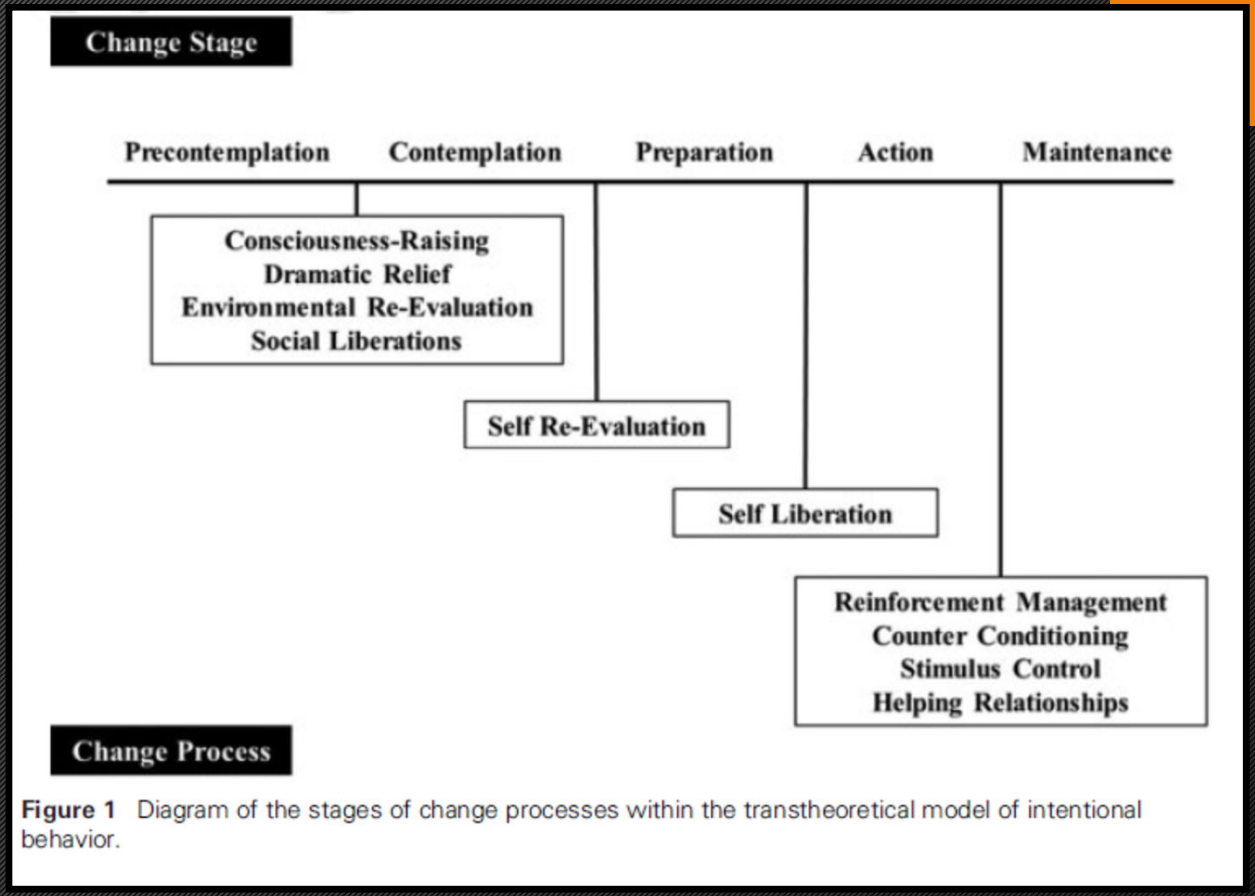


Figure 1 Diagram of the stages of change processes within the transtheoretical model of intentional behavior.

Transtheoretical Model – Literature Review

- Milstein & Weinstein (2002, *J Acad Rehab Audiol*)
  - Obtained hearing screening results and stage of change responses in 147 older adults
  - Prior to the screening, 76% of the participants rated themselves as either precontemplative or contemplative
  - Respondents then provided stage of change responses after participating in a hearing screening, with no significant change in stage response
- Laplante-Lévesque et al (2013, *Ear Hear*)
  - Participants who reported a lower stage of change (i.e., precontemplation) were those with milder hearing losses, and these individuals were less likely to use intervention and report successful outcomes
- Laplante-Lévesque et al (2015, *Ear Hear*)
  - Evaluated the stage of change in 224 adults who failed an online hearing screening
  - Results revealed that 88% of the participants were either in the preparation or contemplation stages of change, while 12% reported being in the preparation or action stage

Taylor & Francis
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International Journal of Audiology 2016; 55: S99–S104

International Journal of Audiology

Review Article

Applying theories of health behaviour and change to hearing health research: Time for a new approach

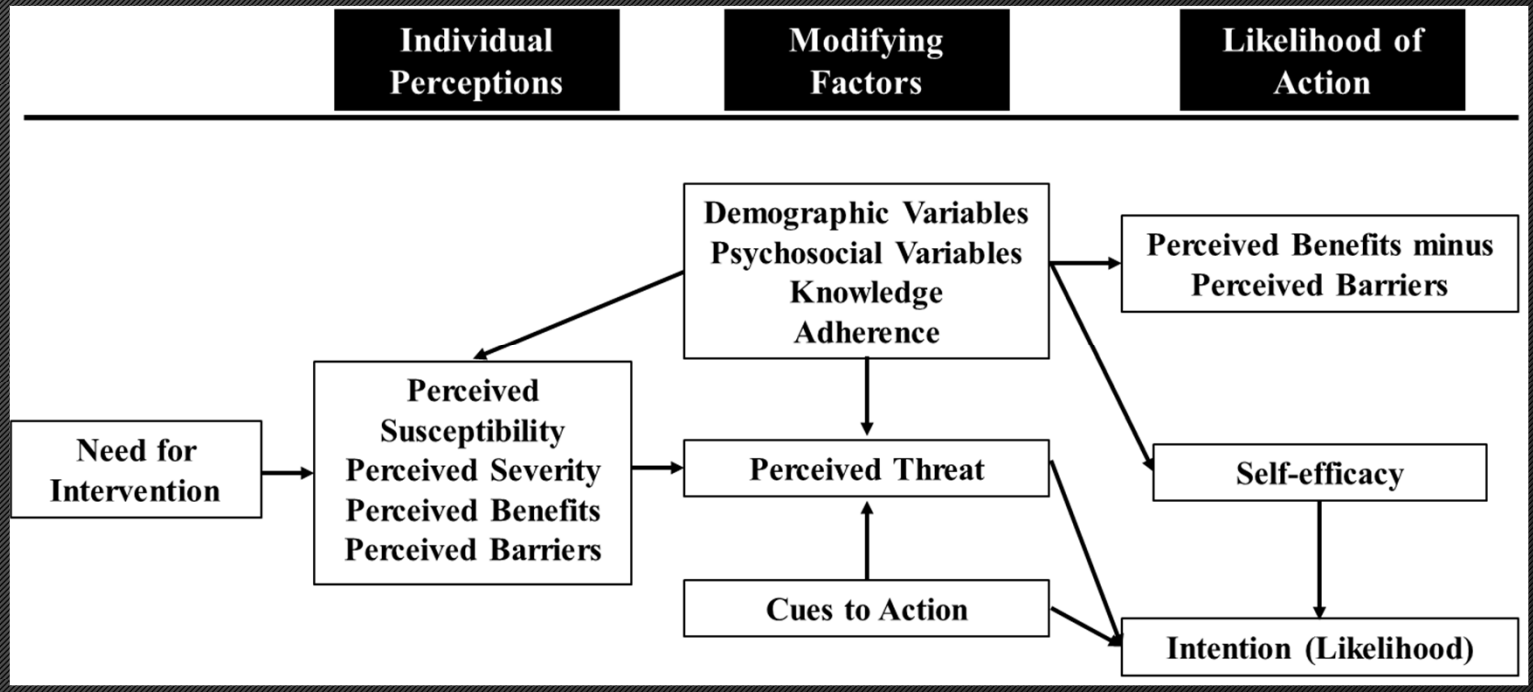
Neil S. Coulson[1], Melanie A. Ferguson[2], Helen Henshaw[2] & Eithne Heffernan[2]

[1]Division of Rehabilitation and Aging, School of Medicine, Queen's Medical Centre, University of Nottingham, Nottingham, UK and [2]National Institute of Health Research, Nottingham Hearing Biomedical Research Unit, Nottingham, UK

In summary, whilst the TTM has been the focus of a considerable amount of research attention it has also received unprecedented levels of criticism, with some authors (e.g. West, 2005) arguing that we should abandon the model completely. The vast majority of this criticism has been levelled at the 'stages of change' construct within the model, arguing that these stages are in fact 'pseudo stages'.

Health Belief Model

Rosenstock et al. (1974) *Health Educ Monogr*



Perceived Susceptibility – Perceived risk of acquiring the medical condition
Perceived Severity – Degree to which condition affects medically/socially
Perceived Benefits – Intervention will yield a desired outcome
Perceived Barriers – Internal/external obstacles to overcome

Threat - Low risk for developing hearing loss, increase to engage in risky behavior; high risk for developing hearing loss, decrease in risky behavior

Cue – prompt for action (e.g., interventional audiology, appt card reminders)

Health Belief Model – Literature Review

- van de Brink et al (1996, *Brit J Audiol*)
  - Assessed Relationship between attitudes and help-seeking behaviors (n = 624)
  - 41% wore hearing aids, 26% sought out intervention/no uptake, 27% had yet to seek out intervention
  - Survey assessed (1) perceived severity of decreased audibility, (2) perceived benefits of hearing aids, (3) perceived barriers related to cost, and (4) cues to action stemming from perceived social norms.
    - Adopted hearing aids reported higher scores on perceived severity, perceived benefits, and cues to action
    - Intermediate scores for these constructs for those who had had sought out intervention
    - lowest scores reported by participants who had yet to seek out intervention for impaired hearing sensitivity

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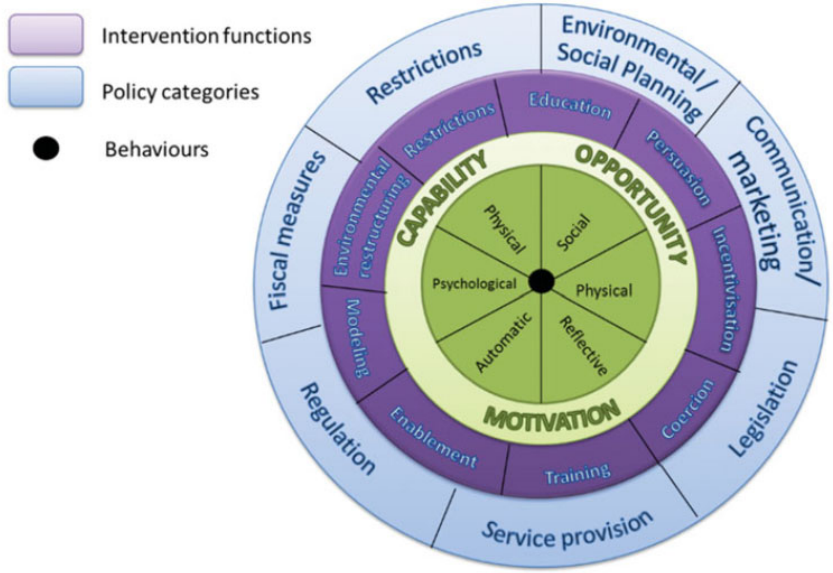
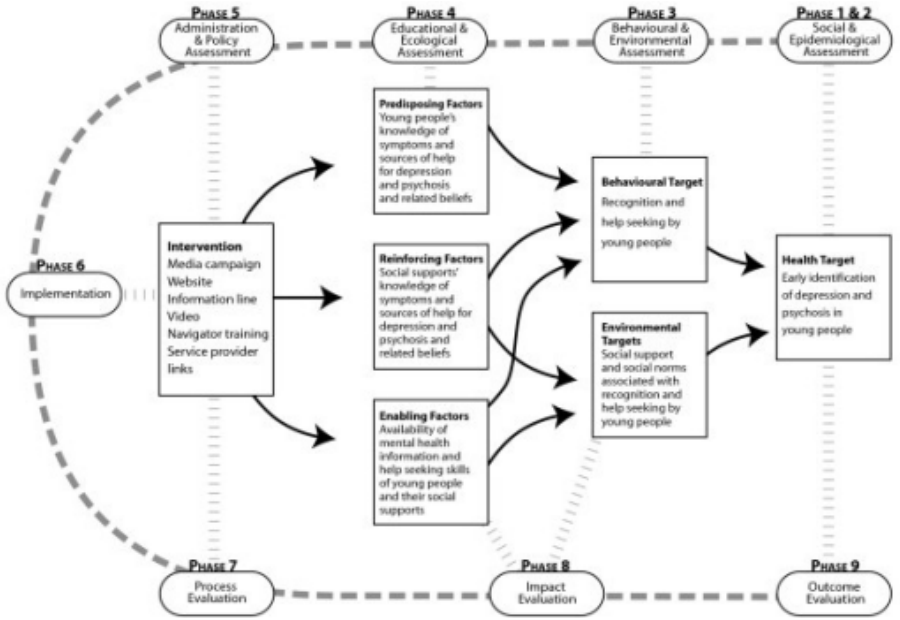
In summary, the evidence for the predictive capabilities of the HBM is arguably weak, particularly when considered in relation to other models (i.e. Theory of planned behaviour / Theory of reasoned action). There are likely to be a range of reasons that include (but not limited to), inadequate construct definition and measurement, lack of clarity with regards how the various components should be combined to predict behaviour, and weaknesses in the predictive validity of the HBM's key components (Armitage & Conner, 2000).

Health Belief Model – Literature Review

- Saunders et al (2013)
  - Developed HBQ with six constructs that measure hearing health behaviors
    - (1) perceived susceptibility to acquiring hearing loss, (2) perceived severity of hearing loss both medically and socially, (3) perceived benefits from intervention, (4) perceived barriers to overcome for intervention to be successful, (5) perceived self-efficacy, and (6) internal (e.g., symptoms of a health problem) and external (e.g., mass media information) cues to action
  - Help seekers demonstrated higher perceived susceptibility, lower perceived barriers, and higher cues to action than non-help seekers
  - Hearing aid adopters perceived an increased susceptible to hearing loss, while perceiving more benefits and fewer barriers to action, and were provided more cues to action compared to those who had not adopted amplification technology.
  - Hearing aid users perceived an increase in severity of the health condition, perceived fewer barriers, increased self-efficacy, and had encountered more cues to action than participants who did not use hearing aids regularly



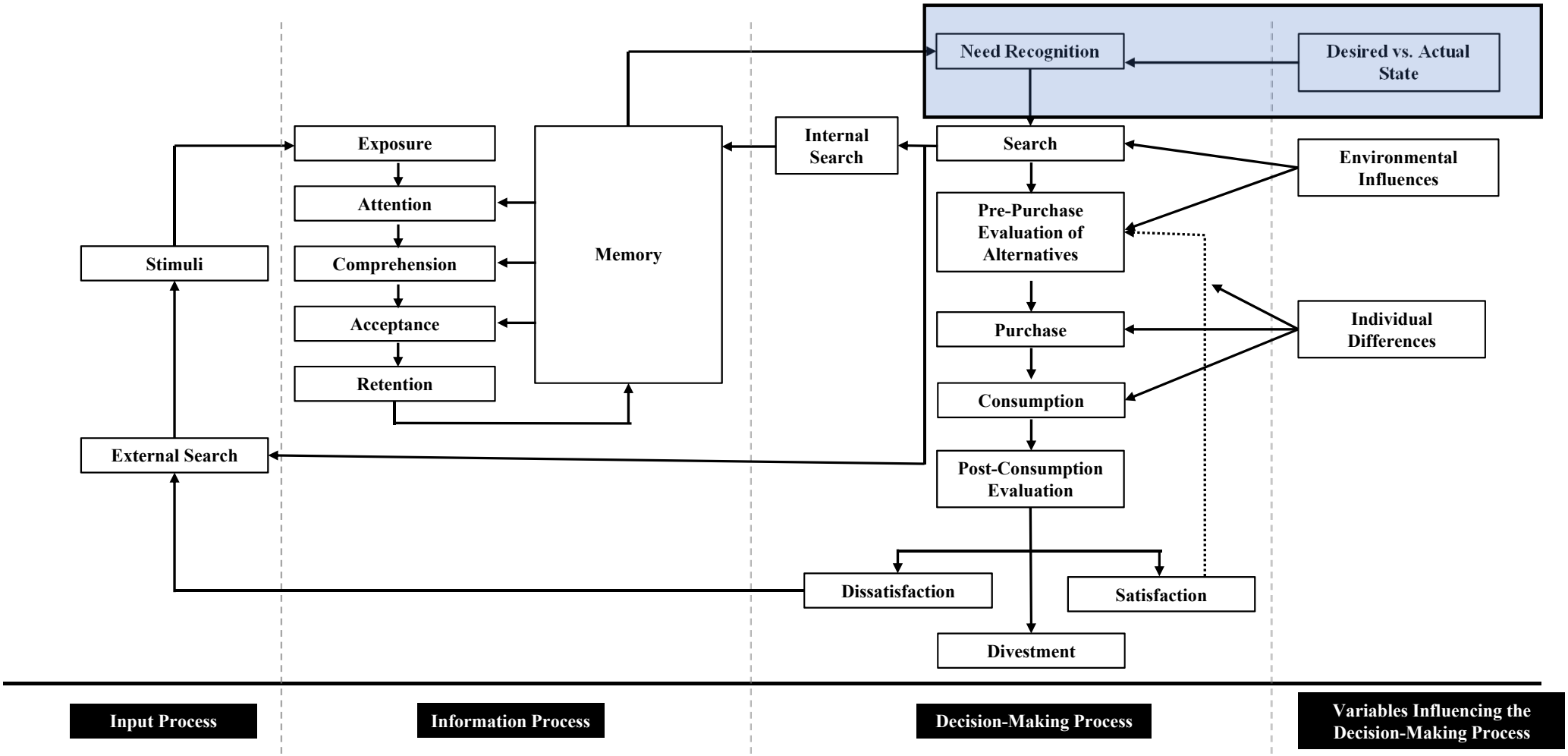
Precede-Proceed Model (Green & Krueter, 1999)



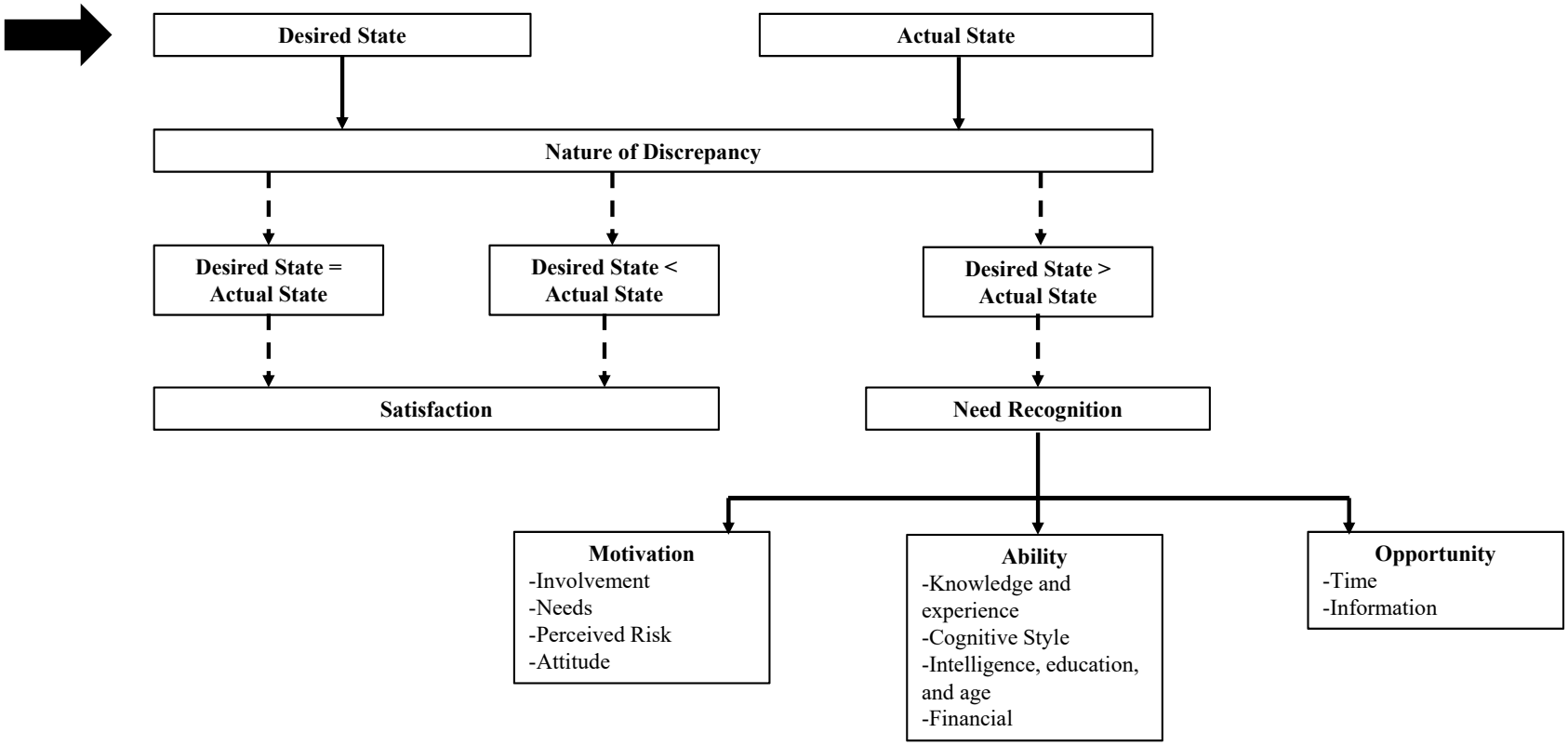
COM-B (Barker et al, 2017)

What if…listeners did not view decreased hearing sensitivity as a medical condition, but as a consumer decision?

(i.e., not a change in behavior, but the need for a strategy to overcome a state)



Consumer Decision Model (Blackwell et al, 2001)…*Consumer Behavior* (Book)
Amlani (2015)…*Seminars in Hearing*



Need Recognition

CDM

- A neo-behavioral approach (i.e., considers, unobservable, internal behaviors) that attempts to describe an individual's psychological and cognitive emphasis toward a stimulus, called a stimulus-organism-response (SOR) approach

Yes

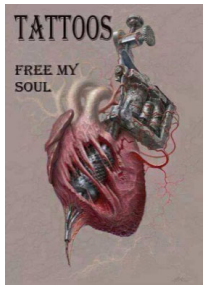
No

Stimulus | **Organism** | **Response**

Internal
(e.g., attitude, emotions, motivation)

External
(e.g., culture, family, social)

NEED RECOGNITION
Desired vs Actual State



Yes

No

Stimulus

Organism

Response

Internal
(e.g., attitude, emotions, motivation)

External
(e.g., culture, family, social)

Consumer Decision Model - Methodology

- 1273 adult listeners completed online questioning
  - Females = 903 (Mean = 58.0 years; SD = 6.1)
  - Males = 370 (Mean = 62.2 years; SD = 5.5)
- Survey open from October 2015 – December 2016
- Participants completed the survey twice:
  - Pre-appointment = desired (i.e., what was expected)
    - Survey requested to be taken within 14 days of appointment (Mean = 7.6, SD = 3.8)
  - Post-appointment = actual (i.e., what was received)
    - Survey requested to be taken within 14 days of appointment (Mean = 3.3, SD = 2.1)

Methodology

- 1273 adult listeners completed online questioning
  - Provider seen:
    - Audiologist (n = 618)
    - Hearing Instrument Specialist (n = 573)
    - Unknown (n = 142)

- Survey Based on Total Utility
  - Responses scored from 1-10 (integers)

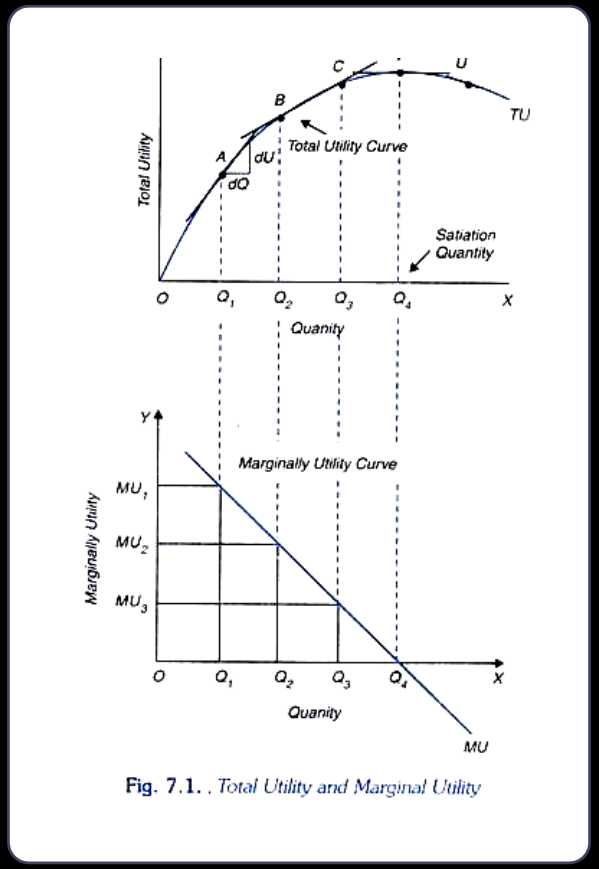


Fig. 7.1. . *Total Utility and Marginal Utility*

Q1. In your opinion, hearing healthcare is best classified under the heading of (a) medical, (b) rehabilitation, or (c) consumer electronics?

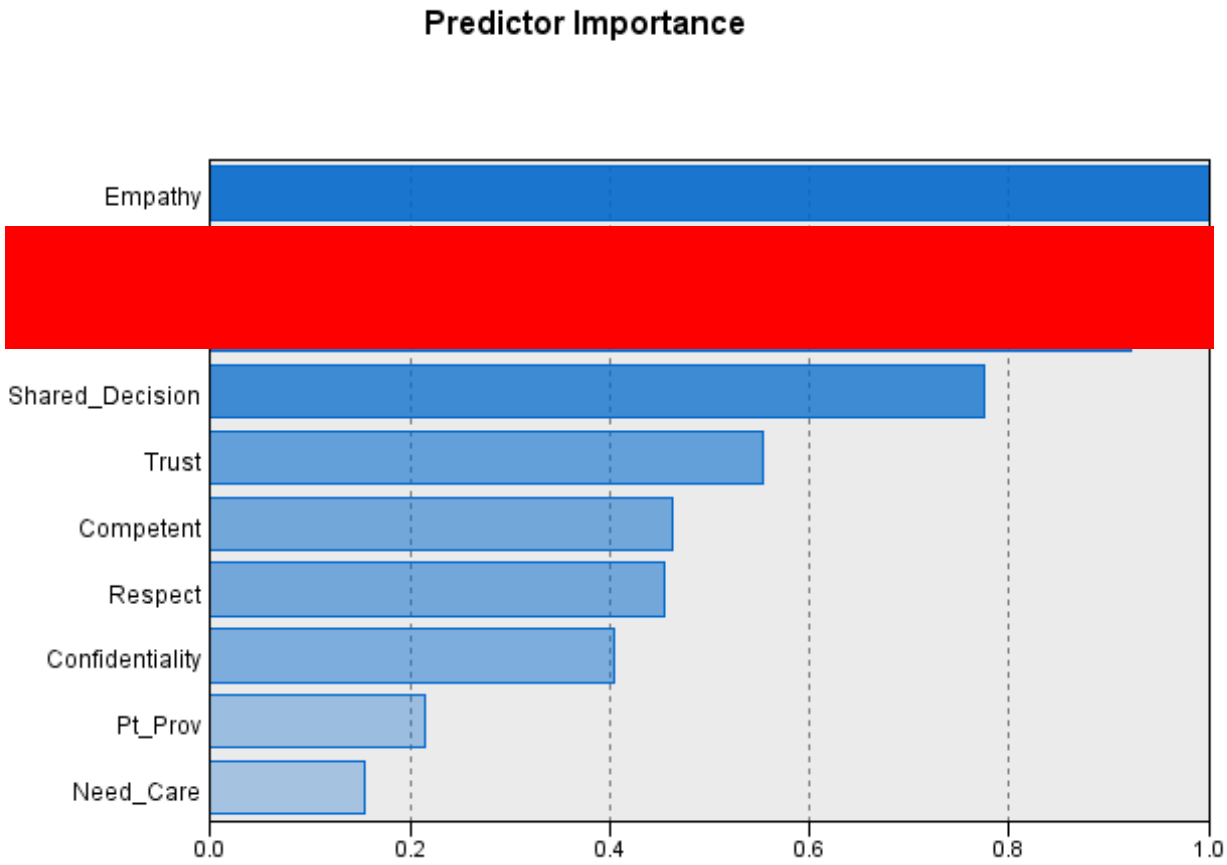
Provider Seen	Sample Size (n)	Interest in Amplification
Medical	142	95
Rehabilitation	389	187
Consumer Electronics	87	72

Factors
Competency
Confidentiality
Empathy
Needed Care
Patient-Provider Communication
Respect
Shared-Decision Making
Trust

Final Q: Based on your hearing awareness perception, are you considering the need to use hearing aids?

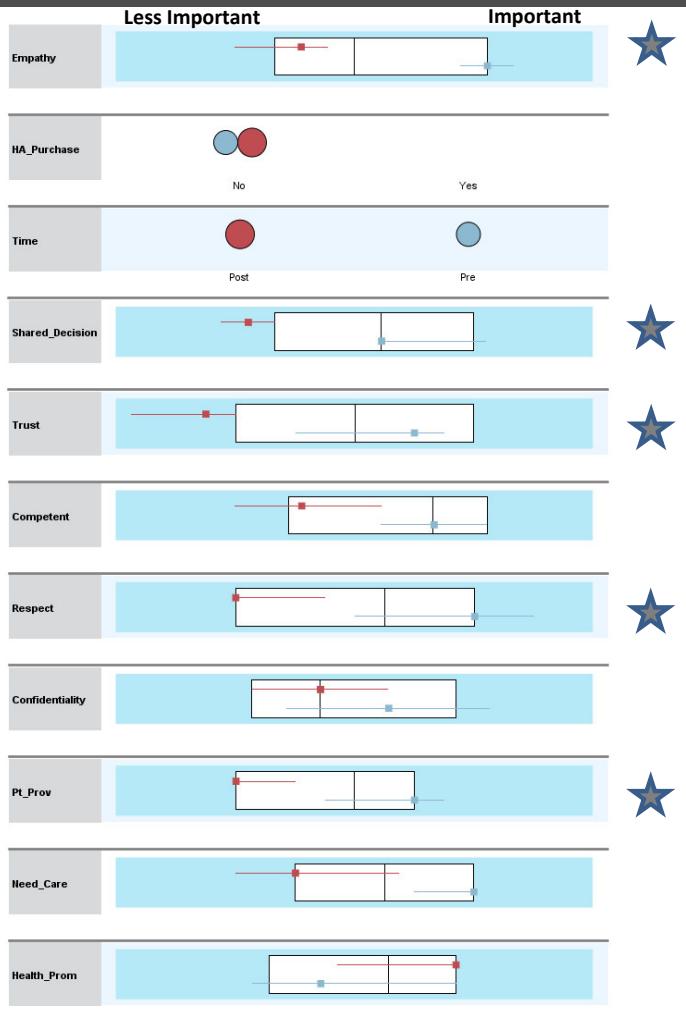
Medical

(n = 142)



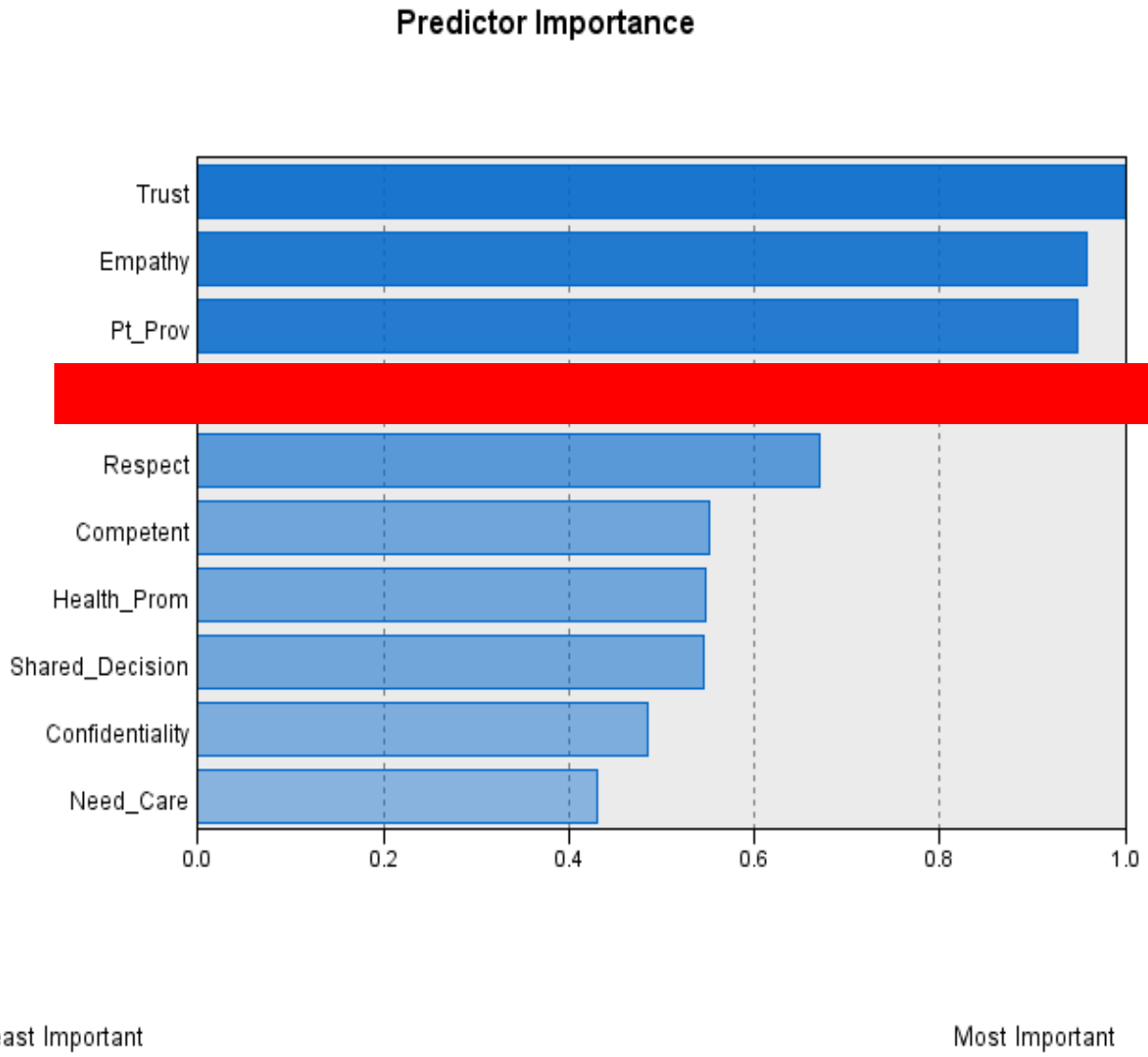
Pre	Post
n = 142	n = 50
Amp = 95	Amp = 36

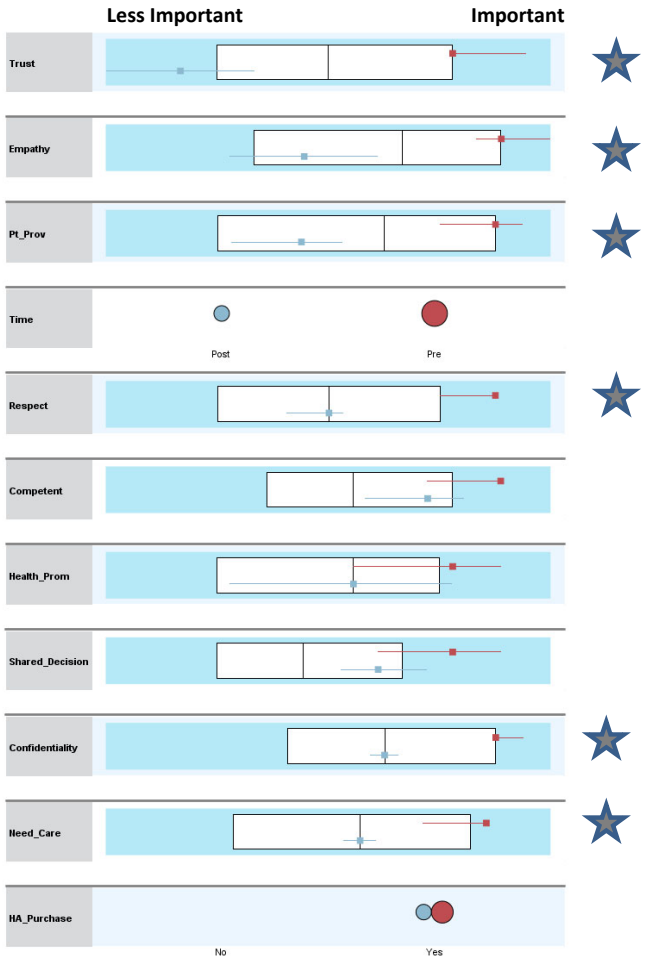
Pre	Post
n = 142	n = 92
Amp = 95	Amp = 7



Rehab

(n = 389)


Predictor Importance
Trust
Empathy
Pt_Prov
Respect
Competent
Health_Prom
Shared_Decision
Confidentiality
Need_Care
0.0
0.2
0.4
0.6
0.8
1.0
Least Important
Most Important

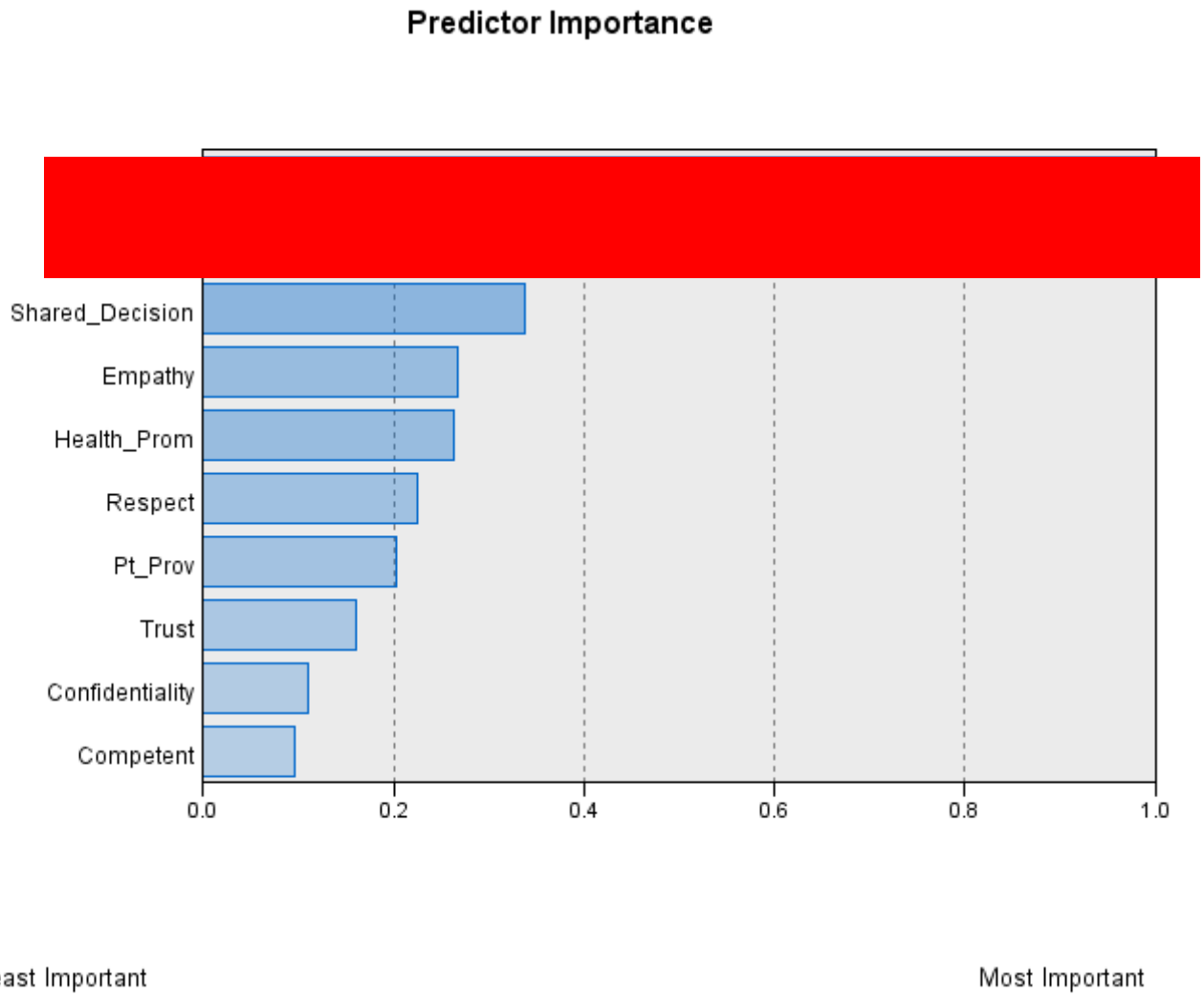


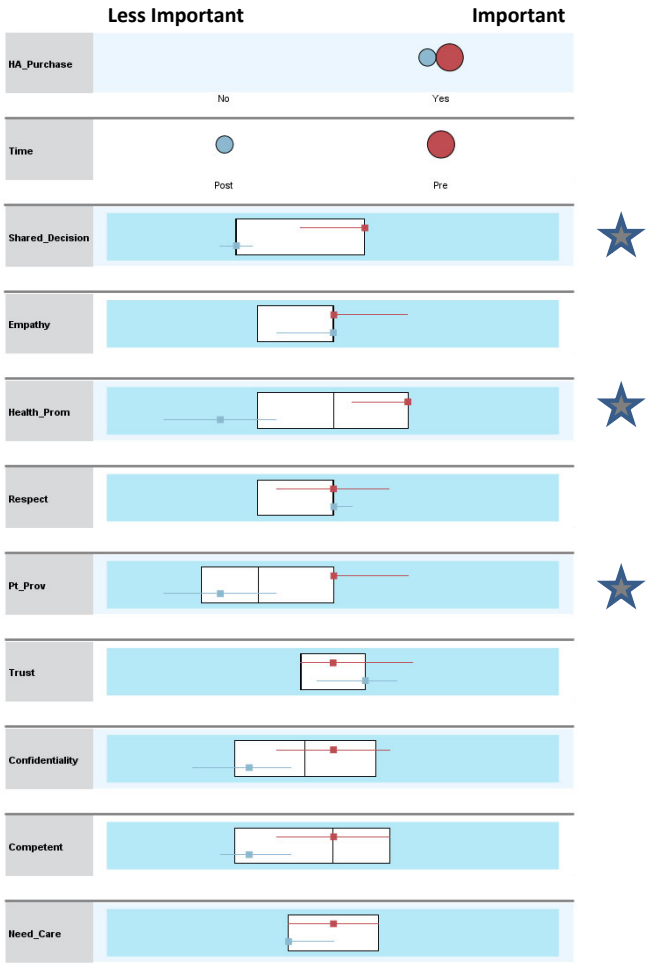
Pre	Post
n = 389	n = 173
Amp = 187	Amp = 29

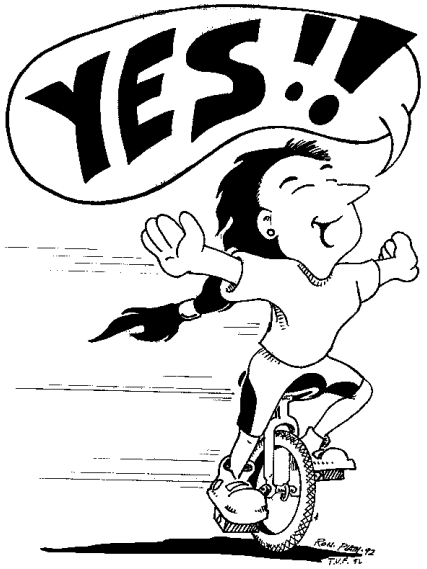
Pre	Post
n = 389	n = 216
Amp = 187	Amp = 5

Consumer Electronics

(n = 87)

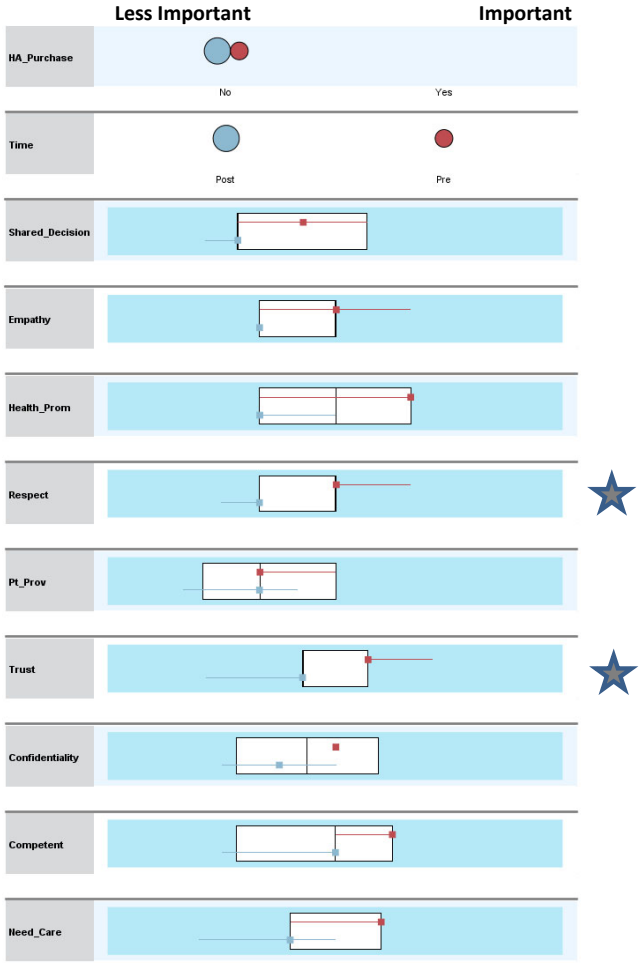






Pre	Post
n = 87	n = 64
Amp = 72	Amp = 49

Pre	Post
n = 87	n = 23
Amp = 72	Amp = 11



Summary

- Patient's have a predisposed perception about the professional and the supply-chain model
- Increased patient perception for provider services
  - Supports model for traditional hearing aid delivery
- Reduced patient perception for provider services
  - Supports model for alternative/D2C technology delivery

86%

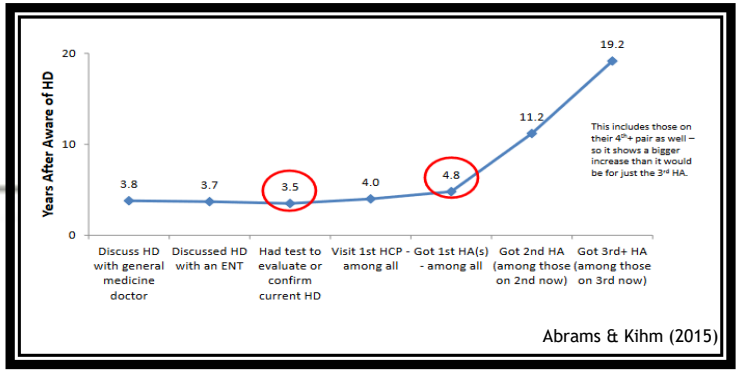
of buyers will pay more for better customer experience

70%

of buying experiences are based on how customers feel they're treated

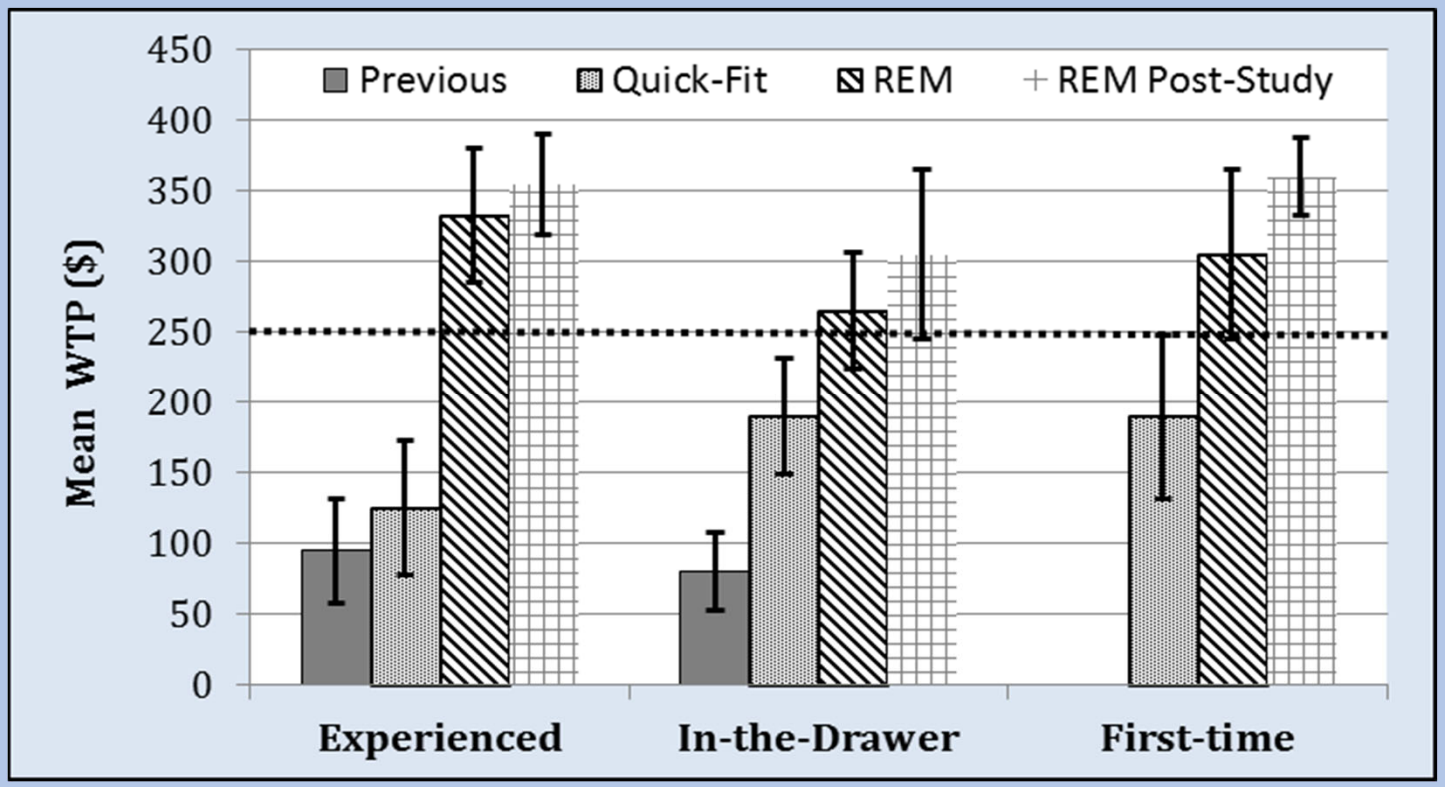
of customers will do business again with the company that resolves their complaints

FIRST IMPRESSIONS LAST FOREVER



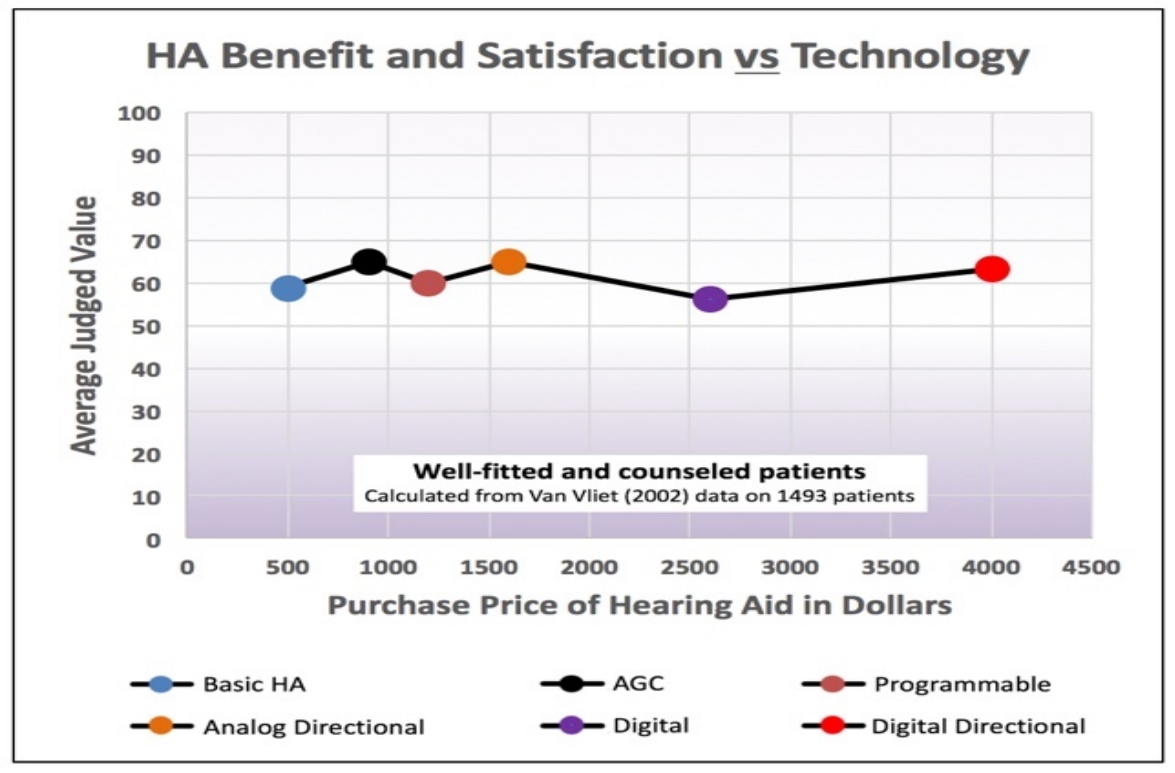
Abrams & Kihm (2015)

Willingness-to-Pay



Amlani et al (2016)

Purchasing trends based on perceived value, *NOT* price



http://hearinghealthmatters.org/waynesworld/2017/otc-hearing-aids-psaps/

Research Article

The Effects of Service-Delivery Model and Purchase Price on Hearing-Aid Outcomes in Older Adults: A Randomized Double-Blind Placebo-Controlled Clinical Trial

Larry E. Humes,[a] Sara E. Rogers,[a] Tera M. Quigley,[a] Anna K. Main,[a] Dana L. Kinney,[a] and Christine Herring[a]

Satisfaction		
Group	Uptake	Undecided (i.e., Benefit)
AB	81%	1.9%
CD	56%	17.6%
P	36%	38%

Table 6. Summary of significant main effects and interactions for general linear model (GLM) analyses of all hearing-aid outcome measures in the clinical trial.

Outcome measure	Service delivery (S)	Purchase price (PP)	S × PP
PHABglobal	AB > P, CD > P	NS	NS
PHABavds	NS	NS	NS
CST benefit	AB > P, CD > P	Typical > reduced[a]	NS
HHIE benefit	AB > P, CD > P	NS	NS
HASShaf	AB > CD, P	NS	NS
HASSdisp	AB, P > CD	NS	NS
Usage	NS	NS	NS

Note. AB = audiology best practices group; CD = consumer decides/over-the-counter group; P = placebo device group; NS = not significant ($p > .05$); PHABglobal = difference between aided and unaided scores of PHAPglobal (Profile of Hearing Aid Performance, average of the five communication-related subscales: Familiar Talkers, Ease of Communication, Reverberation, Reduced Cues, and Background Noise); PHABavds = difference between aided and unaided scores of PHAPavds (PHAPavds = Profile of Hearing Aid Performance, average of the Aversiveness of Sound and Distorted Sound subscales); CST benefit = difference between aided and unaided Connected Speech Test scores; HHIE benefit = difference between aided and unaided Hearing Handicap Inventory for the Elderly scores; HASShaf = Hearing Aid Satisfaction Survey, items concerning hearing aid features; HASSdisp = Hearing Aid Satisfaction Survey, items concerning dispenser-related processes.

[a]Typical > reduced also for unaided CST scores.


GAME
Theory

Assurance Game

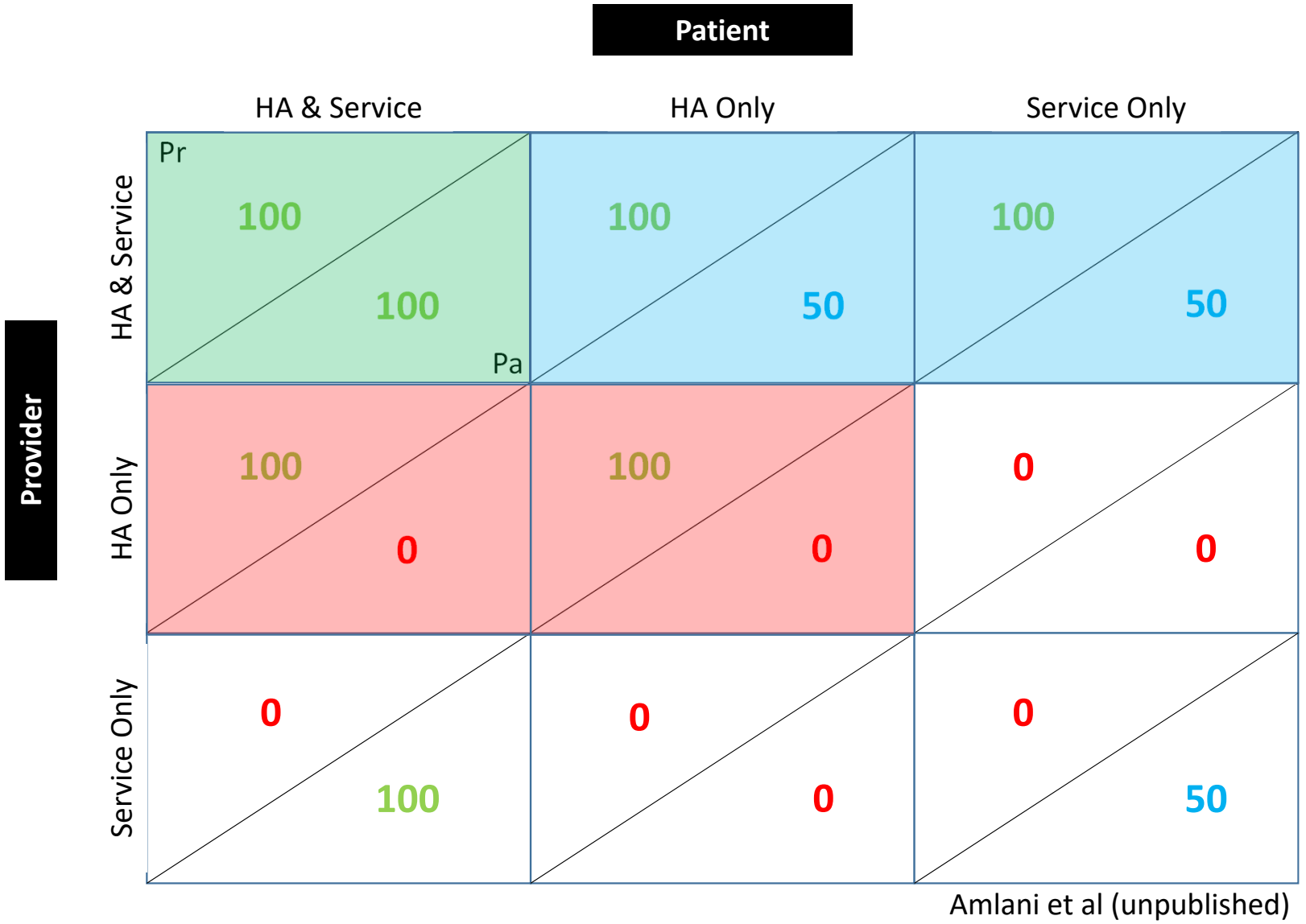
Assurance Games and Coordination

- **ASSURANCE GAME= any situation in which mutual cooperation leads to a better outcome than unilateral defection.**
- **'Assurance Games' have the following payoff order:**
  - *CC > DC > DD > CD*

	COOPERATE	DEFECT
COOPERATE	BEST, BEST	WORST, SECOND
DEFECT	SECOND, WORST	THIRD, THIRD

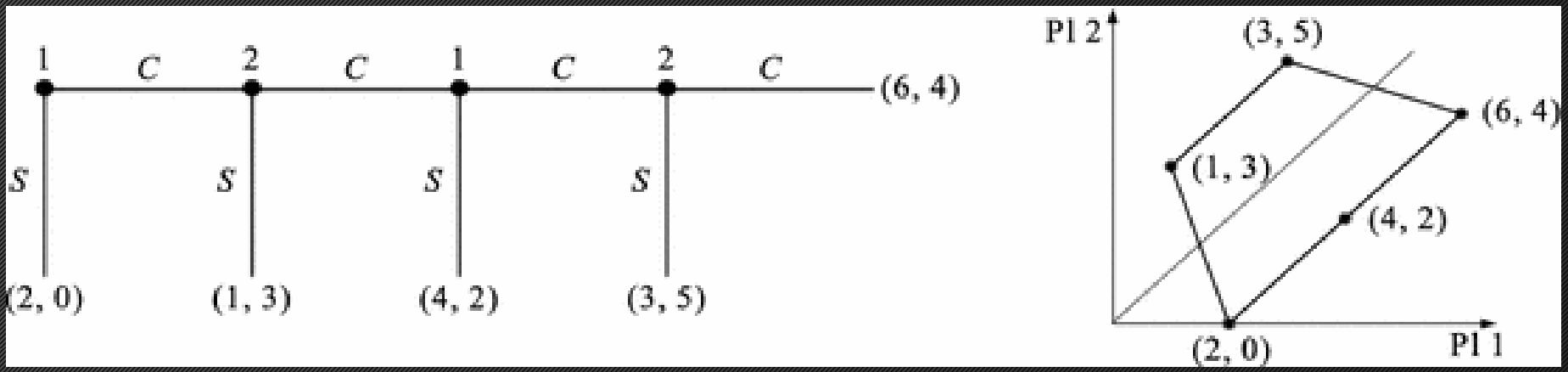
Payoffs written in RED are payoffs for player 1 (row-chooser)
Payoffs written in BLACK are payoffs for player 2 (column-chooser)

Utility:
Yes = 100
Neutral = 50
No = 0



Amlani et al (unpublished)

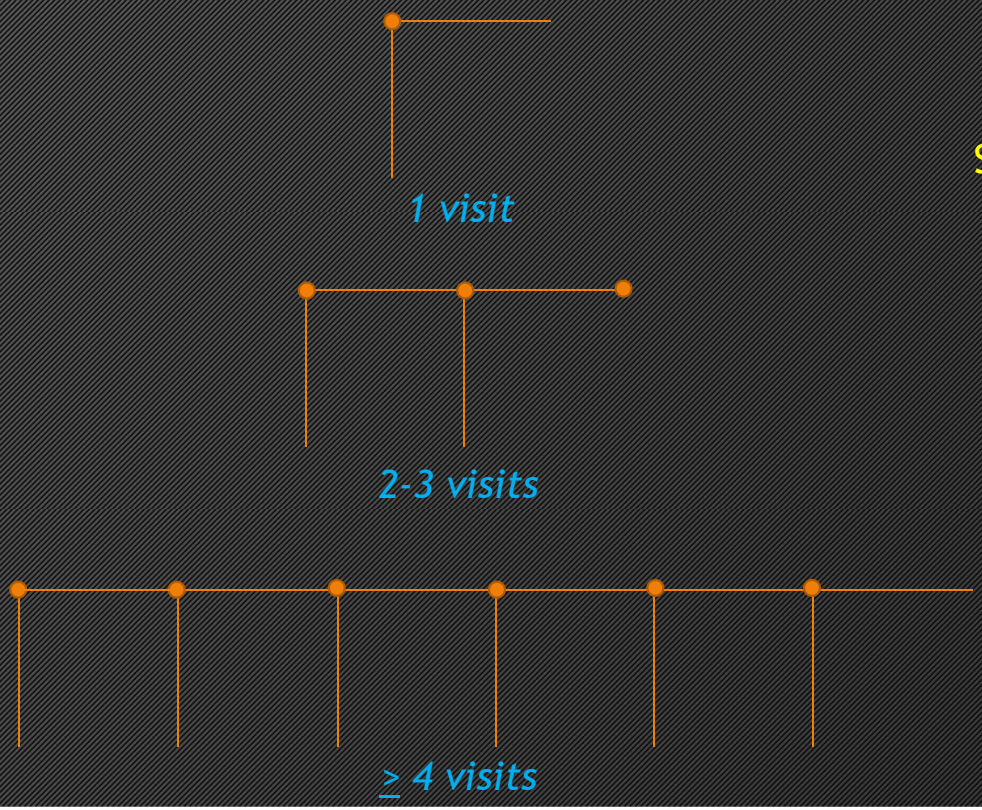
Centipede Game



Frackiewicz (2015)

Audiology Practice and Centipede Game

(n = 169 patients, 2 private practices and
1 university-based clinic that utilize bundling pricing)



N = 91 (54.1%)

Satisfaction = 52.2%

(2,0)

N = 48 (28.6%)

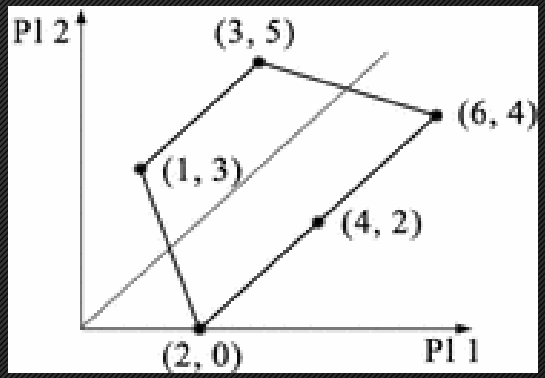
Satisfaction = 77.6%

(1,3)

N = 30 (17.8%)

Satisfaction = 30.3%

(6,4)



Putting It All Together…

- At this time, it does not appear that a health-behavior model captures patient perceptions adequately in hearing behavior
  - New models are being developed
- Consumer Decision Model is a tool that could be used to assess patient behavior at the initial stage (i.e., need recognition) of provider-patient interaction
- Some providers must be cognizant of their service delivery as it influences
  - Patient's lens towards the profession
  - Adoption of audiological services and amplification technologies


The quality of the experience will be remembered long after the price has been forgotten.

THANK YOU