THE ART OF INDEPENDENT PRACTICE IN TODAY'S CORPORATE/COMMODITY CULTURE

David J. Smriga, M.A.
President
AuDNet, Inc.

NYSSLHA Convention – April 2017

Disclosure

- President of AuDNet, Inc., a national group purchasing organization assisting independent practices in lowering their cost of goods
- Senior Audiology Consultant for Audioscan, a hearing aid analyzer manufacturing company

Some Starter Questions . . .

- Do you include hearing aid dispensing as part of your professional scope of practice?
- Are you an employee or an owner?
- Is your salary/income tied to hearing aid sales?

Initial Premise

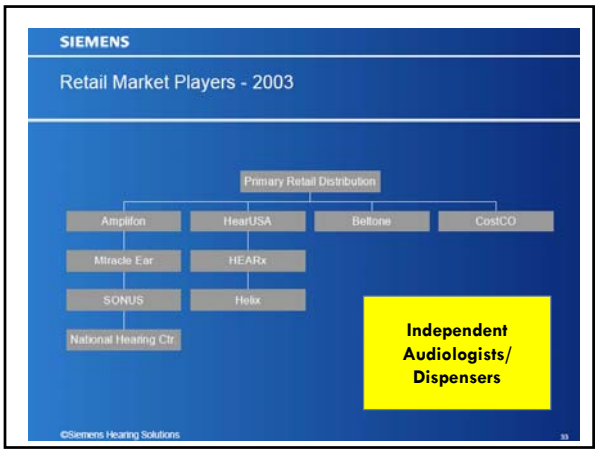
- *Success for an independent audiology practice hinges on its ability to sustain competitive consumer value.*

Key Word Definitions

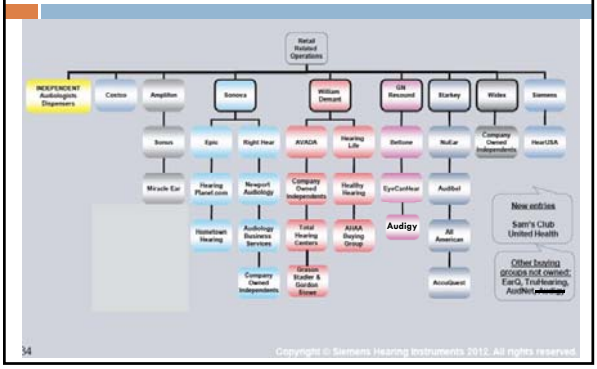
- Success:
  - Your business model allows you to:
    - Provide high quality hearing and balance care in your community
    - Provide for yourself and your family
    - Sustain both of the above as outside forces change

Key Word Definitions

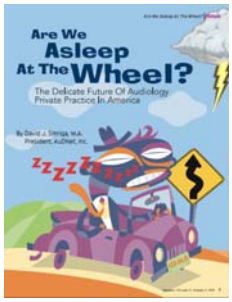
- Independent audiology practice
  - Not owned by a corporation/manufacturer
    - Can make unencumbered business and purchasing decisions
    - The practice's net profits are the provider's net profits

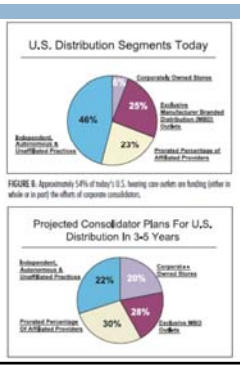


What Tom Said in 2012



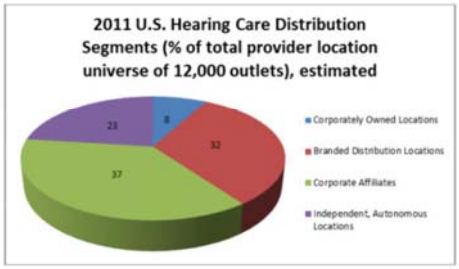
Asleep At The Wheel 1



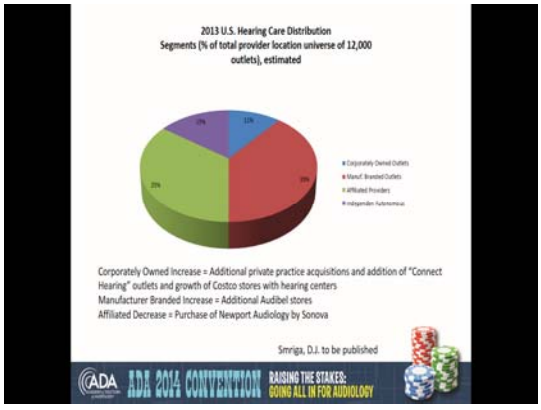


Feedback Magazine, Vol. 2, 2004

Asleep At The Wheel 2



http://www.audiologyonline.com/articles/we-still-asleep-at-wheel-809



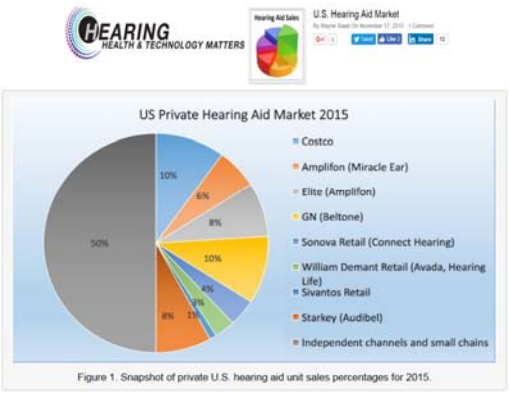


Figure 1. Snapshot of private U.S. hearing aid unit sales percentages for 2015.

Key Word Definitions

- Competition:
  - Manufacturers
  - Corporations
  - Internet
    - Both products and characterizations of what you do
  - Consumer Electronics
  - Cost of goods

Key Word Definitions

- Value:
  - Def: "The regard that something is held to deserve"
  - Synonyms: Usefulness, benefit, gain, merit, good

The Challenges That Corporatization Creates For A Practice

- Erosion of independent practice market share
  - Practices that can make unencumbered business and purchasing decisions
  - Practices where the practice's net profits are the provider's net profits
  - Single best income path is shrinking
- Shareholder value trumps customer experience
- Increased focus on product
  - Encourages consumer electronics and OTC/DTC alternatives
- Cost of goods becomes an independent practice penalty

The Challenges That Corporatization Creates For Our Profession

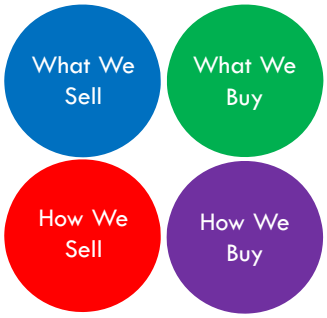
- Single largest income earning pathway is eroding
- Professional association funding traditions are being rewritten

Income Associated With Exhibits At Professional Association Conventions

	2010	2011	2012	2013	2014	2015
Audiology NOW Income	$3,410,365	$3,601,777	$3,919,502	$3,211,764	$2,589,215	$2,711,092
Audiology NOW Expenses	$2,157,073	$1,973,431	$2,362,714	$2,481,678	$2,031,863	$2,134,992
Audiology Now Profit	$1,253,562	$1,628,346	$1,556,788	$730,086	$557,379	$576,101
Association Income - Expenses	$9,685	$257,559	$553,714	-$328,709	-$287,587	$470,093

AAA Fiscal Year Audited Financials

How Can We Achieve Our Premise In Today's Business Environment?



What We Sell

Products

What We Sell

- First Indicator
  - Remains the primary income source
- Second Indicator
  - Advertising/Marketing



Products

What We Sell

- First Indicator
  - Remains the primary income source
- Second Indicator
  - Advertising/Marketing
- Third Indicator
  - Bundled Pricing

Price

What We Sell

- First Indicator
  - We offer patients options
- Second Indicator
  - We advertise price



Price

What We Sell

- First Indicator
  - We offer patients options
- Second Indicator
  - We advertise price
- Third Indicator
  - We fear Costco and PSAP's

Third Party Participation

What We Sell

- First Indicator
  - Participation
- Second Indicator
  - Participation at inadequate reimbursement rates

Initial Sound Quality

What We Sell

- First Indicator
  - You ask the question
- Second Indicator
  - You make adjustments based on the answer to that question
- Third Indicator
  - Trial period
- Fourth Indicator
  - You don't verify

Which of These Are YOUR Value Indicators?

- Product
- Price
- Third party participation
- Initial sound quality

So, what's the alternative?

Key Part of NAS 12 Recommendations

- Recommendation 2:
  - Develop and promote measures to assess and improve quality of hearing health care services
    - Align and promote ***best practices*** and core competencies across the continuum of hearing health care, and implement mechanisms to insure widespread adherence
    - Research, develop and implement a set of quality metrics and measures to evaluate hearing health care services with the end goal of improving hearing and ***communication focused patient outcomes***

Best Practices Guidelines – AAA 2006

(Modified by AuDNet Patient Care Excellence Program)

- Provider Guarantee
- Auditory Assessment
- Auditory Needs Assessment *
- Non-Auditory Needs Assessment
- Hearing Instrument Selection
- Fitting & Verification
- Hearing Instrument Orientation
- Counseling & Follow-Up AR
- Outcome Assessment
- Patient Care Audit

* **Communication Focused Patient Outcomes**

Best Practice

What We Could Sell

- First Indicator
  - Solution-based counseling
- Second Indicator
  - Verification that treatment goals have been reached
- Third Indicator
  - Validation that treatment has delivered a beneficial outcome

Treatment Package

What We Could Sell

- Example
  - Initial fitting
    - Objective verification of speech cue audibility improvement
      - Starter settings and goal settings
  - Structured auditory therapy
    - Builds neural connections needed to utilized restored speech cues comfortably and effectively
  - Improvement Validation
    - Objective measurement of performance enhancement delivered as a result of the above
  - Ongoing performance and condition monitoring

Problem Mitigation

What We Could Sell



How We Sell

Bundled Pricing

How We Sell

- Definition:
  - You bundle all of your hearing aid product and service costs, as well as your professional fees, under one, singular, price (code)

Amlani, Cavitt, Sjoblad: "Price Unbundling: A Vade Mecum For Practitioners" Presentation at the 2015 ADA Conference in Washington, D.C.

Why Keep Bundling?

Pros	Cons
Easy	Price often based on nothing meaningful
What everyone else does	Not how insurance pays for things
	Does not reflect your professional time
	May be collecting less than your break-even
	It's what your competition does

Did You Know . . .

How We Sell

- Your bundling habit is being used against you.

Embracehearing.com

How We Sell

EFFECTIVE PRICE PER VISIT: EXAMPLE CALCULATION

Manufacturer Price	$1,000
"Bundled" Price	$5,000
Less: "Fair" Sale Price	$2,000
Effective Price for Follow-on Services	$3,000
Divided by: Actual Follow-on Visits	3
Effective Price per visit	$1,000

EFFECTIVE PRICE PER VISIT

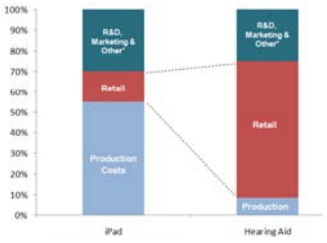
	"Fair" Sale Price				
Visits	$1,500	$1,750	$2,000	$2,250	$2,500
1	$3,500	$3,250	$3,000	$2,750	$2,500
2	$1,750	$1,625	$1,500	$1,375	$1,250
3	$1,167	$1,083	$1,000	$917	$833
4	$875	$813	$750	$688	$625
5	$700	$650	$600	$550	$500
6	$583	$542	$500	$458	$417
7	$500	$464	$429	$393	$357
8	$438	$406	$375	$344	$313
9	$389	$361	$333	$306	$278
10	$350	$325	$300	$275	$250

"At the risk of stating the obvious, we submit to you that these are very high numbers.

In our view, it is unlikely that hearing aid wearers would be willing to pay per-visit prices at these levels, if given a transparent choice."

Audicus.com

How We Sell



"The comparison is startling, and should raise questions on whether the industry and hearing aid costs are operating at its most favorable level for the consumer."

So, what's the alternative?

Unbundling

How We Could Sell

- Definition:
  - Charging separately for each item or service as it occurs.

Why Unbundle?

Pros

- Collect the amount you need to cover costs/profit
- Improved cash flow
- Increased reimbursement with most manage care
- Makes you price competitive
- Forces a higher standard of care
- Allows for service provision for outside product purchases

Cons

- Does not work with managed care plans that take a provider discount or offer their own warranty
- Will need to change office policies and procedures
- Have to collect money from patients and be comfortable with that
- Will need to change marketing program

A "Starter Kit" For Unbundling

Amlani, Cavitt, Sjoblad: "Price Unbundling: A Vade Mecum For Practitioners" Presentation at the 2015 ADA Conference in Washington, D.C.

Step One:

How We Could Sell

- Calculate Hourly Break-Even
  - Go to your annual P&L
    - Divide expenses by contact hours

Examples:

Bundled Model

Total Annual Expenses (including COGS)		Annual Contact Hours	Hourly BREAK-EVEN Rate
$570,000	÷	3360	$170

Unbundled Model

Total Annual Expenses (excluding COGS)		Annual Contact Hours	Hourly BREAK-EVEN Rate
$300,000	÷	3360	$89

Total Annual Expenses = Personnel Expenses (e.g., salaries, benefits) + Clinic Expenses (e.g., Rent, Utilities, Office Supplies) + Cost of Goods Sold (e.g., Hearing Aids, ALDS)

*Annual Contact Hours = Patient Contact Hours Weekly (e.g., 35) * Operating Weeks Annually (e.g., 48) * Number of Full-Time Providers (e.g., 2)*

Note that all prices shown in this presentation are hypothetical, and are used simply to highlight various procedures.

Step Two:

How We Could Sell

- Calculate Hourly Billing Rate
  - Break-even plus targeted profit

Examples:

Bundled Model Expenses Plus $50,000

Total Annual Expenses (including COGS)		Annual Contact Hours	Hourly BILLING Rate
$620,000	÷	3360	$184.50

Unbundled Model Expenses Plus $30,000

Total Annual Expenses (excluding COGS)		Annual Contact Hours	Hourly BILLING Rate
$330,000	÷	3360	$98

Total Annual Expenses = Personnel Expenses (e.g., salaries, benefits) + Clinic Expenses (e.g., Rent, Utilities, Office Supplies) + Cost of Goods Sold (e.g., Hearing Aids, ALDS)

*Annual Contact Hours = Patient Contact Hours Weekly (e.g., 35) * Operating Weeks Annually (e.g., 48) * Number of Full-Time Providers (e.g., 2)*

Note that all prices shown in this presentation are hypothetical, and are used simply to highlight various procedures.

Step Three:

How We Could Sell

- Calculate Your Payment For Services
  - Fee for each of the services within your standard of care

Example 1 (Initial Fitting Services):

Procedure	Time Billed (Minutes)	Quantity	Procedure Fee
Diagnostic Evaluation & Counseling	90	1	$147
Hearing Aid Fitting & Orientation	60	1	$98
Probe-Microphone Verification	15	2	$49
Counseling/AR	30	2	$98
Hearing Aid Check/Follow-up	30	4	$196
Electro-acoustic Performance Eval.	15	1	$49
Speech-in-Noise Testing	15	1	$49

Total: $685

Example 2 (Services- Next 4 Years):

Procedure	Time Billed (Minutes)	Quantity	Procedure Fee
Probe Microphone Verification	15	8	$196
Counseling/AR	15	4	$98
Hearing Aid Check/Follow-up	30	4	$196
Electro-acoustic Performance Eval	15	8	$196
Speech-in-Noise Testing	15	4	$98
Repairs: In-House	30	4	$196
Repairs Manufacturer	30	1	$49

Total: $1,029

Summary

How We Could Sell

Assumption: Professional Services For the Life of the Aids (5 Years)

Bundled Model

	Retail Cost	Quantity	Total
Hearing Aids	$2211*	2	$4422

* = Wholesale cost of $1,005 increased by 120%

Unbundled Model

	Retail Cost	Quantity	Total
Hearing Aids	$1362*	2	$2723
Professional Services – 1 Year	$685	1	$685
Professional Services – Year 2-5	$1029	1	1029

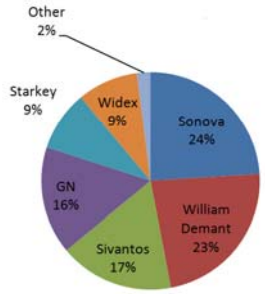
* = Wholesale cost of $1,005 increased by 35%

Total = $4,437.00

What We Buy

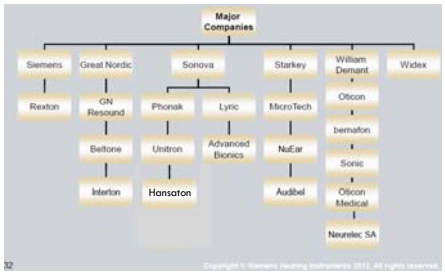
The "Big Six"

What We Buy



http://hearinghealthmatters.org/hearingnewswatch/2013/research-firm-analyzes-market-share-retail-stores-prospects-of-major-hearing-aid-makers/

The "Bigger Six"



It's Your Choice

What We Buy

- The "Big Six" exist because:
  - Practices buy their products
- The "Big Six" exist because:
  - Practices provide them with large margins

An Example

What We Buy

	20 Channel High-End RIC Product
Wholesale List Price	
AuDNet Member Price	
VA Price	
Costco Retail Price	

An Example

What We Buy

	20 Channel High-End RIC Product
Wholesale List Price	$2099.00
AuDNet Member Price	
VA Price	
Costco Retail Price	

An Example

What We Buy

	20 Channel High-End RIC Product
Wholesale List Price	$2099.00
AuDNet Member Price	$1299.00
VA Price	
Costco Retail Price	

An Example

What We Buy

	20 Channel High-End RIC Product
Wholesale List Price	$2099.00
AuDNet Member Price	$1299.00
VA Price	$375.00
Costco Retail Price	

An Example

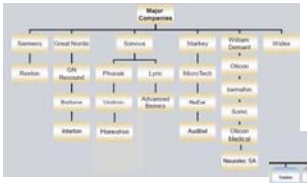
What We Buy

	20 Channel High-End RIC Product
Wholesale List Price	$2099.00
AuDNet Member Price	$1299.00
VA Price	$375.00
Costco Retail Price	$1299.00

Your Money At Work

What We Buy

Companies Acquired



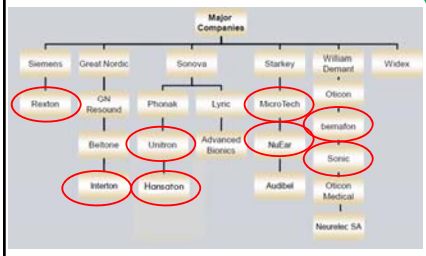
Distribution Bought/Established



So, what's the alternative?

Feelin' Bold?

What We Could Buy



These Are All Less Expensive

Feelin' Bolder?

What We Could Buy

- Independent Manufacturers
  - Audina
  - ExSilent
  - Lori Medical
- Alternative Listening Solutions
  - PSAP's
  - Smart phone apps
  - Hearables

How We Buy

Option 1

How We Buy

Direct From Manufacturer

- Price based on your business's buying power
- Decision influenced by
  - Technology
  - Relationship with representative
  - Incentives offered by manufacturer
  - Entanglements
- Usually 2-3 manufacturers are involved

Option 2

How We Buy

Through a Services Buying Group

- Price based on the group's buying power
- Offers discounted products from one or more manufacturers (sometimes private labeled)
- Purchases pay for the services provided
- Member price = Negotiated discount – a fee for the services (amount typically not disclosed)

HEARING HEALTH & TECHNOLOGY MATTERS

ReSound

GN Resound Announces $151 Million Agreement for Audigy

By Brian Taylor On May 15, 2016 · Add Comment

Article Disclosures:

"Audigy. . .is reported to have over 250 network members"

"The network dispensed more than 80,000 units in 2015"

"Audigy's estimated 2015 revenues were around $35 million"

$35 million ÷ 80,000 units = $437.50 per unit

Option 3

How We Buy

Medical Model Group Purchasing (GPO)*

- Price based on collective buying power
- Offers discounts with more than one manufacturer
- No member benefit other than discount
- Designed to operate on a 3% fee margin

*"A Primer on Group Purchasing Organizations" – Healthcare Supply Chain Association

http://c.ymcdn.com/sites/www.supplychainassociation.org/resource/resmgr/research/gpo_primer.pdf

Example

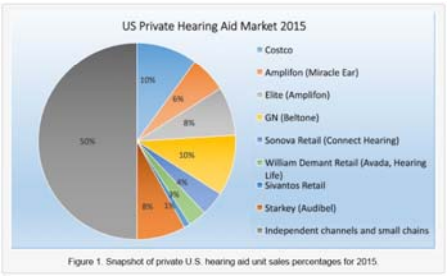
How We Buy

- You buy a high end hearing aid through the GPO at an invoice price of $800

$800 X .03 = $24 per unit

HEARING HEALTH & TECHNOLOGY MATTERS

U.S. Hearing Aid Market



To Summarize

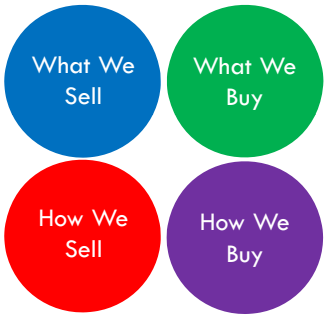
We Started With A Premise

- *Success for an independent audiology practice hinges on its ability to sustain competitive consumer value.*

We Identified Challenges To That Premise

- Erosion of independent practice market share
- Corporatization
- Focus on product
- Cost of goods

We Asked How Can We Achieve Our Premise In Today's Business Environment?



WHAT WE SELL

- We should move away from selling
  - Products
  - Price
  - Third Party Participation
  - Initial Sound Quality
- We should move toward selling
  - Best Practice Patient Care
  - A Treatment Package
  - Communication Problem Mitigation
    - With a connection to the comorbidities we also address

HOW WE SELL

- We should move away from
  - Bundled Pricing
    - It shifts the focus away from professional care
    - It is being used against you
- We should move toward
  - Bundled Pricing
    - Step One: Calculate hourly break-even
    - Step Two: Calculate hourly billing rate
    - Step Three: Calculate your payment for services
    - Comparison examples

WHAT WE BUY

- By Buying Through the "Big Six:
  - We maintain higher prices
  - We fueled the consolidation of suppliers
  - We fueled the corporatization of our competition
- At This Point In Time, Our Options Are Few
  - Buy through smaller (albeit acquired) companies with comparable technologies at lower prices
  - By from the few remaining independent manufacturers
  - Incorporate alternative listening solutions in our arsenal of meaningful options available to build a treatment package

HOW WE BUY

- Buying direct sustains both higher prices to smaller customers and sustains challenging dependencies
- Buying through service buying groups can't reduce the COGS penalty, and ultimately can be expensive
- Medical Model Group Purchasing (GPO) focuses on independent practice cost reduction with no services and minimal fees

REDEFINING PROFESSIONAL CARE FROM A PATIENT EXPERIENCE PERSPECTIVE

NYSSLHA Convention – April, 2017

Any of these been on your mind lately?

COSTCO WHOLESALE

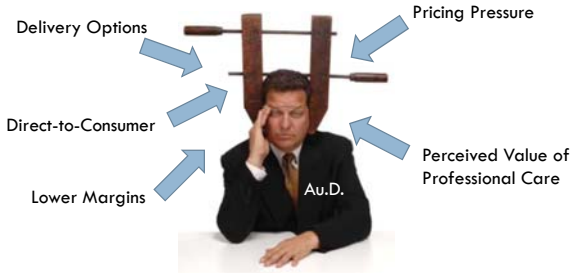
Office of Science and Technology Policy

The National Academies of SCIENCES · ENGINEERING · MEDICINE

OTC/DTC "Hearing Aids"

FDA

Feelin' The Squeeze?



Key Part of NAS 12 Recommendations

- Recommendation 2:
  - Develop and promote measures to assess and improve quality of hearing health care services
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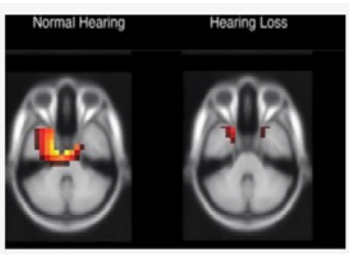
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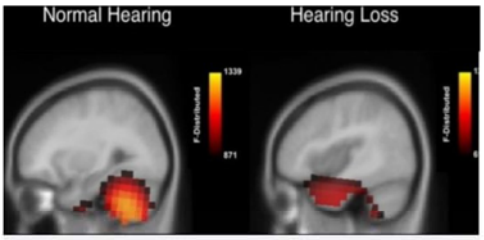
* **Communication Focused Patient Outcomes**





Adults with early-stage age-related hearing loss (right) show decreased activation of the hearing portion of the brain compared with normal hearing age-matched adults (left).

http://www.hearingreview.com/2015/05/researchers-discover-brain-reorganizes-hearing-loss/



Adults with mild age-related hearing loss (right) show brain reorganization in which hearing portions of their brain are recruited for processing visual patterns. This is not seen in age-matched adults with normal hearing (left).

Credit: Anu Sharma

http://www.hearingreview.com/2015/05/researchers-discover-brain-reorganizes-hearing-loss/

Question. . .

- Can a rewired brain be rewired again?

INNOVATIVE APPROACHES

The brain's habit of rewiring itself takes time, an important concern in good fittings.

HABRAT: *Hearing Aid Brain Rewiring Accommodation Time*

STUART GATEHOUSE, PHD, AND MEAD C. KILLION, PHD

Every practicing dispenser knows that it may take a considerable amount of time for the listener to "get used to" new hearing aids. But do fundamental and beneficial changes in the wiring of the brain itself help the auditory rehabilitation process? Data presented here indicate it is sometimes impossible to properly evaluate the benefit of a particular hearing aid fitting for weeks or even months, which in turn implies that extraordinary judgment is required when the "wear it awhile and you'll get used to it" vs. "let me readjust the hearing aid" decision must be made by the dispenser.



S.C.: So I'll be happy with my hearing aids in another 3-6 weeks?

Dr. Abonso: Maybe, maybe not. Before going through that much unhappiness, it would be a good thing to have your dispenser do a "real ear" measurement to make absolutely certain your hearing aids are giving you the right amount of high frequency gain. Perhaps they need to be readjusted.

S.C.: So after my hearing aids have been readjusted, I'll be happy in 3-6 more weeks and not toss them into my dresser drawer?

Dr. Abonso: Unless the problem is that the hearing aids are painfully loud

Hearing Instruments Volume 44, Number 10, 1993

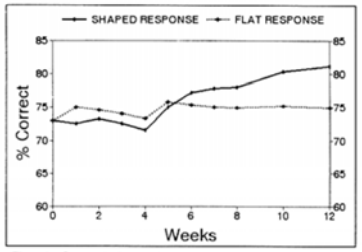


Fig. 1. Speech-identification-in-noise scores from Gatehouse[5] in the fitted ears for flat amplification and a rising frequency response.

5. Gatehouse S: The time course and magnitude of peripheral acclimatization to frequency responses: Evidence from monaural fitting of hearing aids. *J Acoust Soc Am* 92:1256-1268, 1992.

Michael Merzenich on plasticity:

- Plasticity exists from cradle to grave
- Radical improvements in cognitive function are possible even in the elderly
- ***Practicing a new skill under the right conditions*** can change millions if not billions of connections between nerve cells in our brain maps

Doidge, N., "The Brain That Changes Itself" Penguin Books, 2007

Kevin Munro's work

studying plasticity and acclimatization

- The ABR amplitude has been found to be greater in ears that had been aided, than in ears with the same degree of hearing impairment that had not been aided.
- The brain will only reorganize if speech is amplified to new, higher levels than the person previously experienced.

THE HEARING JOURNAL SEPTEMBER 2010 • VOL. 63 • NO. 9

Two Key Take-aways

- The brain will only reorganize if speech is amplified to new, higher levels than the person previously experienced. (Munro)
- Practicing a new skill under the right conditions is required to change our brain maps. (Merzenich)

Aural Rehabilitation (AR)

". . . the reduction of hearing-loss-induced deficits of function, activity, participation, and quality of life through sensory management, instruction, perceptual training and counseling."

Boothroyd, A., "Aural Rehabilitation: What is it and Does it Work?" Trends in Amplification, 2007 Jun; 11(2): 63-71

Treatment

It's a matter of perspective

Today's Techno-centric Model



Jessen, D., Altidis, P., "ADA and IAA: Aural Rehabilitation in Private Practice"
ADA webinar recording at http://audiologist.org/ada-and-iaa-aural-rehabilitation-in-private-practice

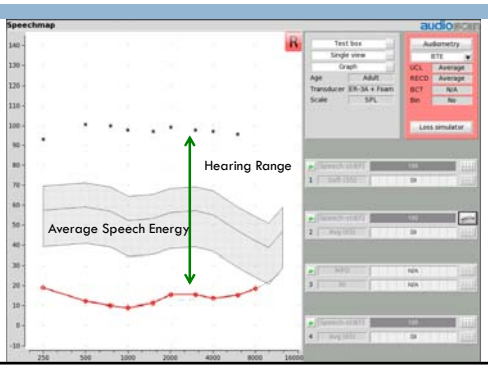
Proposed Solution-centric Model



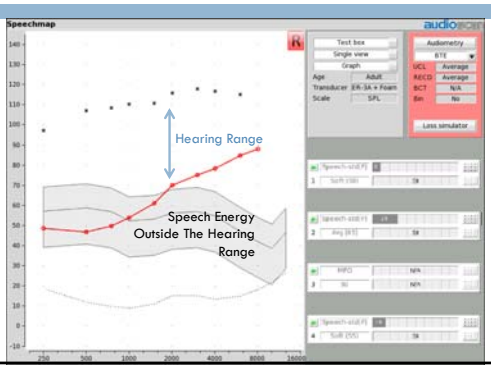
Jessen, D., Altidis, P., "ADA and IAA: Aural Rehabilitation in Private Practice"
ADA webinar recording at http://audiologist.org/ada-and-iaa-aural-rehabilitation-in-private-practice

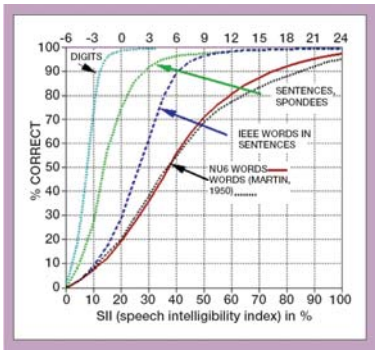
How Speechmapping Can Facilitate and Guide Solution-centric Treatment

The Basic Speechmap Screen - Verifit



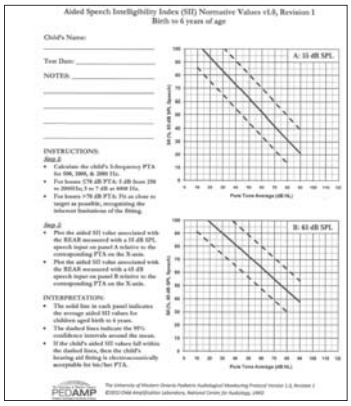
The Basic Speechmap Screen - Verifit





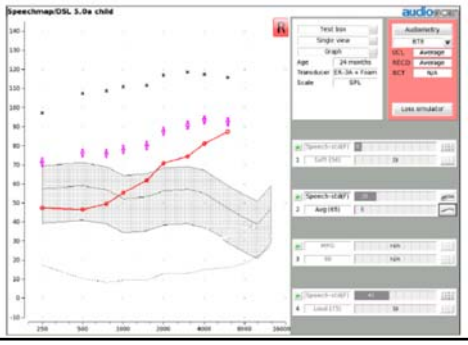
Killion, M., Mueller, H.G., "Twenty Years Later: The New Count-The-Dots Method", Hearing Journal, January 2010, pp 10-15

From "PedAMP"
@ www.dslio.com

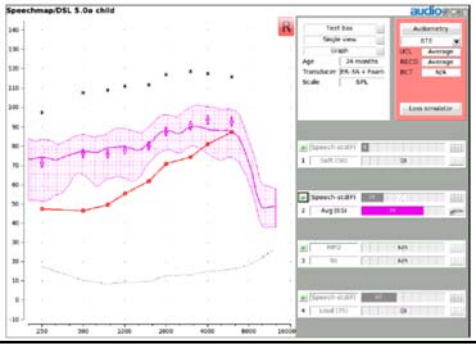


A Bit About Rules

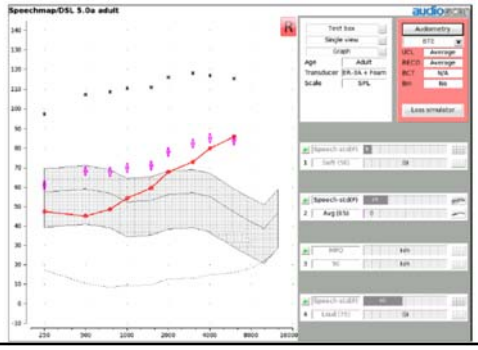
DSL Child – 24 Months



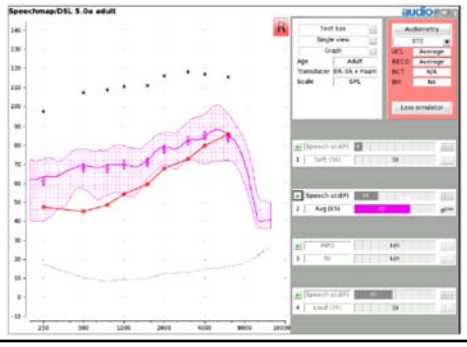
DSL Child – 24 Months



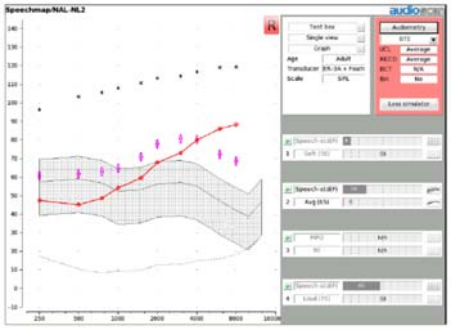
DSL Adult



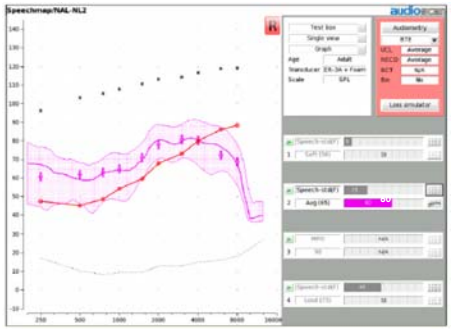
DSL - Adult



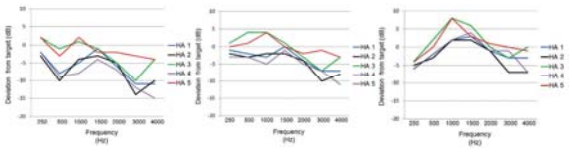
NAL-NL2



NAL-NL2



NAL-NL2 REAR Results Using 5 Different Manufacturers' Programming Software



55dB 65dB 75dB

Sanders, J., Stoody, T., Weber, J., Meuller, H., "Manufacturers' NAL-NL2 Fittings Fail Real Ear Verification" Hearing Review, March 2015 24-32

A Speechmapping/Auditory Training Strategy

The Notion of "Goal" Fitting & "Starter" Fitting

- Definition of "Goal" Fitting:
  - Brings speech sounds back into the listening range for as broad a range of frequencies as possible:
  - Delivers an acceptable SII result
- Definition of "Starter" Fitting:
  - Settings that the patient feels comfortable enough with to start their new listening experience
- Difference between the two:
  - Practice!

Initial Aided Audibility Verification

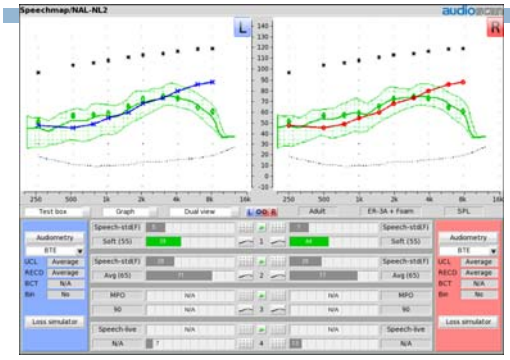
Yes or No – Is This A "Goal" Fitting?

- Set instrument to the most experienced user setting with the fitting software
- Select the fitting formula you wish to use
- Program the hearing instrument (First Fit)
- Place pre-programmed hearing instrument in the test box:
  - Session is re-loaded with RECD if available
- Run Speechmap at 65dB input in TEST 2 and obtain long-term average
  - Did you hit the target? Yes or No
  - Do you have an acceptable aided SII? Yes or No

Speechmap® fitting protocol

- Test 1:
  - Set input to 50dB STD speech
    - This will show you a new target for that input level
  - Goal: To adjust the overall gain of the aid so that the middle line of the aided speech banana hits the target values indicated

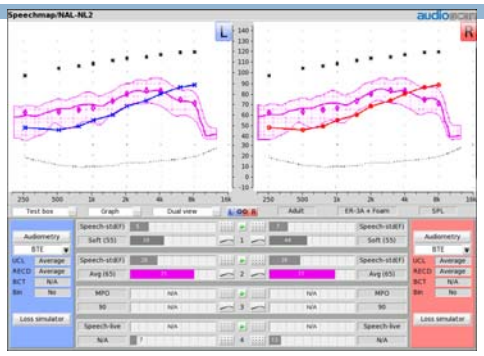
Fitting Test One: Soft Speech



Speechmap Fitting Protocol

- Test 2:
  - Input: 65dB STD speech
  - Goal: To verify that the gain adjustments made in Test 1 deliver target results for dots and SII
    - If not, use compression settings to make adjustments as necessary
      - Adjust gain values for Loud and/or Moderate inputs, while leaving gain for Soft inputs as set in Test 1

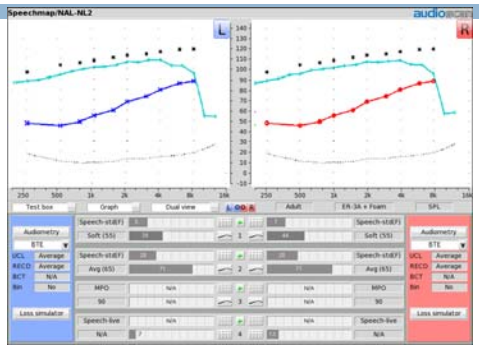
Fitting Test Two: Conversational Speech



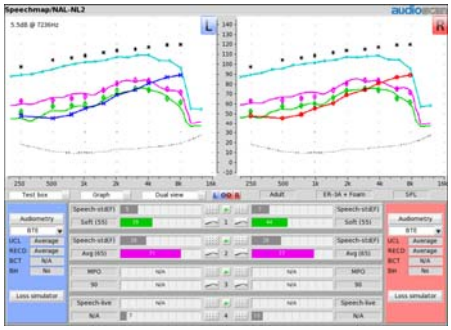
Speechmap Fitting Protocol

- Test 3:
  - Input: MPO Sweep
  - Goal: To adjust the MPO of the aid so that the blue dots hit the output target, or are about 3dB below the UCL asterisks

Fitting Test Three: MPO



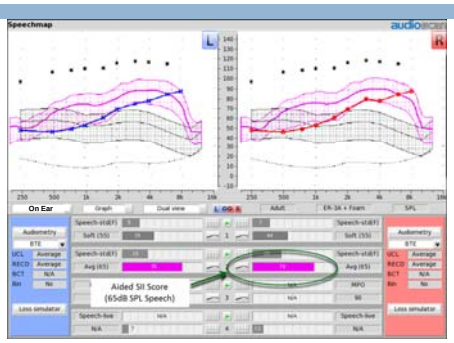
Final Fitting Summary



FIRST-FIT COUNSELING

ON-EAR VERIFICATION

"Goal" Fitting vs. "Starter" Fitting



"Process" Counseling

- For first-time wearers:
  - Start with settings that the patient is comfortable to start with
  - Point out the utility that is now missing
  - Discuss the need for practice/brain training
  - Assign brain training tools
  - Outline the therapeutic process that will be undertaken to move toward "Goal" settings while still maintaining comfort.

Some Brain Training Tools

Computer Based	Apps	Booklet	Group
•**LACE*** (neurotone.com) •**Read My Quips*** (sensesynergy.com) •**Seeing & Hearing Speech #** (sensimetrics.com)	•**Hear Coach*#** (itunes.apple.com) •**Music Based Mobile Auditory Training Game*#** (orca-us.info)	**Cut To The Chase*#** (cuttothechasehearingpros.com)	•**G.R.O.U.P. AR*** (idainstitute.com) •**ACE – Active Communication Enhancement*** https://shrs.uq.edu.au

* = Adult
\# = School age children

CLINICAL VERIFICATION OF CONSUMER ELECTRONICS HEARING PRODUCTS

Is There A Role For The Clinician In The OTC Market?

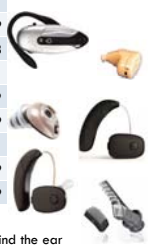
- Currently, no clinical guidelines regarding the professional's role for the OTC consumer

Study Design

- Establish and test an objective clinical testing package for PSAP products using verification technology that can:
  - Document the overall performance of a PSAP device based on agreed upon industry standards
  - Determine the practical fitting range of a PSAP product based on recognized fitting formula and clinical tools
  - Based on the above, craft a set of clinical guidelines that are easy to implement and useful to both consumer and clinician for predicting outcomes

Products Evaluated

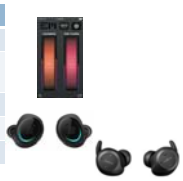
Manufacturer	Model	Style/Mic Position	Price
Low-End PSAP's	*<$100*		
Bell & Howell	Silver Sonic X>	BTE/BTE*	$19.99
Acutrue	Invisible Sound.	ITE	$59.98
Mid-Range PSAP's	*$100-$300*		
Etymotic Research	Bean	ITE	$299
Sound World Sol.	CS10	BTE/ITE**	$149
High-End PSAP's	*> $300*		
Sound World Sol.	CS50	BTE/ITE**	$349
ExSilent	Q-LEAF LITE	ITC	$399



* = Microphone positioning was external to the pinna, but not behind the ear
** = Microphone positioning was ITE, with the BTE portion only containing the battery.

Products Evaluated

Manufacturer	Model	Style	Price
Smart Phone App			
Earmachine	Smart phone app.	Smart phone/hdst.	Free
Smart Earbuds			
Bragi	Dash	ITE	$249
Jabra	Elite Sport	ITE	$249



Evaluation Method

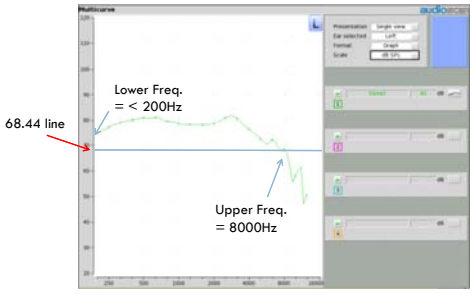
Electro-acoustic Performance (2cc coupler)	Fitting Range Estimate
ANSI S3.22-2009 (HA-1 test configuration as depicted in ANSI S3.22-2014)	Speechmap REAR -65dB cal. Speech input - TEST BOX using .4cc coupler/avg. RECD
ANSI-CTA-2051 PSAP Performance Criteria Level One Criteria: -Bandwidth - Peak - Maximum Output	Speechmap REAR -65dB cal. Speech input - ON-EAR using REM

CTA Test Detail - Bandwidth

- Bandwidth:
  - Measure 2cc values for 80dB SPL input stimulus
  - Calculate estimated insertion response for 1/3 octave values from 500-3150Hz
  - Upper and lower cutoff frequencies are when the curve falls 10dB below this average

10dB DOWN CALCULATION											
1/3 Octave Frequency	500	630	800	1000	1250	1600	2000	2500	3150	Avg.	Avg. -10dB
2cc values (80dB Sweep)	81	80	79	79	78	78	79	81	81		
ITE CORFIG from CTA Table	-3.3	-3.1	-2.8	-2.9	-2.4	-1.1	1.3	3.4	0.9		
Estimated IR	77.7	76.9	76.2	76.1	75.6	76.9	80.3	84.4	81.9	78.44	68.44

Bandwidth Calculation



Bandwidth PASS/FAIL Criteria

- Bandwidth < than 5KHz = FAIL
- Bandwidth > 5KHz but < 10KHz = PASS- Standard Band
- Bandwidth at or above 10KHz = PASS- Wide Band

CTA Test Detail – Peak Amplitude

- Peak:
  - Measure 2cc values for 80dB SPL input stimulus
  - Calculate estimated insertion response for the 1/3 octave values of the response
  - Identify the peak 1/3 octave value and the value of 2 1/3 octaves above and below that



Peak Amplitude PASS/FAIL Criteria

- Peak amplitude > 12 dB = FAIL

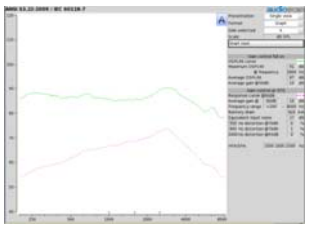
CTA Test Detail – Maximum Output

- Maximum Output:
  - No output greater than 120dB SPL on the OSPL90 curve (this is approximately equivalent to 115dBA referred to sound field)
    - <120dB = PASS
    - >120dB = FAIL

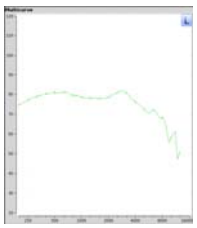
Example of Raw Data Collection: Electro-acoustic Measures

Product: Etymotic Research "Bean" at "Normal" Setting

ANSI Test Results



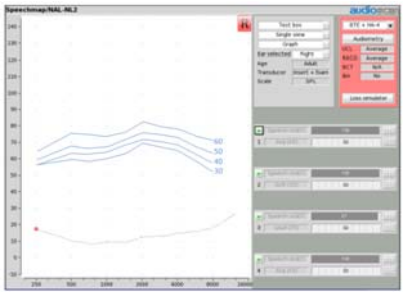
80dB Swept Pure Tone Test Results



CTA Level One Findings:

Output = 91dB PASS
Bandwidth = 100 – 8200Hz PASS
Peak = 8dB PASS

NAL-NL2 Fitting Range Template



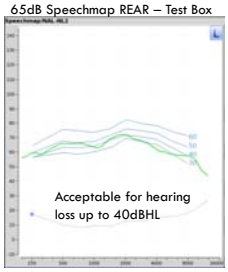
"Fitting Range Template" reflecting NAL-NL2 targets for 30, 40, 50 & 60dBHL flat audiograms

Proposed "Basic" PSAP Test Battery

Product Quality Test Results

TEST	RESULT
Bandwidth	PASS
Peak	PASS
Maximum Output	PASS

65dB Speechmap REAR – Test Box



Results

1) CTA Test Summary

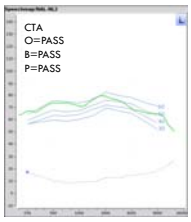
9 PSAP Products Tested
24 Product Configurations Tested

TEST RESULT	# OF CONFIGURATIONS	REASON FOR FAILURE
Pass all 3 tests	11	
Fail 1 test	8	2 bandwidth fails 6 peak ampl. fails
Fail 2 tests	3	1 output fail 3 bandwidth fails 2 peak fails
Fail all 3 tests	2	

Results

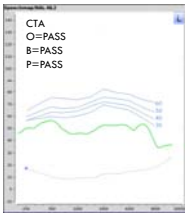
2) Fitting Range Outliers

Highest Flat Response REAR



Etymotic Bean
High Setting

Lowest Flat Response REAR

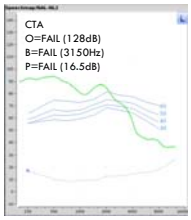


Sound World Solutions CS10
½ gain setting – Program 2

Results

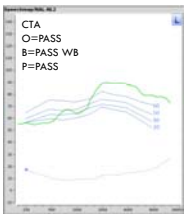
2) Fitting Range Outliers

Highest Low Freq. Over Reach



Bell & Howell Silver Sonic
FOG Low Setting

Highest High Frequency Over Reach



Ear Machine
Ref. Test +50 Fine Tuning



Proposed PSAP Clinical Report Summary

Potential Applications

- A service audiologists can offer to existing PSAP owners
- A service audiologists can offer to consumers interested in a certain PSAP
- A clinical procedure for quantifying PSAP products an audiologist may wish to stock/sell

Conclusions

- A professional can offer a potentially useful service to the PSAP market
- The described test package can be completed quickly and easily
- This service can be offered for a modest fee.
- This interface can lead to additional testing and possible better treatment with PSAP or other device

Thank You!

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daves@audioscan.com