COURSE OUTLINE

CSD 9528a Applications in Modern Hearing Technology
The University of Western Ontario, Fall Semester, 2018

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                        (Jonathan is available in November & December)

Required sessions: 9:00 to 11:00 or 12:30 – 4:20 Tuesdays, Fall term.

Course Description

This course will support advanced clinical practice in prescribing and verifying hearing aids, with an emphasis on evidence-based use of procedures and technologies. This course will train advanced practice procedures in hearing aid prescription, technology selection, and technology evaluation with a focus on practice with the pediatric population and advanced technologies. Hands on activities with simulated patients, reflection, portfolio building, and training on protocols will build practical skills in these areas of practice.

You are required to attend all sessions and to contribute effectively to your group's work, to work individually on written assignments, and to integrate knowledge from ongoing and past coursework and practica into your work on this course. Some weekly sessions do not culminate in a handed in activity sheet. These sessions are intended as coaching sessions, and have been designed to facilitate your competency in the required skills. You are required to complete these activities, through a combination of lab session time and independent work outside of lab session time. Assignments are listed in the attached pages.

Course Materials

Reading resources for this course are co-required with CSD 9526 and are listed at the end of the CSD 9526 course outline. Readings will be posted to the CSD 9526 course area on OWL. Weekly activities that are marked as "coaching sessions" allow you to probe potential additions to your case's fitting or an alternative case if candidacy is specific. These sessions are ungraded to allow you to focus on case development, readings, and skills acquisition in preparation for the practical exam. Because teams have different cases, exchange of knowledge gained from other cases is important for generalizing your fitting skills across client profiles.

Methods of evaluation : The final grade for this course will be Pass/Fail. You will receive grades and/or feedback (formal or informal) on each of these Units.

1. **Components**

Experiencing the roles of the fitter and user	(Unit One due Nov 5)	5%
Candidacy Assignments	(Unit Two Part 1:Oct 8 Part 2:Dec 3)	15%
Compression assignment	(Unit Three due Oct 9)	10%
Venting & Occlusion assignment	(Unit Five due Oct 16)	5%
Directional assignment	(Unit Seven due Nov 20)	10%
DNR & Feedback assignment	(Unit Eight due Nov 26)	15%
Practical examination	(during exam period)	30%

2. **Grading scheme**

Grading will follow the clinical grading system unless otherwise specified on each assignment. Therefore, a grade of 73% or higher must be achieved on Unit Two and on the Practical examination for successful course completion. Grades on written assignments will be reduced by up to 20% for errors in spelling and grammar and/or for an unclear writing style. Your overall course grade will be reduced by up to 20% for failure to participate. The policy of the CSD program is that the assigned course grade is the instructor's final assessment of a student's performance and already includes any and all grade rounding an instructor has chosen to implement. Assigned grades "close to" 60% or other letter-grade boundaries will not be further rounded up, with the exception that grades submitted with decimal percentages are rounded up or down to the nearest integer by the Registrar before appearing on the student's record.

Statement on Academic Offenses

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univ*The policy of the CSD program is that the assigned course grade is the instructor's final assessment of a student's performance and already includes any and all grade rounding an instructor has chosen to implement. Assigned grades "close to" 60% or other letter-grade boundaries will not be further rounded up, with the exception that grades submitted with decimal percentages are rounded up or down to the nearest integer by the Registrar before appearing on the student's record.*/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

Graduate Course Health and Wellness

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page http://www.music.uwo.ca/, and our own McIntosh Gallery

http://www.mcintoshgallery.ca/. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.

Timetable of Topics in this Course and Related Activities:

CSD 9526 room 2508 Mondays 1:30 to 4:30		CSD 9528 in Starkey Lab Tuesdays Group 1: 9-11 Tuesdays Group 2: 12:30-2:30 Tuesdays Group 3: 2:30 – 4:30		Unit One: (Fit your own ear and reflect on the role of the fitter and the wearer). Complete on your own schedule **any time during Sept to Early November.**
	Classes start Sept. 10		Classes start Sept. 11	
Sept. 10	Hearing aid components & DSP review	**Sept. 11**	Case assignments; enter your case's data into software systems, orientation to fitting procedures. **Review Unit One Assignment, due Nov 5.**	
	Level-dependent processing I – Basics			
Sept. 17	Level-dependent processing II (multichannel WDRC, Channel-Free & ADRO)	**Sept. 18**	**Unit Two:** Follow "steps for setting hearing aids to create basic fitting for your case. Compare unaided and aided speed and assess candidacy.	
	Wireless & Remote Mic Technologies			
Sept. 24	Prescriptive methods I	**Sept. 25**	**Unit Three:** Compare & contrast processing strategies for level-dependent amplification.	
	Prescriptive methods II: Infant fitting, conductive corrections, venting corrections			
Oct. 1	Open Fitting, Venting, Occlusion effect. CROS & BiCros	**Oct. 2**	**Unit Four:** Complete Jennifer & Charlie cases. Compare targets for DSL5 and NAL-NL2 for your case. Coaching session.	
	Profound hearing losses including safety of hearing aid fitting. Hearing Aid orientation.			
Oct. 8	Thanksgiving	**Oct. 9**	**Score an Unaided QuickSIN.** **Unit Five:** Open fitting and venting **Part 1 of Unit Two** Compare and Contrast two different hearing aid prescriptions due today.	

Oct. 15	Case discussions, candidacy, fine tuning, troubleshooting Frequency lowering **Guest: Danielle Glista**	Oct. 16	**Unit Six:** Frequency lowering fitting and verification. Coaching session. **Guest: Danielle Glista**
Oct. 22	Outcomes Assessment in Adults Outcomes Assessment **Guest: Marlene Bagatto**	Oct. 23	**Unit Nine:** Real Ear Measurement with CROS fittings. Coaching session.
Oct. 29	Directional Technologies - I Directional Technologies - II	Oct. 30	**Unit Seven:** Directional technologies.
Nov. 5	Adaptive Noise Reduction Feedback Control	Nov. 6	**Unit Eight:** ANR & Feedback features.
Nov. 12	Environment Classifiers OTC & PSAPs	Nov. 13	**Demo Unit: PSAPs and Skull Simulator**
Nov. 19	Hearing Aid Apps Master Hearing Aid Clinical protocols for remote microphone and phone fitting. Venting review.	Nov. 20	**Unit Ten:** Phone fitting (telecoil, Bluetooth, bridge devices). Coaching session. **Guest: Paula Folkeard.**
Nov. 26	Music and hearing aids. **Guest: Jonathan Vaisberg** Tinnitus maskers and therapeutic sound	Nov. 27	**Unit Eleven:** Remote Mic Fitting and Verification. Coaching session.
Dec 3	**Case presentations**	Dec. 4	**Unit Twelve:** Fitting and fine tuning tinnitus maskers. Coaching session.
Final exam period	**Final exam (cumulative)**	Final exam period	**Practical exam (cumulative)**

COMPETENCIES RELEVANT TO THIS COURSE:

CASLPA COMPETENCY COVERAGE:

1.7 INSTRUMENTATION
Demonstrate basic knowledge of:
i. The instrumentation relevant to clinical practice and its operation (e.g., amplification and assistive devices, audiometers, audio and video recorders, voice and speech synthesizers and analyzers).
1.7.i   Advanced knowledge of certain aspects (The instrumentation relevant to clinical practice and its operation (eg, amplification and assistive devices, audiometers, audio and video recorders, voice and speech synthesizers and analyzers))

1.9 RESEARCH METHODOLOGY
Demonstrate basic knowledge of:
i. The scientific method.
ii. Basic statistical concepts and theories.
iii. Commonly used research designs.
iv. How to critically evaluate research.
v. Systematic evaluation of the reliability and validity of assessment procedures, and of treatment efficacy.
1.9   Application of concepts from 1.9 Research Methodology (basic knowledge) as they pertain to the evidence-based evaluation of signal processing efficacy/effectiveness, especially 1.9.iv and v.
AND: 2.4 Reporting

UNIT THREE: CLIENT MANAGEMENT
3.2 AMPLIFICATION AND ASSISTIVE LISTENING DEVICES
Demonstrates knowledge in the following areas:
ii. Current Principles and Methods of Selection and Fitting:
d) Verification strategies, including real ear measurements and sound field evaluation.
e) Validation of hearing aid benefits (outcome measures, self-assessment questionnaires).
3.2.d and e: Verification and validation of hearing aid fittings

4, 5   Modification of procedures to allow accurate and timely client management for the infant/neonatal, and preschool/school-aged populations, throughout and particularly:
UNIT FOUR: NEONATAL AND INFANT POPULATIONS
4.3 COUNSELLING
Demonstrates the ability to:
i. Communicate diagnostic information, its implications, and resulting habilitative recommendations to caregivers and referral sources.
ii. Understand the effects of hearing loss in daily life and of emotional reactions to hearing handicap.
4.4 (RE)HABILITATION
Demonstrates knowledge of:
vi. Special considerations for selection, evaluation, and monitoring of hearing devices
4.3, 4.4 Counselling and habilitation, especially 4.4.vi – special considerations for device fitting.

CSD 9528 workbook

UNIT ONE: EXPERIENCING THE ROLES OF THE FITTER AND THE USER

Learning objectives

- ❑ Experience the acts of fitting someone and orienting them to hearing aid use
- ❑ Experience being a hearing aid user, and reflect on the experience for your own growth

Activity

Fit each other with a hearing aid[1] and wear it for a week (unilateral or bilateral depending on stock and your choice of what you wish to try. Hearing aids made for your own ear may be used.).

Requirements for content and format:

- ❑ Reflect on your role as client and your role as clinician.
- ❑ 2 pages double spaced 12 point Calibri font, 1 inch margins.
- ❑ Your name and page numbering must be listed in the Header and Footer.

Instructions:

Work in pairs. Each person should have the experience of fitting a hearing aid and also wearing a hearing aid for about a week. If the wearer has normal hearing, fit using a very mild loss. You are not required to submit verification results for this fitting. If anything needs to be adjusted in the fitting, the client should report to the clinician, who will then make the appropriate adjustments. Even if the fitting goes well, the client should give feedback to the clinician about the experience.

1. Physical fit – how did your hearing aid feel after wearing it for several days? How often is physical fit a barrier to successful outcome (consult your textbook, and/or recent data from Hickson or Kochkin).
2. Client service – list three to five factors associated with successful client outcome. Pick one that you found surprising and say why it surprised you. (read and reference your course readings)
3. Consult your Dillon textbook for information about listening logs for new users of amplification (the STEP form in Chapter 13). Fill out and hand in your completed log. As you make your log, consider the following:

   How did it feel to hear across environments with these various options? Did people notice right away? Did anyone ask you about them? How did they feel, physically? Did you experience comfortable listening across all environments? Are you concerned about wearing a sound amplifier if you have normal hearing? Consider the information about safety limits and the TTS protocol suggested in the Dillon text. This information will be discussed in CSD 9526.

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[1] If you are a hearing aid or cochlear implant user, modify or omit this activity as you see fit. Please discuss with instructors as needed.

UNIT TWO: CANDIDACY EVALUATIONS AND CASE ASSIGNMENTS
(handed in)

Learning objectives

- ❑ understand the factors that determine candidacy for hearing aid use
- ❑ explore and critically evaluate structured methods for assessing listening needs and candidacy
- ❑ complete a full multimemory fitting with accessories, after considering the needs of the person and the features of various products

UNIT TWO PART 1

- ❑ **Day One: Enter your two cases into at least one fitting station's Noah database. Find at least one hearing aid that is fittable to this loss and complete a basic fitting for speech in quiet and max output. Follow Steps for Setting Hearing Aids when doing this.**
  - o **This fitting may be done on the coupler or on CARL.**
- ❑ Assess your own listening needs and expectations of hearing aid use, by completing the unaided version of the APHAB (*HINT: access the questionnaire via the NOAH module for outcome measurement*).
- ❑ Fully score your responses and compare your scores to the most recently published normative percentiles[2]. Attach your scored questionnaire to this assignment.
- ❑ Note that you will have some time to work on this in Unit Four as well. Fit your cases to two different prescriptive targets **for speech in quiet only** and attach your work. Assess the SII differences, maximum audible output frequency (Glista et al., 2016), and fits to targets against Folkeard et al (2018) or Moodie et al (2017). Compare and contrast the two different prescriptions, and give a rationale for the fitting method that you will use for your case. Your discussion should integrate course readings.

UNIT TWO PART 2

Consult the "Steps for setting hearing aids" on the course site to complete a full fitting that includes multiple programs and accessories as needed. Contrast at least three possible choices, including at least two brands (e.g., two brands at a low price point, one brand also at a higher price point), and at least one fitting that is done on CARL. Choose which hearing aid is most likely to be an appropriate starting place for your client. Prepare a final summary that can be shared with your classmates in an informal discussion session (One per fitting group is sufficient, although you need not agree on the final choice). You must complete full costing for each of your three choices. The presentation is a discussion and is ungraded.

Describe your final fitting (you can keep case histories and detailed assessment reports to a minimum – please focus on the fitting and hearing aid issues specifically) with relevant screen captures of fittings and software adjustments that illustrate what you would provide. You must explain the reasons for your selection (brand and price level).

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[2] Johnson, Cox, & Alexander. (2010).

UNIT THREE: LEVEL-DEPENDENT AMPLIFICATION

(handed in)

Learning objectives

- ❑ explore level-dependent amplification features in modern hearing aids
- ❑ run electroacoustic tests to measure level-dependent amplification
- ❑ awareness of signal processing across a wide range of brands

Resources

- ➢ instructional videos on test box setup for electroacoustic measurements of level-dependent amplification

Activity:

Work in pairs (one report is due per pair). Create a comparison table for the assigned hearing aids (to be determined, up to 8 brands in all, selected hearing aids will be placed in a marked storage box in the lab for your use. Please do not remove them from the lab!) in terms of compression channels/bands, and any buzzwords that describe the compression processing.   There is <u>no need to call</u> the manufacturers; try to find this information from the fitting software (installed in 1557 computer lab).

Note that the hearing aids have all been pre-fitted to the standard N3 audiogram.

For the set of hearing aids assigned to your group:

1. Run a suite of electroacoustic tests including : (a) Input/Output curves at 2 kHz and 4 kHz, (b) Attack/Release times at 2 kHz, and (c) frequency response to pink noise input at 60, 70, and 80 dB SPL.
2. Do measurements for half of the hearing aids with the Verifit, and the other half with the Affinity. See the resources below for some guidance on how to make measurements with these systems. Take screenshots of your measurements.
3. Open "UnitThree_studentnameshere.xlsx" from the OWL site. Fill in the values for attack and release times, and output levels based on your measurements. Use these results to compute the compression ratios. Save this file with your names in the filename, and upload the updated file to OWL.
4. As mentioned above, upload a report which includes a comparison table showing the number of compression channels/bands and any buzzwords that describe the proprietary amplitude compression for your assigned hearing aids. Include in your report, a short summary on how DSP has enabled different approaches to amplitude compression.
5. Finally, in your report, comment on the electroacoustic measurements and their utility.

Resources for this unit: Videos are posted on OWL

UNIT FOUR: INFANT PRESCRIPTION AND PROFOUND PRESCRIPTION

(not handed in but this unit includes some tasks for Unit Two)

Learning objectives:
- ❑ Explore differences between prescriptions
- ❑ Practice pediatric hearing aid fitting protocols appropriate for EHDI programs
- ❑ Practice real ear measurement with a high-gain fitting

Case study: Charlie (age: 4 months)

Thresholds In nHL	500	1000	2000	4000
R thresholds	75	75	80	75
L thresholds	75	80	85	75

Etiology: Anoxia during birth, no other health complications known
Age/gender: 4 months old corrected age (premature), male
Current aids: None but parents have chosen to pursue amplification
Life situation: Infant, typical home environment, hearing family
COSI: Auditory development, listening comfort, parent education
Funding: ADP, ODSP

Activity for Charlie:
- ❑ Program a hearing aid of your choice for the above loss (assume a pediatric bilateral hearing aid fitting but program the hearing aid only for one ear). Complete a basic fitting.
- ❑ Follow Ontario Infant Hearing Program or BC Early Hearing Program protocols.
- ❑ **Keep a copy of the basic fitting's verification results and bring it with you to the Pediatric Outcome measures class with Dr. Bagatto**. You will evaluate the adequacy of the fit to targets and SII according to the UWO PedAmp protocol.

Activity for Jennifer: (Jennifer case is posted to the OWL site)
- ❑ Generate DSL v5.0 Child and DSL v5-Adult targets and NAL-NL2 Child and NAL-NL2-Adult targets. Compare these alternative prescriptions in terms of SII and audible bandwidth of targets.
- ❑ **Save a copy of these comparisons.**
- ❑ **Fit a hearing aid using CARL, and assess whether the hearing aid can be worn without feedback. Run the feedback manager, measuring the aid both before and after to see if the manager changes the frequency response.**

Activity for one of your assigned cases:
- ❑ Fit to two different prescriptions and compare the aided SIIs that result. **Save a copy of these comparisons.**
- ❑ If you had measured LDLs for this case, can you enter them into all prescriptions?

Knowledge checker:
- ❑ Can you summarize the rationale and evidence-based differences between the alternatives?
- ❑ Can you describe in your own words what an nHL to eHL correction is, and why it is important?
- ❑ Are individually measured LDLs incorporated into each prescription?
- ❑ How are mixed or conductive hearing losses handled by each prescription?

UNIT FIVE: VENTING AND OCCLUSION

(handed in)

Learning objectives

- ❑ Learn to measure "acoustic transparency" in order to evaluate degree of occlusion
- ❑ Understand the distinction between occlusion (REOG) and the occlusion effect, and be able to measure each.
- ❑ Access and apply resources available for assessing candidacy for venting.

Resources: Instructional video and tutorial sheet

Real ear measurements

Measuring venting

- ❑ Measure REUR and compare to REOR for ear plug, closed dome and open dome.
- ❑ Include your screen shots and label curves. Interpret the curves (100 words).

Measuring the Occlusion Effect

- ❑ Measure occlusion effect with open canal, ear plug (shallow and deep), open dome, and closed dome.
- ❑ Include your screen shots and label curves. Interpret the curves.

Make sure you can identify the following:
- o The peak frequency of the open ear response
- o Where a 0 dB REIG would be on the graph
- o The frequency range over which the vent is providing an open response
- o The interaction between providing venting and providing a fitting without the occlusion effect.
- o Does sound come in through the vent or go out through the vent or both?

Assessing candidacy for venting

- ❑ Consult Occlusion Effect and Venting sections in your textbook. Consider your cases' audiograms and the fittings you have completed to date. Do your fittings include venting? Is either case a candidate for venting? Do you understand how to estimate what comes in through the vent versus what goes out?
- ❑ Discuss in lab: For a typical presbyacusic loss with near-normal low frequency hearing, what are the advantages of providing venting? How does this impact your choice of performing either on-ear or on-coupler verification?

UNIT SIX: FREQUENCY LOWERING

(not handed in)

Resources: Course Video and Frequency Lowering fitting protocol

Hearing aid to use: Any hearing aid with Frequency Lowering (FL) technology. Either look for information on the manufacturer's website or on the hearing aid software. Fit on the coupler or on CARL.

Case: Use the provided audiogram for Stefan, below. Testing for dead regions reveals masked thresholds above the range of testing at 3000 Hz and above.

250	500	750	1000	1500	2000	3000	4000	6000	8000
20	20	25	30	50	70	95	100	110	110

Assignment: verify frequency lowering (keep screenshots for each step):

- ❑ Step 1: Verify the hearing aid's frequency response to a prescriptive target without FL.
- ❑ Step 2: Verify MPO with FL disabled.
- ❑ Step 3: Without and then with FL, evaluate the maximum audible output frequency (MAOF) of /s/. Consult the Ontario Infant Hearing Program protocol and determine if this case is a candidate for frequency lowering (or perhaps for a hearing aid with better bandwidth?).
- ❑ Step 4: Enable frequency lowering default settings. Remeasure MAOF and note down the default settings.
- ❑ Step 5: Fine tune the frequency lowering if needed and re-verify. What differences do you note compared to the default settings? Remember to note down the FL settings and MAOF.
- ❑ Step 6: Try an alternative type of frequency lowering (by fitting with a brand that uses a different processing strategy) and compare the two.

Listening check: Listen carefully to the hearing aid at each setting and make notes:

	No FL	With default FL settings	With fine tuned settings
/s/			
/sh/			
speech			

- ❑ Based on your verification, would you recommend frequency lowering? Why/why not?
- ❑ If yes, what frequency lowering types and settings would you recommend? Why?

UNIT SEVEN: DIRECTIONAL TECHNOLOGIES

(handed in)

Individual reports required. Hearing aids will be assigned individually (one of these will be a hearing aid from your case assignment (Unit Two)).

Learning objectives:

1. Familiarize with directional processing technologies in different hearing aids
2. Measure and quantify directional performance in a test box

Resources:

1. Instructional videos
2. Documents describing hearing aid placement and directionality measurement in Verifit, Verifit 2, and Aurical Freefit.

Activity:

For the set of hearing aids given to you, create a comparison table for directional processing. Indicate in this table what the product-specific features are (adaptive directionality? automatic switching? etc), and buzzwords.

In a recent two-part series, Cox (2009a,b) discusses test box verification of advanced DSP functions including directional processing. Read #7 in Cox (2009a), and make similar measurements of the abovementioned hearing aids using Verifit in the Starkey lab. Create a comparative graph, similar to Figure 1 in Cox (2009a), and comment on your findings.

Now, read #17 in Cox (2009b) and discuss your results within the context of Figure 7. What are your thoughts on test box verification of directional functionality?

UNIT EIGHT: ANR & FEEDBACK CONTROL

(handed in)

Individual reports required. Hearing aids will be assigned individually (one of these will be the hearing aid from your case assignment (Unit Two)).

Learning objectives:
1. Explore noise reduction options in modern hearing aids and learn test-box verification of the noise reduction feature
2. Explore feedback control options in modern hearing aids. Learn a method of electroacoustic verification of feedback control with Verifit or Verifit 2

Resources:
1. Instructional videos
2. Documents on setting up Verifit, Verifit 2, and Aurical Freefit for DNR and feedback evaluation

Activity:

Adaptive Noise Reduction (ANR)

Create an ANR comparison table for the set of hearing aids given to you. Indicate in this table what the product-specific features are (varying DNR strength? separate speech enhancement? environmental classifier? Impulse noise reduction?), and buzzwords.

Fit these hearing aids to the audiogram given to you, and measure the ANR performance using protocols provided (in lab and/or by video). Compute the Noise Reduction Scores following the procedure outlined in #19 of Cox (2009b), and create a comparative summary graph. Comment on your results with Figure 8 from Cox (2009b) in mind. Note that some hearing aids have several degrees of noise reduction: only use the maximum DNR setting.

Feedback Control

For the same group of hearing aids, create a similar comparison table for the feedback cancellation technologies. Indicate whether the hearing aid provides an option for static feedback measurements, and if yes whether it uses broadband noise or pure tones for this measurement.

Using the technique demonstrated in the class or through a video tutorial, verify the functionality of the feedback cancellation algorithm with each of these hearing aids (Note: this measurement technique can only be used with some test systems!).   Do all hearing aids feedback at the same frequency? What are your thoughts on test box verification of the feedback cancellation feature?

UNIT NINE: CROS/BICROS HEARING AIDS

(not handed in)

Learning objectives:

1. Assess candidacy for CROS/biCROS hearing aid fitting.
2. Develop skills in CROS/biCROS hearing aid fitting.

Resources: Instructional videos

Based on 9526 lecture, video and readings fit and verify a CROS program on a classmate using the Unitron Tandem system or any other system that offers a modified binaural phone program for CROS. You should follow the protocol described in Pumford (2005) or in your textbook. Keep a screen shot of the verification and label your curves. Take a screenshot of the hearing aid software (window where gain adjustments are made).

Questions to think about:

1. Steps (in terms of target and gain adjustments) you would do differently for verification of a BiCROS fitting instead of a CROS fitting.
2. Reasons why
    a. We use the better ear's REUR as target in CROS fittings
    b. We switch to CROS mode on the Verifit system during verification.
3. Ways to measure benefit with CROS (BiCROS) fittings.
4. Read through the Diane case offered on the 9528 course site. How is this case different than the CROS fittings you completed on yourselves? What are her listening needs? What targets would be used for the fittings?

UNIT TEN: PATCHING IN EXTERNAL INPUTS TO HEARING AIDS (PHONE FITTING, BLUETOOTH)

(NOT HANDED IN)

Learning objectives for Phone fitting:

1. Fitting and verification of a telecoil program
2. Use of a bridge device and/or direct wireless streaming

Resources: Instructional videos

Activity:

Verifying and troubleshooting telecoil programs and binaural streaming

❑ Guest audiologist: Paula Folkeard, Au.D., Manager of the NCA's TRU lab will run a tutorial on these, worksheet to be provided.

Choose a hearing aid that has been set for your case, and that offers telephone solutions. Enable T-coil and T-coil+M as other programs, making sure to couple or link your programs so that the enabled T programs derive their frequency response from that of the basic fitting.

Fit to CARL or on the coupler. Verify the output of the T-coil only and T+M program for speech. Refer to the OWL site for resources on setting up for this measurement. Hold phone's receiver against the aid in T-mode/T+M and measure.

1. Compare T only with T+M.
   a. Check how varying the phone position can vary the output.
2. Compare with a telephone amplifier OFF and ON condition in T or T+M.
3. Try the acoustic telephone program.
4. Use a telecoil simulator in the verification test system to assess the telecoil's performance in the coupler and/or on ear. Include assessment of binaural wireless streaming of either the M or T signal.

❑ Take verification screen captures. Begin to build a phone plan for your case.

Using bridge devices or direct wireless streaming

❑ Try pairing your hearing aid with a wireless bridge device or direct to your phone if this feature is available.
❑ Measure the effects of placing the receiver in less-than-optimal positions.
❑ Try coupling the bridge device to your phone via bluetooth and attempt a phone call.
   o Does it support bilateral streaming of monaural signals?
❑ Try listening to a music device connected to the bridge device via the audio cable.
   o Is the stereo aspect of the signal preserved? How can you check?

UNIT ELEVEN: REMOTE MIC FITTING

(NOT HANDED IN)

Learning objectives for Remote Mic systems:

1. Verification of FM or DSP-remote-mic systems
2. Familiarise with different systems and programming with verification

Resources: Instructional videos

Activity 1:

The following verification protocol is based on the AAA clinical practice guidelines (2011).

Basic fitting: If possible, fit your case with a suitable hearing aid that goes with available FM/Remote Mic transmitters. Else, choose any audiogram appropriate for the hearing aid-receiver pair. Fit and verify for average speech and MPO in with average RECDs and the prescription of your choice. Let's call this curve 1. Does this instrument require a separate FM+M program? Save settings in the hearing aid.

1. Connect the FM receiver. Sync the transmitter and receiver. Do a listening check. Use the **product manual** for controls.
2. Mute the FM transmitter/microphone. Re-do the 65 dB SPL speech input (curve 2) and compare it with curve 1. If there are changes, make note.
3. Activate the transmitter/microphone. Next, measure the FM+M program with the same 65 dB SPL speech input but for the FM mic (keep HA connected to coupler). Make sure the mic mode is omni. Call this curve 3. Provide verification screen capture.
4. View the numerical table of values from verification, and complete the following table:

Coupler or Real ear measure on CARL	750 Hz	1 kHz	2 kHz
FM microphone (curve 3)			
Minus HA microphone (curve 2)	-	-	-
Equals **FM offset (dB)**	=	=	=

Add offset values and divide by 3:

❑ Average Offset = _____
❑ Based on the offset value you have calculated would you adjust gain in the receiver? (Y/N)

Activity 2

Use the following hearing aids: _____ with the following remote mic system: _____. What type of receiver is connected?

Programming the Inspiro and the receiver:

- Open the FM successware. Connect the Inspiro via a USB (micro) to the computer.
- Follow the steps on the left. Mainly, select band NB (protected in Canada).
- You could choose a default channel. Enter client info.
- Detect the Inspiro and receiver (via Inspiro- keep the 2 close) to assign to the client.

FM advantage: The default 0=10 dB FM advantage. How can you determine if this is a good setting? What is the rationale for it? Do your course readings have guidance on this processing setting?

Knowledge check: do you know what this setting is for? Consult Lewis & Eiten (2004) for more info.

Do a listening check with the Inspiro, EasyLink and Zoomlink as transmitters. Use the audio cable to listen to any audio input from the computer (WMP). Copies of the guides are available in the lab/ on the manufacturer's website.

Discuss what you would do if:

1. The user complains of difficulty hearing his/her own voice
2. The user complains of difficulty hearing others?
3. The user complains of the teacher's voice getting distorted
4. The user complains of difficulty hearing the teacher
5. The user needs to use their hearing to listen to signals from a computer

Discuss how you can determine what type of remote mic boot is needed to use a universal receiver from either Oticon or Phonak. What online tools are available? Do you know how to use them?

Consider whether your assigned case requires remote microphone support, and if so, what type? Add this to your fitting if needed.

UNIT TWELVE: FITTING TINNITUS MASKERS

(NOT HANDED IN)

Learning objectives for Remote Mic systems:

1. Familiarise with different systems and programming with verification
2. To enable a tinnitus masker system within a hearing aid
3. To characterize the fitted strategy within known schemes for sound therapy
4. To contrast two different maskers or masker settings

Using one of your assigned cases, assume that the patient has a significant tinnitus that is chronic, bothersome, and not associated with a referral criterion for assessment by a physician. Explore tinnitus maskers associated with one or more hearing aids, fitting the tinnitus masker and verifying the output of the masker.

Discussion questions:

1. What type of therapeutic sound(s) is/are offered by the hearing aid(s)? Can you classify them on the therapeutic sound worksheet, and do you know how to apply this tool in clinical practice?
2. What is the difference between tinnitus masking and mixing?
3. Which of these is more consistent with TRT?
4. What would the purpose, if any, be in verifying the output of the tinnitus masker?