



# SPH 312

## Speech Perception and Hearing Science

S1 Day 2017

*Dept of Linguistics*

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## General Information

Unit convenor and teaching staff

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Australian Hearing Hub, 3.435

By appointment

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Credit points

3

Prerequisites

39cp at 100 level or above including (6cp in LING units at 200 level including (LING210 or LING217))

Corequisites

Co-badged status

### Unit description

This unit is a detailed examination of human auditory anatomy and physiology, and also of psychoacoustics and speech perception. The structure of the outer, middle and inner ear, the auditory nerve, the auditory brainstem and the auditory cortex are examined, as are the mechanisms of hearing and the physiology of the auditory system. Another major focus of this unit is the psychoacoustics of hearing and speech perception, which are examined both in lectures and in practicals.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

- Demonstrate an advanced knowledge of the anatomy and physiology of the ear to the cortex
- Demonstrate and communicate an understanding of neural anatomy and physiology as this relates to sound encoding
- Analyse the processes involved in successful hearing, and evaluate what factors may lead to compromised audition
- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.
- Demonstrate understanding of psychoacoustic phenomena
- Apply an advanced understanding of speech perception as a mapping of auditory information on linguistic representations
- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## General Assessment Information

The assessment tasks have been designed to enable students to demonstrate critical thinking skills and problem-solving skills in the understanding of how the auditory system works, psychoacoustics and speech perception.

### Late penalties

Late submissions will receive a penalty of 5% of the total marks for the assignment per day including weekends and public holidays

## Completion of All Assessment Tasks:

It is a requirement of this unit that students make a serious attempt to complete all assessment tasks. Failure to make a serious attempt to complete all assessment tasks may result in failure in the whole unit even if the total marks for completed tasks add up to more than 50%. In such cases, failure results from the learning outcomes of the unit not being met.

Any request for an extension must be submitted via [ask@mq](mailto:ask@mq) along with relevant information *before the assignment deadline*. Please make us aware of any circumstance that may affect your ability to complete an assessment on time. We are often able to help you manage your study load if we are aware of the situation. Granting extensions or special considerations after the fact is much more difficult.

Students must keep a copy of each assignment as proof that it was completed and submitted in the event that a submitted assignment is misplaced or damaged.

## Return of Marked Assignments

Students' marked assignments will, in general, be returned to them within 3 weeks of submission. Please note that assignments cannot be accepted after the return of marked materials.

## Assignment Submission:

All assignments must be submitted via turnitin. For each assignment, you **MUST**: ? submit the assignment in Word or pdf format ? fill in and include the cover sheet ? add a footer to each page of the assignment, with page numbering, your name and student number, and "SPH312" clearly marked Assignments will not be accepted unless they have both the cover sheet and the footer.

## Appeals Against Grades

If a student has a problem with the mark given for a particular assessment, the student should contact the Unit Convenor directly. A request for a re-mark must be lodged within two weeks of the date of receipt of the assessment. If a remark is granted, the final mark can be sustained, raised or lowered.

If a student wishes to appeal against a final grade for a unit, then the student should lodge their appeal via [ask@mq.edu.au](mailto:ask@mq.edu.au).

[http://students.mq.edu.au/support/complaints\\_appeals/appeals/](http://students.mq.edu.au/support/complaints_appeals/appeals/)

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">OAE Practicum</a>	20%	No	29 March 2017; 5pm
<a href="#">Categorical Perception Report</a>	20%	No	10 May 2017; 5pm
<a href="#">Experiment proposal</a>	20%	No	14 June 2017; 5pm

Name	Weighting	Hurdle	Due
<b>Exam</b>	40%	No	Within the exam Period

## OAE Practicum

Due: **29 March 2017; 5pm**

Weighting: **20%**

In this practicum, you will develop an understanding of the clinical use of distortion product otoacoustic emissions (DPOAEs), the clinical equipment used to measure them and the procedure undertaken for this. You will also develop an appreciation for physiological and non-physiological factors that could result in an absent evoked emission.

On successful completion you will be able to:

- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.

## Categorical Perception Report

Due: **10 May 2017; 5pm**

Weighting: **20%**

Categorical Perception (henceforth: CP) is a benchmark phenomenon in the study of phoneme perception. This practicum will introduce you to the experimental procedures involved in measuring Categorical Perception. You will be asked to interpret the data collected in the practicum and write a concise lab report outlining the findings.

On successful completion you will be able to:

- Apply an advanced understanding of speech perception as a mapping of auditory information on linguistic representations
- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments

## Experiment proposal

Due: **14 June 2017; 5pm**

Weighting: **20%**

Speech perception research has become a branch of phonology since the discovery that the mapping of phonetic cues on linguistic representations is highly languagespecific. This practicum invites you to formulate hypotheses about the speech perception phenomena discussed in the lectures, but applied to listeners with a different language background. The experiment that you propose will be a replication of one of studies that were discussed in the lecture, but applied to a different population of first language (L1) or second language (L2) listeners. You will be asked to

formulate a hypothesis and write a concise experiment proposal outlining the background, hypotheses, methods, and predicted results.

On successful completion you will be able to:

- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## Exam

Due: **Within the exam Period**

Weighting: **40%**

The aim of the final exam is to integrate the theory learned in this unit. The examination will be scheduled within the University's mid-year examination period. This exam will be 3 hours in duration.

The following website provides details of the university examination policy:

<http://www.mq.edu.au/policy/docs/examination/policy.html> Only in exceptional circumstances will supplementary exams be available. Request for supplementary exams are submitted as special consideration to [ask@mq](mailto:ask@mq).

On successful completion you will be able to:

- Demonstrate an advanced knowledge of the anatomy and physiology of the ear to the cortex
- Demonstrate and communicate an understanding of neural anatomy and physiology as this relates to sound encoding
- Analyse the processes involved in successful hearing, and evaluate what factors may lead to compromised audition
- Demonstrate understanding of psychoacoustic phenomena
- Apply an advanced understanding of speech perception as a mapping of auditory information on linguistic representations
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## Delivery and Resources

Recommended Readings per Week

### Weeks 1-6

Fettiplace R. Hackney CM. (2006). The sensory and motor roles of auditory hair cells. Nature

Reviews Neuroscience, 7; 19-29.

Londsbury BL. Martin GK. (1990). The clinical utility of distortion-product otoacoustic emissions. Ear & Hearing, 11; 144-154.

Kemp DT. (2002). Otoacoustics emissions, their origin in cochlear function, and use. British Medical Bulletin, 63 (1): 223-241.

## **7 Perception of segments**

Liberman, A.M., Harris, K. S., Hoffman, H.S. & Griffith, B. C. (1957). The discrimination of speech sounds within and across phoneme boundaries. Journal of Experimental Psychology, 54, 358-368.

Miyawaki, K., Jenkins, J. J., Strange, W., Liberman, A. M., Verbrugge, R., & Fujimura, O. (1975). An effect of linguistic experience: The discrimination of [r] and [l] by native speakers of Japanese and English. Perception & Psychophysics, 18(5), 331-340.

Benders, T., Escudero, P., & Sjerps, M. J. (2012). The interrelation between acoustic context effects and available response categories in speech sound categorization a. The Journal of the Acoustical Society of America, 131(4), 3079-3087.

Ganong, W.F. (1980). Phonetic categorization in auditory word perception. Journal of Experimental Psychology: Human Perception and Performance, 6, 110-125. 12.

## **8 Perception of prosody**

Dupoux, E., Pallier, C., Sebastian, N., & Mehler, J. (1997). A distressing "deafness" in French?. Journal of Memory and Language, 36, 406-421.

Cooper, N., Cutler, A., & Wales, R. (2002). Constraints of lexical stress on lexical access in English: Evidence from native and non-native listeners. Language and speech, 45(3), 207-228.

Akker, E., & Cutler, A. (2003). Prosodic cues to semantic structure in native and nonnative listening. Bilingualism: Language and Cognition, 6(02), 81-96.

Grosjean, F. (1996). Using prosody to predict the end of sentences in English and French: Normal and brain-damaged subjects. Language and cognitive processes, 11(1-2), 107-134.

## **9 L2 development of speech perception**

Escudero, P., Benders, T., & Lipski, S. C. (2009). Native, non-native and L2 perceptual cue weighting for Dutch vowels: The case of Dutch, German, and Spanish listeners. Journal of Phonetics, 37(4), 452-465.

Cooper, N., Cutler, A., & Wales, R. (2002). Constraints of lexical stress on lexical access in English: Evidence from native and non-native listeners. Language and speech, 45(3), 207-228.

Weiss, D., & Dempsey, J. J. (2008). Performance of bilingual speakers on the English and Spanish versions of the Hearing in Noise Test (HINT). Journal of the American Academy of Audiology, 19(1), 5-17.

## **10 Speech perception by hearing-impaired listeners**

Moberly, A. C., Lowenstein, J. H., Tarr, E., Caldwell-Tarr, A., Welling, D. B., Shahin, A. J., & Nittrouer, S. (2014). Do adults with cochlear implants rely on different acoustic cues for phoneme perception than adults with normal hearing?. *Journal of Speech, Language, and Hearing Research*, 57(2), 566-582.

Straatman, L. V., Rietveld, A. C. M., Beijen, J., Mylanus, E. A. M., & Mens, L. H. M. (2010). Advantage of bimodal fitting in prosody perception for children using a cochlear implant and a hearing aid. *The Journal of the Acoustical Society of America*, 128(4), 1884-1895.

Holt, C. M., Demuth, K., & Yuen, I. (2016). The Use of Prosodic Cues in Sentence Processing by Prelingually Deaf Users of Cochlear Implants. *Ear and hearing*, 37(4), e256-e262.

### **11 (early) L1 development of speech perception**

Werker, J. F. and Tees, R. C. (1984) Cross-language speech perception: Evidence from perceptual reorganization during the first year of life. *Infant Behavior and Development*, 7, 49-63.

Narayan, C. R., Werker, J. F., & Beddor, P. S. (2010). The interaction between acoustic salience and language experience in developmental speech perception: Evidence from nasal place discrimination. *Developmental science*, 13(3), 407-420.

Altwater-Mackensen, N., & Fikkert, P. (2010). The acquisition of the stop-fricative contrast in perception and production. *Lingua*, 120(8), 1898-1909.

Jusczyk, P. W., Houston, D. M., & Newsome, M. (1999). The beginnings of word segmentation in English-learning infants. *Cognitive psychology*, 39(3), 159-207.

Lammertink, I., Casillas, M., Benders, T., Post, B., & Fikkert, P. (2015). Dutch and English toddlers' use of linguistic cues in predicting upcoming turn transitions. *Front. Psychol*, 6(495), 10-3389.

### **12 Psychoacoustics**

None

## **Unit Schedule**

1. The Ear: An overview
2. Cochlear anatomy and physiology (mechanoelectrical transduction)
3. Cochlear non linearity
4. Auditory nerve - anatomy and physiology
5. Central Auditory nervous pathway
6. Auditory cortex, Localization and acoustic reflex pathway
7. Perception of Segments
8. Perception of Prosody
9. L2 Development of Speech Perception



10. Speech perception by hearing-impaired listeners
11. Early (L1) acquisition of speech perception
12. Psychoacoustics
13. Closing remarks

PRACS WILL BE HELD IN:-

- Weeks 1 - 2 DPOA
- Weeks 7 - 8 Categorical Perception
- Week 10 - 11 Experiment Proposal

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

Assessment Policy [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html)

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy (in effect until Dec 4th, 2017): [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html)

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

### Learning outcomes

- Demonstrate an advanced knowledge of the anatomy and physiology of the ear to the cortex
- Demonstrate and communicate an understanding of neural anatomy and physiology as this relates to sound encoding
- Analyse the processes involved in successful hearing, and evaluate what factors may

lead to compromised audition

- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.
- Demonstrate understanding of psychoacoustic phenomena
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- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## **Assessment tasks**

- OAE Practicum
- Categorical Perception Report
- Experiment proposal
- Exam

## **Critical, Analytical and Integrative Thinking**

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

## **Learning outcomes**

- Analyse the processes involved in successful hearing, and evaluate what factors may lead to compromised audition
- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.
- Apply an advanced understanding of speech perception as a mapping of auditory information on linguistic representations
- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## **Assessment tasks**

- OAE Practicum
- Categorical Perception Report
- Experiment proposal
- Exam

## **Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

## **Learning outcomes**

- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.
- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## **Assessment tasks**

- OAE Practicum
- Categorical Perception Report
- Experiment proposal
- Exam

## **Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

## **Learning outcomes**

- Analyse, interpret and report on audiometric data to engage with theoretical issues relating to clinical assessment techniques.

- Evaluate, make informed decisions regarding, and report on the methods, data, and results from speech perception experiments
- Communicate on methods, results, and theories of speech perception within typical and special populations.

## **Assessment tasks**

- OAE Practicum
- Categorical Perception Report
- Experiment proposal
- Exam