

## Current Topics in Perception: Multisensory Integration

### I) Course information

Course number: PSYD51H3

Tuesdays, 12 - 2pm

Where: online, Zoom ID: 229 739 3701, no password

(<https://utoronto.zoom.us/j/2297393701>)

Prerequisites: PSYB51, [0.5 credit from the PSYC50-series of courses] or NROC64H3

### II) Instructor:

Dr. Matthias Niemeier<sup>[L]</sup><sub>[SEP]</sub>

1265 Military Trail

SW550<sup>[L]</sup><sub>[SEP]</sub>

phone: 416-287-7466<sup>[L]</sup><sub>[SEP]</sub>

e-mail: m.niemeier@utoronto.ca<sup>[L]</sup><sub>[SEP]</sub>

Office Hours: I will have special one-on-one office hours for everyone to help with preparations for their presentation in class. I request to please approach me about this at least one week before your presentation.

### III) Course coverage and goals

The world around us is multimodal. How do we join our senses (vision, audition, touch, olfaction, balance etc.) together to obtain a coherent percept of the world? In the past few years, multisensory integration has become a topic of major research interest. The course provides a survey of the recent developments. Selected readings will cover neurophysiological results, psychological and neuropsychological findings, synaesthesia, and an introduction to the Bayesian mechanisms of multisensory integration.

On a more general level PSYD51 is modeled after seminar courses in grad school as well as lab meetings in research labs. As such PSYD51 provides training in reading and understanding scientific articles, oral and written scientific communication, critical thinking, and grant writing.

By the end of this course, you will have ...

- developed an in-depth understanding of the contemporary scientific body of knowledge about multisensory perception
- further strengthened your ability to consume scientific literature (especially original articles)
- become quite independent to acquire scientific knowledge
- increased your ability to understand, critique and extend original research in psychology and neuroscience
- further trained your ability to effectively communicate scientific knowledge to others

#### **IV) Course Web Site: Quercus**

Here you will find the syllabus, instructions for the papers, the most up-to-date version of the lecture schedule, and announcements.

Please check on a regular basis for announcements.

#### **V) Evaluation**

One aim of this course is to be closer to the real world of science than that is possible in a lecture. That is, there won't be exams nor a textbook. There won't even be a regular lecture. Instead, your presence in class and **active** participation in the course is expected and will be a significant part of the grade. We will have a reading list of original research papers (2 per week), and every week there will be presentations and discussions on them. Also, we will have assignments; there are three thought papers on the research papers from the reading list, and at the end of the course there will be a research proposal on a topic on multisensory perception.

**25% Presentation.** On one day you are asked to present one of the research papers for the respective day. The quality of your presentation will be crucial for your own and for everyone else's learning experience. You can earn these 25% within ~20 min, which is the length of your presentation. To be successful it needs to be a free presentation. You can use notes, but reading from a manuscript just doesn't work for your audience. The exact structure of the presentations will vary from article to article. But it should have the following parts:

- (a) a brief introduction to the topic (up to 3 min)
- (b) a summary of the methods, results and conclusions of the paper. (~15 min)
- (c) a summary of the discussion of the article (up to 2 min)

A group discussion will follow your presentation (not part of your grade). To choose a topic, please refer to the Schedule and the reading list. Topics will be assigned on a first-come-first-serve basis. Please email me your first 3 choices. Please contact me to set up a 1-hr appointment with me to prepare for your presentation.

**25% Active participation in the group discussions.** Every week you are expected to read the respective literature (2 papers) so that you are properly prepared to engage in discussions on them. The 25% emphasize that I value participation very much. Science lives from discussions. For this seminar it means that you need to say something in class that pertains to the respective topic. No worries, you don't need to make genius comments in class (but it doesn't hurt, of course). It is perfectly fine to convey any kind of thought of your own. For example: Do you agree with the authors? Do you have concerns about confounds or gaps in the study? Or maybe, were you impressed with something about the study? Do you have ideas about how to extend the research? Anything from your thought paper (see below) that you might want to share? Even if there was something in the paper that you didn't understand that could be worth talking about. There is a good chance that others had the same problem (but you get the credit for bringing it up). – Our discussions can be about many different things, and you will get a point for every session during which you contribute to those discussions. Speaking of "every session". Part of participating implies that you are present. Every week. That's the hitch of having no exams and no textbook. For more than one missed session I will need to factor this in, unless you submit a Request for Missed Term Work Accommodations form.

**25% Three thought papers (8.33% each).** Having read the weekly literature (2 papers) you also need to write thought papers about some of these articles. That means 2 double-spaced pages of your own thoughts. The purpose is (a) to encourage you to read the literature carefully and to prepare for the respective session of course (e.g., you may write a paper about a great idea and bring that same idea up during class), (b) to practice scientific writing, (c) to encourage you to develop your own thoughts on the particular topic. ***Thought papers always need to be submitted for the respective session during which the respective article is being discussed (email submission before the start of the class; a deduction of 10% per every 24h of late submission).*** Please note that thought papers need to be structured in a specific way, see instructions on Quercus (“How to write a thought paper”).

There is a specific schedule according to which you need to submit your thought papers:

- Thought paper 1: session 2, 3, 4, or 5
- Thought paper 2: session 6, 7, 8 or 9
- Thought paper 3: session 10, 11, or 12

**Because there are multiple opportunities to submit thought papers, I will not accept any additional accommodation requests as detailed under VIII).**

You have the option to submit **one extra t-paper** in case you want to improve a grade. That is, you can submit a second t-paper 1, 2, or 3. But make sure not to wait until the end of the course. **The make-up paper still needs to be submitted on the day the respective article is being discussed** (e.g., if you submitted your first t-paper 1 for session 2 and if you want to submit a second t-paper 1, then you need to write that make-up paper on Spence & Driver or Mengotti et al. for session 3, **or** write on Ocelli et al. or Amedi et al 2001 to submit for session 4, **or** write on Amedi et al 2007 or Sathian et al to submit for session 5, etc.).

**25% Research proposal.** The proposal is due on the last day of UTSC classes. Please go to Quercus for tips and instructions on “**How to write a research proposal**”.

## VI) Schedule

The schedule is subject to changes as we go along. The most up-to-date version will be on the Intranet.

Week	Topic	Literature
1	Introduction	--
2	Neural mechanisms of multisensory integration	<a href="#">Hummel &amp; Gerloff (2005)</a> , <a href="#">Bremmer et al. (2001)</a>
3	Crossmodal cueing of attention	<a href="#">Spence &amp; Driver (1997)</a> <a href="#">Mengotti et al. (2018)</a>
4	Multisensory object perception I	<a href="#">Ocelli et al. (2016)</a> , <a href="#">Amedi et al. (2001)</a>
5	Multisensory object perception II	

		<a href="#">Amedi et al. (2007)</a> , <a href="#">Sathian et al. (2011)</a> ..
6	Optimal multisensory integration: psychophysics and models	--- <i>Introduction to Maximum Likelihood Estimation</i> --- <a href="#">Ernst &amp; Banks (2002)</a> <a href="#">Deneve et al. (2001)</a>
7	Vision and sound in space	<a href="#">Alais &amp; Burr (2004)</a> , <a href="#">Fujisaki et al. (2004)</a>
8	Vision and somatosensation in space	<a href="#">Zwiers et al. (2003)</a> , <a href="#">Blanke et al. (2005)</a>
9	Plasticity	<a href="#">Wallace et al. (2004)</a> , <a href="#">Putzar et al. (2007)</a>
10	Development & learning	<a href="#">Gori et al. (2008)</a> , <a href="#">Lewkowicz &amp; Hansen-Tift (2012)</a>
11	Multisensory integration and action	<a href="#">Juravle et al. (2010)</a> , <a href="#">Cappagli et al. (2019)</a> .
12	Plus and minus syndromes of multisensory perception: A crossmodal illusion vs. autism	<a href="#">Dieter et al. (2014)</a> , <a href="#">Foxe et al. (2015)</a>

## VII) References

- Alais D, Burr D (2004). The ventriloquist effect results from near-optimal bimodal integration. *Curr Biol* 14:257-262.
- Amedi A, Malach R, Hendler T, Peled S, Zohary E (2001). Visuo-haptic object-related activation in the ventral visual pathway. *Nat Neurosci* 4:324-330.
- Amedi A, Stern WM, Camprodon JA, Bermpohl F, Merabet L, Rotman S, Hemond C, Meijer P, Pascual-Leone A (2007). Shape conveyed by visual-to-auditory sensory substitution activates the lateral occipital complex. *Nat Neurosci* 10:687-689.
- Blanke O, Mohr C, Michel CM, Pascual-Leone A, Brugger P, Seeck M, Landis T, Thut G (2005). Linking out-of-body experience and self processing to mental own-body imagery at the temporoparietal junction. *J Neurosci* 25:550-557.
- Bremmer F, Schlack A, Shah NJ, Zafiris O, Kubischik M, Hoffmann K, Zilles K, Fink GR (2001). Polymodal motion processing in posterior parietal and premotor cortex: a human fMRI study strongly implies equivalencies between humans and monkeys. *Neuron* 29:287-296.
- Cappagli G, Finocchietti S, Cocchi E, Giammari G, Zumiani R, Cuppone AV, Baud-Bovy G, Gori M (2019). Audio motor training improves mobility and spatial cognition in visually impaired children. *Sci Rep*;9(1):3303.
- Deneve S, Latham PE, Pouget A (2001). Efficient computation and cue

- integration with noisy population codes. *Nat Neurosci*. 2001 Aug;4(8):826-31.<sup>[L]<sub>SEP</sub></sup>
- Dieter KC, Hu B, Knill DC, Blake R, Tadin D (2014). Kinesthesia can make an invisible hand visible. *Psychol Sci* 25(1):66-75.<sup>[L]<sub>SEP</sub></sup>
- Ernst MO, Banks MS (2002). Humans integrate visual and haptic information in a statistically optimal fashion. *Nature* 415:429-433.<sup>[L]<sub>SEP</sub></sup>
- Foxe et al. (2015). Severe Multisensory Speech Integration Deficits in High-Functioning School-Aged Children with Autism Spectrum Disorder (ASD) and Their Resolution During Early Adolescence. *Cerebral Cortex*, 25:288-312.
- Fujisaki W, Shimojo S, Kashino M, Nishida S (2004). Recalibration of audiovisual simultaneity. *Nat Neurosci* 7:773-778.<sup>[L]<sub>SEP</sub></sup>
- Gori M, Del Viva M, Sandini G, Burr DC (2008). Young children do not integrate visual and haptic form information. *Curr Biol* 18:694-698.<sup>[L]<sub>SEP</sub></sup>
- Hummel F, Gerloff C (2005). Larger interregional synchrony is associated with greater behavioral success in a complex sensory integration task in humans. *Cereb Cortex* 15(5):670-8.<sup>[L]<sub>SEP</sub></sup>
- Juravle G, Deubel H, Tan HZ, Spence C (2010). Changes in tactile sensitivity over the time-course of a goal-directed movement. *Behavioural Brain Research*, 208(2), 391- 401.
- Lewkowicz DJ, Hansen-Tift AM (2012). Infants deploy selective attention to the mouth of a talking face when learning speech. *Proc Natl Acad Sci U S A*, 109(5):1431-6.
- Mengotti P, Boers F, Dombert PL, Fink GR, Vessel S (2018). Integrating modality-specific expectancies for the deployment of spatial attention. *Sci Rep*;8(1):1210.
- Ocelli V, Lacey S, Stephens C, John T, Sathian K (2016). Haptic object recognition is view-independent in early blind but not sighted people. *Perception*. 2016 Mar;45(3):337-45.
- Putzar L, Goerendt I, Lange K, Rösler F, Röder B (2007). Early visual deprivation impairs multisensory interactions in humans. *Nat Neurosci*;10(10):1243-5.
- Sathian K, Lacey S, Stilla R, Gibson GO, Deshpande G, Hu X, Laconte S, Glielmi C (2011). Dual pathways for haptic and visual perception of spatial and texture information. *Neuroimage*, 57(2):462-75.
- Spence C, Driver J (1997). On measuring selective attention to an expected sensory modality. *Percept Psychophys* 59(3):389-403.<sup>[L]<sub>SEP</sub></sup>
- Wallace MT, Perrault TJ Jr, Hairston WD, Stein BE (2004). Visual experience is necessary for the development of multisensory integration. *J Neurosci* 24:9580-9584.<sup>[L]<sub>SEP</sub></sup>
- Zwiers MP, Van Opstal AJ, Paige GD (2003). Plasticity in human sound localization induced by compressed spatial vision. *Nat Neurosci* 6:175-181.

## **VIII) Additional information**

## Disability-Related Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office (<http://www.utsc.utoronto.ca/ability/>) as soon as possible.

AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Please contact 416-287-7560 (tel/TTY) or email [ability.utsc@utoronto.ca](mailto:ability.utsc@utoronto.ca) for more information.

The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

## Department of Psychology Missed Term Work Policy

For missed term work (assignments and term tests) due to illness, emergency, or other mitigating circumstances, please follow the procedures outlined below.

Note:

- The following reasons are not considered sufficient for missed term work: travel for leisure, weddings, personal commitments, work commitments, human error.
- [Missed Final Exams](#) are handled by the Registrar's Office and should be declared on eService.
- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, accommodations are only possible via the Registrar's Office [petition process](#).

The email address to submit missed term work accommodation requests in **PSYD51** is:  
**[m.niemeier@utoronto.ca](mailto:m.niemeier@utoronto.ca)**

### **ILLNESS OR EMERGENCY accommodations:**

For missed work due to ILLNESS OR EMERGENCY, complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Declare your absence on [ACORN](#) (Profile & Settings > Absence Declaration)
3. Email **both** of the following items to the course email **WITHIN 2 BUSINESS DAYS** of the missed work:
  - the [Request for Missed Term Work Accommodations Form](#) **\*AND\***
  - a screenshot of your Self-Declared Absence on ACORN

Note:

- *If you are unable to submit your request within 2 business days, you must still email your instructor within the 2 business day window to explain the nature of the delay. Exceptions to the 2 business day deadline will only be made under exceptional circumstances.*
- *If your absence is declared on ACORN, we do not require any additional supporting documentation (e.g. medical notes) to support your missed term work accommodation request.*

### **ACADEMIC CONFLICT accommodations:**

For missed term work due to an ACADEMIC CONFLICT (e.g. two midterms at the same time):

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Take screenshots of your course Quercus pages that demonstrate the conflict.
3. Email the form and screenshots to the course email **at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

#### Note:

- *Multiple assignments due on the same day are not considered conflicts. Students are expected to manage their time effectively to meet assignment deadlines.*
- *Back-to-back tests/quizzes are not considered conflicts. Only overlapping activities are conflicts.*
- *Students are responsible for keeping their course timetables conflict-free. Students who register in two courses with overlapping lecture/tutorial/lab schedules will not be accommodated.*

### **RELIGIOUS CONFLICT accommodations:**

For missed term work due to a RELIGIOUS CONFLICT:

1. Complete the [Request for Missed Term Work Accommodations Form](#).
2. Email the form to the course **email at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

### **ACCESSABILITY SERVICES accommodations:**

For missed **TERM TESTS** due to ACCESSABILITY REASONS:

- **Contact your AccessAbility consultant** and have them email the course email detailing accommodations required.

For missed **ASSIGNMENTS** due to ACCESSABILITY REASONS:

- If your desired accommodation is **within the scope** of your Accommodation Letter (e.g. your letter includes “extensions of up to 7 days” and you need 3 days):
  1. Complete the [Request for Missed Term Work Accommodations Form](#).

2. Email the form **\*AND\*** your **Accommodation Letter** to the course email specifying how many days extension you are requesting.
- If your desired accommodation is **outside the scope** of your Accommodation Letter (e.g. your letter includes “extensions of up to 7 days” but you need more time than that):
  1. **Contact your AccessAbility consultant** and have them email the course email detailing the accommodations required.

### **Accommodation Procedure:**

After submitting your documentation, you will receive a response from your instructor or TA. This form does not guarantee that you will be accommodated. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request. **You are responsible for checking your official U of T email and Quercus course announcements daily**, as accommodations may be time-critical.

For missed assignments, **do not wait for the instructor’s response to resume work on your assignment**. Extensions may be as short as one business day, depending on the nature of the illness/emergency. Complete your assignment as soon as you’re able, and email it to your instructor.

For an **anticipated absence** (e.g. a scheduled surgery or an illness with a prolonged recovery period), if you would like to request accommodations in advance, submit a [Verification of Illness Form](#) completed by your doctor AND the [Request for Missed Term Work Accommodations Form](#) to the course email. Absences can be declared up to 14 days into the future on ACORN.

### **Missed Accommodations**

If an accommodation is granted but a continued illness/emergency prevents you from meeting its requirements, you must repeat the missed term work procedure to request additional accommodations. **Please make it clear in your subject line that you are requesting a second accommodation**. E.g. If you are given an extension but are still sick and need more time, or if you miss a make-up term test, you must submit *another* [Request for Missed Term Work Accommodations Form](#) and declare your extended absence on ACORN. \*Note: In the case of a missed make-up test, an opportunity to write a second make-up test may not necessarily be provided.

### **Help With Writing**

If you would like help with academic writing, the following resources are available to you:

- The Centre for Teaching and Learning (AC312) Writing Centre offers students



one-to-one appointments and supplementary materials to help improve upon their writing skills.

<http://ctl.utsc.utoronto.ca/home/><sup>[SEP]</sup><http://ctl.utsc.utoronto.ca/twc/>

- The English Language Development Centre offers support and specialized writing programs for students who do not speak English as their primary language. <http://ctl.utsc.utoronto.ca/eld/>

- Advice on academic writing

<http://www.writing.utoronto.ca/advice>

### **Academic Integrity**

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

### **Religious Accommodations**

The University has a commitment concerning accommodation for religious observances. I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. According to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

### **Equity, Diversity, Inclusion**

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to

create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

### **Masks in the Classroom**

While the mask mandate has been paused as of 1 July 2022, the use of medical masks continues to be strongly encouraged at U of T Scarborough in indoor settings where physical distancing is not possible. We ask everyone to respect each other's decisions, comfort levels, and health needs. Masks are available at all building entrances at U of T Scarborough and in all classrooms.

### **Literature Searches**

Students can use the following resources when conducting literature searches to find relevant articles for their presentation and final essay:

The UTSC Library (AC235)

<http://www.library.utoronto.ca/utsc/>

PubMed

<http://www.ncbi.nlm.nih.gov/pubmed>

PsychINFO

<http://www.apa.org/pubs/databases/psycinfo/index.aspx>

Google Scholar

<http://scholar.google.ca/>

### **For Your Health**

The Health and Wellness Centre (SL270, 416-287-7065) provides diagnostic, treatment and referral services for all illnesses ranging from the medical to psychological to health promotion. The professional staff of physicians, nurses and counselors provides personal advice and assistance with family issues, eating disorders, depression, stress, drug and alcohol abuse, relationship issues, a positive space for gender/sexuality issues, and more.

<http://www.utsc.utoronto.ca/wellness>