

## VIRGINIA B. PENHUNE

Concordia University  
Dept of Psychology, SP-A 244  
7141 Sherbrooke St. W  
Montreal, QC H4B 1R6  
(514)848-2424 x7535 – phone  
[virginia.penhune@concordia.ca](mailto:virginia.penhune@concordia.ca)  
<http://psychology.concordia.ca/fac/penhune>

### EDUCATION

1998 McGill University, PhD in Clinical Psychology  
1986 - 1989 Harvard University Extension and Summer Schools, Psychology course-work  
1981 Wellesley College, BA in Philosophy, cum laude

#### **Concordia University, Department of Psychology**

- **Department Chair, June 2013 to present**
- **Professor, June 2012 to present**
- **Associate Professor, July 2005 to June 2012**
- **Assistant Professor, July 2000 to July 2005**

#### **McGill University, Integrated Program in Neuroscience, Department of Neurology and Neurosurgery**

- **Adjunct Professor, June 2010 to present**

### **Laboratory for Motor Learning and Neural Plasticity**

My research program explores the neural basis of human motor skill learning. I use structural and functional neuroimaging techniques to examine the role of the cerebellum, striatum and motor cortical areas in the learning and retention of motor skills. My work takes a broad developmental perspective, including studies in children and older adults, as well as individuals with musical training. I am a founding member of the Montreal Laboratory for Brain, Music and Sound (BRAMS), as well as the NSERC-funded training grant in Auditory Cognitive Neuroscience. In addition, I am a member of the Scientific Committee of the Quebec Bio-imaging Network, as well as a member of the FRQ-funded Centre for Research in Human Development, the Centre for Research in Brain, Language and Music, and an associate member of the Centre for the Study of Behavioural Neuroscience.

### PREVIOUS RESEARCH EXPERIENCE

#### **Post-doctoral research, April 1998 to April 2000**

Supervisor: Dr. Julien Doyon

**Laval University, Laboratory for Research in Rehabilitation and Physical Disability**

**Montreal Neurological Institute, McConnell Brain Imaging Center**

#### **Doctoral research, September 1990 to June 1998**

**Supervisor:** Dr. Michael Petrides

**McGill University, Department of Psychology**

**Montreal Neurological Institute, Cognitive Neuroscience, McConnell Brain Imaging Center**

**Thesis:** “The neural basis of human auditory rhythm perception and production”

## GRANTS AND AWARDS

- **Concordia University Team Seed Funding** (Co-PI with Drs. Karen Li and Laurel Young). *Walking and rhythm – the impact of rhythm ability on mobility in healthy aging*. 19,853 (2018).
- **Grammy Foundation Research Award** (Co-PI with Dr. Anouk). *Music-assisted therapy for stroke*. \$20,000 (2016-17)
- **Centre for Research in Brain, Language and Music Research Incubator Award** (Co-PI with Dr. Anouk Lamontagne). *Motor cortical changes associated with music-assisted therapy for stroke*. \$10,000 (2016-17)
- **CIHR Foundation Grant (Collaborator)**. With Dr. Robert Zatorre. *Auditory Cognitive Neuroscience: Pathways, Processes, Plasticity and Predispositions*, 270,000/year for seven years (2015-2022).
- **NSERC Discovery (PI)**. *Brain mechanisms of auditory-motor integration and learning*. \$28,000 per year for five years (2015-2020).
- **Centre for Research in Brain, Language and Music Research Incubator Award** (Co-PI with Dr. Denise Klein). *Sensitive periods for brain organization: A study of bi-directional effects of early music and language training*. \$7000 (2015-16)
- **Concordia University Individual Seed Funding (PI)**. *Effects of early musical training in school-age children*. \$7000 (2012).
- **CIHR Operating Grant (Co-PI)**. With Dr. Robert Zatorre. *Brain anatomy in auditory and motor learning: predispositions and plasticity* 120,000/year (%35) for five years (2010-2015).
- **NSERC Discovery (PI)**. *Human motor skill learning: The interaction between individual differences in brain function, experience and development*. \$35,000 per year for five years (2010-2015).
- **Concordia University Team Seed Funding (PI)**. *Walking and talking – the impact of cognitive and motor interactions in healthy aging*. 13,755 (2009).
- **Concordia University Individual Seed Funding (PI)**. *Neural Basis of Human Motor Learning and Memory*. 16,388 (2008).
- **CIHR Operating Grant (Co-PI)**. With Dr. Peter Shizgal. *Neural correlates of thermal comfort and discomfort: a functional magnetic resonance imaging study*. 140,000/year for five years (2008-2013).
- **Fonds de la recherche en santé du Québec – Chercheur Boursier, Junior II, career award**. *Developmental contributions to human motor skill learning*, \$65,000/year for three years (2007-2010).
- **Fonds de la recherche en santé du Québec – Chercheur Boursier, Junior I, career award**. *Developmental contributions to human motor skill learning*, \$46,000/year for two years (2005-2007).
- **Natural Science and Engineering Research Council of Canada – Discovery Grant (PI) Operating**. *Developmental contributions to human motor skill learning*, \$15,000/year for five years (2005-2010).
- **CIHR Operating Grant (Co-PI)**. With Dr. Karen Li. *Age-related differences in concurrent motor and cognitive performance: An investigation of neuronal and cognitive compensation*. 47,000/year for four years (2004-2008).
- **CFI Infrastructure Operating Fund (PI)**. With Dr. Karen Li. *Laboratory for motor and cognitive performance across the lifespan*. 20,000/year for three years (2004-2007).

- **CFI New Investigator Award (PI). Equipment.** With Dr. Karen Li. *Laboratory for motor and cognitive performance across the lifespan.* \$500,000 to be spent over five years (2002-2007).
- **Natural Science and Engineering Research Council of Canada New investigator award (PI). Operating.** *Neural Basis of Human Temporal Motor Learning,* \$16,000/year for four years (2001-2005).
- **Fonds de la recherche en santé du Québec – New investigator award (PI), operating.** *Neural Basis of Human Temporal Motor Learning,* \$14,888/year for three years (2001-2004).
- **Fonds de la recherche en santé du Québec – soutien aux équipes (co-investigateur). Operating.** With Dr. Isabelle Peretz (PI, Université de Montréal), Dr. Sylvie Hébert (Université de Montréal), Dr. Pascal Belin (Université de Montréal) and Dr. Robert Zatorre (McGill). *Neural basis of deficits in human auditory perception,* \$11,000/year for three years (2001-2003).
- **Fonds de la recherche en santé du Québec – soutien aux équipes (co-investigateur). Equipment.** With Dr. Isabelle Peretz (PI, Université de Montréal), Dr. Sylvie Hébert (Université de Montréal), Dr. Pascal Belin (Université de Montréal) and Dr. Robert Zatorre (McGill). *Neural basis of deficits in human auditory perception,* \$44,000 to be spent over two years (2002-2003).
- **Concordia University Funds for Research Development (PI). Operating.** *Neural Basis of Human Temporal Motor Learning,* \$9,500/year (2000-2002).
- **Concordia University General Research Funds (PI). Operating.** *Neural Basis of Human Temporal Motor Learning,* \$3,965/year for two years (2000-2002).

**Post-doctoral Fellowship:** Institut de réadaptation en déficience physique du Québec, 1999-2000.

**Dean's Honor List:** Overall performance in the graduate program and quality of PhD thesis, 1998

**Predoctoral Fellowship:** National Institutes of Health and Mental Health, April 1995 - October 1997

### TEACHING AND SUPERVISION

**Concordia University,** Department of Psychology, 2001 - present

*Students:* 3 current MA students, 4 current PhD students

*Courses:* Functional Neuroanatomy  
 Human Neuropsychology  
 Introduction to Abnormal Psychology  
 Abnormal Psychology: Psychotic and Organic Disorders  
 Abnormal Psychology: Schizophrenia and related disorders  
 Graduate clinical practicum in Neuropsychology  
 Graduate clinical seminar in Cognitive Assessment  
 Graduate clinical practicum in Cognitive Assessment  
 Graduate seminar in Neuroimaging Techniques  
 Graduate seminar: Core topics in Psychology  
 Graduate seminar: Writing skills

### **CLINICAL EXPERIENCE**

**Neuropsychologist, Clinical Psychologist** 1998 - present

Teaching and clinical supervision as part of the Clinical Training program, Concordia

**Clinical Neuropsychologist, Jan 2000 – June 2000**

Montréal Neurological Hospital, Department of Neuropsychology

**Douglas Hospital Centre**, Cognitive and Behaviour Therapy Unit, Dr. Ron Harris

*Clinical internship: 1996-97*

**Montréal Neurological Hospital**, Department of Neuropsychology, Dr G Leonard, Mr LB Taylor

*Supervised clinical experience: 1990 to 1999; Clinical internship: 1993-94*

**Montréal Neurological Hospital & Montréal Children's Hospital**, Dr G Leonard

*July 1993 - Jan 1995*

**Douglas Hospital**, Child and Adolescent Psychology Service, Dr S Benaroya

*Clinical practicum: May to August, 1991*

*Member of the Ordre des Psychologues du Québec*

### **Peer Reviewed Papers:**

1. **Matthews TE**, Witek MAG, Heggli OA, Penhune VB and Vuust P (2019). The sensation of groove is affected by the interaction of rhythmic and harmonic complexity. *PLoS One*. 14(1): e0204539. <https://doi.org/10.1371/journal.pone.0204539>
2. Karpati F, **Giacosa C**, Foster NEV, Penhune VB and Hyde KL (2018). Structural Covariance Analysis Reveals Differences Between Dancers and Untrained Controls. *Frontiers in Human Neuroscience*. <https://doi.org/10.3389/fnhum.2018.00373>
3. **Vaquero L**, Ramos-Escobar N, François C, Penhune VB and Rodriguez-Fornells A (2018). White-matter structural connectivity predicts short-term melody and rhythm learning in non-musicians. *NeuroImage*, 181:252-262. doi: 10.1016/j.neuroimage.2018.06.054
4. **Brown RM** and Penhune VB (2018). Efficacy of auditory versus motor learning for skilled and novice performers. *Journal of Cognitive Neuroscience*, Aug 29:1-26. doi: 10.1162/jocn\_a\_01309
5. **Ireland K, Parker A**, Foster NEV and Penhune, VB (2018). Rhythm and melody tasks for school-aged children with and without musical training: Age-equivalent scores and reliability. *Frontiers in Auditory Cognitive Neuroscience*. doi: 10.3389/fpsyg.2018.00426.
6. Wollman I, Penhune VB, Segado M, Carpentier T, Zatorre RJ (2018). Neural network retuning and neural predictors of learning success associated with cello training. *PNAS*. doi: 10.1073/pnas.1721414115
7. **Segado M, Hollinger A, Thibodeau J**, Penhune, VB and Zatorre RJ (2018). Partially overlapping brain networks for singing and cello playing. *Frontiers in Auditory Cognitive Neuroscience*. doi: 10.3389/fnins.2018.00351.
8. **Stephan MA, Lega C and Penhune VB** (2018). Auditory prediction cues motor preparation in the absence of movement. *NeuroImage*, 174: 288-296. [doi.org/10.1016/j.neuroimage.2018.03.044](https://doi.org/10.1016/j.neuroimage.2018.03.044)
9. **Ireland K, Parker A**, Foster N, Penhune VB (2018). Rhythm and Melody Tasks for School-aged Children With and Without Musical Training: Age-Equivalent Scores and Reliability. *Frontiers in Auditory Cognitive Neuroscience*. <https://doi.org/10.3389/fpsyg.2018.00426>
10. Karpati FJ, **Giacosa C**, Foster NEV, Penhune VB and Hyde KH (2017). Dance and music share grey-matter structural correlates. *Brain Research*. 1657:62-73 doi: 10.1016/j.brainres.2016.11.029
11. **Stephan MA, Brown RM, Lega C** and Penhune VB (2016). Melodic Priming of Motor Sequence Performance: The Role of the Dorsal Premotor Cortex. *Frontiers in Auditory Cognitive*

*Neuroscience*. 10:210. doi: 10.3389/fnins.2016.00210.

12. **Lega C, Stephan MA**, Zatorre RJ and Penhune VB (2016). Testing the role of dorsal premotor cortex in learning auditory-motor associations using TMS. *PLoS One*. doi:10.1371/journal.pone.0163380
13. **Giacosa C**, Karpati F, Penhune VB and Hyde KH (2016). Dance and music training have different effects on white matter diffusivity in sensorimotor pathways. *NeuroImage*. 135:273-86. doi: 10.1016/j.neuroimage.2016.04.048.
14. Karpati FJ, **Giacosa C**, Foster NEV, Penhune VB and Hyde KH (2016). Sensorimotor integration is enhanced in dancers and musicians. *Experimental Brain Research* 234(3):893-903. doi: 10.1007/s00221-015-4524-1.
15. **Matthews TE, Thibodeau JNL, Gunther B** and Penhune VB (2015). Impact of instrument-specific music training on rhythm perception and production. *Frontiers in Psychology*. 7:69. doi: 10.3389/fpsyg.2016.00069.
16. **Korotkevich Y, Trewartha K**, Penhune VB and Li KZH (2015). Effects of age and cognitive load on response reprogramming. *Experimental Brain Research*. 233(3):937-46. doi: 10.1007/s00221-014-4169-5.
17. Karpati FJ, **Giacosa C**, Foster NEV, Penhune VB and Hyde KH (2015). Dance and the brain: A review. *Annals of the New York Academy of Sciences*, 1337: 140-146 doi: 10.1111/nyas.12632.
18. **Baer LH**, Park MT, Bailey JA, Chakravarty MM, Li KZH and Penhune VB (2015). Regional cerebellar volumes are related to early musical training and finger tapping performance. *NeuroImage*, 105:130-139. Doi: 10.1016/j.neuroimage.2014.12.076
19. **Villeneuve M**, Penhune VB and Lamontagne A (2014). A piano training program to improve manual dexterity and upper extremity function in chronic stroke survivors. *Frontiers in Human Neuroscience*, 22 August 2014 | doi: 10.3389/fnhum.2014.00662
20. **Padrão G**, de Diego-Balaguer R, Marco-Pallares J, Penhune VB and Rodriguez-Fornells A (2014). Evidence of adaptive changes in error processing and attentional control during rhythm synchronization learning. *Neuroimage*. PMID: 24956067
21. **Bailey JA**, Zatorre RJ and Penhune VB (2014). Early musical training: Effects on auditory motor integration and grey matter structure in ventral premotor cortex. *Journal of Cognitive Neuroscience*, 26(4): 755-67. PMID: 24236696
22. **Bailey JA** and Penhune VB (2013). The relationship between the age of onset of musical training and rhythm synchronization performance: Validation of sensitive period effects. *Frontiers in Auditory Cognitive Neuroscience*, doi: 10.3389/fnins.2013.00227. PMID: 24348323
23. **Trewartha K, Spilka, M**, Penhune VB, Li KZH and Phillips N (2013). Context updating processes facilitate response reprogramming in younger but not older adults. *Psychology and Aging*, 28 (3): 701-713. PMID: 24041003
24. **Baer LH, Thibodeau JLN, Gralnick TL**, Li KZH and Penhune VB (2013). The role of musical training in emergent and event-based timing. *Frontiers in Human Neuroscience*. PMID: 23717275.
25. **Steele CJ, Bailey JA**, Zatorre RJ and Penhune VB (2013). Early musical training and white-matter plasticity in the Corpus Callosum: Evidence for a sensitive period. *Journal of Neuroscience*, 33(3): 1282-1290. PMID: 23325263

26. **Kung SJ**, Chen JL, Zatorre RJ and Penhune VB (2013). Interacting cortical and basal ganglia networks underlying finding and tapping to the musical beat. *Journal of Cognitive Neuroscience*, **25**(3): 401-420. PMID: 23163420.
27. Brown RM, Chen JL, **Hollinger A**, Penhune VB, Palmer C & Zatorre RJ (2013). Repetition suppression in auditory-motor regions to pitch and temporal structure in music. *Journal of Cognitive Neuroscience*, **25**(2):313-328. PMID: 23163413.
28. **Steele CJ**, Scholtz J, Douaud G, Johansen-Berg H and Penhune VB (2012). Structural correlates of skilled performance on a motor sequence learning task. *Frontiers in Human Neuroscience*, 6:28; doi: 10.3389/fnhum.2012.00289. PMID: 23125826
29. **Bailey JA** and Penhune VB (2012). A sensitive period for musical training: Contributions of age of onset and auditory working memory. *Proceedings of the New York Academy of Sciences*, **1252**(1): 163-170. PMID: 22524355
30. Penhune VB and **Steele CJ** (2012). Parallel contributions of cerebellar, striatal and M1 mechanisms to human motor sequence learning. *Behavioral and Brain Research*, **226**(2): 579-91. PMID: 22004979
31. **Trewartha K**, Li KJH and Penhune VB (2011). Movement kinematics of pre-potent response suppression in aging: Effects of conflict salience and frequency. *Journals of Gerontology: Psychological Sciences*, **66**(2):185-194. PMID: 21183582
32. Penhune VB (2011). Sensitive periods in human development: evidence from musical training. *Cortex*, 47(9):1126-37. PMID: 21665201
33. **Spilka M**, **Steele CJ** and Penhune VB (2010). Action imitation and the effects of musical training. *Experimental Brain Research*, **204**(4): 549-558. PMID: 20574688
34. **Savion-Lemieux T** and Penhune VB (2010). The effect of practice pattern on the acquisition and consolidation of motor sequences. *Experimental Brain Research*, **204**(2):271-81. PMID: 20526710
35. **Bailey JA** and Penhune VB (2010). Rhythm synchronization performance and auditory working memory in early- and late-trained musicians. *Experimental Brain Research*, **204**(1):91-101. PMID: 20508918.
36. **Steele CJ** and Penhune VB (2010). Specific increases within global decreases: An fMRI investigation of five days of motor sequence learning. *Journal of Neuroscience*, **30**(24):8332-41.
37. **Fraser SA**, Li KZH and Penhune VB (2010). Dual-tasks performance reveals increased involvement of executive control in fine motor sequencing in healthy aging. *Journals of Gerontology: Psychological Sciences*, **65**(5):526-35
38. **Chen JL**, Penhune VB and Zatorre RJ (2009). The role of auditory and premotor cortex in sensorimotor transformations. *Proceedings of the New York Academy of Sciences*, **1169**:15-34.
39. **Fraser SA**, Li, KZH and Penhune VB (2009). A comparison of motor skill learning and retention in younger and older adults. *Experimental Brain Research*, **195**(3):419-27.
40. **Savion-Lemieux T**, **Bailey JA** and Penhune VB (2009). Developmental contributions to motor sequence learning. *Experimental Brain Research*, **195**(2):293-306.
41. **Trewartha KM**, **Endo A**, Li KZH and Penhune V (2009). Examining pre-potent response suppression in aging: A kinematic analysis. *Psychology and Aging*, **24**(2):450-61.
42. Doyon J, Bellec P, Amsel R, Penhune VB, Monchi O, Benali H (2009). Contributions of the Basal Ganglia and functionally related brain structures to motor learning. *Behavioral and Brain Research*, **199**(1):61-75.

43. Warrier CM, Wong PCM, Penhune VB, Zatorre RJ and Kraus N (2009). Relating structure to function: Heschl's Gyrus and auditory temporal processing. *Journal of Neuroscience*, **29**(1):61-69.
44. **Chen JL**, Penhune VB and Zatorre RJ (2008). Listening to musical rhythms recruits motor regions of the brain, *Cerebral Cortex*, **18**(12): 2844-54.
45. **Chen JL**, Penhune VB and Zatorre RJ (2008). Moving on time: brain network for auditory-motor synchronization is modulated by rhythm complexity and musical training. *Journal of Cognitive Neuroscience*, **20**(2):226-239.
46. Wong PCM, Warrier CM, Penhune VB, Roy AK, Sadehh A, Parrish TB, and Zatorre RJ (2008). Volume of left Heschl's Gyrus and linguistic pitch learning. *Cerebral Cortex*, **18**(4): 828-36.
47. Zatorre RJ, **Chen JL** and Penhune VB (2007). When the brain plays music: Sensory-motor interactions in music perception and production. *Nature Reviews Neuroscience*, **8**: 547-558.
48. **Fraser SA**, Li KZH, DeMont RG, Penhune VB (2007). Effects of balance status and age on muscle activation while walking under divided attention. *Journal of Gerontology: Psychological Sciences*, **62B**(3): P171-P178.
49. **Watanabe D**, **Savion-Lemieux T** and Penhune VB (2007). The effect of early musical training on adult motor performance: Evidence for a sensitive period in motor learning. *Experimental Brain Research*. **176**: 332-340.
50. **Hollinger A**, Steele CJ, Penhune VB, Zatorre RJ and Wanderley M (2007). fMRI compatible electronic controllers. *Proceedings of the 2007 International Conference on New Interfaces for Musical Expression (NIME07)*, New York City, USA, pp. 246-249.
51. **Chen JL**, Zatorre RJ and Penhune VB (2006). Interactions between auditory and dorsal premotor cortex during synchronization to musical rhythms. *Neuroimage*. **32**: 1771-1781.
52. Raquel Dorsaint-Pierre, Virginia B. Penhune, Kate E. Watkins, Peter Neelin, Jason P. Lerch, Marc Bouffard and Robert J. Zatorre (2006). Asymmetries of the planum temporale and Heschl's gyrus: Relationship to language lateralization. *Brain*, **129**(Pt 5): 1164-76.
53. **Chen JL**, Penhune VB and Zatorre VB (2005). Tapping in synchrony to auditory rhythms: effect of temporal structure on behavior and neural activity. *Proceedings of the New York Academy of Sciences*, **1060**:400-3.
54. Penhune VB, **Watanabe D** and **Savion-Lemieux T** (2005). The effect of early musical training on adult motor performance: evidence for a sensitive period in motor learning. *Proceedings of the New York Academy of Sciences*, **1060**: 265-8.
55. Penhune, VB and Doyon, J (2005). Cerebellum and M1 interaction during early learning of timed motor sequences. *NeuroImage*, **26**: 801-812.
56. **Savion-Lemieux T** and Penhune VB (2005). The effects of practice and delay on motor skill learning and retention. *Experimental Brain Research*. **161**: 423-431.
57. Penhune VB, **Cismaru R**, Dorsaint-Pierre R, Petitto LA and Zatorre RJ (2003). The morphometry of auditory cortex in the congenitally deaf measured using MRI. *Neuroimage*. **20**:1215-1225.
58. Doyon J, Penhune VB and Ungerleider LG (2003). Distinct contributions of the cortico-striatal and cortico-cerebellar systems to motor skill learning. *Neuropsychologia*. **41**(3): 252-262.
59. Penhune, VB and Doyon J (2002). Dynamic cortical and subcortical networks in learning and delayed recall of timed motor sequences. *Journal of Neuroscience*, **22**(4): 1397-1406.
60. Zatorre, RJ, Belin, P and Penhune, VB (2002). Structure and function of the human auditory

- cortex: Music and speech. *Trends in Cognitive Sciences*, **6**(2): 37-46.
61. Peretz I, Ayotte J, Zatorre RJ, Mehler J, Ahad P, Penhune VB and Jutras B (2002). Congenital amusia: A disorder of fine-grained pitch discrimination. *Neuron*, **33**(2): 185-191.
  62. Zatorre, RJ and Penhune, VB (2001). Spatial localization after excision of human auditory cortex. *Journal of Neuroscience*, **21**(16): 6321-6328.
  63. Peretz I, Blood A, Penhune VB and Zatorre, RJ (2001). Cortical deafness to dissonance. *Brain*, **124**(Pt 5): 928-40.
  64. Griffiths TD, Penhune V, Peretz I, Dean JL, Patterson RD and Green GGR (2000). Frontal processing and auditory perception. *Neuroreport*, **11**: 919-922.
  65. Johnsrude IS, Zatorre RJ and Penhune VB (2000). Functional specificity in right human auditory cortex for perceiving pitch direction. *Brain*, **123**: 155-163.
  66. Penhune VB, Zatorre, RJ and Feindel, WH (1999). The role of auditory cortex in retention of rhythmic patterns as studied in patients with temporal lobe removals including Heschl's gyrus. *Neuropsychologia*, **37**(3): 315-331.
  67. Penhune VB, Zatorre RJ and Evans AE (1998). Cerebellar contributions to motor timing: A PET study of auditory and visual rhythm reproduction. *Journal of Cognitive Neuroscience*, **10**(6): 752-765.
  68. Penhune VB, Zatorre RJ, MacDonald D and Evans AE (1996). Interhemispheric anatomical differences in human primary auditory cortex: Probabilistic mapping and volume measurement from MR scans. *Cerebral Cortex*, **6**(5): 661-72.
  69. Faux SF, McCarley RW, Nestor PG, Shenton ME, Pollak SD, Penhune V, Mondrow E, Marcy B, Peterson A, Horvath T and Davis K (1993). P300 topographic asymmetries are present in unmedicated schizophrenics. *Electroencephalography and Clinical Neurophysiology*, **88**: 32-41.
  70. Nestor PG, Faux SF, McCarley RW, Penhune V, Shenton ME, Pollak SD, Sands SF (1992). Attentional cues and chronic schizophrenia: abnormal disengagement of attention. *Journal of Abnormal Psychology*, **101**(4): 682-689.

#### **Non-peer-reviewed papers:**

1. Penhune VB and deVilliers-Sidani E (2014). Time for new thinking about sensitive periods: An Introduction to the Frontiers Research Topic "What we learn and when we learn it." *Frontiers in Systems Neuroscience/ Frontiers in Auditory Cognitive Neuroscience*, doi: 10.3389/fnsys.2014.00055. PMID: 24782723
2. Penhune VB (2013). Neural encoding of movement sequences in the human brain. *Trends in Cognitive Neurosciences (Spotlight)*, **17**(10):487-489. PMID: 23973185

#### **Book Chapters:**

1. Zatorre, RJ and Penhune, VB (in press). *Music: Prediction, Production, Perception, Plasticity and Pleasure* in The Cognitive Neurosciences VI from MIT Press, Edited by David Poeppel, George R. Mangun and Michael S. Gazzaniga.
2. Penhune VB (2019). Music training and brain structure: The causes and consequences of training. *The Oxford Handbook of Music and the Brain*. Michael Thaut and Donald Hodges, editors. DOI: 10.1093/oxfordhb/9780198804123.013.17
3. **Brown RM**, Zatorre RJ and Penhune VB (2015). Expert music performance: cognitive, neural, and developmental bases. In Eckart Altenmüller, Stanley Finger, François Boller, editors: *Music*,

### Papers under review:

1. **Ireland K, Parker A, Iyer T** and Penhune, VB (in submission). Contributions of age of start, cognitive abilities and practice to musical task performance in childhood. *PLoS One*.
2. **Giacosa C**, Karpati F, Foster NEV, Hyde KL and Penhune VB (in submission). The descending motor tracts are different in dancers and musicians. *Brain Structure and Function*

### Conference presentations:

- 1) Rousseau P, Vaquero L, Klein D and Penhune VB (2018). The Striatum is Shaped by Bilingual Experience and Musical Training. Society for the Neurobiology of Language, Quebec, QC.
- 2) **Ireland K, Parker A, Salendres G, Iyer T**, Foster N, Penhune V (2017) Age-equivalent scores for melody discrimination and rhythm synchronization tasks in children aged 7-13. *Neurosciences and Music VI*, Boston, MA.
- 3) **Iyer T, Ireland K, Parker A, Salendres G**, Penhune V (2017). Is there a sensitive period for rhythm synchronization in children? (2017). *Neurosciences and Music VI*, Boston, MA.
- 4) **Rousseau P.N., Vaquero L, Gunther B, Vozian D**, Klein D, Penhune V (2017). The effect of early musical training on foreign language perception and production. *Neurosciences and Music VI*, Boston, MA.
- 5) **Shenker J, Agapiadis A**, Zatorre R, Penhune V (2017). The effects of musical experience and age of start on cerebellar development. *Neurosciences and Music VI*, Boston, MA.
- 6) **Wollman I, Segado M**, Penhune V, Zatorre RJ (2017). Brain plasticity and individual differences in cello learning. *Neurosciences and Music VI*, Boston, MA.
- 7) **Bodak R**, Stewart L, Stephan M, Witek M, Penhune V, Vuust P (2017). Can listening to sounds train motor skills? A between-subjects study. *Neurosciences and Music VI*, Boston, MA.
- 8) **Giacosa C**, Karpati FJ, Foster NEV, Penhune VB, Hyde KL (2017). Different white matter tracts in dancers and musicians. *Neurosciences and Music VI*, Boston, MA.
- 9) **Gunther B., Vaquero L., Rousseau P-N**, Penhune V. (2017). Sensitive periods for brain organization: a study of bidirectional effects of early music and language training. *Neurosciences and Music VI*, Boston, MA.
- 10) Karpati F, **Giacosa C**, Foster N, Penhune V, Hyde K (2017). The dorsolateral prefrontal cortex is structurally decoupled in dancers. *Neurosciences and Music VI*, Boston, MA.
- 11) Vaquero L, Ramos-Escobar N, Francois C, Penhune V, Rodriguez-Fornells A (2017). White-matter structural connectivity predicts fast music learning in nonmusicians. *Neurosciences and Music VI*, Boston, MA.
- 12) **Matthews T**, Witek M, Heggli O, Penhune V, Vuust P (2017). Interactions between rhythm, harmony and musical training on the sensation of groove: an online study. *Neurosciences and Music VI*, Boston, MA.
- 13) Witek M, **Matthews T**, Lund T, Kringelbach M, Penhune V, Vuust P (2017). Interaction of rhythmic and harmonic complexity in groove: effects on reward and motor areas. *Neurosciences and Music VI*, Boston, MA.

- 14) **Lega C, Stephan M**, Zatorre RJ, and Penhune VB (2016). Investigating the role of the dPMC in the formation of auditory-motor associations: a TMS study. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 15) **Stephan M, Lega C, and Penhune VB** (2016). Investigating corticomotor excitability during melody listening: a TMS study. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 16) **Wollman I, Segado M**, Penhune VB, and Zatorre RJ (2016). Sensory-motor integration and music imagery in expert cellists. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 17) **Vacquero L, Rousseau PN, Voznian D**, Klein D and Penhune VB (2016). The effects of early musical training on brain organization and foreign phoneme perception. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 18) **Matthews T, Thibodeau J** and Penhune VB (2016). Basal ganglia activity is modulated by tapping and rhythm complexity during a beat maintenance task. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 19) **Brown RM**, and Penhune VB (2016). Time-course of auditory and motor learning for skilled and novice performers. *Organization for Human Brain Mapping meeting*, Geneva, Switzerland.
- 20) **Matthews T** and Penhune VB (2015). The role of the basal ganglia in beat processing. *Rhythm Production and Perception Workshop*, Amsterdam, Netherlands.
- 21) **Villeneuve M**, Lamontagne A and Penhune VB (2014). Playing piano to enhance manual dexterity and upper extremity function after stroke. *Neurosciences and Music V*, Dijon, France.
- 22) **Ireland KDK, Landry-Roy C, DiCesare A, Pearson HS** and Penhune VB (2014). Sensitive periods for musical training in children: contributions of age of onset and cognitive abilities. *Neurosciences and Music V*, Dijon, France.
- 23) **Segado M, Hollinger A**, Penhune VB and Zatorre RJ (2014). Neural substrates for cello and vocal performance. *Neurosciences and Music V*, Dijon, France.
- 24) Penhune VB, **Matthews T, Anderson KA, O'Toole L and Gunther B** (2014). Comparing rhythm abilities of drummers, singers, pianists and string players (2014). *Neurosciences and Music V*, Dijon, France.
- 25) **Matthews T, O'Toole L, Gunther B** and Penhune VB (2014). The importance of movement in finding and maintaining the musical beat. *Neurosciences and Music V*, Dijon, France.
- 26) Karpati F, **Giacosa C**, Foster NEV, Penhune VB and Hyde KL (2014). The specificity of dance versus music training on gray matter structure. *Neurosciences and Music V*, Dijon, France.
- 27) **Padrão G**, de Diego-Balaguer R, Marco-Pallares J, Penhune VB and Rodriguez-Fornells A (2014). Adaptive changes in error monitoring and attentional control during rhythm learning. *Neurosciences and Music V*, Dijon, France.
- 28) **Giacosa C**, Karpati F, Penhune VB, Foster NEV and Hyde KL (2014). White-matter differences in dancers and musicians. *Neurosciences and Music V*, Dijon, France.
- 29) **Bailey JA**, Zatorre RJ and Penhune VB (2013). Differences in grey matter between early- and late-trained musicians assessed using a multimodal approach. *Society for Music Perception and Cognition*, Toronto, Canada.
- 30) **Segado M, Hollinger A**, Zatorre RJ and Penhune VB (2013). Auditory-motor integration in cello players. *Progress in Motor Control IX*, Montreal, Canada
- 31) **Villeneuve M**, Penhune V, Lamontagne A. (2013) Coordination of finger movements improves after piano training sessions in chronic stroke, *Progress in Motor Control IX*, Montreal, Canada, July 13-16, 2013.

- 32) **Villeneuve M**, Penhune V, Lamontagne A. (2013) Music supported therapy to improve upper extremity function after stroke: a preliminary study, Canadian Physiotherapy Association 2013 National Congress, Montreal, Canada, May 24, 2013.
- 33) **Villeneuve M**, Penhune V, Lamontagne A. (2013) Music supported therapy to improve upper extremity function after stroke: a preliminary study, Journée Scientifique du REPAR 2013, Quebec City, Canada, May 17, 2013.
- 34) **Baer LH**, Li KZH and Penhune VB (2013). The relationship between age of onset of musical training and finger tapping performance. *Progress in Motor Control*, Montreal, Quebec.
- 35) **Giacosa C**, Karpati F, Penhune VB, Foster NEV and Hyde KL (2013). White-matter structural differences in professional dancers. *Progress in Motor Control*, Montreal, Quebec.
- 36) Karpati F, **Giacosa C**, Penhune VB, Foster NEV and Hyde KL (2013). Grey-matter structural differences in professional dancers. *Progress in Motor Control*, Montreal, Quebec.
- 37) **Giacosa C**, Karpati F, Penhune VB, Foster NEV and Hyde KL (2013). Dance and the brain: white-matter structural differences in professional dancers. *Organization for Human Brain Mapping meeting*, Seattle, Washington.
- 38) Karpati F, **Giacosa C**, Penhune VB, Foster NEV and Hyde KL (2013). Dance and the brain: grey-matter structural differences in professional dancers. *Organization for Human Brain Mapping meeting*, Seattle, Washington.
- 39) **Steele CJ**, **Hollinger A**, **Thibodeau JLN** and Penhune VB (2013). Multiple Components of Motor Sequence Learning. *Organization for Human Brain Mapping meeting*, Seattle, Washington.
- 40) **Bailey JA**, Zatorre RJ and Penhune VB (2012). Characterizing grey-matter differences between early- and late-trained musicians. *Society for Cognitive Neuroscience meeting*, San Francisco, CA
- 41) **Brown R**, **Chen JL**, **Hollinger A**, Penhune VB, Palmer C and Zatorre RJ (2011). Neurological and behavioral basis for auditory-motor transformations in music performance. *International Conference on Music Perception and Cognition*, Seattle, Washington
- 42) **Baer LH**, **Hamel-Doyon M-O**, Gralnick T, Li K and Penhune VB (2011). The role of musical experience in circle drawing and finger tapping. *Meeting of the Society for the Neural Control of Movement*, Cleveland, OH.
- 43) **Christopher J. Steele**, **Jennifer A. Bailey**, Pike B, Zatorre R and Penhune VB (2011). Structural Correlates of Sensorimotor Synchronisation: Evidence from Musicians. *Organization for Human Brain Mapping meeting*, Quebec, Canada.
- 44) **Jennifer A. Bailey**, Christopher J. Steele, Krista L. Hyde, Robert J. Zatorre and Virginia B. Penhune (2011). A multimodal approach: Grey matter differences in early and late-trained musicians. *Organization for Human Brain Mapping meeting*, Quebec, Canada.
- 45) **Bailey JA**, **Spilka M**, **Best E** and Penhune VB (2011). Auditory synchronization and cognitive abilities in early- and late-trained musicians. *Neurosciences and Music IV*, Edinburgh, Scotland
- 46) **Christopher J. Steele**, Jan Scholz, Heidi Johansen-Berg, Virginia B. Penhune (2010). Structural Correlates of Sequence Skill Performance: Evidence from DTI and VBM. *Organization for Human Brain Mapping meeting*, Barcelona, Spain.
- 47) **Jennifer A. Bailey**, **Christopher J. Steele**, Robert J. Zatorre and Virginia B. Penhune (2010). White matter differences in early and late-trained musicians: Evidence for a sensitive period. *Organization for Human Brain Mapping meeting*, Barcelona, Spain.
- 48) **Krista L. Hyde**, **Jennifer A. Bailey**, Robert J. Zatorre and Virginia B. Penhune (2010). Gray and white matter concentration differences between early and late-trained musicians. *Organization for*

*Human Brain Mapping meeting*, Barcelona, Spain.

49) **Christopher J. Steele**, Jan Scholz, Heidi Johansen-Berg, Virginia B Penhune (2010). Structural Correlates of Sensorimotor Synchronisation on a Sequence Learning Task. *Society for Cognitive Neuroscience meeting*, Montreal, Canada.

50) **Michael Spilka, Christopher J. Steele** and Virginia B. Penhune (2010). Musician see, musician do: Musical experience influences gesture imitation. *Society for Cognitive Neuroscience meeting*, Montreal, Canada.

51) **Jennifer A. Bailey, Amanda Daly**, Virginia Penhune, Caroline Palmer and Robert Zatorre (2010). Sensorimotor and sensory discrimination abilities among early and late-trained musicians. *Society for Cognitive Neuroscience meeting*, Montreal, Canada.

52) **Rachel Brown, Avrum Hollinger**, Virginia Penhune (2010). Behavioral and neural basis for auditory motor interactions in music performance. *Society for Cognitive Neuroscience meeting*, Montreal, Canada.

53) **Korotkevitch Y, Steele CJ** and Penhune VB (2009). Learning of multiple motor sequences: The effects of repetition and interference. *Progress in Motor Control VII*, Marseilles, France.

54) **Baer L, Shepard, E, Tang WY, Endo A**, Li KZH and Penhune VB (2009). The relative contributions of tactile and proprioceptive feedback in a sensorimotor synchronization task. *Progress in Motor Control VII*, Marseilles, France.

55) **Trewartha KM**, Penhune VB and Li KZH (2009). Equated reaction time, but age-related changes in kinematic signatures of key-presses in a multi-finger sequence task. *Progress in Motor Control VII*, Marseilles, France.

56) **Steele CJ** and Penhune VB (2009). Functional networks for motor sequence learning. *Organization for Human Brain Mapping*, San Francisco, CA.

57) **Kung SJ**, Chen JL, Zatorre RJ and Penhune VB (2009). Musical beat-finding and tapping involves the prefrontal cortex in working memory. *Organization for Human Brain Mapping*, San Francisco, CA.

58) **Steele CJ** and Penhune VB (2008). Neural correlates of human motor sequence learning. *Organization for Human Brain Mapping*, Melbourne, Australia

59) **Daly A, Bailey JA** and Penhune VB (2008). Rhythm synchronization performance and auditory working memory in early and late-trained musicians. *Neuroscience and Music III meeting*, Montreal, Canada

60) **Kung SJ, Chen JL**, Penhune VB and Zatorre RJ (2008). Does tapping performance reflect subjective feelings of tapping to the beat? *Neuroscience and Music III meeting*, Montreal, Canada

61) **Abbud GAC**, DeMont R, Li KZH, **Fraser SA**, Penhune VB, Hendry M and **Bailey JA** (2008). An EMG analysis of attentional demands of the gait cycle according to time of an auditory stimulus. *Society for Gait and Mental Function*, Amsterdam, NL.

62) **Baer L**, Endo A, Huberdeau J, Balasubramaniam R and Penhune VB (2008). Tapping surface and movement symmetry in a sensorimotor synchronization task. *Society for the Neural Control of Movement*, Naples, FL.

63) **Fraser SA**, Li, KZH, Penhune VB, Ward M and Fontil, L (2008). Dual-tasking with fine motor and semantic tasks. *Society for Cognitive Aging*, Atlanta, GA.

64) **Trewartha KM, Endo A**, Li KZH and Penhune VB (2008). Pre-potent motor sequences: Aging, executive control and movement kinematics. *Society for Cognitive Aging*, Atlanta, GA.

65) Li KZH, Leroux A, Bherer L, McKinley P, Penhune VB, & DeMont R (2008) Training divided

attention to improve dual-task balance in healthy older adults. *Society for Gait and Mental Function*, Amsterdam, NL.

- 66) **Richard M, Bailey JA** and Penhune VB (2007). The effect of metricality on auditory-motor synchronization in early and late-trained musicians. *Society for Music Perception and Cognition*.
- 67) **Fraser, S. A., Li, K. Z. H., Penhune, V. B., DeMont, R. G., Hendry, M. C., Abbud, G., & Hamati, K.** (2007) Age differences in walking and judging during different phases of gait. *International Society for Posture and Gait Research*.
- 68) **Hollinger A,** Penhune VB, Zatorre RJ, **Steele CS** and Wanderly M (2007). fMRI compatible electronic controllers (2007), *International Conference on New Interfaces for Musical Expression*.
- 69) **Steele C, Baily JA** and Penhune VB (2007). Functional correlates of motor sequence learning and consolidation. *Organization for Human Brain Mapping*, Chicago, USA.
- 70) **Longo dos Santos C, Dellerba M** and Penhune VB (2007). The neural basis of abstract rule learning. *Organization for Human Brain Mapping*, Chicago, USA.
- 71) **Savion-Lemieux T, Bailey JA,** Penhune VB (2007). Developmental Changes in Motor Skill Learning. *Society for Cognitive Neuroscience*.
- 72) **Fraser SA, Bailey JA, Savion-Lemieux T,** Doramajian C, Li K and Penhune VB (2007). Do younger and older adults differ in their implicit learning and consolidation of a fine motor sequence ? *Society for Cognitive Neuroscience*.
- 73) **Longo dos Santos C** and Penhune VB (2007). The effects of secondary rules on the process of consolidation of abstract rules. *Society for Cognitive Neuroscience*.
- 74) **Trewartha K, Endo A,** Li K and Penhune VB (2007). Age-related differences in kinematic signatures of inhibitory responses in a multi-finger movement task. *Neural Control of Movement*, Seville, Spain.
- 75) Penhune VB and **Savion-Lemieux T** (2007). What you learn and how you learn it : The effect of practice pattern on learning, recall and transfer of a visuo-motor sequence. *Neural Control of Movement*, Seville, Spain.
- 76) C Warriar and VB Penhune (2006). Anatomical asymmetries in Heschl's Gyrus relate to lateralization of temporal auditory processing. *Organization for Human Brain Mapping*, Florence Italy.
- 77) **H Ozturk,** VB Penhune, F Lepore and RJ Zatorre (2006). Morphological measurements in Heschl's Gyrus and Corpus Callosum in the blind. *Organization for Human Brain Mapping*, Florence Italy.
- 78) **Clarisse Longo dos Santos,** Virginia Penhune and **Maria Dellerba** (2006). Competition of Primary and Secondary Rules in a Biconditional Grammar Learning Task. *Society for Cognitive Neuroscience Annual Meeting*, San Francisco, CA.
- 79) Virginia Penhune, **Clarisse Longo dos Santos** and **Nicole Robitaille** (2006). Consolidation of Implicit and Explicit Learning in a Biconditional Grammar Task. *Society for Cognitive Neuroscience Annual Meeting*, San Francisco, CA.
- 80) **Tal Savion-Lemieux,** Virginia B. Penhune, and **Stephanie Alexander** (2006). The Effect of Practice Pattern on the Acquisition, Short-Term Retention, and Transfer of a Multi-Finger Visual-Motor Sequence Task. *Society for Cognitive Neuroscience Annual Meeting*, San Francisco, CA.
- 81) **Kevin Trewartha,** Karen Z. H. Li, and Virginia Penhune(2006). Age Differences in error correction and learning in a multi-finger movement task. *Society for Cognitive Aging*, Atlanta, GA.

- 82) **Sarah A. Fraser**, Karen Z. H. Li, Virginia B. Penhune, Nathalie Fazzari (2006). Age differences in the consolidation of a fine-motor skill (2006). *Society for Cognitive Aging*, Atlanta, GA.
- 83) **Sarah A Fraser**, Karen ZH Li, Virginia B Penhune and Richard G DeMont, (2005). Cognitive facilitation in dual task performance. *Behavioral, Brain and Cognitive Sciences meeting*.
- 84) Richard G DeMont, **Sarah A Fraser**, Karen ZH Li, Virginia B Penhune (2005). The effect of cognitive distraction on muscle activity during dynamic tasks. *Canadian Athletic Therapists Association*, Calgary.
- 85) **Chen JL**, Penhune VB and Zatorre RJ (2005). Tapping in synchrony to auditory rhythms: effect of temporal structure on behaviour and neural activity. *Organization for Human Brain Mapping*.
- 86) **Chen JL**, Penhune VB and Zatorre RJ (2005). Tapping in synchrony to auditory rhythms: effect of temporal structure on behaviour and neural activity. *The Neurosciences and Music II: From Perception to Performance, Annals of the New York Academy of Sciences*. 1060 p.400.
- 87) Virginia Penhune, **Donald Watanabe** and **Tal Savion-Lemieux** (2005). The Effect of Early Musical Training on Adult Motor Performance: Evidence for a Sensitive Period in Motor Learning. *The Neurosciences and Music II: From Perception to Performance, Annals of the New York Academy of Sciences*. 1060, p.265-8.
- 88) **Donald Watanabe**, Virginia Penhune and **Tal Savion-Lemieux** (2005). The Effect of Early Musical Training on Adult Motor Performance: Evidence for a Sensitive Period in Motor Learning. *Society for the Neural Control of Movement*. Key Biscayne, Florida.
- 89) **Watanabe D**, Penhune VB and **Savion-Lemieux T** (2005). Effect of the start of musical training on the acquisition and retention of a temporal motor sequence task. *Cognitive Neuroscience Annual Meeting*. New York, New York.
- 90) **Longo DosSantos C** and Penhune VB (2005). Learning of secondary rules in a biconditional grammar. *Cognitive Neuroscience Annual Meeting*. New York, New York.
- 91) **Chen JL**, Penhune VB and Zatorre RJ (2004). The role of auditory and premotor cortex in sensorimotor integration. *Soc Neurosci Abst*, **30** : 321.8.
- 92) Krista L. Hyde<sup>1</sup>, Isabelle Peretz<sup>1</sup>, Robert J. Zatorre<sup>2</sup>, Virginia Penhune<sup>3</sup> (2004) . Brain morphometry of congenital amusic individuals. *Cognitive Neuroscience Society Abs*,.
- 93) **Fraser S**. Li K, Penhune V and Demont R (2004). Age differences in sensorimotor and cognitive interactions. ACFAS.
- 94) Penhune, VB and Doyon, J (2003). Dynamic cortical and subcortical networks involved in early learning and consolidation of timed motor sequences. *Cognitive Neuroscience Society Abs*, 134.
- 95) **Savion-Lemieux T** and Penhune VB (2003). Effects of practice and delay on motor skill retention : A behavioral analysis. *Cognitive Neuroscience Society Abs*, 134.
- 96) **Dos Santos, C** and Penhune VB (2003). Implicit and explicit learning of abstract rules. *Cognitive Neuroscience Society Abs*, 133.
- 97) **Chen, J**, Penhune, VB and Zatorre, RJ (2002). Motor synchronization to musical auditory stimuli: How and where? *Soc Neurosci Abst*, **28** : 273.3.
- 98) Doyon J, Amsel R, Bouras R, Monchi O, Penhune VB and Petrides MP (2002). Knitting functional patterns: Neural correlates of early leaning vs. expert performance of a motor skill. *Soc Neurosci Abst*, **28** : 20.5.
- 99) **Dorsaint-Pierre R**, Zatorre RJ, Penhune VB (2001). Morphometric asymmetries of the Planum Temporale and Heschl's gyrus: Relationship to language lateralization. *Soc Neurosci Abst*, **27**: 822.10.

- 100) Penhune VB, **Desouza K** and Doyon J (2000). Cerebellar involvement in human temporal motor sequence learning. *Soc Neuroscience Abstracts*, **26**. 691.7.
- 101) Zatorre RJ and Penhune VB. Spatial localization after excision of human auditory cortex (1999). *Soc Neuroscience Abstracts*, **25**: 392.
- 102) **Cismaru R**, Penhune VB, Petit L, **Dorsaint-Pierre R**, Klein D and Zatorre RJ. Auditory cortex morphometry in the congenitally deaf measured using MRI (1999). *Soc Neuroscience Abstracts*, **25**: 1421.
- 103) Penhune VB, **Desouza K**, **Milewski A** and Doyon J. Learning and retention of temporal motor sequences in humans (1999). *Soc Neuroscience Abstracts*, **25**: 1898.
- 104) Penhune VB, Petrides M, Lavoie K, Collins DL, Evans AC and Doyon, J. Volumetric Measurements of the Human Cerebellum from MRI Scans (1999). *Neuroimage*, **9**(6, Part 2): S226.
- 105) Doyon J, Lavoie K, Penhune VB, Collins DL, Schmahmann JD, Evans AC and Petrides, M (1999).
- 106) 3D Probabilistic Mapping of the Human Cerebellum from MRI Scans in Stereotaxic Space. *Neuroimage*, **9**(6, Part 2): S264.
- 107) Penhune VB, Zatorre RJ, Feindel W, Collins DL and Evans AC (1997). Effect of auditory cortex excision on perception and reproduction of temporal sequences. *Soc Neuroscience Abstracts*, **23**: 1580.
- 108) Penhune VB, Zatorre RJ and Evans AC (1997). Neural mechanisms underlying encoding and reproduction of timed motor sequences. *Brain and Cognition*, **35**:3.
- 109) Penhune VB, Zatorre RJ and Evans AC (1996). Cerebellar contributions to motor reproduction of temporal sequences. *Soc Neuroscience Abstracts*, **22**: 7.
- 110) Penhune VB, Zatorre RJ and Evans AC (1996). Neural systems underlying temporal perception and timed motor response. Proceedings of the 2nd International Conference on Functional Mapping of the Human Brain, *Neuroimage*, **3**(3, part2): S314.
- 111) Penhune VB, Zatorre RJ, MacDonald D and Evans AE (1994). Three-dimensional mapping of human auditory cortex in stereotaxic space from MRI data. *Soc Neuroscience Abstracts*, **20**: 977.

#### **Invited talks:**

- *What we learn and when we learn it: sensitive periods for musical training and possible transfer to cognitive skill.* Workshop on Cognitive Training and Transfer, University College London and the Jacobs Foundation. May, 2018
- *Music and auditory-motor integration in the human brain*, Institute of Cognitive Neuroscience, University College London. May, 2018
- *The role of practice in auditory-motor learning.* Panel: The role of practice in auditory-motor learning: from sensorimotor adaptation to mastering de-novo skills. Society for the Neural Control of Movement, Santa Fe, NM. May, 2018.
- *Brain networks for auditory-motor integration in the context of music training and expertise.* Symposium: Individual or group patterns of human sensorimotor control and learning. Society for Neuroscience, Washington, DC. Nov, 2018
- *Brain mechanisms for auditory-motor integration in the context of music and dance*, Consortium d'imagerie en neurosciences et santé mentale de Québec, Université Laval, April, 2017
- *Music and auditory-motor integration in the human brain*, Montreal Neurological Institute Circuits and Cognition. April, 2017

- *Music and auditory-motor integration in the human brain*, Centre de recherche en neuropsychologie et cognition, Université de Montréal. March, 2017.
- *Musicians Born or Made?* Aspen Music Festival & Aspen Science Centre lecture series. August, 2016
- *What we learn and when we learn it: Behavioral and brain effects of early musical training.* International Symposium on Music Performance, Tubingen, Germany. April, 2016
- *Music and the role of premotor cortex in auditory-motor integration.* Douglas Hospital Research Centre, April, 2016
- *The effects of early musical training.* Centre for Research in Brain, Language and Music Workshop: *Musicians Born or Made?* April, 2015
- *What we learn and when we learn it: Behavioral and brain effects of early musical training.* Department of Psychology, Queens University. October, 2014
- *Sensitive periods for music perception and performance.* Symposium on Music and the Brain, World Congress on Brain, Behavior and Emotions, April, 2014, Montreal, Canada
- *Cerebellar engagement in rhythm and timing.* International Conference on Timing and Time Perception, March 2014, Corfu, Greece
- *Musical Rhythm and auditory-motor integration in the brain.* University of Helsinki, Department of Psychology, February 2014
- *Action, timing and auditory-motor integration: What do we learn from music processing and musicians' brains?* Department of Psychology, University Claude Bernard, Lyon 1, November 2013
- *Music, Poetry and the Brain: Symposium on neuroscience and the arts*, Universitat Nova de Lisboa, Portugal, May, 2013
- Centre for Research in Brain, Language and Music, Organizer and moderator for a Workshop on Sensitive periods in music and language acquisition, May, 2013
- Centre for Research in Brain, Language and Music, Workshop on Rhythm Processing, November, 2012
- Department of Music, University of Ottawa, November, 2012
- Department of Psychology, Università di Brindisi, Italy, May, 2012
- Texas Tech University, El Paso Neurosciences Institute, Feb 2012
- Helsinki University, Dept. of Psychology, Nov 2011
- European Society for Cognitive Psychology, Symposium on Timing and Language, Oct 2011
- The Neurosciences and Music – IV Conference, Symposium on Memory and Learning in Musical Performance, Edinburgh, June 2011
- Functional Brain Imaging Unit, Oxford University, June 2011
- Department of Psychology, University of Barcelona, May 2011
- Department of Psychology, University of Majorca, April 2011
- Symposium organizer, “Musical Training: It’s impact on auditory, motor and cognitive skills,” for the International Conference on Multidisciplinary Research in Music Pedagogy, May 2010
- Sensorimotor Synchronization Lab, Birmingham University, UK, May, 2010
- BRAMS Scientific Day, Montreal, QC, 2010
- Functional Brain Imaging Unit, Oxford University, October 2009
- Royal Holloway University, Department of Psychology, October 2009
- TENNET, Symposium on Music as a Model for Cognition, June 2009

- Brain Tuning Workshop, University of Helsinki, 2009
- Institute for Music and Mind Workshop, McMaster University, 2008
- Department of Neurology, Lausanne, Switzerland, 2007
- Concordia Centre for the Study of Behavioural Neuroscience Workshop : Dopaminergic modulation of motor and motivational functions of the striatum, March 2007.
- Psychology, Université Charles de Gaulle -Lille 3, December 2006
- Workshop on Motion Capture for Musical Performance, McGill University, October 2006
- Symposium speaker at the meeting of the Association canadienne-française pour l'avancement des sciences, "L'interdisciplinarité dans les sciences et technologies de la musique", May 2006
- Department of Physiology, University of Montreal, January, 2006
- Karolinska Institute, Stockholm, Sweden. Department of Women & Child Health, 2005
- School of Human Kinetics, University of Ottawa, September, 2005
- Department of Psychology, Cognitive Science, McGill University, October, 2005
- School of Communications Sciences and Disorders, McGill University, October, 2005
- Nobel Symposium. Neural control of skilled hand movements. Stockholm Sweden, June 2003.
- University of Wisconsin, Madison. Department colloquium in Neuroscience, May 2002.
- International Society for Behavioral Neuroscience. Cannon Beach, Oregon, May 2000.
- International Society for Behavioral Neuroscience. Maessaria, Greece. June, 1999.
- International Society for Behavioral Neuroscience. St. Valery sur Somme, France. June, 1995.

#### **Public Lectures:**

- What we learn and when we learn it: behavioural and brain effects of early musical training. Royal Conservatory of Music. As part of a public symposium entitled "Music is a Mind Builder." April, 2017
- What we learn and when we learn it: Sensitive periods for musical training. McGill Mini Science series, March 2014
- Coeur des Sciences, UQAM. Lecture as part of « Science, rythmes et percussion » combining scientific lectures on musical rhythm with percussion performances. June, 2013
- Museum of Science "CosmoCaixa" of Barcelona. "Fascinatin' Rhythm" Lecture as part of a series "Music and Its Impact on Mind and Body." May, 2013
- "Musical rhythm and training" lecture as part of the I Medici de McGill Orchestra lecture series "Biology of Music – Music and Medicine" April, 2013

#### **Media coverage:**

Montreal Gazette; Le Devoir; Times of London; New Scientist; "Quirks and Quarks," "Le Code Chastenay" "Monsieur Homme"

#### **Theses completed:**

Yana Korotkevich (PhD), 2015, Psychology, Concordia University, co-supervised with Dr. K.Li, "Age-related contributions of executive control to motor performance"

Lawrence Baer (PhD), 2014, Psychology, Concordia University, "Timing, kinematics and the cerebellum: Tapping into differences between musicians and non-musicians"

Avrum Hollinger (PhD), 2014, Music Technology, McGill University, co-supervised with Dr. Marcello Wanderly "Development of MRI compatible musical instruments"

Jennifer Anne Bailey (PhD), 2013, Psychology, Concordia University, “Evidence for a sensitive period for musical training”  
Christopher Steele (PhD), 2012, Psychology, Concordia University, “The relationship between brain structure, motor performance, and early musical training”  
Kevin Trewartha (PhD), 2011, Psychology, Concordia University, co-supervised with Dr. K.Li, “Conflict monitoring and motor control during pre-potent response suppression in aging: A behavioral, kinematic, and electrophysiological investigation”  
Sarah Fraser (PhD), 2010, Psychology, Concordia University, co-supervised with Dr. K.Li, “Fine motor control and aging: A role for executive functions in sequential tapping performance?”  
Clarisse Longo dos Santos (PhD), 2010, Psychology, Concordia University, “Reading Between the Letters: Neural Basis of Abstract Rule Learning in a Biconditional Grammar”  
Tal Savion-Lemieux (PhD), 2010, Psychology, Concordia University “The Contributions of Practice Pattern, Musical Training, and Development to Motor Sequence Learning”  
Joyce Chen (PhD), 2008, Neurology and Neurosurgery, McGill University, co-supervised with Dr. R. Zatorre, “The neural basis for auditory-motor interactions during musical rhythm processing”

### **Theses in progress:**

Chiara Giacosa (PhD), Psychology, Concordia University, co supervised with Dr. K. Hyde (McGill).  
“Structural brain correlates of professional dance training”  
Kierla Ireland (PhD), Psychology, Concordia University « Effects of early musical training in school-age children »  
Tomas Mathews (PhD), Psychology, Concordia University « Basal ganglia and premotor cortex contributions to musical rhythm processing »  
Melanie Segado (PhD), Neuroscience, McGill University, co-supervised with Dr. R. Zatorre, “Neural basis of auditory-motor adaptation in cello players”  
Brian Gunther (PhD) “Impact of musical training on non-native language perception and production”  
Jake Shenker (PhD) “Cerebellar volumes and musical training”

### **Post-doctoral fellows**

Rachel Brown (2013-15)  
Marianne Stephan (2013-15)  
Fiona Manning (2016-17)  
Roberta Bianco (2016-17)  
Lucia Vaquero (2017-present). Received FQRNT Merit Scholarship for Foreign Students (PBEEE).

### **Thesis examination committees:**

Benjamin Elgie, Integrated Program in Neuroscience, McGill University, 2018 – Committee member  
Pauline Tranchant, Psychology, Udm, 2018 – External Examiner  
Jonathan Berken, Integrated Program in Neuroscience, McGill University, 2015 – Committee member  
Kyoko Konishi, Integrated Program in Neuroscience, McGill University, 2015 – Committee member  
William Aubé, Psychology, Université de Montréal, 2014 – External Examiner  
Marc-Andre Bacon, Psychology, MA, Concordia, 2014 – Committee member  
Vesa Putkinen, Psychology, Helsinki University, 2014 – External Examiner  
Tia Ouiment, Education, McGill University, 2014 – External Examiner  
Floris Van Vugt, Psychology, Universite Claude Bernard, Lyon , 2013 – External Examiner

Jean-Sébastien Provost, Psychology, Université de Montréal, 2013 – External Examiner  
 Daniel Lametti (PhD), Psychology, McGill University, 2012  
 Mervin Blair (PhD), Psychology, Concordia University, 2012  
 Pierre-Luc Tremblay (PhD), Psychology, University of Quebec, Montreal, 2010 – External Examiner  
 Virginia Chow (PhD), Psychology, Concordia University, 2009  
 Marco Sinai (PhD), Psychology, Concordia University, 2009  
 Carla Arasanz (MA), Exercise Science, Concordia University, 2008  
 Raby Bouras (PhD), Psychology, University of Montreal, 2008 – External Examiner  
 Sean Hutchins (PhD), Psychology, McGill University, 2008  
 Marion Noulhiane (PhD), Psychology, Université Charles de Gaulle-Lille 3, 2006 – External Examiner  
 Miriam Beauchamp (PhD), Psychology, University of Montreal, 2006 – External Examiner  
 Sarah Bengtsson (PhD), Neuroscience, Karolinska Institute, 2005 – External Examiner  
 Daniel Gagnon, Psychology (PhD), McGill University, 2005  
 Raquel Dorsaint-Pierre (PhD), Psychology, McGill, 2005  
 Vivian Akerib (MA), Psychology, Concordia University 2004  
 David Gold (PhD), Psychology, University of Montreal 2003

### **Academic Service**

2013 to present          Department Chair

#### *Internal committee membership:*

2016-present    Steering Committee of Senate  
 2015- present    University Senate  
 2015 -16          Faculty Council Steering Committee  
 2015 -present    PERFORM Centre Executive Committee  
 2012-13          Faculty Council Steering Committee  
 2011-12          Chair, Department Appraisal Committee  
                       Chair, Department Personnel Committee  
                       Chair's Advisory Committee  
 2010-11          Department Personnel Committee  
                       Chair, Departmental Ethics Committee  
 2009-10          Department Personnel Committee  
                       Chair, Departmental Ethics Committee  
 2008-09          Chair, Department Personnel Committee  
                       Chair, Departmental Ethics Committee  
 2007-08          Chair, Clinical Hiring Committee  
                       Chair, Departmental Ethics Committee  
                       Department Personnel Committee  
                       Chair's Advisory Committee  
 2006-07          Sabbatical  
 2005-06          Member, Cognitive Science Hiring Committee  
                       University Human Research Ethics Committee  
                       Departmental Research Ethics Committee  
                       Chair's Advisory Committee  
 2004-05          Chair, Clinical Hiring Committee

University Human Research Ethics Committee  
 Departmental Research Ethics Committee  
 Chair's Advisory Committee  
 2003-04 Co-Chair, Clinical Hiring Committee  
 2002-03 Co-Chair, Clinical Hiring Committee  
 2001-02 Graduate Admission Subcommittee  
 2000-01 Graduate Admission Subcommittee

*External contributions:*

Editor:

- Frontiers in Auditory Cognitive Neuroscience
- Frontiers in Neuroscience Special Issue: “*What we learn and when we learn it: Sensitive periods in development*”

Reviewer:

|                                 |   |
|---------------------------------|---|
| Cerebral Cortex                 | Journal of Neuroscience                         |
| Current Biology                 | Nature Neuroscience                             |
| Experimental Brain Research     | NeuroImage                                      |
| Human Brain Mapping             | Journal of Cognitive Neuroscience               |
| Frontiers in Human Neuroscience | Proceedings of the National Academy of Sciences |

Reviewer for Grant Agency :

|           |   |
|-----------|---|
| 2017      | CIHR review panel <i>Behavioral Sciences C</i>                    |
| 2016      | CHIR Program grant first round reviewer                           |
| 2012      | CIHR review panel <i>Behavioral Sciences C</i>                    |
| 2012-2013 | FRSQ PhD graduate fellowship award review committee               |
| 2007-2010 | FRSQ MA graduate fellowship award review committee                |
| 2009      | CIHR review panel <i>Biological and Clinical Aspects of Aging</i> |
| 2000-2002 | FCAR Group grants – Committee member                              |

Ad Hoc reviews: CIHR, NSERC, CFI, Wellcome Trust (UK)

**Other activities:**

Scientific Committee, Neuroscience and Music V, Boston, June 2017  
 Scientific Committee, FRSQ Quebec BioImaging Network (2007-2014)  
 Scientific Committee and local organizer, Neuroscience and Music III meeting, Montreal, July 2008  
 Scientific Committee and local organizer, Society for Music Perception Cognition, Montreal, June 2007