

APCAM 2007

**6th Annual Auditory Perception, Cognition, and
Action Meeting**

Thursday November 15

Hyatt Regency Hotel

Long Beach, CA, USA

Program sponsored by

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Welcome to APCAM 2007

We are pleased to welcome you to the sixth annual Auditory Perception, Cognition, and Action Meeting (APCAM). The goal of APCAM is to bring together researchers from various theoretical perspectives to present focused research on auditory cognition, perception, and aurally guided action. APCAM is a unique meeting in its exclusive focus on the perceptual, cognitive, and behavioral aspects of audition. Many thanks to all those whose contributions have helped make APCAM such a success. Have a wonderful meeting!

Sincerely,

Devin McAuley
John Neuhoff
Peter Pfordesher
Mike Russell

Co-Chairs, APCAM 2007

APCAM 2007 Schedule

8:00	Registration	
8:20	Opening Remarks	
<i>Attention and Memory</i>		
8:30	Isolating the Effect of Familiar Distractor Sequences on Auditory Search (p. 4)	Lori A. Doan Jason P. Leboe Todd A. Mondor
8:50	Automatic Auditory Sequence Processing Causes Auditory Distraction (p. 4)	Bill Macken Fiona Phelps Dylan Jones
9:10	Effects of Pitch Repetition Priming in Short Melodies (p. 4)	Sean Hutchins Caroline Palmer
9:30	The Effect of Contextual Cueing on Repetition Deafness (p. 5)	Tamara L. Ansons Lori A. Doan Jason P. Leboe Todd A. Mondor
9:50	Break (20 min)	
<i>Object Recognition</i>		
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10:30	Understanding Chimaeric Speech (p. 5)	Philip T. Quinlan Rebecca E. Millman
10:50	A New Pitch Circularity Illusion (p. 6)	Diana Deutsch Kevin Dooley Trevor Henthorn
11:10	Hearing within Rigid Constraints: Speech Detection while Wearing a Football Helmet (p. 6)	Michael S. Gordon Jose DeAnda Charles H. Brown
11:30	Lunch	
12:00	Posters	
2:00	Keynote Address Rhythm in speech and music: parallels and differences. (p. 6) Aniruddh D. Patel (The Neurosciences Institute, San Diego, CA)	
2:45	Break (15 min)	
<i>Timing</i>		
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3:20	Effects of Ambiguous Rhythmic Stimuli on Unconstrained Dance (p. 7)	Timothy R. Brick Steven M. Boker Jennifer L. Waddell
3:40	Privileged Binding: Challenging Current Theories of Audio-Visual Integration (p. 7)	Michael Schutz Michael Kubovy
4:00	Break (20 min)	
<i>Auditory Skills</i>		
4:20	Echolocation: Blind and Sighted People in Ordinary and Anechoic Rooms (p. 8)	Bo N. Schenkman Mats E. Nilsson
4:40	Hooray for Hollywood: Psychoacoustic Lessons from the Film Industry (p. 8)	Lawrence D. Rosenblum
5:00	Closing Remarks	
5:00-6:30 Social Hour (Cash bar)		

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2	How Visible Motion Paths Influence the Perceived Duration of Percussive Sounds	James A. Armontrout Michael R. Schutz Michael Kubovy
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4	Using an Orienting Auditory Display during a Concurrent Listening Task: Most Earcons Do Not Interfere	Terri L. Bonebright Michael A. Nees
5	She Hears Seashells: Detection of Small Resonant Cavities via Ambient Sound	Ethan J. Chamberlain Lawrence D. Rosenblum Ryan L. Robart
6	The Cerebellar Subsystem for Absolute Time	Manon Grube Freya E. Cooper Patrick F. Chinnery Jessica Foxton Timothy D. Griffins
7	Attention Control in Musical Perception: Attention-Shifting as a Function of Performance Experience	Talya A. Grumberg Norman Segalowitz
8	Bimodal Integration Mechanisms for Phonemes and Emotional Expressions During Speech	Michael D. Hall Jennifer M. Roche
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10	Disruption of Short-Term Memory by Changing and Deviant Sounds: Two Forms of Auditory Distraction	Robert W. Hughes Francois Vachon Dylan M. Jones
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14	Repeating the Standard Interval Weakens Expectancy Profiles in Time-Judgment Tasks	Nathaniel S. Miller John D. McAuley
15	Estrogen Levels and Auditory Time-to-Arrival Estimates	John G. Neuhoff Amy Jo Stavnezer
16	Velocity Perception of Auditory, Visual and Audiovisual Apparent Motion	Thuan K. Ngo Thomas Z. Strybel
17	Revisiting Magnitude of Judgment of Loudness Change for Discrete and Dynamic Stimuli	Richard E. Pastore Jesse D. Flint Jeremy R. Gaston
18	Hearing Your Place: Perceiving Room Position from Reflected Sound	Ryan L. Robart Lawrence D. Rosenblum Ethan J. Chamberlain
19	Identification of Self-Walking Pace: Are You Nothing More Than a Clock?	Michael K. Russell
20	Name that (Percussive) Tune: Tone Envelope Affects Learning	Michael Schutz Jeanine Stefanucci Andrew Carberry Amber Roth
21	Effects of Spatial versus Spectral Switching in the Auditory Attentional Blink	Francois Vachon Sébastien Tremblay
22	The Influence of Rhythm Complexity on the Recognition of Images	Marc G. Wallace Todd Mondor
23	The Role of Attention in the Formation of Auditory Streams: The Effect of Competing Tasks	Minhong Yu Mowei Shen

8:30

Isolating the Effect of Familiar Distractor Sequences on Auditory Search

Lori A. Doan
Jason P. Leboe
Todd A. Mondor

University of Manitoba
University of Manitoba
University of Manitoba

Implicit memory of spatial context can guide visual attention and aid visual search, an effect referred to as contextual cueing (Chun, 2000). We used Chun & Jiang's (1998) experimental paradigm to investigate the effects of non-spatial context on auditory perception. We presented participants with sequences comprised of 23 randomized pure tones and one of two target sounds. At the end of each sequence participants were asked to indicate which of the two targets had been presented. Within each of 12 blocks of trials, participants completed 12 novel sequences and 12 sequences presented once in each block and repeated across blocks. Participants more accurately identified targets embedded in repeated sequences than they did targets embedded in novel sequences. In a subsequent experiment, we maintained the context of the repeated sequences but varied the acoustic nature of the target to examine the role of target identity in the auditory contextual cueing effect.

Email: umdoanla@cc.umanitoba.ca

8:50

Automatic Auditory Sequence Processing Causes Auditory Distraction

Bill Macken
Fiona Phelps
Dylan Jones

Cardiff University
Cardiff University
Cardiff University

The role of separating task-relevant from task-irrelevant aspects of the environment is typically assigned to the executive functioning of working memory. However, pervasive aspects of auditory distraction have been shown to be unrelated to working-memory capacity in a range of studies of individual differences. We measured individual differences in automatic and deliberate auditory sequence processing and showed that while deliberate processing was related to short-term memory performance, it did not predict the extent to which that performance was disrupted by task-irrelevant sound. Individual differences in automatic sequence processing were, however, positively related to the degree to which auditory distraction occurred. We argue that much auditory distraction, rather than being a negative function of working memory capacity, is in fact a positive function of the acuity of automatic auditory processing.

Email: macken@cardiff.ac.uk

9:10

Effects of Pitch Repetition Priming in Short Melodies

Sean Hutchins
Caroline Palmer

McGill University
McGill University

Previous experiments have documented a benefit of tone repetition in music performance (Hutchins & Palmer, in press). We examine the effects of repetition priming with timbral changes (changes to the sensory features of the tone while leaving the pitch constant) in a reaction time task. Participants are presented short melodies, the final tone of which is either a repetition of previous melodic tones or not. In addition, the final tone is either an expected tonic ending tone or a less expected non-tonic ending tone. We compare reaction times for melodies in which the final tone has a same or different timbre than previous tones. We discuss the implications of the results on sensory versus cognitive accounts of repetition priming.

Email: Sean.Hutchins@gmail.com

9:30

The Effect of Contextual Cueing on Repetition Deafness

Tamara L. Ansons
Lori A. Doan
Jason P. Leboe
Todd A. Mondor

University of Manitoba
University of Manitoba
University of Manitoba
University of Manitoba

In the visual domain, contextual cueing and repetition blindness have received a fair amount of attention from researchers. In contrast, these phenomena have received little attention from auditory researchers. A facilitative contextual cueing effect is defined as a benefit in searching for a visual target when it is embedded in a familiar configuration of distractors. Conversely, repetition blindness is defined as the impaired ability to perceive the second instance of a stimulus presented in a rapidly, serial sequence. Recent work by Doan, Leboe and Mondor (2006) demonstrated an auditory contextual cueing effect, observing superior detection of target sounds embedded within a familiar sequence of distractor sounds. Also, a study by Ansons, Leboe and Mondor (2006) demonstrated a repetition blindness effect for nonverbal auditory stimuli. The current study merges these two cognitive phenomena and examines whether the presentation of target sounds within familiar distractor sequences may reduce this repetition deafness effect.

Email: umansons@cc.umanitoba.ca

10:10

Spectral Completion of Partially Masked Sounds

Josh McDermott
Andrew Oxenham

University of Minnesota
University of Minnesota

The presence of multiple sound sources is a routine occurrence in the natural world, but poses a vast challenge to the auditory system, which must separate each source from the composite sum of source waveforms. This challenge is compounded by the frequent occurrence of masking, in which sounds of interest are partially obscured by other sufficiently loud sounds. Because masking noises are often not spectrally uniform, they have the potential to block some portions of an object's spectrum but not others, which if uncorrected could lead to severe distortions of an object's timbre. Here we report that the auditory system partially corrects for the effects of masking in such situations, using the audible, unmasked portions of an object's spectrum to fill in the inaudible portions. This spectral completion mechanism may help achieve timbre constancy, and thus object recognition, in complex auditory scenes.

Email: joshmcd@umn.edu

10:30

Understanding Chimaeric Speech

Philip T. Quinlan
Rebecca E. Millman

The University of York
The University of York

Following on from Smith, Delgutte, and Oxenham (2002), a series of experiments were carried out on the processing of chimaeric speech. Single spoken word chimaeras were generated; either the envelope contained noise and the speech in the fine detail (NoiseEnv-SpeechFineDetail) or the envelope contained speech and noise in the fine detail (SpeechEnv-NoiseFineDetail). Psychophysical experiments were carried out in which speech identification and sound localisation were measured as a function of the number of frequency bands used to process the stimuli. In general, the results replicated the findings reported Smith et al. (2002). However, in the NoiseEnv-SpeechFineDetail condition, speech identification was poor, regardless of how many processing bands were sampled. Preliminary beamforming results, from a magnetoencephalography (MEG) study with the chimaeric speech-noise stimuli are described. The utility of such techniques for exploring putative "what" and "where" pathways in the auditory system is discussed.

Email: ptq1@york.ac.uk

10:50

A New Pitch Circularity Illusion

Diana Deutsch
Kevin Dooley
Trevor Henthorn

Department of Psychology, University of California, San Diego
Department of Psychology, University of California, San Diego
Department of Psychology, University of California, San Diego

This paper describes a new algorithm for producing pitch circularity using a full harmonic series. As each scale descends, the amplitudes of the odd-numbered harmonics are reduced relative to the even-numbered ones by 3.5 dB for each semitone step. In consequence, the tone with the lowest fundamental frequency is heard as though displaced up an octave. When such scales are traversed in semitone steps, impressions of infinitely ascending or descending scales are obtained. Similar effects are obtained with glides. In an experiment employing two such scales, all possible ordered tone pairs from each scale were presented, making 132 ordered tone pairs for each scale. Sixteen subjects judged for each pair whether the second tone was higher or lower than the first. The data derived from these pairwise comparisons were subjected to Kruskal's nonmetric multidimensional scaling, and excellent circularity was obtained. Individual differences in the subjects' judgments were also explored.

Email: ddeutsch@ucsd.edu

11:10

Hearing within Rigid Constraints: Speech Detection while Wearing a Football Helmet

Michael S. Gordon
Jose DeAnda
Charles H. Brown

University of South Alabama
University of South Alabama
University of South Alabama

Hearing is a function of the acoustic signals and environmental properties that structure sound. To investigate how hearing is affected by structural properties, hearing within football helmets was studied. Several measurements were made of speech and noise signals to determine precisely how these signals interacted with the helmet as they would be conveyed to a listener. It was found that in large part the level of distortion was related to the angle of incidence for the signal relative to the listener. Behavioral studies confirmed these acoustic analyses, with the finding that while, in general, the football helmet made hearing speech more difficult, the magnitude of the decrement was a function of the angle of incidence. Results are discussed in terms of the implications for an ecological approach to hearing and the design of football helmets.

Email: mgordon@jaguar1.usouthal.edu

2:00

Keynote Address: Rhythm in speech and music: parallels and differences.

Aniruddh D. Patel

The Neurosciences Institute, San Diego, CA

Abstract: In this talk I draw a basic distinction between periodic and nonperiodic rhythms in human auditory cognition. I argue that music and speech have fundamental differences in terms of periodic rhythms, and deep connections in terms of nonperiodic rhythms. Evidence for this argument draws on diverse strands of evidence including empirical comparisons of rhythmic structure in the two domains, research on rhythm perception, and data from cognitive neuroscience.

Email: apatel@nsi.edu

3:00

Neural correlates of individual differences in beat perception

J. Devin McAuley
Jessica Grahn

Bowling Green State University
Cambridge University

Functional magnetic resonance imaging was used to characterize brain activity of individuals who varied in their tendency to hear an implied beat. Participants completed an ambiguous tempo perception task, in which they judged whether tone sequences were 'speeding up' or 'slowing down'. A signal detection model was used to fit response proportions in order to quantify the extent to which participants' tempo judgments were based on the explicit temporal intervals comprising each sequence or on an implied beat. Based on this analysis, two groups were identified: 'interval' listeners and 'beat' listeners. Beat listeners showed significantly greater brain activation than interval listeners in the SMA, left medial premotor cortex, left insula, and left inferior frontal gyrus (BA 44). Interval listeners showed greater activation than beat listeners in two areas of the left posterior superior temporal gyrus and right premotor cortex. Implications of models timing and temporal processing will be discussed.

Email: mcauley@bgnnet.bgsu.edu

3:20

Effects of Ambiguous Rhythmic Stimuli on Unconstrained Dance

Timothy R. Brick
Steven M. Boker
Jennifer L. Waddell
Eric S. Covey

University of Virginia
University of Virginia
Villanova University

A repeating auditory rhythm will be quickly segmented by a listener into a repeating gestalt-like unit. While some rhythms afford only a single primary segmentation, others are more ambiguous, having two or more segmentation points that could be interpreted as the beginning of the unit. Even for these more ambiguous rhythms, a listener quickly perceives a single segmentation and is unlikely to report hearing other interpretations for the duration of the presentation. We present evidence from two experiments in which participants were asked to dance to computer-generated rhythmic auditory stimuli while their motions were recorded. We suggest that dancers are sensitive to the alternative interpretations of ambiguous rhythms even after a single interpretation has been formed.

Email: tbrick@virginia.edu

3:40

Privileged Binding: Challenging Current Theories of Audio-Visual Integration

Michael Schutz
Michael Kubovy

University of Virginia
University of Virginia

Schutz & Lipscomb (2007) report that percussionists use gestures to alter perception of note duration, a finding at odds with traditional theories of sensory integration. Here, we propose this previously unobserved phenomenon represents the privileged binding of auditory and visual information sharing a common source. The visual influence persists when replacing the sound of the percussive marimba with another percussive instrument (piano) but disappears when non-percussive sounds (voice, french horn, clarinet) are used despite rough equivalence with respect to ambiguity. A second experiment demonstrates influence persists when auditory information lags (but not leads) the moment of visual impact, reflecting the ecology of our environment in which sound travels more slowly than light. As traditional theories such as modality appropriateness and information quality fail to account for these findings, we propose the notion of privileged binding based upon the detection of auditory and visual information plausibly sharing a common source.

Email: schutz@virginia.edu

4:20

Echolocation: Blind and Sighted People in Ordinary and Anechoic Rooms

Bo N. Schenkman
Mats E. Nilsson

Stockholm University and Blekinge Institute of Technology, Sweden
Gösta Ekman Laboratory, Stockholm University and Karolinska Institutet,
Sweden

The ability of people to use echolocation was tested in an ordinary room and in an anechoic chamber. White noise with different durations were emitted from a loudspeaker on the chest of an artificial head. At different distances was a reflecting aluminum sheet, diameter 0.5m. Recordings were made through the microphones of the artificial head. These sounds were later presented for 10 blind and 10 sighted people using a 2AFC paradigm. The task was to detect the reflecting object. Feedback was given. All persons could use echolocation at close distances. The blind had a higher detection. Detection was higher for the longer sounds and for sounds recorded in the reverberating room, except for at longer distances. Audiometric tests indicate equal hearing thresholds in both ears to be important for echolocation. A supplementary experiment for the two best blind persons showed that their superior performance was not a chance event.

Email: bos@psychology.su.se

4:40

Hooray for Hollywood: Psychoacoustic Lessons from the Film Industry

Lawrence D. Rosenblum

University of California, Riverside

The field of psychoacoustics has studied hearing largely in idealized settings. Arguably, the field knows less about how listeners perceive common sounds in common environments. In contrast, sound professionals in the film industry know a great deal about listener sensitivity in more natural contexts. Based on in-depth interviews with a film sound mixer, a sound designer, and a foley (live sound effects) artist, lessons about everyday audition will be presented. For example, common techniques used to simulate room acoustics demonstrate the ear's impressive sensitivity to reverberant sound. These techniques involve acoustic modification of studio spaces during filming and literal recreation of acoustic spaces during post-production. Similarly, foley techniques reveal the ear's astonishing sensitivity to real vs. synthesized sounds, as well as the relative importance of different components of the signal for recognizing sound sources. A discussion of these professionals as expert listeners will also be presented.

Email: rosenblu@citrus.ucr.edu

Poster session 12:00 – 2:00

1

Musical Change Deafness

Kat R. Agres
Carol L. Krumhansl

Cornell University
Cornell University

Research in visual perception has demonstrated that viewers can fail to notice major changes in a visual scene, a phenomenon called change blindness. Because this topic addresses perception, attention, and memory, the question arises as to whether change blindness occurs in other modalities. Although a handful of studies exist on change deafness, the auditory analogue of change blindness, none focus on music. To address this, we sought to discover what types of changes in music are least detectable. Tonality, musical interval, note duration, and musical experience were explored. We found significant effects of all the musical variables, as well as some of their interactions. Additionally, non-musicians were more subject to change deafness than professional musicians; non-musicians performed at chance levels in some conditions of the experiment. Presumably, musical training facilitates the rapid and accurate encoding of certain musical characteristics.

Email: kra9@cornell.edu

2

How Visible Motion Paths Influence the Perceived Duration of Percussive Sounds

James A. Armontrout
Michael R. Schutz
Michael Kubovy

University of Virginia
University of Virginia
University of Virginia

Schutz & Libscomb (2007) found that a marimba player using long or short gestures while striking a note can alter the note's perceived duration without altering its physical duration. This contradicted established theory, which states that audition dominates in temporal tasks. The current series of studies explores the motion of the strikes to determine what about the visual stimulus determines its effect on perceived note duration. Using point-light displays to manipulate the motion, we found that the portion of the gesture after impact is all that matters, that a visual rebound must occur with the impact sound, and that the side-to-side motion does not matter. We also found that the amount of time the gesture lasts after impact drives the effect rather than the distance traveled, speed of travel, acceleration, or jerk of the motion. We conclude that duration of the motion after impact is what affects perceived note duration.

Email: mrs8q@virginia.edu

3

Effects of Talker Gender and Voice Style on Perceived Urgency of Voice Cockpit Warnings

Robert Arrabito

Defence R&D Canada – Toronto

Methods for making voice warnings distinct from cockpit radio communication were investigated. Participants were required to monitor the auditory channel and identify verbal warnings, while simultaneously performing a tracking task. The warnings were announced by a male and female actor in a monotone, urgent, and whisper style. Experiment 1 presented the warnings in quiet, and experiment 2 presented the warnings in a background of speech babble. Experiment 1 showed that both the monotone and urgent styles had the largest effect on perceived urgency regardless of the gender of the talker. Experiment 2 showed that the male talker announcing in either the monotone or urgent style had the largest effect on perceived urgency. Effects of word on warning compliance were found in both experiments. These preliminary data suggest the effective use of speech parameters could help make the warning messages distinct from speech on the flight deck.

Email: robert.arrabito@drdc-rddc.gc.ca

4

Using an Orienting Auditory Display during a Concurrent Listening Task: Most Earcons Do Not Interfere**Terri L. Bonebright**
Michael A. Nees*DePauw University*
Georgia Institute of Technology

A cross-modal dual attention experiment was completed by 198 undergraduates in 3 blocks that each consisted of an orientation task and a concurrent listening task. For the orientation task, participants located regions on an LCD that were cued by speech or one of 4 types of symbolic auditory cues (i.e., earcons); the concurrent task required participants to listen to and answer questions about GRE sample test passages. Results indicated the orientation task had no effect on comprehension of the passages compared to a passage-only control for 4 of the 5 auditory cue types. All auditory cues resulted in high performance for the orientation task, with speech and complex sounds exhibiting the highest performance. Implications for auditory display design and for assistive technologies for visually impaired persons are discussed.

Email: tbone@depauw.edu

5

She Hears Seashells: Detection of Small Resonant Cavities via Ambient Sound**Ethan J. Chamberlain**
Lawrence D. Rosenblum
Ryan L. Robart*University of California, Riverside*
University of California, Riverside
University of California, Riverside

Blind listeners can detect the presence of obstacles based on how the obstacles structure the ambient sound in a quiet room. Potentially, this ability is based on auditory sensitivity to the build up of ambient wave interference patterns in front of the obstacle. This effect is not unlike how the internal structure of a seashell amplifies a room's ambient sound to emulate ocean sounds. Experiments were conducted to determine whether unpracticed, sighted listeners were sensitive to this information. Blindfolded listeners were placed in a quiet room and judged whether a small resonant cavity was placed next to their left or right ear. Results revealed that listeners were accurate at this task. Follow-up experiments examined the limits of this sensitivity as well as its acoustical support. These findings suggest that unpracticed listeners might be sensitive to subtle changes in the ambient acoustic structure of a quiet environment.

Email: rosenblu@citrus.ucr.edu

6

The Cerebellar Subsystem for Absolute Time**Manon Grube**
Freya E. Cooper
Patrick F. Chinnery
Jessica Foxton
Timothy D. Griffiths*Newcastle Auditory Group, Newcastle University*
Newcastle Auditory Group, Newcastle University

This study tested the hypothesis of controversially discussed cerebellar contributions to timing [1-5], with specific respect to interdependencies between single interval and higher-order pattern analysis. Seven subtests of auditory timing analysis were administered in 34 patients with the genetic disorder spinocerebellar ataxia type 6 and a matched control group. Cerebellar patients exhibited significant impairments for single subsecond intervals of variable and fixed durations as well as within neutral simple pattern context, and a trend for suprasedond durations. Relative interval timing in beneficial context of a simple isochronous pattern, metrical pattern processing and pulse detection in contrast were not significantly different from controls. Correlations between subtests suggest the reliance on one timing mechanism in patients but two in controls. The data support the existence of a cerebellar subsystem that critically subserves absolute but not relative analysis of time and are consistent with recent results from repetitive transcranial stimulation of the cerebellum.

Email: manon.grube@ncl.ac.uk

7

Attention Control in Musical Perception: Attention-Shifting as a Function of Performance Experience**Talya A. Grumberg**
Norman Segalowitz*Center for the Study of Learning and Performance, Concordia University*
Center for the Study of Learning and Performance, Concordia University

The current study investigated the relationship of attention control to musical performance experience. Participants were 32 pianists self-reporting varying number of years of performing experience. Attention control was operationalized in terms of attentional shift costs in a musical auditory task-shifting experiment modeled after the alternating runs task of Rogers and Monsell (1995). In the experimental condition, the alternating tasks were to identify the dynamic (crescendo, diminuendo) or the articulatory (legato, staccato) properties of auditorily presented melodic target lines (where the stimuli were bivalent, always possessing dynamic and articulatory properties). In the control condition, the tasks were to identify analogous properties of non-musical auditory stimuli. Surprisingly, greater musical performance experience was related to inferior attention control (greater shift costs) on experimental (music) trials but not on control (non-music) trials. The implications are discussed in terms of perceptual integrality versus separability of musical dimensions resulting from prolonged musical performance experience.

Email: talyag@yahoo.com

8

Bimodal Integration Mechanisms for Phonemes and Emotional Expressions During Speech**Michael D. Hall**
Jennifer M. Roche*James Madison University*
James Madison University

Evidence for bimodal integration of speech comes from the McGurk effect (McGurk & MacDonald, 1976); given synchronous auditory and visual consonant productions that reflect different places of articulation, participants hear a consonant that matches neither source. Corresponding effects have been reported with incongruous auditory-visual expressions of emotion (deGelder & Vroomen, 2000). The current investigation compared phonemic and emotional integration mechanisms. Each experiment included a bimodal/unimodal identification task to evaluate integration, plus auditory discrimination that paired an auditory stimulus with a congruent/incongruent auditory-visual stimulus. Experiment 1 evaluated integration for vowel-consonant-vowel productions. Experiment 2 used the same stimuli to evaluate emotion integration (sadness/joy). Experiment 3 extended analyses to complex emotions (sarcasm/innuendo). Identification performance generally provided integration evidence. However, during discrimination participants frequently recognized identical emotions despite incongruent visual information, suggesting unimodal access. Furthermore, identification performance could not predict discrimination for emotions. These findings suggest different integration mechanisms, with emotions integrated relatively late.

Email: jroche@memphis.edu

9

Increasing Pitch Velocity Increases the Magnitude of the Auditory Tau Effect**Molly J. Henry**
Marta Zaleha
J. Devin McAuley*Bowling Green State University*
Bowling Green State University
Bowling Green State University

Previous research on the auditory kappa effect has shown that increasing the implied pitch velocity of ascending auditory sequences increases the dependence of timing judgments on pitch spacing (Henry & McAuley, 2007). In the current study, we examined the effect of manipulating implied pitch velocity on the dependence of pitch judgments on sequence timing (i.e., the magnitude of the auditory tau effect). Participants judged the pitch of the middle 'target' tone in ascending three-tone sequences with the instruction to ignore deviations in target timing. Pitch velocity took on two values (8 ST / 800 ms and 8 ST / 364 ms). Consistent with predictions derived from an auditory motion hypothesis, the magnitude of the auditory tau effect was larger for sequences with a faster pitch velocity (8 ST / 364 ms) than for sequences with a slower pitch velocity (8 ST / 800 ms).

Email: mjhenry@bgnet.bgsu.edu

10

Disruption of Short-Term Memory by Changing and Deviant Sounds: Two Forms of Auditory Distraction

Robert W. Hughes
Francois Vachon
Dylan M. Jones

Cardiff University
Cardiff University
Cardiff University

Disruption of serial recall by to-be-ignored auditory stimuli that change from one to the next ('changing-state effect') is often ascribed to the action of attentional orienting responses (or attentional capture) typically associated with a deviant stimulus ('deviation effect'). We provide support for an alternative view that whilst the deviation effect is due to attentional capture, changing-state stimuli disrupt serial recall by yielding order cues that conflict with the serial rehearsal of to-be-remembered items. The effect of a single deviation in voice embedded in an irrelevant speech sequence presented during serial recall was additive to—and hence functionally independent of—the changing-state effect. Moreover, when the focal task was stripped of a serial rehearsal component (using a 'missing-item' task) the changing-state effect, but not the deviation effect, disappeared. The results serve to functionally dissociate the changing-state and deviation effects indicating that there are at least two distinct forms of auditory distraction.

Email: HughesRW@cardiff.ac.uk

11

Psychological effects of Vehicle Noise and Vibration

Jessica Korning-Ljungberg

Division of Engineering Psychology, Lulea University of Technology

Vehicle drivers are often exposed to multiple stressors like noise, whole-body vibration (WBV) and mental loads – conducting tasks with strong short-term memory and spatial manipulation components. Standards that govern health risk assessment don't take into consideration the complexities of these multiple exposure environments. The effect of one factor may be different than the effect of two factors presented together. A series of studies were designed to expose participants to noise and WBV stimuli designed to simulate real life working conditions. Combinations of subjective ratings, cognitive tests, and cortisol measurements were conducted during and immediately after exposures. Results showed that a combination of noise and WBV do not degrade cognitive performance more than a single stimulus, but are perceived more annoying and work is more difficult in such conditions. WBV can also degrade attention performance after exposure is turned off when participants have been working under high mental load during exposure.

Email: jessica.korning-ljungberg@ltu.se

12

The Influence of Non-temporal Acoustic Features on Judgments of Sound Duration

Launa C. Leboe
Todd A. Mondor

University of Manitoba
University of Manitoba

The current study investigated the contribution of non-temporal stimulus characteristics to the perception of stimulus duration. On each trial, participants presented with two consecutive sounds were required to determine if the second sound was longer or shorter in duration than the first. In Experiment 1, we observed that a continuous change in frequency caused participants to perceive the duration of a sound as longer than a sound that maintained a constant frequency. In Experiment 2, we examined whether a continuous change in the frequency of a sound directly leads to an increase in the perceived duration of that sound or if this time perception illusion also occurs when there is an abrupt change in sound frequency. Prevailing counter-based models and the fluency attribution approach of time perception cannot account for these sources of error in the perceived duration of auditory events.

Email: umleboe@cc.umanitoba.ca

13

Impairment of Word-Finding by Auditory Distraction: An Interference by Process Account

John E. Marsh
Robert W. Hughes
Dylan M. Jones

Cardiff University, Wales, UK
Cardiff University, Wales, UK
Cardiff University, Wales, UK

Typically, the phonological similarity between to-be-recalled items and to-be-ignored auditory stimuli has no impact in the context of short-term serial recall. However, in the present study we showed that the generation of words in response to a letter cue (letter or phonemic fluency) was impaired by irrelevant items that shared the same initial phoneme (but not orthography) with to-be-generated words. The pattern of results favors an interference-by-process over an interference-by-content approach to auditory distraction whereby the disruption reflect the degree to which the irrelevant material competes given the particular processes involved in the focal task.

Email: marshje@cardiff.ac.uk

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Repeating the Standard Interval Weakens Expectancy Profiles in Time-Judgment Tasks

Nathaniel S. Miller
John D. McAuley

Bowling Green State University
Bowling Green State University

Individuals listening to auditory sequences have difficulty ignoring rhythm. This is evident in studies where listeners make judgments about the relative duration of standard-comparison pairs of time intervals preceded by a to-be-ignored rhythmic context sequence (Barnes & Jones, 2000; McAuley & Jones, 2003). In this work, relative duration judgments are more accurate when the tone marking the end of the standard interval is on-time (relative to the context rhythm) than when it is early or late, resulting in an 'expectancy' profile. The present study examined whether expectancy profiles would be eliminated or reduced by repeating the standard interval. Participants judged the duration of a variable comparison relative to a fixed standard preceded by a to-be-ignored rhythmic context, responding "shorter", "same" or "longer." The standard was specified by either a two-tone or six-tone isochronous sequence. Consistent with entrainment models, the observed expectancy profile was much weaker with repetitions of the standard.

Email: natmill@bgsu.edu

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Estrogen Levels and Auditory Time-to-Arrival Estimates

John G. Neuhoff
Amy Jo Stavnezer

The College of Wooster
The College of Wooster

Males and females show mean difference in their estimates of auditory time-to-arrival of looming sound sources, with females showing greater anticipatory responses than males. However, there also appears to be greater variability in the female responses than in the male responses. One potential explanation for this greater variability is the naturally fluctuating estrogen levels in females due to the menstrual cycle. Varying estrogen levels have been shown to influence spatial judgments in the visual domain. Here, we investigated the hypothesis that estrogen also influences auditory spatial performance. We presented females with looming sounds and asked them to estimate when the sound would reach them. We used cycle self-report and saliva-based hormone assays to assess estrogen levels, and in a within subjects design we presented our stimuli several weeks apart when estrogen levels were high and low. The results will be discussed in terms of hormonal influences on general spatial ability.

Email: jneuhoff@wooster.edu

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Velocity Perception of Auditory, Visual and Audiovisual Apparent Motion**Thuan K. Ngo**
Thomas Z. Strybel*California State University Long Beach*
California State University Long Beach

A moving object in our environment can provide information regarding its motion to multiple sense modalities, yet produce the perception of a single moving object. However, multisensory motion perception experiments typically require participants to focus on one modality and ignore another “distractor” modality. Moreover, in these experiments, the multimodal events usually occur only in the horizontal plane (i.e., left-right motion or vice-versa). We examined multisensory motion and velocity perception in the horizontal and vertical planes when participants were instructed to attend to the whole audiovisual stimulus instead of attending to one sense modality and ignoring another. Previously we reported on multisensory motion perception; here, we report on multisensory velocity. Participants responded whether the auditory or visual stimulus moved faster, or whether their velocities were equivalent. The perceived velocity of the auditory and visual stimuli depended on the plane and direction in which they moved.

Email: tstrybel@csulb.edu

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Revisiting Magnitude of Judgment of Loudness Change for Discrete and Dynamic Stimuli**Richard E. Pastore**
Jesse D. Flint
Jeremy R. Gaston*Binghamton University (SUNY)*
Binghamton University (SUNY)
Binghamton University (SUNY)

At APCAM 2006, we criticized the methodology and conclusions of a recent study by Neuhoff (Nature, 1998) that had asked the important question of whether perceived loudness change across dynamic stimuli can be understood from traditional research with stationary stimuli. Loudness reflects a ratio, rather than an interval, relationship that differs across spectral content. The current study provides empirical data generated using ratio-appropriate scaling procedures that addresses Neuhoff’s important question. Magnitude of loudness change for both discrete and dynamic stimulus changes are mapped across a variety of conditions that allow evaluation of intensity range, perceptual anchoring, temporal order, and integration of power across time. Commonalities and differences with predictions of traditional psychophysics are discussed.

Email: jflint2@binghamton.edu

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Hearing Your Place: Perceiving Room Position from Reflected Sound**Ryan L. Robart**
Lawrence D. Rosenblum
Ethan J. Chamberlain*University of California, Riverside*
University of California, Riverside
University of California, Riverside

Research has shown that reflected sound can provide substantial information to listeners in real-world settings. Using reflected sound, listeners can determine the rough location, size, shape, and material of boards, as well as recognize the general size and material composition of rooms. Experiments were conducted to determine whether listeners could perceive their position in a room based on reflected sound. Unpracticed, blindfolded subjects were passively moved to one of nine positions in a medium-sized classroom. Once positioned, subjects listened to reflections produced by sounds either emitted by them, or another source located at their position. Based on these sound reflections, subjects were able to judge at which of the nine position they were located at better than chance levels. Furthermore, errors in position judgments often retained one correct spatial dimension (e.g., guessing ‘left-back corner’ while in left-front corner position). Follow-up experiments examined the informational support for this skill.

Email: rosenblu@citrus.ucr.edu

Identification of Self-Walking Pace: Are You Nothing More Than a Clock?
Michael K. Russell*Washburn University*

It is well known that observers are able to use sound to identify objects and events. If this ability is a reflection of experience, then the sound of one's own actions should be easily identifiable. With respect to walking, individuals are frequently exposed to the sound of their own footsteps and therefore walking pace should be easily and accurately identified. If one assumes that the leg is a simple pendulum, then one need only consider walking pace as a function of the individual's leg length. This notion was tested in the present study. Here, participants were exposed to nine "footstep" events that differed solely in terms of period. Following each presentation, the task of the participant was to rate the event in relation to the pace at which they comfortably walk. The extent to which participant leg length was a useful predictor of participant judgments was determined.

Email: mike.russell@washburn.edu

Name that (Percussive) Tune: Tone Envelope Affects Learning

Michael Schutz
Jeanine Stefanucci
Andrew Carberry
Amber Roth

University of Virginia
College of William and Mary
College of William and Mary
College of William and Mary

The role of amplitude envelope has received little attention within perceptual and cognitive research. Here we demonstrate melodic sequences based on tones with percussive envelopes are learned more quickly than sequences of tones using traditional "binary" envelopes. Participants were asked to associate various household objects (e.g., cell phone, key, credit card) with 4-note melodies made up of tones using one of two amplitude envelopes: "binary" (off-on-off envelope traditionally used in psychological research) or "percussive" (exponential decay mimicking natural impact sounds). Participants were trained on the associations until able to recall at least 70% of the sequences (a pre-defined threshold). Memory was then tested using a recall/know paradigm after a 10-minute distracter task. Though no differences were observed in recall ability, participants presented with percussive tones required 42% fewer training trials. We conclude that amplitude envelope plays an important role in the learning of auditory sequences.

Email: schutz@virginia.edu

Effects of Spatial versus Spectral Switching in the Auditory Attentional Blink

Francois Vachon
Sébastien Tremblay

School of Psychology, Cardiff University, UK
École de psychologie, Université Laval, Canada

The failure in reporting the second of two targets embedded in a rapid stream of distractors is known as the attentional blink (AB). In vision, introducing a switch of location between the targets modulates the AB and the influence of masking. The present study aimed at contrasting the impact of switching target location in the spatial versus the spectral domain on the auditory AB and at exploring the potential interaction between switching and masking in audition. Within a sequence, the targets could occur in either different spatial locations (left vs. right ear) or different spectral locations (male vs. female voice) and each target could be followed by either a mask or a silence. Whilst masking effects were similar across switching conditions, the expression of the auditory AB depended on the nature of switch suggesting that the role of frequency in auditory selective attention may differ from that of spatial location.

Email: VachonF@Cardiff.ac.uk

The Influence of Rhythm Complexity on the Recognition of Images

Marc G. Wallace
Todd Mondor

University of Manitoba
University of Manitoba

Recent studies indicate that music can attract the attention of the observer, evoking both temporary changes in mood and long-lasting changes in attitude toward the advertised product. However, the particular attributes of music that are most important in effecting these changes remain unclear. Music tempo may be most pleasing at a distinct range of speeds, and particular rhythmic forms may be most effective in capturing attention and facilitating memory for the advertised product. The present study examined whether the complexity of rhythm, at a constant musical time (tempo), influences later memory. In the first phase of the experiment, three increasingly complex rhythms were presented as background music to a series of visually advertised products. In the second phase, participants were presented images, some new and some that had been presented in the first phase, and asked to detect the images seen earlier. Effects of musical structure on recognition memory are discussed.

Email: mwallace66@yahoo.com

The Role of Attention in the Formation of Auditory Streams: The Effect of Competing Tasks

Minhong Yu
Mowei Shen

Zhejiang University
Zhejiang University

Although many studies have investigated whether auditory streaming requires attention, they have not reached a consensus. In Experiment 1, a 20-second standard "ABA ..." tone sequence was presented to participants' left ear. They were asked to rate the degree of streaming after completing a right-ear noise discrimination competing task with multiple load levels during the first 10 seconds. The rated degree of streaming during the later 10s was such that no load > low load > high load condition, meaning participants were easier to form auditory streaming with more available attentional resources. So the results suggest the requirement of attention in the formation of auditory streaming might not be "all-or-none." In Experiment 2, the auditory competing task was replaced by a visual task. Ratings of streaming did not differ based on distractor load, indicating visual competing task had little influence on auditory streaming. Auditory and visual modalities may have independent attention systems. (Supported by a grant from NIDCD to the University of Virginia, M. Kubovy, PI.)

Email: minhongyu@virginia.edu