An investigation of the impact of working memory capacity and emotional prosody on selective attention and inhibition in the auditory modality”

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Working Memory Capacity (WMC)

- Working memory (WM) is the active component of memory
  - Active processing and manipulation of information.
- WM may be an important part of our ability to process and understand speech
Working Memory Resources

- Working memory is considered to be a limited resource
  - (Süβ et al. 2002)
- Known to decline with age
  - Haut et al., 1999;
Attention is a primary function of working memory

Executive Functions of WMC
- Inhibition
- Shifting
- Updating  (Baddeley (1986))
Working Memory & Emotion

- Attentional control factors heavily on the inhibition and shifting function
  - Barrett, 2004
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These have been shown to be impacted by emotion
- Eysenck et al., 2007 showed negative effect of anxiety on inhibition
- De Lissnyder et al., 2010 showed negative effect of depression.
- Savine et al., 2010 showed improved shifting with positive affect
Working Memory & Emotion

- Attentional control factors heavily on the inhibition and shifting function
  - Barrett, 2004
- These have been shown to be impacted by emotion

- Findings regarding emotion’s influence in aging are mixed
  - Van Gerven & Murphy (2010)
  - Carstensen (1995)
  - Hasher & Zacks (1988)
Emotional Prosody

- Refers to the cues provided within a speech segment that indicate meaning or underlying tone
  - Comes from the way words are said and the stress patterns of the speech
- Humour and sarcasm are good examples
Why does it matter?

- Emotional prosody is a part of all verbal communication
- Prosody can change the understanding of what is being said
Current Experiment

- Assessed the impact of different emotional tones (prosody) on the ability to recall target words
  - Potential age-related differences in this effect
- Examined the effect of WMC on:
  - Effect of emotional prosody
  - Effects of age
Research Participants

- 24 individuals aged 18-28 (YA)
  - Mean age: 22.42; SD= 2.80
  - Median age: 21.5

- 25 individuals aged 60-78 (OA)
  - Mean age: 67.56; SD=5.37
  - Median age: 66
Participant Screening

- Pure tone audiometry (dB HL)
- Babble threshold (dB SPL)
  - Threshold for speech sounds
Participant Screening (cont.)

Working Memory Capacity (WMC) test
  - Working memory subtests from the WAIS-IV

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<tr>
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<th>M</th>
<th>SD</th>
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<tbody>
<tr>
<td>Younger</td>
<td>96.38</td>
<td>16.82</td>
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<tr>
<td>Older</td>
<td>97.44</td>
<td>16.53</td>
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Prosodic Working Memory Task

- Stimuli consisted of sentences spoken with different emotional prosody
  - TESS
  - Developed by Dr. Kate Dupuis and Dr. Kathleen Pichora-Fuller of the University of Toronto
Experimental Stimuli

- Sentences were recorded in Angry, Neutral, and Happy tones
- All sentences were in the format: “Say the word _______
  - OAF Happy 🎤 YAF Angry 🎤
  - YAF Neutral 🎤 YAF Happy 🎤
  - OAF Angry 🎤 OAF Neutral 🎤
Prosodic Working Memory Task

- Sentences presented in blocks by emotional prosody (randomized)
- Number of sentences increased with each correct response
- Prosodic Working Memory score = maximum number of sentences in a block correctly recalled in order.
Hypotheses and Predictions

- Emotional prosody would have a significant effect on Prosodic Working Memory in both younger and older adults.
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- Emotional prosody would have a significant effect on the recall of target words in both younger and older adults.
- Negative emotion would have a greater impact than positive emotion.
- Older adults would be influenced more than younger adults by negative emotional prosody.
Hypotheses and Predictions

- Emotional prosody would have a significant effect on the recall of target words in both younger and older adults.
- Negative emotion would have a greater impact than positive emotion.
- Older adults would be influenced more than younger adults by negative emotional prosody.
- Positive prosody would have a smaller, positive influence on recall, and this would be more pronounced in older adults.
More Hypotheses and Predictions

- Working memory capacity would have a significant effect on Prosodic Working Memory
  - WMC would moderate any age-related effects of emotional prosody
Results

- An ANOVA on WMCGroup 2 was conducted:
Prosodic working memory scores are significantly lower when listening to angry speech compared with neutral and happy speech.

*Significantly different at p<.025  **Significantly different at p<.01
Discussion & Implications

- Both older and younger adults of average WMC show poorer Prosodic Working Memory when information is presented in angry tones.
Discussion & Implications

- Older and younger adults are similarly influenced by prosody
- Interesting, although not the result that was expected
Angry tones are likely to result in decreased information processing in older adults.
Discussion and Implications

- It seems that the best approach for effective delivery of information for maximum recall and accuracy is a calm, even, and fairly neutral tone.
References