

Vocal Music and Emotion.

A study on the effect of vocal music stimuli on emotional valence of emergency service personnel with post-traumatic stress disorder.

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Research Context.

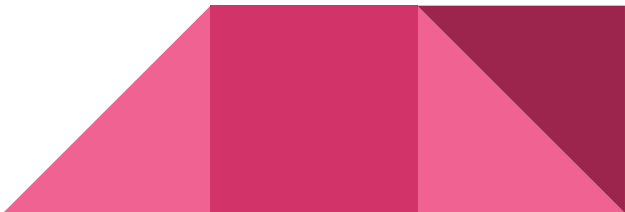
Background

- Singing for well-being programs.
- Hypervigilance and stimuli discrimination (Chetty *et al.*, 2014).
- Positive v's negative outcomes (Sakka and Juslin, 2018).

Justification

- Robust rationale for repertoire selection.
- Positively aid in processing or reinforce/exacerbate negative mental health states (Bibb *et al.*, 2018).

Project Aims

- To study the effect of vocal music stimuli on emotional valence of emergency service personnel with PTSD.
 - Positive / negative valence.
 - Impact of voice and lyrics.
 - 'Safe' repertoire.
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Literature Review.

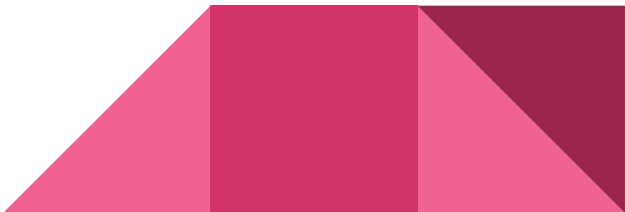
Post-Traumatic Stress Disorder (Pezzin *et al.*, 2018; APA, 2013)

- Severe emotional trauma (repeated exposure).
- Military veterans and emergency service personnel.
- Challenges with emotion regulation (Wu *et al.*, 2022).
- Music aids in emotion regulation (Bensimon *et al.*, 2008).

Emotion Theory

- Circumplex Emotion Theory (Eerola and Vuoskoski, 2013).
- Valence: positive/negative.
- Emotions: perceived/induced.

Music Stimuli

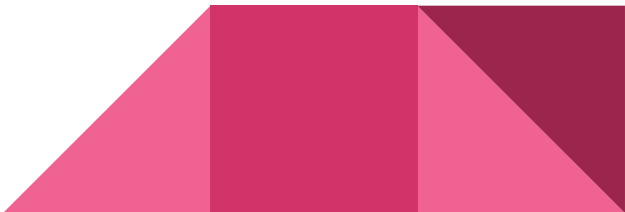
- Almost exclusively instrumental.
 - Violin or cello used to mimic emotional expression of voice.
 - Classical music superior for use in music and emotion studies (Eerola and Vuoskoski, 2013).
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Literature Review.

Voice and Lyrics

- Voice enhances memory and activates greater depth of processing (Weiss *et al.*, 2012; Loui, 2013).
- Vocal melodies heighten engagement greater than non-vocal sounds (Agus *et al.*, 2012).
- **Temporal lobe representations of voice differ from acoustic approximation, music** (Tervaniemi *et al.*, 2016).
- Lyrics implicate language processing which influences emotional valence of music (Fiveash and Luck, 2016).
- Lyrics improves melody recognition (Serafin *et al.*, 1982).
- Lyrics have a greater influence on mood than melody and vocal expression (Pond and Leavens, 2023).

Measuring Emotion Response to Music

- BRECVEMA Framework (Juslin, 2013).
 - 8 induction mechanisms.
 - 12 item emotion scale.
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Research Methodology.

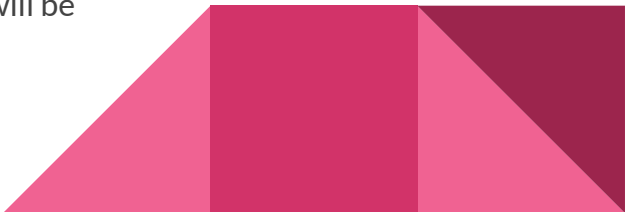
Paradigm

- Pragmatic - research question central (Creswell, 2009).
- Mixed methods - non-experimental descriptive design.

Research Question

- What is the impact of vocal music stimuli on emotional valence in emergency service personnel with PTSD?

Hypotheses

- H1: Positive emotional valence will be higher in non-PTSD participants.
 - H2: Negative emotional valence will be higher in PTSD participants.
 - H3: Induction of brain stem reflex, contagion and episodic memory will be higher in PTSD participants.
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Ethical Considerations.

Vulnerability of Population

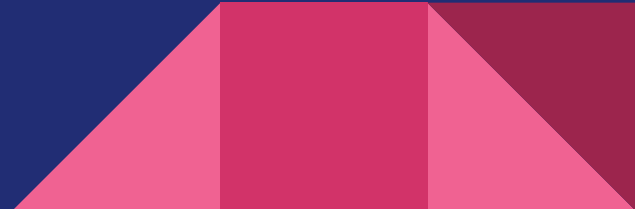
- Discuss with medical team.
- Participant Information Sheet.
- Consent Form.
- Withdrawal.

Data Security

- Anonymous participation.
 - Minimal personal information.
 - Research Randomiser code.
 - Restricted disclosure.

Insider Researcher

- Common identity.
- Mitigation strategy
 - Anonymous and remote participation.



Participants.

Demographics

- 32 participants (13 female, 9 male) - Australian.
- Diagnosis PTSD / non-PTSD.
- Police (27), Ambulance (2), Fire (1), other (2).
- Between 18-70+ years.
- Mood rating: low (3.1%), moderate (81.3%), high (15.6%).

Inclusion / Exclusion Criteria

- Over 18.
- Current or former serving member.
- Unobstructed hearing.

Recruitment

- Purposive / snowball sampling (Creswell, 2009).
- Social media
 - Code 9 Foundation.
 - Police Veterans Victoria.



Measures.

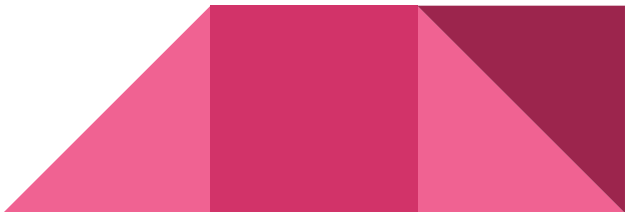
Emotion Rating Scale (Juslin *et al.*, 2014)

- **Felt** emotions.
- 12 item scale.
- Likert scale 1 (not at all) to 5 (a lot).

MecScale (Juslin *et al.*, 2014)

- **Induction** mechanisms.
- 8 questions (Yes/No).
- Quality of memory/association.

STOMPR (Rentfrow and Gosling, 2003)

- Music **Preferences**.
 - 22 item scale.
 - Likert scale 1 (not at all) to 5 (a lot).
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Vocal Music Stimuli.

Vocal Music Stimuli

- 7 excerpts.
- 60 seconds duration.

BRECVEMA Framework (Juslin *et al.*, 2014; O'Keefe, 2024)

- *Brain Stem Reflex*
- Rhythmic Entrainment
- Evaluative Conditioning
- *Contagion*
- Visual Imagery
- *Episodic Memory*
- Musical Expectancy
- Aesthetic Judgement

Broadly mapped to 4 music dimensions in STOMP (Rentfrow and Gosling, 2003).



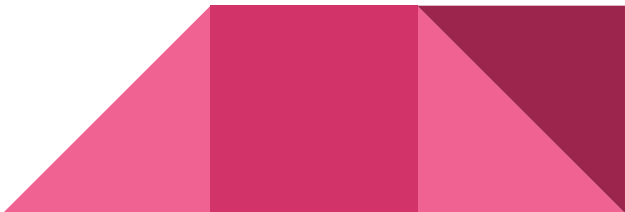
Significant Findings.

Result of Independent-Samples Kruskal-Wallis Test.

Vocal Music Excerpt	Emotion Rating Scale Item	Degrees of Freedom (<i>df</i>)	Test Statistic (<i>H</i>)	Result (<i>p</i>)
3	Calm-Contentment	1	3.938	$p=0.047$
3	Pride-Confidence	1	3.913	$p=0.048$
4	Calm-Contentment	1	3.262	$p=0.071$
4	Surprise-Astonishment	1	3.455	$p=0.063$

H1: Accepted

H2: Null Retained



Significant Findings.

Result of Pearson's Chi-square Test.

Vocal Music Excerpt	Induction Mechanism	Test Statistic (χ^2)	Degrees of Freedom (df)	Result (p)	Likelihood Ratio
6	Brains Stem Reflex	4.571	1	$p=.033$	6.119

H3: Neither Null /Alternative



Findings.

Influence of voice, music and lyrics on felt emotion across vocal music stimuli.

Statistics	Vocal Music Excerpt 1 (Brain Stem Reflex)	Vocal Music Excerpt 2 (Rhythmic Entrainment)	Vocal Music Excerpt 3 (Episodic Memory)	Vocal Music Excerpt 4 (Visual Imagery)	Vocal Music Excerpt 5 (Evaluative Conditioning)	Vocal Music Excerpt 6 (Musical Expectancy)	Vocal Music Excerpt 7 (Contagion)
Mean	1.3226	2.1250	2.6875	1.5806	2.3125	1.4667	1.5000
Median	1.0000	2.0000	3.0000	1.0000	2.0000	1.0000	1.5000
Std Dev	.54081	.79312	.69270	.88597	.59229	.68145	.50800

Limitations.

Small sample size

- Assumption testing and statistical analysis.

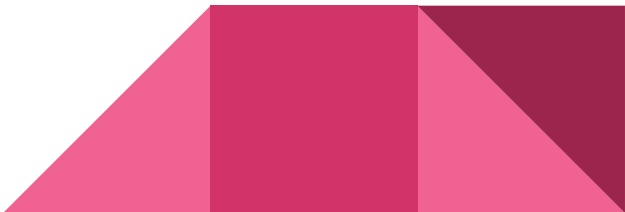
Vocal music stimuli

- Narrow scope mapped to BRECVEMA Framework.

Remote Participation

- Equipment and sound quality, decibel range, duration.
- Listening environment - distractions, time of day.

Participants

- Quality of mood, medications, terminology.
 - Self-report diagnosis.
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Conclusions.

1. In response to vocal music intended to induce episodic memory, positive valence and feelings of nostalgia, individuals with PTSD are significantly **less likely** to experience emotions of calm-contentment and pride-confidence than individuals without PTSD.

This may be due to the quality of the memory evoked and the **bias** of individuals with PTSD toward negative associations which heightens arousal.

2. Contrary to expectations, individuals without PTSD are significantly **more likely** to experience emotions induced by brain stem reflex than individuals with PTSD.

This may be due to cognitive and emotion regulation deficits in PTSD populations, medications or fatigue.

3. Vocal music that triggers a memory of the past or has lyrical content that may evoke a negative memory or image should be used with **caution** for individuals with PTSD.
4. Voice has an influence on felt emotions in response to vocal music stimuli.



Recommendations.

- Meta-Analysis of stimuli used in *music and emotion* and *vocal processing and emotion* research.
- Broaden music genres used.
- Validated PTSD / Mood measure.
- Streamline recruitment process.
- Biological measure ie. pulse metre.
- Laboratory setting for consistency.
- Qualitative interviews.



Critical Reflection.

- Challenges with statistical analysis.
- Complexity of project for available time frame.
- Isolation due to module change.
- Personal focus on PTSD.
- Re-engaging with emergency service personnel.



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Thank you for your time.

Questions?

