Abstract

- This study sought to develop an objective measure of empathy.
- Brief films depicting individuals having an emotional experience were selected and validated on a sample of undergraduates.
- Corrugator and zygomatic EMG activity, acoustic startle reflex, and self-reported emotion were measured during emotional film viewing in another sample of undergraduates.
- Results suggest these films are effective for eliciting physiological responses consistent with happy and sad emotion.
- Results suggest that this task is a promising approach for eliciting and measuring empathy.

Introduction

What is empathy?
- Empathy is the understanding and sharing of another’s emotional state or condition.
- It is comprised of two separate, but linked components: perspective-taking and affective response.

Why objectively measure empathy?
- Current measures are self-report and thus, subject to demand characteristics.
- An objective measure removes the possibility of social desirability responding, which is particularly problematic in criminal justice samples.
  - Accurate measures of empathy are needed in these populations for assessment, treatment, and research purposes.
- The current study employs a multi-measure approach to assess state and trait levels of empathic responding using both self-report and psychophysiological indicators.

Method

Stimuli Selection

- 100 undergraduates rated short digital films from the gettyimages database which depict individuals experiencing discretely happy, sad, or neutral events.
- Participants rated each film on 5 discrete emotions (happiness, sadness, anger, confusion, and fear) on a 0 (not at all) to 8 (extremely) point scale.
- The 10 films in each category rated most consistently with the intended emotion were chosen as the empathy-inducing stimuli for the psychophysiological study.

Stimuli Attributes

- Films are silent and range from 4 to 20 sec in length.
- Characters are diverse with respect to age and ethnicity.

Table 1. Emotion ratings for selected films, on a 0-8 scale.

<table>
<thead>
<tr>
<th>Film</th>
<th>Happy</th>
<th>Neutral</th>
<th>Sad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5.44</td>
<td>0.73</td>
<td>0.31</td>
</tr>
<tr>
<td>SD</td>
<td>2.15</td>
<td>1.41</td>
<td>1.09</td>
</tr>
<tr>
<td>Mean</td>
<td>0.37</td>
<td>0.77</td>
<td>5.15</td>
</tr>
<tr>
<td>SD</td>
<td>1.13</td>
<td>1.49</td>
<td>2.31</td>
</tr>
<tr>
<td>Mean</td>
<td>0.36</td>
<td>1.31</td>
<td>2.31</td>
</tr>
<tr>
<td>SD</td>
<td>0.84</td>
<td>1.35</td>
<td>2.02</td>
</tr>
<tr>
<td>Mean</td>
<td>0.47</td>
<td>1.31</td>
<td>1.96</td>
</tr>
<tr>
<td>SD</td>
<td>1.42</td>
<td>1.35</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Sample Stimuli

- Snapshots from a Happy film.
- Snapshots from a Sad film.

Measuring the Psychophysiology of Empathy

- Undergraduate students (n=32) recruited from an introductory psychology course based on trait empathy scores.
- Top and bottom 10% on the Interpersonal Reactivity Index (IRI; Davis, 1983).

Procedure

- Participants viewed happy, neutral and sad films in randomized order while corrugator, zygomatic, and obicularis oculi EMG activity were continuously sampled.
- Random 50 msec bursts of 95 db white noise with instantaneous rise time were delivered binaurally during films.
- Participants rated each film on valence and arousal using the Self-Assessment Manikin (SAM; Lang, 1980).
  - Ratings were given for each participant’s emotion, as well as the emotion of the individual(s) in the film to assess perspective-taking abilities.

Data Processing

- All EMG signals were high-pass filtered at 12 Hz, rectified, and epoched locked to film times corresponding to peak emotion in pilot testing.
- Corrugator and zygomatic signals were averaged over the epoch, then these averages were In-transformed and standardized within-subject. Each standard score was averaged according to valence to yield a score for happy, neutral, and sad films.
- The filtered-rectified obicularis signals were smoothed with a 40 Hz low-pass filter. Valid startles were identified if the maximum value in the 30-180 msec post-probe window was greater than the mean plus 2 SD of activity in the 50 msec pre-startle window. All valid startle peaks were then In-transformed and standardized within-subject, and finally averaged across films of each valence.

Results

Emotion Ratings (Mean ± Std. Error)

- | Film Type | Happy | Neutral | Sad |
- | SAM Valence Ratings | | | |
- | Self | Other |
- | | | |

- | Film Type | Happy | Neutral | Sad |
- | SAM Arousal Ratings | | | |
- | Self | Other |
- | | | |

- | Film Type | Happy | Neutral | Sad |
- | Corrugator Activity | | | |
- | Zygomatic Activity | | | |
- | Starle Response | | | |

Significance across valences is represented in yellow for ‘self’ ratings and orange for ‘other’ ratings.

EMG Activity (Mean ± Std. Error)

- | Film Type | Happy | Neutral | Sad |
- | Corrugator | | | |
- | Zygomatic | | | |
- | Starle | | | |

Significance is represented by asterisks: * p < .05, ** p < .01, *** p < .005.
Results (cont.)

**Gender Differences**
- Females (n=15) scored significantly higher on the IRI than males (n=17), F(1,30)=9.01, p<.005, indicating higher reported levels of trait empathy.

**Emotion Ratings (Mean ± Std. Error)**
- Increased corrugator EMG activity to sad films
- Arousal effects cannot account for the finding, given that sad films have an attenuated effect compared to both neutral (less arousing) and happy (more arousing) films.

**Empathy Group Differences**
- The high empathy group (n=17) is comprised of males and females who scored in the top 10% for their sex on the IRI (mean=85.1, SD=6.7)
- The low empathy group (n=15) is comprised of males and females who scored in the bottom 10% for their sex on the IRI (mean=40.2, SD=7.7)
- There are no differences in gender distribution across empathy groups (X²=.54, ns)

**Facial EMG (Mean ± Std. Error)**
- Preliminary results suggest these films are effective for eliciting happy and sad emotion, as represented by:
  - SAM ratings consistent with film valence
  - Increased corrugator EMG activity to sad films
  - Increased zygomatic and decreased corrugator EMG to happy films
  - Modulation of the acoustic startle reflex
- Sad films elicit attenuated startle responses compared to happy and neutral films. This differs from startle responses to other unpleasant but threatening stimuli.
- Arousal effects cannot account for the finding, given that sad films have an attenuated effect compared to both neutral (less arousing) and happy (more arousing) films.
- We thus propose the attenuated startle to sad films may represent an approach tendency toward the sad individual, suggesting an empathic or helping response.

**Discussion**
- Gender differences in behavioral ratings and facial EMG are consistent with the literature
- Females report experiencing more emotion and exhibit greater facial muscle reactivity to the emotional films
- Although differences in reported trait empathy were not associated with differences in reported state empathy, they were associated with differential psychophysiological responses
  - High empathy individuals showed:
    - Increased facial muscle reactivity to emotional films
    - Greater startle modulation to emotional films
- Overall, these results suggest the promise of this approach for eliciting and measuring empathy

**References**

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Handouts available: [www.psychofizz.org](http://www.psychofizz.org)