SOME BACKGROUND:
Observers are able to recognize expressive intent from musicians’ movements (e.g. Davidson 1993). In music performance, audio cues are used by listeners to discriminate between expressive intents (e.g. Juslin 2000). Even 4 to 5-year old children use movement cues when portraying emotions (Boone & Cunningham 2001).

EXPERIMENT
Video recordings of performances of the same piece with the intentions happiness, anger, sadness, and fear.
Video clips in four viewing conditions were prepared, showing different parts of the player.
Twenty subjects watched and rated 32 video clips (4 emotions x 2 performances x 4 conditions) without sound.

QUESTIONS
• How successful is the overall communication of a specific intended emotion?
• Are there any differences depending on what parts of the player that are visible?
• How can perceived emotions be classified in terms of movement cues?

EMOTIONS
The subjects rated the four emotions happiness, anger, sadness, and fear on individual scales from 0 (none) to 6 (very much).

The measure of achievement was obtained by comparing the intention (vector x) and the rating (vector y) for each video clip (in practice the same as the covariance between the two). The achievement is given by:

\[ A(x, y) = \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x}) (y_i - \bar{y}) \]

Where \( n = 4 \) is the number of rated emotions and \( C \) is a normalisation factor.

Sadness was the most successfully communicated emotion, followed by anger and happiness. The performances with the intention fear were not well conveyed.

In general there were small effects from viewing conditions, although the head was important to convey the sad intention.

The small black squares in the figure indicate the relative proportion of correct identifications, obtained by converting the ratings to "forced choice" responses. The proportion correct identifications followed the pattern of the measure of achievement and is well above chance level (25%) in most cases.

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MOVEMENT CUES were rated on bipolar scales from 0 to 6. The cues were selected to be:

- **Amount**: none to large
- **Speed**: fast to slow
- **Fluency**: jerky to smooth
- **Distribution**: uneven to even

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
<th>Speed</th>
<th>Fluency</th>
<th>Distrib.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>0.40</td>
<td>-0.27</td>
<td>-0.15</td>
<td>-0.12</td>
</tr>
<tr>
<td>Sadness</td>
<td>0.32</td>
<td>0.60</td>
<td>0.50</td>
<td>0.38</td>
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<tr>
<td>Anger</td>
<td>0.31</td>
<td>-0.48</td>
<td>-0.54</td>
<td>-0.44</td>
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<tr>
<td>Fear</td>
<td>-0.24</td>
<td>-0.01</td>
<td>-0.13</td>
<td>-0.11</td>
</tr>
</tbody>
</table>

Correlations between rated emotions and rated movement cues. All correlations, except between Fear and Speed, were statistically significant ($p < 0.01$, $N = 603$).

**CONCLUSION**

- The intentions Sadness, Anger, and Happiness were successfully conveyed through movements only, while Fear was not.
- Only slight influence of viewing conditions. The head movements important in some cases.
- The movement cues used have similarities to the audio cues in musical performance.

**REFERENCES**