What can the body movements reveal about a musician's emotional intention?

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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).

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**?
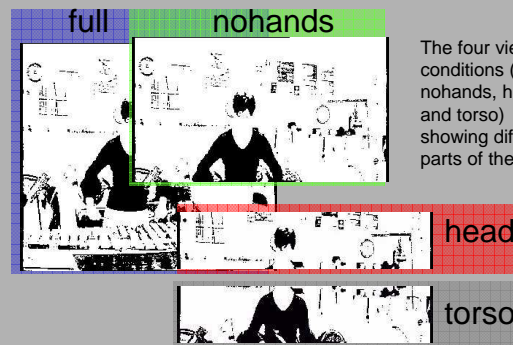- How can perceived **emotions** be classified in terms of **movement cues**?

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**.

full   nohands

head

torso

The four viewing conditions (head, nohands, head, and torso) showing different parts of the player

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:
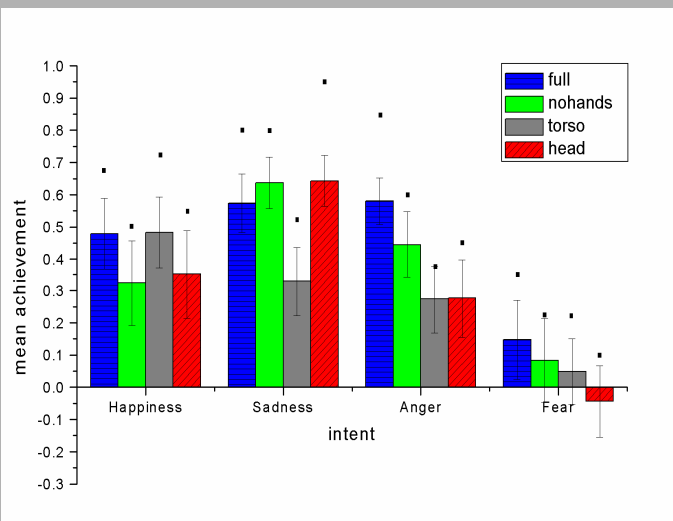
$$A(x, y) = \frac{1}{C} \frac{1}{n} \sum_{i=1}^{n} \overbrace{(x_i - \bar{x})}^{\text{intention}} \overbrace{(y_i - \bar{y})}^{\text{rating}}$$

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

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.

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

In the conversion to proportion of correct identifications, only the responses where the intended emotion received the highest rating were considered as "correct".

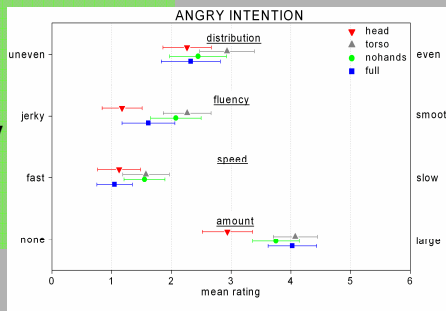## MOVEMENT CUES were rated on bipolar scales from 0 to 6.

The cues were selected to be

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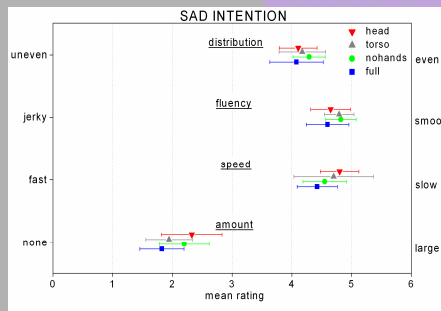- **Fluency:** jerky — smooth
- **Distribution:** uneven — even

	Amount	Speed	Fluency	Distrib.
Happiness	0.40	-0.27	-0.15	-0.12
Sadness	0.32	0.60	0.50	0.38
Anger	0.31	-0.48	-0.54	-0.44
Fear	-0.24	-0.01	-0.13	-0.11

Correlations between rated emotions and rated movement cues. All correlations, except between Fear and Speed, were statistically significant ($p < 0.01$, $N = 603$).
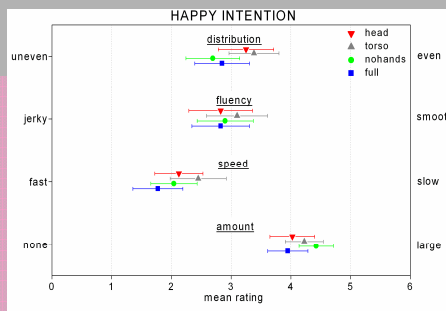
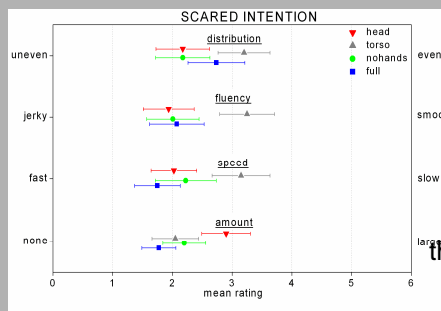**ANGER** was characterized by **large, fast, uneven and jerky** movements

SADNESS was characterized by **small, slow, even** and **smooth** movements

HAPPINESS was characterized by **large and somewhat fast** movements

FEAR: small, rather fast, jerky and uneven movements. But the characterization is questionable

The cues resemble the audio cues in musical performance:

ANGER:	high sound level, fast tempo, staccato articulation, abrupt tone attacks
HAPPINESS:	fast tempo, staccato articulation, fairly high sound level
SADNESS:	slow tempo, legato articulation, low sound level

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 music performance.

REFERENCES:
- Boone, R. T., Cunningham, J. G.(2001), Children's expression of emotional meaning in music through expressive body movement. *Journal of Nonverbal behavior*, 25(1), pp. 21-42.
- Davidson, J. W. (1993), Visual perception and performance manner in the movements of solo musicians. *Psychology of Music*, 21, pp. 103-113.
- Juslin, P. N. (2000) Cue Utilization in Communication of Emotion in Music Performance: Relating Performance to Perception. *Journal of Experimental Psychology: Human Perception and Performance*, 26(6), pp. 1797-1813.