TIMING VARIATIONS IN MUSIC PERFORMANCE: MUSICAL COMMUNICATION, PERCEPTUAL COMPENSATION, AND/OR MOTOR CONTROL?

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OUTLINE

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MOTIVATION

Parameters that make a musical performance unconstrained

Perceptual, cognitive and motor abilities
Multidimensional – Timing variation, articulation, chord asynchronies, dynamics
Paradigm that constrains musicians to use one dimension. Used to investigate timing variations.

Origin of timing variation

Musical communication hypothesis

- Communicate structure and emotion to listener
- Example: Group final lengthening communicates hierarchical grouping structure. Lengthening in first/last beats of a bar communicate metrical structure
Perceptual compensation hypothesis

- Timing variations compensate for perceptual biases.
- Biases due to psychoacoustic effects. Deviation in frequency or intensity can cause the perception of deviation in time.
- Example: Some IOI’s perceive as shorter/longer than they are. So played longer/shorted to restore regularity.

Motor control Hypothesis

- Biomechanical and instrument related constraints may produce systematic variations.
Perceptual Performance paradigm

- Disentangling timing variations due to musical communication from those due to perceptual and motor constraints.
- Adjustment task added to the mechanical and musical performance.

The Rationale of the Perceptual performance paradigm
Procedure for the paradigm

First- Mechanical rendition
Choose one dimension – Timing, articulation, dynamics. Keep others constant
Adjust perceptually performance parameters of each event
Second- Same mechanical rendition as that in the adjustment task
Third- Musical rendition

Paradigm

Perceptual – First task
Perceptual + motor – second task
Perceptual + motor+ musical communication factors – Third task
No hierarchy in 1 and 2. Should be noticed only in 3. ie. Higher levels of hierarchical grouping structure
METHOD

A simple melody, Brahms Intermezzo (opus 117, No.1) and the latter with an accompaniment

5 professional successively adjusted mechanically, performed mechanically, and performed musically.

All tracks at 100 bpm
The three excerpts used

Excerpt 1:

Excerpt 2:

Excerpt 3:

Figure 5. Schema of the computer screen and the score the participants used in the mechanical adjustment task.
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Mechanical adjustment

Average mechanically adjusted timing profile for excerpt 1
Mechanical Adjustment

**Excerpt 1:** Last short IOI of each rhythmic group adjusted to be longer than preceding one.

ANOVA for relative timing variation, with rhythmic group and position of IOI in the group as factors, confirmed an effect of position and revealed no effect of group and no interaction.

**Excerpt 2:** Two levels of rhythmic groups: 16th note and 8th note.

For 16th note group—Last short IOI was adjusted to be longer than the preceding. Pattern not seen for 8th.

ANOVA with 16th note rhythmic group and position of the IOI within the group as factors revealed only an effect of position. Not seen in ANOVA with 8th.
**Excerpt 3:** Rhythmic groups + intensity difference between successive events.

Thus, perceptual bias + bias from intensity difference. Soft-loud IOI's adjusted to be shorter than loud-soft IOI's

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**Mechanical Performance**

**Excerpt 1:** Difference from mechanically adjusted will reveal variations due to motor constraints. There was no difference noticed.

Same variation. Last short IOI longer than preceding.
**Excerpt 2:** Same variations observed as mechanically adjusted task.

8th note also followed pattern. Implies motor constraints brought about variations but did not reflect hierarchy.

**Musical performance**

Difference from mechanical performance should reveal variations in musical communication.

**Excerpt 1:** variation observed and with greater magnitude. ANOVA showed effects of group and position and interaction between the two.

Greater group final lengthening was observed in the musical performance.
Excerpt 2: Same variations
For 16th and 8th – greater group final lengthening was not observed in musical performance, but it was dependent on the excerpt’s hierarchy.

Excerpt 3: Same variations
For 16th and 8th note rhythmic groups, greater group final lengthening was observed.

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Perceptual performance paradigm designed to explain timing variations in musical performance and to distinguish between perceptual compensation, motor control and musical communication hypothesis.

Chunking is common and constrains perception and production.

Group final lengthening – partly due to perceptual constraint and musical communication. It is generally attributed to communication of the musical structure.