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Publication date:
2009

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Dahl, S., & Altenmüller, E. (2009). *Disturbed moving patterns when drumming - influence of extreme tempi on percussionists with and without focal dystonia*. Abstract from 7th Triennial Conference of European Society for the Cognitive Sciences of Music, ESCOM2009, Jyväskylä, Finland.

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Abstracts & Programme

ESCOM 2009

7th Triennial Conference of European Society for
the Cognitive Sciences of Music

12th–16th August 2009 • University of Jyväskylä, Finland



Singing as a form of vocal imitation: Mechanisms and deficits

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BACKGROUND There has been a recent upsurge of interest in the neural and cognitive bases of inaccurate singing, commonly referred to as "tone deafness". Explanations of this deficit have commonly focused on perceptual and motor functions. It is clear, however, that neither of these mechanisms can fully account for deficits in singing. **AIMS** We address the possibility that inaccurate singing (focusing in particular on "poor pitch" singing) results not solely from deficits of perception or action but on the link between the two. In other words, inaccurate singing may be a manifestation of a more general deficit in vocal imitation, possibly reflected in linguistic as well as musical behavior. **METHOD** I will summarize the results of several studies all of which share a common methodology in which participants vocally imitate a presented sequence. In different studies, participants may imitate melodies or spoken sentences, and samples are designed to address potential roles of musical and linguistic background. We analyze the pitch traces from digital recordings of imitations with respect to how accurately people imitate pitches and pitch contours. **RESULTS / MAIN CONTRIBUTION** A common finding is that approximately 15% of a given sample will sing off-key by more than a semitone, which we refer to as "poor pitch" singing. The results we review in general support an imitative deficit that may also influence (and be influenced by) speech. Further data will probe the degree to which a possible imitative deficit may be linked to a deeper deficit in the representation of musical structure. **CONCLUSIONS/IMPLICATIONS** Inaccurate singing is a more complex phenomenon than common nomenclature suggests. Moreover, inaccuracies in singing may be linked to a broader range of deficits that are not observed in everyday life but that nevertheless may have important implications. It is thus not surprising that successful "treatments" of inaccurate singing reported in the literature typically enhance sensorimotor associations.

Disturbed moving patterns when drumming – Influence of extreme tempi on percussionists with and without focal dystonia

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BACKGROUND: Professional percussionists have acquired specialized movement patterns that allow them to control timing and striking force in detail. Although such movement patterns can differ considerable between players and playing conditions, the hand movements typically display smooth, wavelike features where the stick is accelerated in a whipping motion (see e.g. Dahl, 2004; 2006). For more extreme tempi and dynamic levels, controlling the stick movement becomes increasingly difficult, sometimes resulting in irregularities in timing and/or striking force. Timing irregularities can also be a revealing sign of motor control problems, such as focal dystonia (Jabusch, Vauth & Altenmüller, 2004). The "breakdown" in motor control can therefore be expected to result in more pronounced changes in movement pattern of the affected arm for these patients. Because drumming movements tend to be symmetrical, studying the movements of percussionists offers a promising method of comparing healthy and disturbed moving patterns for individual players. **AIMS** To investigate the influence of nominal tempo on movement pattern and timing variability for healthy percussionists and those suffering from focal dystonia. **METHOD** The arm, hand, and stick movements of four professional percussionists were recorded using a motion capture system. Two of the players are focal dystonia patients with their left arm affected. For each player and arm 25 s of single strokes at different tempi (50, 120, 300 bpm) and dynamic levels (p, mf, f) were recorded. The motion data was analyzed with respect to general movement pattern, variability in timing and striking force. **RESULTS** Preliminary results show a deterioration in movement patterns for the faster tempi, typically with a stiffening of joints and lack of timing control. As expected, the disturbed patterns were more pronounced for the patients' affected arm compared to the non affected and the healthy players. The onset of deterioration also occurred early for the patients' affected arm, at fast tempo already at the beginning of the recorded trial. **CONCLUSIONS:** At this early stage, the results should not be generalized. However, this type of research could provide valuable insights in how movement patterns change in response to more demanding playing conditions. Such knowledge would have important implications for music teaching and education.