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Expertise is perceived from both sound and body movement in musical performance

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ABSTRACT

Music is a rich form of nonverbal communication, in which the movements that expert musicians make during performance can influence the perception of expressive and structural features of the music. Whether the actual skill of a musician is perceivable from vision of movement was examined. In Experiment 1, musicians and non-musicians rated performances by novice, intermediate and expert clarinetists from point-light animations of their movements, sound recordings, or both. Performances by clarinetists of more advanced skill level were rated significantly higher from vision of movements, although this effect was stronger when sound was also presented. In Experiment 2, movements and sound from the novice and expert clarinetists' performances were switched for half the presentations, and were matched for the rest. Ratings of novice music were significantly higher when presented with expert movements, although the opposite was not found for expert sound presented with novice movements. No perceptual effect of raters' own level of musicianship was found in either experiment. These results suggest that expertise is perceivable from vision of musicians' body movements, although perception of skill from sound is dominant. The results from Experiment 2 further indicate a cross-modal effect of vision and audition on the perception of musical expertise.

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1. Introduction

Perception of the movements and actions of others is a fundamental aspect of human experience. Perception of biological motion in itself can offer a great deal of information about human action,

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intention, identity, emotion and expression (Blake & Shiffrar, 2007). Indeed, certain art forms such as dance, mime and acting, rely on the abilities and acquired skills of performers to make use of their movements to convey expressions, intentions and emotions (Laban, 1980). Musical performance is an art form in which the actions of skilled performers are communicated through sound produced by the physical excitation of an instrument. In addition to sound-producing movements, motions of skilled performers that are not causally efficacious in producing, sustaining or modulating sounds have been shown to affect observers' perception of musical qualities, such as expression or emotion, even when no sound is present (Davidson, 1993; Dahl & Friberg, 2007). The perceptual relevance of these *ancillary movements* in musical performance has led some theorists to consider the role of body motion in music as a fundamental component of communicative musical performance (Godoy & Le-man, 2009).

The ability to communicate expressive ideas or emotions in musical performance is a highly acquired skill (Lehmann & Davidson, 2002), and so research into the role of biological motion on perception of music has tended to use stimuli generated from performances by highly trained, professional musicians. As a result, it is unclear whether different levels of musical skill of performers is perceivable from viewing their ancillary body movements, nor how the visual effect of motion may compare with sound in the perception of musical skill. Here, it is proposed that a comparison of observers' abilities to judge the skill level of novice or expert musicians when presented with visual displays of their ancillary movements and/or sound recordings of performances will address these questions.

Experimental studies concerning the visual perception of human biological motion have shown that participants are able to recognize a wide range of actions solely from the presentation of moving points of light that correspond to the relative movement of limbs (Johansson, 1973). Using stimuli presentations of this form – *point-light displays* (PLDs) – Cutting (1978) found that observers could estimate at above chance levels whether an actor was male or female, while Runeson and Frykholm (1981) reported that most viewers could correctly tell whether the actor was pretending to lift a heavy box or actually lifting a heavy box, and hence were able to perceive the intention of the actor from the motion of the point lights alone. Runeson and Frykholm (1981) also reported that judgements of the weight of a box from perception of others lifting it are almost as accurate as when participants lift the box themselves, and that this accuracy is only slightly impaired when lifting is presented as point-lights rather than full vision of the person and the box. Hence, participants in these studies were sensitive to the characteristics of biological motion that revealed mechanical and intentional properties of the performed actions.

The class of actions made by musicians in performance constitute a rich and complex example of non-verbal communication. A now-classic investigation into perception of musicians' movements in performance was carried out by Davidson (1993). In this work, Davidson asked pianists to perform the same piece of music in three different expressive manners: 'deadpan, projected and exaggerated' and these performances were recorded using Johansson's technique of videoing the players wearing reflective ribbons over black clothing to highlight the movements of these points against a dark background. Participants were then played these videos, asked to listen to sound recordings of the same performances, or given both the video and sound together, and asked to rate the perceived expression on a seven-point scale from 'dead pan' to 'exaggerated'. The results from this study showed that in all modality conditions (visual, auditory and audio-visual) mean judgements of expression differentiated accurately between different expressive conditions, with deadpan performances rated as being less expressive than projected performances, which in turn were rated as being less expressive than the exaggerated performances. Results also showed that the differences between mean ratings were even more pronounced when visual information was present. Taken together, these findings show that there is information relevant to the expressive qualities of musical performance available in the ancillary movements of musicians that is at least complimentary to that of the auditory channel.

Further research projects have confirmed and expanded upon Davidson's results. Dahl and Friberg (2007) explored the communication of different emotional intentions in marimba, bassoon and saxophone performances, in which players were asked to perform in a manner that conveyed one of four possible emotions - happiness, sadness, anger or fear. Results from this study indicated that participants were able to perceive above chance the first three emotions from videos of the performances alone. Interestingly, ratings of emotions from vision of movements followed similar patterns

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