Perceptions of Skill in Performances with Acoustic and Electronic Instruments

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ABSTRACT

We present observations from two separate studies of spectators' perceptions of musical performances, one involving two acoustic instruments, the other two electronic instruments. Both studies followed the same qualitative method, using structured interviews to ascertain and compare spectators' experiences. In this paper, we focus on outcomes pertaining to perceptions of the performers' skill, relating to concepts of embodiment and communities of practice.

Keywords

skill, embodiment, perception, effort, control, spectator

1. INTRODUCTION

The subjects of skill and virtuosity in Digital Musical Interactions (DMIs) [11] have emerged as prominent concerns in NIME. The literature reflects a desire for DMIs that can support virtuosity in performance [24, 19, 2], of which skill is an important component [12]. However, we have asserted that skill is not a quantity contained solely within the interaction between the performer and instrument, but exists also in a wider context that includes subjective assessments made by spectators [9, 13, 4, 15].

A previous study exploring spectators' understanding of performance with DMIs addressed mental models and the understanding or error [10]. Results from this study challenged the assumption (or failure to question) that audiences would perceive performances with electronic instruments in the same manner as those with traditional instruments [11]. Skill development with DMIs has largely been accepted to function in much the same manner as acoustic instruments [19, 2], in spite of the fact that others have described inherent differences in developing skills with digital technologies [6], attributable in part to the disembodied nature of interaction with many digital systems [8].

The broader HCI literature has begun to address questions of skill in digital interactions, but, with very few exceptions [20, 5, 14] it has not taken spectators into account. Discussions of the *perception* of skill are even rarer still. Djajadiningrat, Matthews and Stienstra [6] describe the aesthetic value of skilled action for both the actor and spectators, but do not delve into the specifics of how skill is perceived. Using point-light displays, Rodger [21] examined the role of bodily movement in spectators' ability to discern the skill level of clarinet performers, however this study focused primarily on acoustic music in known contexts.

In NIME, in spite of the widespread desire to see more virtuosic performances, there has been very little discussion of what actually constitutes skill in performances involving DMIs, nor of the spectator's contribution to this determination of skill. Studies in the literature tend to ask the question "*how can I become more skilled on this instrument?*" rather than "*why does a spectator think I'm skilled?*".

Following a previous study examining spectators' understanding of performance with DMIs [10], we conducted a qualitative study of acoustic instruments following the same methodology. It is important to note that we are not evaluating the instruments in the study, nor using them to draw generalized distinctions between perceptions of acoustic and electronic instruments. This paper presents observations from both studies, from which we identify phenomena that underlie the perception and understanding of skill.

2. METHODOLOGY

Twenty seven participants were selected to take part in the study. Each participant was individually shown two short video performances. One was an original contemporary composition for solo violin (*Broken Flames and Little Wind* by R. Mannion), performed by a professional violinist with approximately fifteen years experience. The piece explored timbral and textural variation through combinations of standard and extended technique. The second performance was a solo structured improvisation with the *sheng*, a Chinese blown free-reed instrument. This was performed by a PhD student in computer music with nearly twenty years of practice on the saxophone in jazz and free improvisation. The performer had only had a few hours of experience with the *sheng* before the performance was recorded.

After viewing the performances participants were prompted to discuss a variety of aspects of the performance in a structured interview. In this paper we focus on their discussions of skill. The interviews were recorded on video for post-study transcription and analysis. The method of presentation and analysis was the same as in the previous study – full details can be found in [10].

The violin and *sheng* were selected in order to reflect aspects of the instruments (Theremin and Tilt-Synth) used in the previous study [10]. A counterpart to the Theremin, the violin was selected in order to ensure that all participants would be familiar with the instrument and broadly how the performer's actions correlated to the resultant sounds. As with the The Tilt-Synth, which was created specifically for the prior study, the *sheng* was chosen primarily as an instrument that very few people would be familiar with. The results confirmed that only one participant had prior experience with a *sheng*. Although we selected instruments that

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we suspected would give rise to diverse spectator experiences – we expected that familiarity would have an impact on perceptions of skill – we emphasize that this was a qualitative study; the instruments, performances and performers' skill were not treated as controlled independent variables as one would in a quantitative experiment. Rather, we observed a range of participants and performers, and through rigorous qualitative analysis of participant interviews, identified common phenomena that underlie spectators' perceptions and experiences of skilled performance.

3. OBSERVATIONS

We present observations and analysis from both studies that relate specifically to participants' perceptions and assessments of skill. Two important themes emerged: those of embodiment and communities of practice.

3.1 Skill as Embodied Interaction

The concept of embodied interaction has gained prominence in HCI and cognitive science, more recently applied to musical instruments [1, 3]. Described as an intrinsic coupling between an agent and its environment [16], embodied interaction denotes "participative status" in the unfolding of an activity [7]. Embodied interaction thus depends on immersive, situated and timely engagement [1, 17], in which action is inextricably linked to perception that is guided by biological, psychological and cultural forces [23]. According to Dourish, "embodiment is about engaged action rather than disembodied cognition; it is about the particular rather than the theory, directness rather than disconnectedness" [8].

A central premise in much of Ingold's work is that skill is embodied knowledge [15]. In our observations, it is clear that participants perceived it as such; the perception of (dis)embodiment in the performer's interaction with their instrument featured prominently in descriptions of skill across all performances. Furthermore, participants' embodied knowledge from their own hands-on experiences with musical instruments was central in forming perceptions of skill among the performances they saw.

3.1.1 Confidence

In describing the performers' skill in both of our studies, a perception of physical confidence or comfort was salient for many participants. Many such comments (violin: n=10, *sheng*: n=5, Theremin: n=5, Tilt-Synth: n=4) were generic, such as, "*She was very confident with the instrument*," or "*She looked very comfortable with what she was doing.*" However, a number of participants went further; one noted that the violinist "*looked quite natural... It wasn't like she was sitting there thinking about her technique in any way.*" Another participant made a similar observation of the *sheng* performer: "*He had his eyes closed and he wasn't trying to watch where his fingers were going, so he must have known the instrument rather intuitively.*" The participants describe a state in which the performer is not actively attending to their instrument; they are not exploring or playing *with* the instrument, but rather creating sounds *through* it.

Thus, more than just 'confidence', participants appeared to sense an embodied connection between the performer and their instrument. This was frequently articulated as the initial, and in some cases the only, influence on judgements of skill. It is important to highlight that this impression was not solely based on posture of physical comportment; several participants described perceiving confidence in sound and action. Many perceived the performer's embodied connection to their instrument holistically. Whereas we suspected that participants might piece together evidence of skill from individual perceptible features (errors, slips, technical facility), it appears that skill is an embodied impression, perceived 'directly', as ecological psychology would suggest [4]. Note the way the following participant interchangeably describes visual and sonic features in their assessment of the *sheng* player's skill:

> "*So there were some notes that I felt like 'I'm not sure if he meant to play that.' I feel like he was still exploring the instrument and its potential... I think in some ways it also looked like he may not have known - it sounded like it was more of an experiment. Like, 'Oh god I hope this comes out the way I want it to.'*"

3.1.2 Disembodiment

Positive descriptions of skill in terms of confidence were more frequently associated with the violinist, who was the only performer among the four who had substantial experience on the instrument they played for the study. In contrast, assessments of the *sheng* performer's skill in these terms were ambivalent. Although some took note of his confidence, others described a perception that the performer was concentrating on finding his way around the instrument. Thus, failing to engage with it in an embodied way was indicative of a *lack* of skill. In the DMI study, although a number of participants also described those performers' skill in terms of confidence, a sense of disembodiment was also associated with negative impressions of skill. Of the Thereminist, one participant said, "*He was concentrating on it, he had his eyes on both his hands and the antennae as well.*" Another judged the Tilt-Synth performer to be unskilled because "*he looked very self conscious at the start... He wasn't confident.*"

3.1.3 Perception as Embodied Experience

When discussing skill and difficulty in both studies, many participants' descriptions were based on personal experiences with musical instruments, suggesting they experienced the performance in terms of their own embodied knowledge. For the violin, many (n=8) focused on experience with the violin itself. Praising the violinist's skill, one participant recalled, "*I've held a violin and bow in my hand, it was too small and the bow was too awkward!*"

Participants also referred to a *lack* of personal experience with instrument in the study as contributing to an inability to assess skill. Five participants highlighted that they don't play the violin. For the *sheng*, two participants said they could not judge the performance because they had never played or held the instrument. According to one: "*I'd have to play the [sheng] myself to see. I couldn't gauge. Whereas I know how a violin works, so I thought her performance was very skilful.*" Regarding the Tilt-Synth, one participant said they would "*have to play it in order to make judgements.*"

However, many who lacked direct experience with the instruments in the performances expressed their perceptions of skill in terms of other instruments they *had* played. Of the *sheng*, one noted, "*I've tried to play a clarinet before and I know it takes a bit of skill, it's not just blowing, you have to blow a certain way.*" One participant related the violin's difficulty to his experience as a guitarist: "*Well obviously, compared to a guitar, it doesn't have frets so you don't know where to put your fingers.*" Of course, the violinist *does* know where to put *her* fingers – she plays the violin! The guitarist is assessing the performance as if he were playing the violin, in which case, as a guitarist, he wouldn't know where to put his fingers. This tendency was far more prevalent with the acoustic instruments than with the electronic ones. Notably, no participants described the Tilt-Synth in terms of their own instrumental experience.

3.1.4 Control and Effort

Perceptions of control and effort frequently appeared in participants' discussions of skill. For the violin, comments (n=14) focused on the accuracy of manual control necessary to produce specific pitches. Many (n=12) similarly described the difficulty of the Theremin in terms of control and precision of hand/arm movement. Several participants even related control of the Theremin to the violin (recall these were separate studies). One described the Theremin as "*kind of like the violin but more difficult*," due to the precision required to achieve specific pitches. Unlike the violin, participants (n=8) discussed the difficulty of the Theremin as a matter of coordination between both hands. One participant described it as "*rubbing your tummy and patting your head... I imagine its hard to do both things.*"

In contrast to all the other instruments, participants did not describe specifically physical challenges to playing the Tilt-Synth. Many (n=9) echoed that the instrument was "*more complicated than the Theremin because there are more controls on it.*" However, this difficulty was seen as a cognitive or intellectual challenge, rather than a physical one. One participant asserted that it was "*the sheer amount of buttons he had to remember*" making the Tilt-Synth difficult. Furthermore, several participants believed that skill in playing the Tilt-Synth was a matter of technical knowledge of the system, rather than physically interacting with it. One participant commented that, "*In order to understand what's going on inside and make it sound the way you want it to, there's a fair amount of skill involved in that ... more technical, intellectual skill than physical performance skill.*"

In addition to control, *effort* was especially salient in assessments of skill in the *sheng* performance. One participant exemplified both perceptions stating, "*you would really need to be good at controlling your breath. You would have to have a very strong diaphragm.*" In contrast to the *sheng*, we observed that participants' comments regarding the Tilt-Synth alluded to a distinct lack of effort. Several specified that the Tilt-Synth was, "*simple to control*," that the performer was "*just pressing buttons.*"

3.2 Skill Exists in a Community of Practice

Lave and Wenger [18] describe the importance of what they termed a "community of practice" in activities where skill development is important. They claim that *identity* and *meaning* are imprinted into practical actions through the presence of a community of practice. Dourish similarly asserts that "in becoming a member of the community, one learns not only to exercise the skills of that community, but also to exercise them as a member of that community - with the same set of understandings, expectations, significances and meanings that are characteristic of that community and how it sees itself" [8]. From the perspective of a spectator, in order for the practitioner's skilled action to bear meaning the spectator must have knowledge of the community of practice in which it is situated.

3.2.1 Effect on Skill Assessments

A "lack of familiarity" dominated participants' comments in assessing the skill of the *sheng* and Tilt-Synth performers. For the *sheng*, these comments (n=23) are exemplified by statements like, "*It's hard to judge because I've never seen anyone else play that instrument.*" Another reported, "*There's no expectation of what it should sound like or what is proper Tilt-Synth playing.*" These participants did not simply highlight that they were unfamiliar with the instrument, but that they lacked a frame of reference in which to judge skill. They had no experience of a community of practice or prior exemplars that would imbue meaning to the performers' actions. This absence of a relevant community of practice resulted in divergent judgements or an inability to assess skill. Summarizing the difference between the violin and *sheng*, one participant stated, "*With the violin you are drawing from all the teachers and the wealth of knowledge about it...* [The sheng] *is hard to judge because I've never even seen anyone else play that instrument.*"

When participants were able to relate the performances to a body of experiences, they were more likely to formulate an assessment of skill based in part on the community from which these experiences were drawn. Several participants (violin: n=9, Theremin: n=8) discussed skill in reference to what they characterized as beginners or experts. When asked to describe the skill of the Thereminist, one participant replied, "*On a scale of 1 to Rockmore?*" Another focused on the performer's 'unconventional' technique, claiming "*95 percent of people don't play a Theremin like that.*"

Several participants further said they expected the Thereminist to deliver a violin-like performance. The expectation of a particular style of performance stemmed from having experienced highly skilled performances (e.g., Rockmore), but also from the timbre of the instrument. Frequent comparisons to the violin suggest that the distinctly string-like timbre of the Theremin gave rise to corresponding expectations of the performance.

In discussions of the *sheng*, several participants (n=10) associated skill with perceived errors. However, due to unfamiliarity with both the instrument and its associated performance practice – the absence of what it 'should' sound like – many could not conclude whether the perceived sonic artifacts were errors, an inherent and unavoidable part of the instrument, or intentional. One participant was confused whether perceived errors were a "*limitation of his ability or a limitation of the instrument. Or whether it was a conscious decision to have those bits that sounded like flaws.*"

Some participants unfamiliar with contemporary violin performance were surprised by the timbres the violinist employed (including harmonics, scratching and *col legno*). In many cases this led to difficulty judging skill, along with confusion or ambiguity between the expected sounds of a beginner and those of an expert. One participant, unsure of the performer's skill, deemed that the performance could have been a product of "*someone mucking about on the violin.*" Others placed this contradiction in a wider social context [18], associating the "*scratchy*" timbres with those of beginners or school concerts. Especially for the violin, participants appeared keenly aware of the entire continuum of skill in the overall body of practice, along which they were able to place this performer's skill almost instinctively.

4. DISCUSSION

We have observed that spectators perceive skill in musical performance as an embodied phenomenon. This gave rise to vastly different assessments of skill according to the diversity of experiences with the instruments employed in the studies. The violinist was by far the most experienced performer with the instrument she played in the study, also the most familiar among participants. Consequently, participants developed a strong impression of confidence or 'naturalness' in her interaction, even before she started playing. There was a perception that she *knew* the violin, not in an intellectual or technical way, but a bodily way. This is borne out by participants with a high estimation of her skill but difficulty expressing why: "*She appeared to be certainly classically trained; just the precision and rigidity and that kind of thing. Her touch on the violin – she had obviously been practising and knew what she was doing on the violin.*"

The *sheng* player was an expert saxophonist and improviser, but was new to this instrument. Many participants perceived musical knowledge manifested in his performance, but did not see the same bodily facility as with the violinist. With the Tilt-Synth, there was a similar impression of *disembodiment*; that the performer was 'exploring the instrument.' We do not claim that these impressions of the Tilt-Synth are necessarily characteristic of all DMIs; the performers in our studies had varying degrees of experience with their instruments, which were not intended to represent all acoustic or electronic instruments. Rather, we highlight the centrality of embodiment – the perceived *disconnect* between performer and instrument was as salient for spectators as the violinist's embodied engagement – and note that many authors have identified disembodiment as a particular and significant challenge in digital interactions [6, 8, 17, 22].

Many participants' descriptions of skill reflect Heidegger's distinction between *ready-to-hand* and *present-at-hand*, seen as a foundation for the theory of embodied interaction [8]. *Ready-to-hand* describes a state of interaction that is 'action without theorizing' in which an object becomes an invisible extension of the user. Klemmer [17] identifies a human capability characterized by "the intimate incorporation of an artifact into bodily practice to the point where people perceive that artifact as an extension of themselves; they act *through* it rather than *on* it." Significantly, this capability was perceptible to spectators in our studies, and was among the most salient phenomena in their discussions of skill.

Our studies also revealed that spectators perceived skill in terms of their own bodies; experiences with musical instruments they had played were particularly important. Participants' embodied knowledge, or lack thereof, led to significant differences in perceptions of skill for the violin and *sheng*. Whereas some participants' personal experiences of the difficulty of playing the violin (or other stringed instruments) led to high estimations of the performer's skill, the lack of embodied knowledge of the *sheng* (or anything similar) confounded their ability to assess it.

We observed corresponding differences between the Theremin and the Tilt-Synth. Part of the difference is attributable to the relative novelty of the Tilt-Synth; whereas some participants were able to situate the Theremin performance within a body of known practice or in terms of their own experience, this was impossible for the Tilt-Synth, which no participant had ever seen.

Elsewhere we proposed that there is something deeper characterizing the differences between the Theremin and the Tilt-Synth [11]. Even among those with little prior exposure to the Theremin, there was a stronger tendency to understand the performance in terms of other musical instruments or skilled actions. There was a greater sense of *instrumentality* with the Theremin; it was more strongly associated with the violin than with the Tilt-Synth. This is further brought to bear by participants who dismissed the Tilt-Synth performance as mere "button-pressing." Participants ascribed physical difficulty, exertion and necessity for control to the Theremin, whether the performer was able to achieve it or not. In contrast, perceptions of the Tilt-Synth reflected a lack of effort; participants perceived rich and diverse sounds, yet a simple physical interaction, and thus attributed skill to the performer's intellectual understanding of the instrument rather than embodied knowledge.

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