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Creativity in performance

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• **Abstract**

This paper examines different ways in which the notion of creativity has been used in relation to performance, and discusses psychological research on the topic. A considerable amount of this research is concerned with the creative use of expression in score-based performance, but a more conspicuous demonstration of creativity in performance is found in improvised performance. Having considered representative examples of the relatively small amount of cognitive research in this domain, the paper discusses rather different approaches, some based within ethnomusicology, that have looked at improvisational practices in a more embodied, as well as more socially and culturally embedded, manner. The paper concludes with some general recommendations for the way in which future research might bring together the rather disparate perspectives that currently characterise this complex domain.

Introduction

At some level, every performance art is unavoidably creative: if the analysis is sufficiently fine-grained there is bound to be something new or unexpected somewhere. But such a blanket endorsement is unhelpful since it collapses together too many different ways in which the term "creative" can be used: descriptively, simply to indicate that there are features not found in any other performance; combinatorially, to indicate that while none of the elements of a performance belong to a new category, they appear in an arrangement not previously encountered; or more radically, to identify that type of striking innovation that really does seem to come from nowhere. Over twenty years ago Henry Shaffer pointed towards similar distinctions when he wrote:

> Skilled performance is creative in two ways: first in the sense intended by Chomsky (1957) for language, that it is based on a generative grammar which enables the construction of an infinite variety of sentences (sequences, patterns) using a finite set of rules. And second, that over time the person may explore the consequences of extending or modifying parts of the grammar (Shaffer, 1981, p. 1).

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In this paper I examine the different ways in which performance can be said to be creative, discuss the significance of these different varieties of creativity, and explore some of the varied manifestations of creativity that can be found in performance.

First, it is important to recognise that not all musical performance takes creativity in *any* form as its aim. The preoccupation with creativity in performance in the Western tradition is the result of a specific aesthetic outlook, and (in more recent times) commercial pressures. There are other musical traditions in which the preservation of *identity* is the overwhelming imperative. There is a tendency to overlook these because of the concentration on music as art, rather than music as it is involved in a whole variety of other social functions. When music is used in rituals, in co-ordinating physical work, or as a reassuring greeting song in music therapy it may be vital to preserve a particular set of performance characteristics with complete fidelity: if not then the weather may turn out unfavourable, or the work will not get done, or the client will be disorientated and distressed. The songs of the Blackfoot Native American Indians are a documented case: the ethnomusicologist Robert Witmer has shown how two recordings of the same song made nearly 60 years apart are "*virtually identical* down to the very smallest of details" (Witmer, 1993, p. 243; original emphasis), despite being renditions by different performers within an entirely orally transmitted tradition. Witmer himself offers no unequivocal explanation for why there should be such exceptional stability in the renditions — and the song examined does not (from the evidence presented by Witmer) serve an explicitly ritual, religious, or practical function.

The Shakuhachi (a variety of end-blown flute) music of Japan is another tradition in which the absence of variation seems to be extremely important — despite what sounds like an "improvisatory" character to the music. The notation for this music specifies the performance in only fairly general terms — the particular performance features being handed down orally in master/apprentice fashion. In the case of the traditional Shakuhachi music, stability and the preservation of a "canonical form" in performance may be a consequence of the close association between this musical tradition and Zen Buddhist philosophy: if the performance features are regarded as an expression of philosophical or religious principles then there may be strong reasons not to vary performance — to eschew the kind of "creativity" that Western performance has come to hold in such high regard.

Why, then, does performance in the West place such a strong emphasis on creativity in performance, and to what extent is this a permanent and ubiquitous feature of our culture? Contemporary circumstances — and most obviously the recording industry and broadcast media — place a huge emphasis on the identity and distinctiveness of performers for simple commercial reasons, and as part of an ideology of aesthetic and cultural "authenticity". Cook (1998) points to contrasting attitudes to pop and rock music as an illustration of this deeply entrenched belief. Crudely put, the stereotypes are that:

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> Rock musicians perform live, create their own music, and forge their own identities; in short, they control their own destinies. Pop musicians, by contrast, are the puppets of the music business, cynically or naïvely pandering to popular tastes, and performing music composed and arranged by others; they lack authenticity, and as such they come at the bottom of the hierarchy of musicianship. To put it another way, the hierarchy of musicianship elevates the originators of music — the authors, if you like — above those whose role is merely one of reproduction, in other words, the performers (pp. 11-12).

As Cook points out, "a value system is in place within our culture, then, which places innovation above tradition, creation above reproduction, personal expression above the market-place. In a word, music must be authentic, for otherwise it is hardly music at all" (p. 14).

The dominant perspective within classical concert culture brings with it much the same imperative: since the overwhelming majority of concerts, recordings and broadcasts deal with a more or less static musical repertory, the primary way to attract a live audience, or the CD-buying public, is to focus on the identity (musical and personal) and creative attributes of the performer. This emphasis on creativity in performance is bound up with the rise of the public concert towards the end of the eighteenth century, and with Romantic and post-Romantic musical traditions that still play a central role in the dominant culture. Earlier treatises on performance by C.P.E. Bach, Leopold Mozart and Quantz (for a discussion, see *e.g.* Lawson and Stowell, 1999) all convey a rather different performance tradition, where the emphasis was not on the importance of individuality and uniqueness, but on the need to respect conventions and the "customs and practices" of the age.

There is very little in the literature on the psychology of performance that directly addresses the question of innovation and aesthetic value, but Repp (1997) has investigated the related issue of listeners' judgements of more or less normative performances. Repp's starting point was a finding in face recognition research which showed that subjects gave the highest aesthetic ratings to pictures of faces that were constructed (by digital image processing) as the average of a collection of faces — and that this preference increased with the size of the pool of individual faces from which the average came. In other words, viewers preferred the most normative, or prototypical, face. The proposed explanation (which Repp terms the "minimal-distance" hypothesis) is as follows: i) an average face from a large collection of individual faces approximates to a prototype face; ii) the prototype serves as an aesthetic standard; iii) the *average* response from a collection of viewers is to judge this average face to be most aesthetically pleasing - even though some individual viewers may prefer one of the individual constituent faces over the average (and by implication the prototype).

Repp applied this same idea to music, and explored how an arithmetically average performance was rated in relation to individual performances by both students and internationally recognised expert performers. In two experiments which used Schumann's piano piece *Träumerei* Op. 15 no. 7, and Chopin's E major

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Etude Op. 10 no. 3 respectively, Repp showed that an average performance is indeed given a very high — and for the Chopin, the highest — preference rating. Repp discussed this result in terms of the conflict between the need to communicate on the one hand (which depends on adherence to generally shared conventions) and the need to assert a performing identity on the other (which depends on creative transformation or transgression of those conventions). In the context of a laboratory study, albeit presented to the participants as a mock piano competition, it may be that familiarity and 'acceptability' are favoured rather more than the projection of a specific performer identity. In a study using considerably simpler musical materials, Luke Windsor and I showed that music students judged the *least* structurally communicative performances of a simple melody to be their *most* preferred renditions (Clarke and Windsor, 2000). One interpretation of these apparently contrasting results is that the relationship between prototypicality (or normativity) and preference may in turn interact with musical complexity: simple music may require more idiosyncratic or structurally ambiguous performances to engage the interest (and hence the preference) of listeners.

Expression and creativity

The most intensively studied aspect of performance in the art music tradition, and one that is closely related to a consideration of creativity, is expression. It seems uncontroversial to assert that to play music expressively is to be creative in performance. There are serious difficulties, however, in finding an appropriate definition of expression in performance: "deviations from the exact" or "departures from the score", which were once regarded as defensible characterisations of performance expression (*e.g.* Seashore, 1938), have been increasingly challenged, as different musical traditions have been considered, and as a less literal-minded understanding of the nature of a score has been recognised (Clarke, 2002a). Nonetheless, the idea that expression is a transformation of, or a departure from, some kind of norm, still prevails as a background assumption (for a review, see Gabrielsson, 1999).

To what extent, then, can these transformations or departures be regarded as a manifestation of creativity? Creativity itself is notoriously hard to define (as the opening of this paper has already suggested), but most definitions resist the inclusion of phenomena that are either accidental, or completely determined. Johnson-Laird (1988), for example, makes use of a definition of creativity as "mental processes that lead to solutions, ideas, conceptualisations, artistic forms, theories or products that are unique and novel" (Reber, 1985, cited in Johnson-Laird, 1988, p. 203). What light does this shed on expression in performance? First, a distinction can be drawn between expressive features of performance which can be regarded as the unconscious *symptoms* of underlying cognitive processes, and those which are the result of deliberate interpretative choices. In a study that explored the relation-

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ship between metrical structure and expressive communication, Sloboda (1983) asked pianists to play two versions of a melody which differed only in their metrical notation (one was notated as starting on the first downbeat, the other with an upbeat by virtue of a shift in the position of the bar lines). None of the pianists in the study noticed that the two sequences of pitches were identical, and that the only difference was a metrical shift. Nonetheless, all the performers played the two melodies with metrically related expressive features that distinguished the two melodies — both in terms of measurable performance features, and according to the perceptual judgements of a group of listeners who subsequently heard the performances. Despite the spontaneity of these expressive features, it would be hard to argue that they are *creative* components of the performances, since they seem to be an unconscious and perhaps even involuntary manifestation of the performers' parsing of the musical structure. Nonetheless it is still perfectly defensible to regard them as *expressive* features of the performances: the timing, dynamic and articulatory features of the performances express the performers' understanding of the metrical structure.

By contrast, consider the performances of the *Prelude in E minor* (Op. 28 no. 4) by Chopin that I have discussed in some detail elsewhere (Clarke, 1995). The pianist in this study gave six performances of the Prelude in the course of about an hour, of which two are analysed in the chapter. The performer had not been asked to attempt deliberately different interpretations, nor had he been asked to adhere to a single view: these were freely given, and spontaneously varying, performances. Analysis of the two performances demonstrated significant differences between them, amounting to distinct interpretations of the music that appear to prioritise different aspects of the music's structure. In this case it seems more appropriate to claim that these distinctions constitute a creative use of expression in performance — though whether the resulting performances are "unique" (*cf.* Reber's definition above) is questionable. It is worth noting that there was no evidence that the performer was conscious of trying to articulate these different interpretations: between performances he gave spontaneous commentaries on the thoughts that he had been aware of while playing, which consisted of a wide range of vivid images, personal preoccupations, and apparently irrelevant or even intrusive thoughts. This is, however, perfectly consistent with other evidence for the fluid relationship between creativity and conscious awareness, which demonstrates that creative solutions may often be the result of an unconscious process[1].

Novelty and uniqueness, which Reber takes as defining attributes of creativity, are central to that powerful Romantic notion of creativity which still dominates our culture — creativity portrayed as the mysterious appearance of the radically new, apparently from nowhere. Earlier, and perhaps also more recent, notions of

(1) A well-known example is Kekulé's discovery of the structure of the benzene molecule when, after puzzling for days over the problem, he fell asleep and dreamed of a snake biting its own tail, and upon waking realised that the structure of the molecule must be a ring (see Weisberg, 1988).

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creativity are far more ready to incorporate influence and recombination into such a definition, and this has an interesting bearing on creativity in performance. In a number of studies, Repp has examined sizeable collections of recorded performances of the same work, and has used these to explore the relationship between commonality and idiosyncrasy in interpretation. In one such study (Repp, 1992) examining 28 performances of Schumann's *Träumerei*, Repp demonstrates that the considerable commonalities underlying manifestly diverse performances by some of the twentieth century's most celebrated pianists tend to be found at more global levels of performance, with diversity increasing at lower hierarchical levels. This might be understood either as a reflection of deep-seated general cognitive constraints that necessarily regulate performance, or as the expression of very general (though arbitrary) cultural conventions of performance practice. The distinction between these two kinds of explanation is widespread but nonetheless questionable: how plausible is the idea that culture-free cognitive constraints might be directly expressed in expert performance, and conversely how likely is it that performance conventions could ever be entirely arbitrary? The norms of performance must necessarily be subject to the constraints of human biology as well as being a repository of common cultural practices — just as creativity itself arises out of the conjunction of novelty (whether accidental or deliberate) with more slowly evolving norms and traditions. Repp discusses the limits within which performers' idiosyncrasies are tolerated, since creativity in performance can all too easily spill over into eccentricity and incomprehensibility. He recognises that it would be futile to try to identify fixed boundaries for acceptable performance, since any such boundaries would inevitably shift according to all kinds of factors (history, circumstance, listener-type). He proposes that a more useful approach is to conceive of an abstract performance ideal that can be realized in a large (perhaps infinite) number of concrete manifestations, and which lies at the centre of a theoretically bounded performance space. The difficulty of attaining even one concrete realization of that ideal means that even if the abstract ideal stays fixed, the challenge to a performer — and the opportunity for limitless experimentation — remains. "Concrete realizations are conceived, perceived, and judged with reference to the underlying norm, but deviation from the norm (within certain limits of acceptability) can — to some extent, must — be an artistic goal" (Repp 1992, p. 2565).

The relationship between idiosyncrasy and incomprehensibility depends as much on the values and sensitivities of listeners as it does on any objective properties of the performances, but there is still very little research that has even attempted to address the matter, nor the related question of what leads to a performance being evaluated as strikingly original. A simple approach might suggest that the relationship between idiosyncrasy (however one might assess that) and aesthetic preference shows the same kind of inverted-U function as that between

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complexity and arousal (as in the Yerkes-Dodson law), or between complexity and aesthetic preference — as in Berlyne's (1971) version of the principle. Berlyne and others (*e.g.* Dowling and Harwood, 1986) assert that the position of the peak in the inverted-U varies with expertise, such that more sophisticated listeners reach a peak of preference at a higher level of complexity than do their more naïve counterparts, as shown in Figure 1. More sophisticated listeners, therefore, might be expected to prefer more idiosyncratic (novel, or creative) performances.

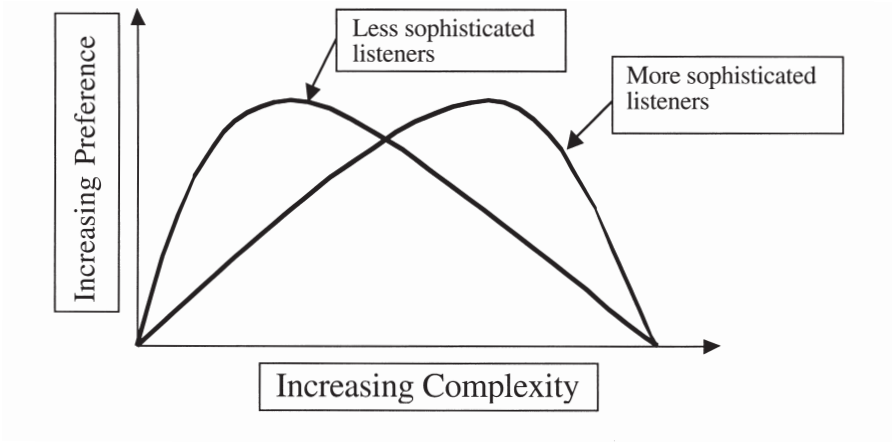

Figure 1.

The hypothesised relationship between complexity and preference, based on Dowling and Harwood's (1986) interpretation of Berlyne (1971). Complexity can be reinterpreted here as the idiosyncrasy or novelty of a performance.

Although the arousal theory is appealing in its simplicity and generality, there are problems when it is applied to a highly culturally embedded phenomenon like musical performance. The recorded performances of the pianist Glenn Gould, for example, provide a case: Gould was (according to some commentators) famously idiosyncratic — and some of his recordings seem to bear out this reputation. His recording of the opening movement of the Mozart piano sonata in A major (K.331) is taken at about half the speed (20 dotted crotchet beats per minute) of almost any other recording, and with a strangely deliberate style of articulation. On a variant of the Berlyne model, we might expect to find that only highly sophisticated or expert listeners show a preference for performances like these, but Taruskin (1995) has claimed that Gould's performances (by contrast with those of Vladimir Horowitz, for example) have become celebrated not particularly for their brilliant innovation or idiosyncrasy but more because they correspond to a particular cultural preoccupation — what Taruskin characterises as "modernist" performance, with its focus on a particular conception of structure and "integrity". Significantly, Bazzana (1997) suggests specifically in relation to Gould's performance of the first movement of

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K.331 that his apparently incomprehensible initial tempo is part of a deliberate strategy of integration and unification, in which the elements of the theme — at first presented as isolated "atoms" by virtue of the tempo and articulation — are progressively brought together across the succeeding variations, which become increasingly fast and loud. Contrary to the view of Gould as wayward, this perspective presents his performances as acquiring cultural capital, and critical approval, through their adherence to a dominating aesthetic norm.

Whether Taruskin's view of Gould is accepted or not, the example makes the point that the boundaries between the mundane, the creative, and the unacceptably idiosyncratic are constantly shifting, and that their position and evaluative significance is a function of judgements made within a shifting cultural and historical context. The standard cognitive approach is to try to separate those cultural and historical forces from some supposedly a-social cognitive component, but this does no more than perpetuate a nature — culture dualism that has dogged, and some would say fatally undermined, the whole cognitive project. It may be tempting either to throw up one's hands in despair and declare the whole thing to be too complex and culturally specific to be tackled, or to dismiss these supposed problems as irrelevant in their abstraction. But a more constructive approach is to try to do empirical studies in a way that acknowledges the complex relationship between culture and perception, and tries to identify the components of this complex set of relationships in a way that doesn't destroy them. An important step in this direction is provided by the GERM model proposed by Juslin, Friberg and Bresin (2001-2), which attempts to show how a number of factors within performance expression, previously studied in a rather disparate fashion, can be related to one another within a computational approach that suggests how their interactions might be empirically investigated. Indeed, an indication of this increasing cultural sensitivity is the development of what was a four factor GERM model (G = Generative; E = Emotional; R = Random; M = Motion) into a five factor GERMS model that explicitly incorporates culturally-specific "stylistic unexpectedness" (S) (see Juslin, 2003).

The counterpart to the question of idiosyncrasy and eccentricity is the extent to which performance may be influenced by, or directly imitative of, other performances — and this has been the object of small amount of systematic research. Studies of performers' abilities to imitate other performances (Clarke, 1993; Repp, 2000; Lisboa, Williamon, Zicari and Eiholzer, 2002) have shown that imitation is more accurate and stable when the expressive profile of the target performance maintains a conventional relationship with the grouping structure of the music, and when the target performance is clearly distinct from the imitator's own spontaneous expressive profile for the music. Since imitation is used as a pedagogical tool in teaching performance (most strikingly in the early phases of the Suzuki method, but more informally in almost all instrumental teaching that makes use of practical demonstration), this research may have implications for the way in which such a

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method is implemented. More generally, the vast and readily available body of recorded performances (as well as other live performances) represents a potentially dramatic influence on performers, though there are different views on whether this should be seen in a positive or negative light. Some have argued that the whole process of recording, the pressures that it imposes upon performers, and the listening attitudes that it encourages, have been disastrously homogenising:

> The unprecedented advantages of the gramophone record need not be listed. Every musician and music lover is aware that with its help, he [*sic*] can hear things he couldn't hear otherwise...
>
> The anti-musical influence and effect of this revolutionary invention, however, have never yet been assessed with the necessary precision. To begin with, a gramophone record is, as such, a means towards unmusical listening, for the musical truth is that a substantial performance is unrepeatable; [...] Performance, especially great performance, is the improvisatory tail-end of composition, and improvisation can't be repeated...
>
> Invariably, we are conscious, in a great performance, of the performer's own creativity, which follows the score's instructions and yet produces meaningful contradictions of our own expectations. The central truth about *all* creativity is indeed the meaningful contradiction of the recipient's expectations, which the creator arouses before he [*sic*] contradicts them. The gramophone record's repeatability has had a disastrous and well-definable effect not only on the sheer act of listening, but also on musical education and, thence, on performance itself (Keller, 1990, p. 22).

It is certainly possible that an overwhelming body of influence might be crushing in its effects, but the dire warnings often seem to come from a perspective that is steeped in a conception of creativity based on the "Romantic Genius" myth. The teacher/apprentice relationship (which was more or less the only model for instrumental learning prior to the invention of the conservatoire system, and which persists in musical traditions all over the world) provides one way to see influence and creative individualism as by no means incompatible. A rather different way to understand the impact of other performances and recordings is as a vast and heterogeneous backdrop, or tradition, from which new interpretations can arise or be inspired.

Keller's pessimism may be partly the result of the historical period through which he was — and to some extent we still are — living. The long history of performance, and perhaps the view of recordings as a way to "capture" the evanescent reality of performance, mean that there has been a strong inclination to regard recordings as "frozen" performances — a tendency that has been encouraged by the production of "live" recordings, and recordings made under performance-like conditions (for example by the recording company Nimbus). But this is not the only way to understand the phenomenon: a recording can be regarded as a specific and particular manner of "sounding" music, one for which rather different cultural and listening expectations are appropriate — as well as performing practices. Popular

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music has demonstrated how recording can be creatively exploited: mixing, sampling, multi-tracking, and a whole variety of turntabling techniques are just some of the ways in which the processes and objects of recording can be used in a manner that is quite different from the idea of capturing a performance on a supposedly neutral medium. Finally, if the vast and constantly growing archive of recordings is regarded as a resource rather than a reified reference, perhaps its potentially stultifying and authoritarian impact can be avoided. Part of this comes down to economics and availability: recordings are now in relative terms cheaper than they have ever been, and unauthorised copying as well as legitimate distribution via websites, libraries and archives mean that within the Western concert tradition it is now much more common for listeners to have come across or to own more than one recording of a work. This immediately undoes the potential stranglehold on interpretation that can come from too great a familiarity with a single recording.

There is scope here for some important empirical investigation into the impact of recording on performing and listening. Despite informal pronouncements like Keller's about the destructive consequences of recording, there is virtually no systematic evidence on whether this is borne out in practice. With over 100 years of recordings now available, and with rapid changes in technology allowing for very different attitudes to both the permanence and authority of a recording, and the ways in which it might be listened to and used, there is a fascinating opportunity to carry out a proper exploration of this contested question. Has (recorded) performance become more bland and normative under the influence of an increasingly globalised recording industry, and has listening really become less discriminating[2]?

Keller described performance as the "improvisatory tail-end of composition", and the extensive research literature on expression in performance has demonstrated some of the ways in which that improvisatory flexibility in performance is organized and achieved. Nonetheless, improvisation "proper" allows for a degree of spontaneous innovation that is of a different order from score-based performance, and it is therefore with the subject of improvisation — the most conspicuous illustration of creativity in performance — that the second half of this paper is concerned.

Improvisation

A renowned exponent of so-called "free improvisation", Derek Bailey opens the introduction to his book on improvisation with the statement that "Improvisation enjoys the curious distinction of being the most widely practised of all musical activities and the least acknowledged and understood". He continues: "Defined in any one of a series of catchphrases ranging from 'making it up as he goes along' to

(2) A recent PhD thesis (Turner, 2004) which examined various apects of performance variability in 32 recordings of the Beethoven Op. 131 String Quartet covering a seventy year period, provides some preliminary evidence on the first of these two questions.

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'instant composition', improvisation is generally viewed as a musical conjuring trick, a doubtful expedient, or even a vulgar habit" (Bailey, 1992, p. ix). When he wrote his introduction to the second edition of the book, twelve years after the first, Bailey observed that he had no reason to revise those views, and that despite what he saw as huge changes in the general musical climate, these "seem to have made very little difference to improvisation" (p. xiii).

This section considers a number of broadly psychological perspectives on improvisation, reviewing some of the relatively small literature that explicitly tackles the subject, and suggesting some issues that have been neglected or overlooked. The ethnomusicologist John Baily writes that improvisation "implies intentionality, setting out to create something new in each performance, 'composition in real time' as it is sometimes described" (Baily, 1999, p. 208), using this characterisation to point out that many non-literate musical traditions are mistakenly assumed to be improvisatory (simply because they are aurally transmitted), when they actually involve none of the creativity that his definition requires. Psychological writing on improvisation has been largely concerned with elaborating cognitive models for the way in which this particular manifestation of creativity might be understood (*e.g.* Clarke, 1988; Johnson-Laird, 1988; 2002; Pressing, 1988; 1998), proposing various kinds of formal or generative systems to explain the structured but unpredictable organisation of material that improvisations typically exhibit.

In two related pieces of writing, Johnson-Laird (1988; 1998) addresses creativity in jazz improvisation from a computational perspective, based on three different models of creativity: neo-Darwinian, neo-Larmarckian, and "mixed". In the neo-Darwinian model, random generation of material is followed by a selection process that discards "competitors" until a single "winner" remains. As Johnson-Laird points out, the advantage of such a model is its potential for unpredictable novelty (the generation of material is completely unconstrained), but its drawback is the massive inefficiency of the process, making it an extremely unlikely contender for the real-time creativity of improvisation. In the neo-Lamarckian model, the generation of material is itself governed by criteria derived from the previous history of the system (or "experience"), such that any one of the much smaller number[3] of outputs will satisfy the original constraints. When there is more than one output, a completely random process arbitrarily selects one[4]. In the mixed model, partial versions of both processes are combined, so that a reasonably small, and partially pre-selected collection of "competitors" is generated under inherited constraints, followed by a selection process that applies a second stage of (non-random) selection criteria.

(3) The size of the number depends on the restrictiveness of the constraints: the tighter they are, the smaller the number of outputs that will satisfy them.

(4) There is therefore a complementary relationship between the neo-Darwinian and neo-Lamarckian models: random generation in one, random selection in the other; constraint-based selection in the one, constraint-based generation in the other.

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Because the neo-Lamarckian model requires no time-consuming selection process, it is well-suited to the rapid creativity of improvisation, while the mixed model seems more appropriate as a model of composition, combining the potentially stimulating unpredictability of semi-random generation with the greater continuity and stability of criteria-based selection.

Johnson-Laird argues that the type of jazz improvisation that is characteristic of the period from Louis Armstrong to Charlie Parker and his successors should be seen as a combination of neo-Lamarckian and mixed model processes. The speed of jazz improvisation means that the immediate melodic components (rhythms and pitches) must be generated by a neo-Lamarckian process — in other words a tightly constrained generative process that makes little or no demand on working memory. He describes simple finite-state grammars that are capable of generating both of these components, and counters the objection that these grammars cannot generate melodies with large-scale or complex structures (while improvisors, arguably, can) by claiming that this larger-scale complexity arises from the compositional character of jazz. Essentially Johnson-Laird's idea is that the much slower (non real-time) activity of jazz composition (the elaboration of large-scale structures, defined primarily by harmony) creates a musical "environment" to which the small-scale elements of melodic improvisation adapt. The macro properties in an expert improvisation are the consequence of that pre-composed environment (ballad, or blues-based for example) — not an intrinsic feature of the micro generative process that creates the melodic material itself. The argument is reminiscent of Simon's (1969) observation that the apparently complex path of an ant traversing the side of a sand dune is not to be explained in terms of some complex process internal to the ant, but as the consequence of a simple "program" in the ant (move directly towards a fixed goal) interacting with a complex environment (the unpredictable slippage of the sand on the dune surface).

Pressing (1988) gives a rather different computational account of the processes involved in improvisation, which builds more complexity into the generative process itself[5]. He summarises the interaction of a large number of contributing components discussed in his chapter by means of a model reproduced here in Figure 2.

The idea of this model is as follows. Each event in the stream of events that constitutes the improvisation (E_{-2} to E_{+2} at the top of the diagram) consists of a number of aspects (acoustic, musical, movement and "other"), each of which in turn has three kinds of component (objects, features, and processes). All of these various attributes are processed (in the "array generator") in the light of other factors (other players, the performer's goals, external referents or images, memory of previous events), and from that processing the equivalent attributes (objects, features and

(5) See also Pressing (1998) for a discussion of many the same elements of this approach, but couched in terms of expertise theory.

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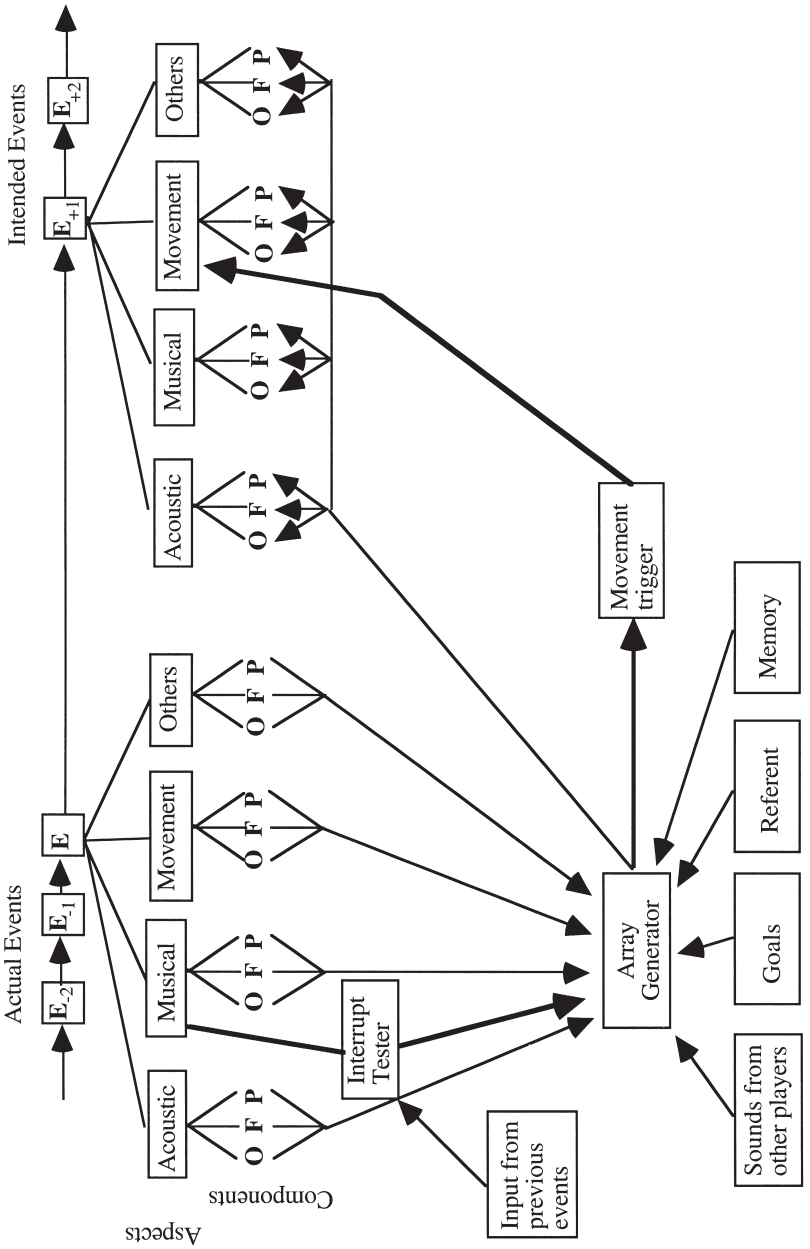

Figure 2.
Summary figure (adapted from Pressing, 1988) representing the different elements and processes at work in Pressing's cognitive model of musical improvisation. See text for details.

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processes of he acoustic, musical, movement and "other" aspects) of the next event are determined. The "interrupt tester" influences the degree of continuity or discontinuity in the improvisation, either maintaining connections between the attributes of one event and another (hence the "input from previous events"), or breaking off and striking out in some other direction. Finally, the incorporation of a "movement trigger" simply acknowledges that the next event in the sequence is initiated by some physical movement on the part of the performer.

Having myself used a simpler variant of the same general kind of representation (*e.g.* Clarke, 1988), I am now not sure how much this kind of "boxes and arrows" approach really achieves: it identifies a considerable number of abstract processes and kinds of data that may be involved in producing an improvised performance, but despite the rather intimidating appearance of its formalism, it is actually not formal enough to be implemented as a testable working model. It seems to be more like an attempt to indicate as many as possible of the components that might be involved in improvising (and it would be hard to disagree with the rather generic collection that is given in Pressing's model), but with no sense of how these categories really work in any particular instance. Improvisation seems to be on the one hand a much more physical and active kind of music-making than this representation would suggest, and on the other hand much more social than the "head-bound" perspective adopted in a great deal of cognitive research — as the majority of the chapters in the collections edited by Nettl and Russell (1998), and Sawyer (1997), and the paper by Iyer (2002), also demonstrate. The next section discusses some of the writing that has paid greater attention to the physical component of musical creativity.

Body and instrument in improvisation

John Baily is one of a number of ethnomusicologists who have pointed out the significance of physical factors in musical performance and creativity (*e.g.* Baily, 1985; Baily, 1991; Baily and Driver, 1992). He has shown how an understanding of the physical properties of stringed instruments can help to explain the adaptation of a musical style as it passes from one culture (and set of instruments) to another, and how the spatial layout of the guitar, for instance, influences the harmonic sequences used in certain genres of pop music.

> Such movement-inspired sequences in rock music have become an important part of the harmonic vocabulary of rock guitar style. The whole thrust of published written teaching material for rock guitar has been to approach all aspects of chord and single line playing from the point of view of physical accommodation of the left hand. This results in a palette of chord shapes and an accepted representation of harmonic relationships, and a position-related view of single lines (Baily and Driver, 1992, p. 68).

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The same relationship between physicality and musical invention is even more explicit in a comment from the jazz saxophonist Harold Ousley:

> Sometimes the ideas come from my mind and I have to find them quickly on the horn, but other times they come from my fingers. My fingers are 'walking through the yellow pages' so to speak. They'll come up with new things and I'll hear it and say, "Hey, I like that" (Berliner, 1989, cited in Baily, 1991, pp. 150-1).

The perspective contained within these quotes shows the importance of avoiding a rigid distinction between motor considerations and cognitive factors. David Sudnow's book *Ways of the Hand* (Sudnow, 2001) is an idiosyncratic attempt to document his own experience of the physicality of improvised performance, with a strong emphasis on what might be called sensorimotor intelligence — the "knowledge" embodied in the hands' relationships with the keyboard. Sudnow rejects that whole approach in which a "central executive" (in the head) "tells" the body where to go and what to do: improvising is as much to do with the body as it is to do with the mind or the imagination, and the body (for a pianist particularly the hands) is as much the repository of this improvising know-how as is the brain. "I intend my descriptions as indications for how one might eventually speak methodically and rationally, if only crudely for now, when saying things like: the hand — in music, eating, weaving, carving, cooking, drawing, writing, surgery, dialing, typing, signing, wherever — this hand chooses where to go as much as 'I' do" (Sudnow, 2001, p. 2). Rather than regarding the hands as passive executors of the controlling brain's ideas, Sudnow presents skilled improvisation as the results of the hands' knowing explorations of the keyboard.

It is this focus on the physicality of performance, on the instrument as a certain kind of structured environment and on the intelligence of the body, which made Sudnow's approach so radical when it was first published in 1978[6]. In the late 1970s, when cognitive science was relatively new and the claims of artificial intelligence seemingly irresistible, when the influence of Chomsky's generative linguistics was powerfully felt throughout cognitive psychology and in the psychology of music in particular, a concern with the body and with the physicality of human behaviour seemed distinctly marginal. Since then a great deal has changed: the claims and promise of an abstractly cerebral and computational approach have receded or been tempered, and the significance of the body in perception, cognition and cultural discourse, has been widely acknowledged.

Sudnow describes three phases in his acquisition of the skills of jazz improvisation. The first phase is primarily concerned with imitating the materials that he hears in the jazz playing of those on whom he models himself. In the second phase, he deconstructs those blocks of material so as to become more able to vary and recombine them, and so that he can develop a more deeply rooted and sensi-

(6) Although republished as a "rewritten" account in 2001, the book first appeared in 1978.

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tive awareness of the relationship between *place* (on the keyboard) and sound. It is in this part of his account more than any other that Sudnow explores the relationships between the hand (and its movement), the sounds of the keyboard, and his own inner hearing and singing. The final phase is triggered not by sound but by sight: Sudnow describes seeing the pianist Jimmy Rowles play in a club one night, and it is the *look* of his posture, and his relaxed, unhurried but attentive relationship with the instrument that provide for Sudnow the key to "going for the jazz", as he puts it. Without trying literally to mimic Rowles' posture and movements, Sudnow finds that when he adopts something of his general style and manner of movement, a new fluency and lack of self-consciousness develops in his own playing. Attempting to look and feel like the player he aspires to be suddenly unlocks the *playing* that has so far eluded him.

The physical actions in performance — whether of the hands, or the whole body — can be thought of as lying on a continuum from ergonomics to choreography. At the ergonomic end, performers want to try to make sounds by means of movements that are fluent, easy and comfortable. Fingering patterns in instrumental performance are one area where ergonomic factors are likely to be important, and Parncutt, Sloboda, Clarke, Raekallio and Desain (1997) present a model for pianists' fingering choices that is based entirely on ergonomic considerations (finger strength and span, hand position, the placement of black and white keys, turning the thumb under, etc). Although in a highly rehearsed performance there are undoubtedly other factors (such as style and expression) which influence final finger choice, the ergonomic model is strikingly successful at predicting the finger choices that skilled pianists make when they sight read. If musical performance involves playing within, or perhaps playing *with*, the ergonomic constraints of the body/instrument relationship, in improvisation (certainly those forms of improvisation in which the constraints of style and material are loose or accommodating) it would not be surprising to find that the creativity of instrumental performers goes "with the grain" of what comes easily or feels good. This is a more physical (more embodied) way to view the principle that Johnson-Laird (2002) presents in more abstract (computational) terms: the speed of improvisational creativity imposes demands that can only be met by player/ environment interactions that require little or no decision-making and have negligible working memory implications.

Fingering is one of the more discreet aspects of bodily involvement in music — though even here there is evidence that performers deliberately employ (and enjoy) "showy" fingerings which have what might be thought of as a choreographic component: Chico Marx's absurd piano fingerings in his performances in the Marx Brothers films provide informal evidence of this, supported by less extreme examples from some of the discussions reported in Clarke, Parncutt, Raekallio and Sloboda (1997). Studies of the whole body movement of performers (*e.g.* Davidson, 1993; 1995; Clarke and Davidson, 1998) have shown that the largely unconscious

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body movements that performers make when playing are a mixture of ergonomic necessity and expressive purpose, while at the choreographic end of the continuum lie musical performers for whom movement comes first, with sound as the consequence. The various systems for using body movement as a sound controller (see Roads, 1996; Chadabe, 1997 for discussion) are perhaps the most obvious manifestations of this, but with a rather different slant on it there is also the jazz pianist Cecil Taylor, for whom (at times) the movements of the hands at the keyboard are the primary focus, and the sounds the secondary consequence (Lockett, 1988). In a less extreme fashion, there are any number of performers across a range of musical traditions (Michael Jackson, Keith Jarrett, Nigel Kennedy, Laurie Anderson) whose use of the body has played a more or less choreographic role in their performances across their performance careers — a perspective on performance recently explored by Davidson (2001).

The social component of improvisation

I have concentrated so far on individual performers, and although there is a significant tradition of solo improvisation (from church organists to free improvisers), the great majority of musical improvisation is an explicitly social activity involving sometimes complex interactions between performers, as well as between performers and audience. Because of the predominantly cognitive orientation of the psychology of music, this aspect of performance has only recently begun to be investigated, and only to the most limited extent in improvisation. Ethnomusicologists have been more keenly aware of the social dimension, as Monson, in a book on jazz improvisation makes plain:

> Rather than being conceived as foundational or separable from context, structure is taken to have as one of its central functions the construction of social context. In other words, there is a mutually defining relationship between structure and context, rather than one of autonomy. [...] At issue is the capacity of aural signs to signify in multiple directions — their ability to simultaneously constitute structure and a broader field of human relationships through a communicative discourse [...] (Monson, 1996, p. 186).

Sansom (1997) carried out an investigation of this "social construction" within improvisation, in a study that focused on creative processes in freely improvising duos. Sansom asked his participants (improvisors with different amounts of experience) first to play together in free improvisations that lasted from five to about fifteen minutes, following which he interviewed the participants individually, asking them to comment on any aspect of the music or their interaction with the other player while listening to a recording of the improvisation. The interviews revealed the central role of personal interactions in these improvised performances, and the kind of interweaving of social and structural factors to which Monson draws

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attention. The creative impetus in Sansom's duos is at least as much to do with an exploration of interpersonal dynamics as it is to do with a direct manipulation of musical materials. The following is a brief extract from an interview with one of the two performers in Sansom's most experienced improvising duo:

> I was really pleased with the way it started because it was reflective — I felt that it was a good way to start relating to each other [...] I was a bit worried before we started that we might go crashing off into the undergrowth and lose a sense of direction straight away [...]
>
> I really liked that note that Ross did there [...], it was completely in the right place at the right time and you know, nothing to do with anything — it was a great drop of randomness. So I was really enjoying that. [...]
>
> Sometimes in this performance, I get a bit worried whether Ross is [...] doing as much as he naturally, as he really wants to, whether he's kind of laying back a bit to give me space, whether he's actually doing it because that's what he wants to do... (Sansom, 1997, ii, p. 11).

While the other performer makes the following comments in relation to the same passage:

> I was wondering how long it would take Mick to be bored with the beginning because I know how he works [...]
>
> I always think of the way Mick plays as having a really [...], you know he's got a really child-like sense of humour, and I think that always comes out in his playing, and you heard it there [...] 'cos I was prepared for that sort of dreamy thing to go on for quite a lot longer and he's not allowing it (Sansom, 1997, ii, p. 8).

These extracts from the performers' commentaries demonstrate that their awareness of musical materials is contained within the framework of a primary attention to interpersonal dynamics. It would be wrong to conclude that this is invariably the case: Sansom's transcriptions show that this varies from duo to duo, and indeed other parts of this same duo's transcript show a different balance between musical materials and personal dynamics. But the clear message is that viewing improvisation as simply a matter of pitches, rhythms, chord changes and textures would be to miss the point — certainly for this idiom, and arguably for most others too. In a similar fashion, Smith (1998) discusses the jazz trumpeter Miles Davis's improvising practices in terms of ritual behaviour (his interactions with co-performers on stage and in the studio), the semiotics of musical gestures, and the physical gestures and non-verbal interactions of stage performance.

Different genres of improvisation engage different kinds of creative skills, and elicit very different kinds of social and musical structures. A distinction is sometimes drawn between idiomatic and non-idiomatic improvisation, the former referring to

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improvisation that is based on or around material that has some particular stylistic identity (examples would be improvised blues and jazz, or the Raga-based improvisation of North Indian classical music). Non-idiomatic improvisation (sometimes called free improvisation) provides opportunities for very unpredictable and extreme social dynamics to develop, and the music that is created in these circumstances often seems to be primarily a product of the particular social context.

Explicitly psychological research on improvisation has only tackled a rather small part of this "most widely practised of all musical activities and the least acknowledged and understood" (Bailey, 1992, p. ix), and has focused on the productional features of improvisation, largely ignoring questions of perception and the relationships between co-performers and audience. Similarly, the treatment of the musical material has itself, with one or two exceptions, been narrow, and has often treated improvisation as if it was a special case of musical problem solving. Musical material is, of course, a far more social "substance" than this view implies, and it is in the social character of improvisation that psychological research still has much to explore. There is an interesting complementarity between composition and improvisation in this respect: composition can be seen as a way to prescribe a musical structure which has as a consequence the construction of certain kinds of social context and sets of (perhaps temporary) interpersonal relationships. A string quartet (the composition, that is) *requires* the formation of certain kinds of social relationships and interactions between the players (and even between the players and the audience) that are very different from those required by a classical symphony, or a choral work (see Davidson and Good, 2002). In free improvisation, the converse often seems to happen: a certain social context is established or engineered (it is not uncommon for improvising groups to prescribe kinds of *interaction* without specifying the musical material) and the musical interactions are then a consequence of the nature of these social relationships. There is a potential problem here — namely the danger that stereotyped musical consequences will result from these social relationships if there is no other factor to pull the musicians out of their own "lines of least resistance", or familiar patterns of social (and hence musical) interaction. But at present, there is almost no psychological research that has attempted to explore this potentially fascinating domain.

Conclusion

How might a psychological approach to creativity in performance bring together the somewhat disparate material that currently exists? Creativity in any domain takes place within a complex physical and cultural environment, and this context not only provides the substrate within which creativity can grow, but also the arbiter of whether what *does* grow is regarded as creative. Csikszentmihalyi and Rich (1997, pp. 45-46) argue that "whether an idea or product is judged creative depends on the effect it is able to produce in others who are exposed to it. Therefore it follows that

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what we call creativity is a phenomenon that is constructed through an interaction between producer and audience. Creativity is not the product of single individuals, but of social systems making judgments about individuals' products". Once again this emphasises the social component in what can all too easily be seen in individualistic terms — and as I have argued elsewhere in this paper, the tendency for psychological theories to place creativity firmly inside the heads of its creators is one of the primary problems. It would be manifestly wrong to dismiss the role of cognitive processes altogether, but it makes little sense to try to explain such a practical and concrete phenomenon as creativity in performance without reference to the physical apparatus (bodies and instruments) and cultural substances (stylistically constituted musical materials and performance practices) by means of which it is expressed. Difficult though it is to find practical ways to study a complex phenomenon in a manner that does full justice to that complexity, there may be ways in which the established quantitative techniques of performance analysis can be combined with the more culturally embedded insights of participant observation. A recent project in collaboration with a professional pianist and three composers (Clarke, Cook, Harrison and Thomas, 2005) has demonstrated the advantages of bringing together a quantitative approach to rehearsal and performance data with the direct insights of the composer and the performer of the newly commissioned work that form the focus of the project. The "raw data" of performance can inevitably only tell a very partial story about what a performer might have been trying to achieve, and in circumstances where direct access to the performers and composers is possible it makes sense to take advantage of the very different kind of information that this can provide.

I have argued elsewhere for the value of an ecological approach to various aspects of music perception and performance (Clarke, 2002b; 2003; forthcoming), in which the relationship between perception and action plays a central role, and the conceptual framework within which Iyer (2002) discusses rhythm and timing in African-American music offers a similarly interactionist perspective: "Improvisation — musical and otherwise — may be understood partially as a dialectic between formal/symbolic and situational/embodied constraints" (Iyer, 2002, p. 409). Creativity in performance takes place at the interface between socially constructed musical materials and performance practices, the possibilities and constraints of the human body and instruments with which it interacts, and the perceptual, motor and cognitive skills of individual performers. The psychology of music has made some progress in studying this complex phenomenon, particularly in understanding the cognitive processes that underlie this highly regarded behaviour. Nonetheless there is still a great deal more that is not well understood, partly because of the de-socialised and rather dis-embodied way in which performance has often been studied. The engagement of cognitive processes with both social factors (performance traditions, socially constructed notions of "innovation" and the limits of acceptable radicalism, the interactions between narrowly defined musical processes

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and the social context of performance) and physical factors represent considerable challenges to the psychology of music. These challenges are already being tackled in various ways, and bring with them the prospect of a less individualistic and "head-bound" understanding not only of creativity in musical performance — but also of the human mind more generally[7].

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• Creatividad en interpretación

Este trabajo examina diferentes maneras en que la noción de creatividad ha sido empleada en relación con la interpretación y discute la investigación psicológica del tema. Una cantidad considerable de esta investigación está relacionada con el empleo creativo de la expresión en interpretación de partituras, aunque se localiza una demostración más notoria de creatividad en la interpretación improvisada. Habiendo considerado ejemplos representativos de las escasas investigaciones cognitivas sobre este tema, el trabajo discute más que las diferentes aproximaciones, algunas localizadas en la etnomusicología, que han estudiado prácticas improvisatorias de forma más personal, a la vez que más insertada social y culturalmente. El trabajo concluye con algunas recomendaciones generales de la forma en que futuras investigaciones podrían reunir las dispares perspectivas que habitualmente caracterizan este complejo asunto.

• La creatività nell'esecuzione

Il presente articolo esamina differenti modi in cui la nozione di creatività è stata usata in rapporto all'esecuzione, e discute la ricerca psicologica sull'argomento. Una porzione considerevole di questa ricerca si occupa dell'uso creativo dell'espressione in un'esecuzione basata su un testo musicale, ma una dimostrazione più evidente della creatività esecutiva è rintracciabile nell'esecuzione improvvisata. Avendo preso in considerazione esempi rappresentativi della ricerca cognitiva in questo ambito (relativamente limitata), l'articolo discute piuttosto approcci differenti, alcuni dei quali provenienti dall'etnomusicologia, che hanno guardato alle pratiche improvvisative in una maniera più comprensiva, come pure più socialmente e culturalmente inserita. L'articolo conclude con alcune raccomandazioni generali sul modo in cui la futura ricerca potrebbe unificare le prospettive, piuttosto disparate, che caratterizzano attualmente questo complesso settore.

• La créativité dans l'exécution

On étudie ici les divers usages de la notion de créativité en relation avec l'exécution et on discute de la recherche psychologique sur le sujet. Une part importante de cette recherche traite de l'utilisation créatrice de l'expression dans l'exécution d'une partition, alors que l'exécution improvisée fournit une démonstration plus visible de la créativité dans l'exécution. Après avoir considéré les exemples représentatifs du nombre assez restreint de recherches cognitives en ce domaine, on aborde des approches relativement différentes — dont certaines sont fondées sur l'ethnomusicologie — qui ont envisagé les pratiques improvisées d'une manière plus concrète et inscrite dans un contexte social et culturel. L'étude s'achève par un certain nombre de recommandations générales qui devraient conduire les recherches à venir sur la voie du rapprochement entre les perspectives disparates qui caractérisent aujourd'hui ce domaine complexe.

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• Kreativität in einer Performance

Dieser Aufsatz untersucht die verschiedene Ansätze, den Begriff der Kreativität auf Performanz anzuwenden und diskutiert psychologische Forschung auf diesem Gebiet. Eine große Anzahl an Forschungsarbeiten beschäftigt sich mit dem kreativen Gebrauch von Ausdruck bei Aufführungen notierter Musik, obwohl Aufführungen improvisierter Musik eine deutlich auffallendere Demonstration von Kreativität darstellen. Im Anschluss an die Darstellung einiger ausgewählter, repräsentativer Beispiele aus der vergleichsweise kleinen Anzahl kognitiver Studien auf diesem Gebiet werden in diesem Artikel ganz verschiedene Ansätze diskutiert, einige aus der Ethnologie, die Improvisationspraktiken aus einer mehr phänomenologisch beschreibenden und sozial und kulturell eingebetteten Perspektive betrachten. Der Aufsatz schließt mit einigen allgemeinen Empfehlungen, wie in zukünftigen Forschungsprojekten die verschiedenen Blickwinkel, die derzeit dieses komplexe Gebiet charakterisieren, zusammengebracht werden können.

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