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## **Communication of (e)motion through performance:**

### **Two case studies**

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### **Abstract**

This paper examines the role of the communication of activity in the communication of emotion in music performance. The starting point is the hypothesis that performers are especially well able to communicate levels of activity and that communication of emotions is to a considerable extent based on this communication. Two case studies are reported that confirm that the ability of performers to communicate the activity of an emotional interpretation of a musical passage is stronger than the ability to communicate the valence of an emotional interpretation. In the first case study, the performers expressed discrete categories of emotions, but the two low activity emotions were strongly associated and happiness was not always reliably communicated. In the second case study, the communication of activity was much stronger than the communication of valence. The question is raised whether emotion in music performance exists without perception of activity and whether communication of emotion is sometimes rather communication of motion.

## Introduction

This paper examines the communication of emotion in two case studies of performances of western tonal music and investigates whether this communication is primarily based on the communication of (emotional) activity. The background of the studies is formed by a series of empirical studies that have recently been conducted by Juslin (1997, 2000, 2001), and closely related work by Gabrielsson, Scherer and Sundberg, among others (Gabrielsson & Juslin, 1996; Scherer & Oshinsky, 1977; Scherer, 1995; Sundberg *et al*, 1995). One of the aims of these empirical studies has been to define cues that are responsible for the communication of emotions from performer to listener, focusing on communication in western tonal music. In a simple manner, communication can be said to occur when a performer expresses an interpretation of music using means (cues) to which listeners are sensitive. The communicated interpretation could concern metrical structure (Sloboda, 1983), phrase structure (Palmer, 1989; Todd, 1985) or an emotional interpretation of music (Gabrielsson & Juslin, 1996). Juslin (2000) elaborated this simple framework by adapting Brunswik's lens model (Brunswik, 1956). In Juslin's adaptation of the model, performers and listeners show preferences for the association between cues and emotions that may only partly overlap. The model (Juslin, 2000) allows for communication of an emotional interpretation of the music to occur ("achievement" of communication) even when listeners and performers do not fully agree on the means to express emotions (lack of "match" in encoding and decoding of cues).

An important assumption of the model is that distinct categories of emotions are communicated. This is in line with observations made by Gabrielsson and Juslin (2003) and others that communication of emotions in music is only reliably above

chance level as long as it concerns a limited number of basic emotions. If listeners are asked to indicate what emotion they perceive in a musical passage, disagreement between listeners will increase considerably when they need to specify for example the type of sadness (*e.g.* melancholy, regret) of a passage, while they may agree that it falls into the general category of sadness.

There are a couple of reasons for assuming that the communication of basic emotions through music is particularly strong, especially when emotions in response to music are seen as related to emotions in daily life. Several authors have suggested the existence of a limited number of emotions that are functionally distinct, have distinct behavioural expressions, and are associated with distinct brain substrates and distinct patterns of physiological changes (*e.g.* Damasio *et al*, 2000; Ekman, 1994; Levenson, 1992; Oatley, 1992, Panksepp, 1994). Ekman and colleagues (1982) described the facial expressions accompanying several emotion types. They demonstrated cross-cultural understanding of facial expressions of happiness, interest, anger, disgust, and to a lesser extent fear and surprise. They also observed similar facial expressions across cultures in comparing facial expressions of Japanese and American participants watching a stress-inducing film. In a parallel manner, the characteristics can be described of vocal expressions of basic emotions and cross-cultural validity can be tested. In an overview, Scherer and colleagues (2003) summarized observed characteristics of vocal expressions of happiness, anger, sadness, fear and boredom, as well as characteristics of aroused/stressed vocal expressions. In an earlier article, Scherer (1986) suggested how tension in the vocal tract (when excited) and the shape of the mouth (as in smiling) may lead to these voice characteristics. In his interpretation, vocal expressions are a result of different emotion components. Physiological arousal is one component that influences vocal expressions especially strong.

The connection to music is made with the suggestion that performers imitate speech cues for expressing emotions in order to communicate discrete emotions in music performance (Juslin & Laukka, 2003). Thus the meaning of the performance cues has its basis in more general vocal cues. Juslin and Laukka (2003) compared the results of studies investigating cue utilization in speech and music performance, and indeed showed clear parallels between expressions of emotions in both domains.

Although this is a most plausible theory with considerable verification, there are nevertheless a couple of problems with it. As mentioned by several authors, the definition of basic emotions is problematic (Ortony & Turner, 1990; Scherer *et al*, 2003). Different authors do not only disagree on which emotions to include, they also do not necessarily include the most applicable emotions to music (Scherer, 2004). Moreover, some authors have argued that music does not express specific emotions.

More characteristically emotional in music might be the dynamical properties of “ebb and flow” or “tension and release”. As Cook and Dibben (2001) indicate, Hanslick played an important role in focussing attention to the internal dynamics of music. According to Hanslick (1854), music cannot present the content of feelings, only the dynamics or motion of a physical process. Influential has also been Meyer’s (1956) theory of emotion and meaning in music. Meyer (1956) focused on “embodied” meaning of music and suggested how emotional responses may be the result of violations and resolution of violations of expectations based on the musical structure. Violations lead to tension increases, while resolutions release tension. The patterns of tension and release may be responsible for emotional responses.

Krumhansl (1996) found some empirical confirmation of the relationship between perceived tension and patterns of expectation based on melodic and harmonic structure. Schubert (2001) emphasised, however, the influence of the performer on

the perception of tension. He summarized several studies on tension, among them the study by Krumhansl (1996), and showed that tension is often most strongly related to the dynamics of a performance. He suggested that the relationship with dynamics is stronger than the relationship with music theoretical predictions.

Sloboda and Lehmann (2001) investigated the influence of the performer on the perceived intensity of emotion of the music. Perceived intensity of emotion was relatively high at moments that pianists had explicitly mentioned in the interview. In a related study, my colleagues and I found a strong correlation between listeners' ratings of emotional engagement and the dynamics of the performance. The pattern of dynamics was closely linked to the pianist's perception of the formal properties of the music (Timmers *et al*, 2006).

The two interpretations of emotions in music as dynamic property or discrete category may seem to be distinct and unrelated. However, the two approaches can be connected if emotion categories such as happy and sad are characterized as a location within a two-dimensional space. In an elaboration of the "continuous response" paradigm as used by Krumhansl for the indication of tension, Schubert (2004) asked listeners to indicate variations in emotions over time when listening to music along two dimensions of "arousal" and "valence". This approach emphasises the changing characteristics of music over time, as do the studies of perception of patterns of tension and release. Schubert showed that arousal is also often related to performed dynamics (Schubert, 2001; 2004). The two dimensions of arousal and valence are derived from Russell's circumplex model (Russell, 1980). According to this model, emotions can be represented in a circle that has pleasure and displeasure at two extremes (right-left), and, at right angles to that, arousal and sleepiness at two extremes (top-bottom). Positions in between at 45, 135, 225, and 315 degrees are marked by

the categories of excitement, distress, depression and relaxation. This representation has an empirical basis and formalizes the conceptual distance between different emotions as well as the structure of affective experience (Russell, 1980). In later use of the model, the dimension of pleasure-displeasure is often referred to as valence, while the dimension of arousal-sleepiness is referred to as arousal or activation. Valence distinguishes “positive” emotions such as joy, hope and love from “negative” emotions such as fear, sadness and anger. Arousal distinguishes “active” emotions such as anger and excitement from “calm” emotions such as depression and hope. From the basic emotions, sadness is the least active, anger and fear are most active, and happiness is the only positive emotion and intermediate to high in activation.

In this paper, I will argue that performers are very well able to communicate “activation” or a sense of “intensity”. Indeed performers are especially able to highlight moments of high intensity and contrast these with moments of low intensity. This sense of intensity may be interpreted as “activation” or as “tension” depending on the context and the instruction to the participants. This does not mean that activation and tension are theoretical synonyms. On the contrary, they both have distinct theoretical backgrounds. Nevertheless, listeners may interpret performers’ expressive intensity as a signal of “emotional activation” or as a signal of “tension” and indeed performers may use similar means to express one or the other. Moreover, this sense of intensity may also provide a strong cue for which emotional category is being expressed. Because different categories of emotions may have distinct levels of activation associated with them, the choice between emotional categories may be cued to a considerable extent by the communication of activity alone.

In contrast, the communication of valence is less straightforward. Although performers may have some means to communicate “optimism” compared to “pessi-

mism”, these means are less consistent over performers and performances of different music, and listeners interpret them less automatically than cues for the level of intensity. Additionally, performers may have specific cues to suggest specific categories of emotions, but again these are less general and perceived less automatically. The main cue is, therefore, an indication of the level of activation. Other additional cues qualify this indication of activation.

These arguments are based on several studies that colleagues and I have conducted in the past years (Timmers *et al*, 2006; Timmers & Ashley, in press; Timmers, 2007; Timmers, in press). Although these studies are limited in scope, they do give several important indications. The suggestions are also in line with results of and suggestions made in studies conducted by others, which will be summarized in the discussion. In this paper, a summary of two studies will be given. The first study examined the communication of basic emotions and the communication of activity and valence in ornamented performances of a Handel sonata. The second study compared the communication of activity, valence and tension in historical and modern performances of a Schubert song. Most details of the method of the studies are provided elsewhere and will not be repeated here. The first study is explained in detail in Timmers and Ashley (in press). The second study is explained in detail in Timmers (2007) and Timmers (in press). The summaries provided below include the details necessary to understand the studies. Additionally, they include re-analyses of the data related to the specific question addressed here.



## **Study 1: Communication of emotion using ornamentation**

The first study (Timmers & Ashley, in press) examined the possibility of the communication of emotion by ornamenting existing melodies. A professional flutist and violinist were asked to ornament the beginning phrases of three melodies from Handel's sonata for recorder and basso continuo in G minor (HWV360). They were asked to ornament these melodies in such a way to make the melodies sound happy, loving, sad, and angry. They performed along with a fixed piano accompaniment that fixed the tempo of each performance. The solo and piano performances were mixed into a mono-track audio file and presented to participants in a listening experiment. The participants rated for each performance the presence of the four moods of "happy", "loving", "sad" and "angry" on a uni-polar seven-point rating scale.

The ornamentation that the performers used to express the four emotions was analysed in two ways<sup>1</sup>. First, the type of the ornament was defined and, secondly, the characteristics of the ornaments were defined. Among the types of ornaments considered were trills, appoggiaturas, mordents and turns (all categories distinguished by Bach, 1753). In addition, the total number of added ornaments was calculated, which gave the density of ornaments, and the ornaments were grouped into simple ornaments that consist of only one ornamental note and compound ornaments that consist of more than one ornamental note. The distinction between simple and compound ornaments was referred to as the complexity of the ornaments.

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<sup>1</sup> The third analysis focusing on the structural position of the ornament is left out of consideration here. The results of this third analysis show the relevance of the metrical position of the ornaments.

The analysed characteristics of the ornaments included its duration, timing (before or at the original onset time of the ornamented main note), harmony (consonant or dissonant), and melodic direction (up or down), again following categories distinguished by Bach (1753). In addition, the average sound level of the entire performance was calculated.

Table 1: *Significant correlations for flute performances between emotions (Columns) and ornamentation (Rows) (N = 24. p < .05). Emotions include instructed (i-H. i-L. i-S. i-A. i-Act. i-Val) and rated emotions (r-H. r-L. r-S. r-A). Aspects of ornamentation include type (top rows) and characteristics (bottom rows).*

Ornament	i-H	i-L	i-S	i-A	i-Act	i-Val	r-H	r-L	r-S	r-A
Single app.			.59	-.48	-.49		-.42	.53	.70	-.62
Trill			-.60		.41			-.44	-.66	.54
Turn	.41									
Slide		.55				.47				
Arpeggio			-.42	.45	.46			-.50	-.55	.41
Complexity			-.55	.46	.46		.41	-.49	-.68	.62
Density		.42					.56			
On-timing	-.41		.48			-.60				
Duration			.61	-.46	-.67			.57	.64	-.48
Direction				-.45				.55		-.59
Harmony			-.55					-.45	-.56	.52

The main results of the analyses of the flute performances are reported in Table 1. This table shows that the flutist varied the ornamentation most systematically

in association with the presence or absence of sadness and anger (Table 1, left column). Fewer characteristics were varied systematically in association with the presence or absence of happiness and love. Similarly, the characteristics that were varied in association with sadness and anger were also best recognized by the listeners, but in a generalized manner (Table 1, right column): Listeners interpreted these characteristics as evidence for the presence of love as well as sadness, and, in some instances, as evidence for happiness as well as anger. This included characteristics such as the complexity and the duration of the ornaments, and the use of larger tone intervals (arpeggios).

In other words, a clear distinction was observed between the use of ornaments to express high and low activity emotions. In contrast, the distinction between positive and negative emotions was less strong. Instructed valence was associated only with the timing of ornaments: ornaments were relatively often timed anticipating the main note in happy and loving performances, while they were timed to delay and shorten the main note in sad and angry performances. However, this distinction did not return in the responses of the listeners.

A similar pattern of results was found for the violinist (see Table 2). Again most characteristics were associated with the presence or absence of sadness and anger (Table 2, left column), but the listeners interpreted these characteristics as evidence for love as well as sadness, and, in some instances, as evidence for happiness as well as anger (Table 2, right column). These characteristics included complexity, density, and timing of the ornaments, as well as the overall sound level. The violinist timed the ornaments in a different way than the flutist. For the violinist, the timing of the ornaments was probably a result of the systematic variation of the number of

added ornaments: if more ornaments were added, relatively many were timed before the original time of main note rather than at the original time of the main note.

Despite the predominant association between the use of ornamentation and activity of emotions, the communication of emotions was successful for both performers. Happy performances were least well recognized from the four emotions followed by loving performances. Still, the recognition was generally well above chance level and the recognition percentages corresponded with results from other studies.

Table 2: *Significant correlations for violin performances between emotions (Columns) and ornamentation (Rows) (N = 24. p < 0.05). Emotions are instructed (i-H. i-L. i-S. i-A. i-Act. i-Val) or rated (r-H. r-L. r-S. r-A). Aspects of ornamentation include type (top rows) and characteristics (bottom rows).*

Ornament	i-H	i-L	i-S	i-A	i-Act	i-Val	r-H	r-L	r-S	r-A
Single app.		.43			-.47					
Double app.			-.58	.43	.70				-.48	
Trill	.64					.47				
Turn							.53			
Substitute			.55						.48	
Complexity			-.47	.54	.65		.57		-.53	.44
Density			-.53	.45	.49			-.42	-.67	.54
On-timing				-.55	-.46			.41	.48	-.43
Sound level			-.76	.71	.64		.42	-.61	-.70	.74

## Study 2: Communication of emotion in vocal performances

The second case study (Timmers, in press) examined communication of emotion in historical and modern performances of *Die junge Nonne*, a late song of Schubert in F minor (D828; Op. 43 No. 1). This is not an experimental study in the sense that performers were instructed to give different interpretations of the song. Instead, performances from records by famous singers as Emmy Ameling, Gundula Janowitz, Lotte Lehman and Elisabeth Schwarzkopf were selected to serve as material. A series of listening experiments was conducted in which fragments from performances of *Die junge Nonne* with different moods were presented to the participants and the participants rated the activity and valence of the perceived emotion on a scale from 1 to 7 (representing either low to high activity or negative to positive valence). After that, the participants listened to the musical fragments again and rated the quality of the performances and how much the performances affected them emotionally. In a second follow up, participants wrote down the dynamics per bar of a musical fragment or the tension per bar of a musical fragment<sup>2</sup>. In all these tests, participants were asked to direct their attention to the performance of the music. The participants were advanced performers.

An additional purpose of the study was to examine the effect of recording quality and familiarity with performing style on the perception of emotion, dynamics

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<sup>2</sup> The results for the tension experiment are not reported in Timmers (in press) to keep the paper limited in scope. Separate publication of these results is planned.

and quality, which is of peripheral interest here, but needs to be taken into account because historical recordings were used.<sup>3</sup>

In discussing the results of this series of studies, the following questions are addressed: 1) Do performers influence both the activity and valence of perceived emotions? 2) How do perceived valence and activity relate to aspects of the performances such as tempo, dynamics and vibrato? 3) How does perceived tension relate to these aspects of the performances?

To answer the first question, an analysis of variance was run that tested the effect of fragment and singer and the interaction between fragment and singer on rated activity and, in a second repeated measures ANOVA, on rated valence. For activity, the main effect of fragment and the interaction between fragment and singer were highly significant ( $p < .0001$ ), while the main effect of singer was marginally significant ( $p < .05$ ). The interaction shows that singers gave a personal interpretation of the activity of the music: the activity of a musical fragment is not the same for each performance. For valence, on the other hand, the main effect of fragment was the only highly significant effect, while the interaction and the main effect of singers were marginally significant ( $p < .05$ ). This indicates that singers' influence on the perception of valence was not very strong.

To answer the second question, the average rated activity and valence per performance were correlated with the average bar duration, dynamics, vibrato rate, and

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<sup>3</sup> In the original study, two versions of each song were used: a clean and a noisy version in order to be able to investigate the effect of version besides the effect of recording date. However, for the purpose of the current paper, only the clean versions of all recordings are used and the effect of version is left out of consideration.

vibrato extent per performance. Bar duration, vibrato rate and vibrato extent were measured using PRAAT<sup>4</sup> (for a description of the measurements see Timmers, 2007). The dynamics per bar were written down by participants in one of the experiments as explained before. To calculate the average dynamics, the dynamic markings – such as piano and mezzo forte – were translated into numerical values and then averaged.

Table 3: *Significant correlations between rated activity and valence and variables of the performance including bar duration, dynamics, vibrato rate and extent, and glissandi up and down.*

Variable 1	Variable 2	Correlation	Variable 1	Variable 2	Correlation
Activity	Dynamics	.86	Valence	Bar duration	.50
Activity	Vibrato extent	.70	Valence	Down	.45
Activity	Up	.53			
Activity	Down	-.41			

Table 3 shows the significant correlations between aspects of the performances and rated activity and valence. As can be seen, activity is especially highly correlated with dynamics, followed by vibrato extent. A rise in activity is associated with an increase in dynamics and vibrato extent. Additionally, performances with higher activity are associated with more upwards and fewer downwards pitch glides than performances with lower activity. Valence correlates positively with bar duration and downward glides. This indicates that performances of music rated as posi-

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<sup>4</sup> A web-link to PRAAT and explanatory texts can be found at [www.fon.hum.uva.nl/praat/](http://www.fon.hum.uva.nl/praat/).

tive are slower and have more downward glides than performances of music rated as negative. This may be counter-intuitive at first, but it is a confirmation of previously found results for this song (Timmers, 2007). The findings can be understood in the context of this particular song, where the positive passages resolve the tension present in the negative passages. In *Die junge Nonne*, a young woman seeks to find rest and peace from her tormented earthly life. Her life is stormy as the roaring wind and her heart is as dark as the grave. She hopes to find peace by joining the convent and marrying the eternal husband. In this sense, negative tension is resolved. This resolution is not a matter of calming down of high arousal, because both the negative and (relatively) positive passages have phrases with high and low activation.

In this analysis, activity does not correlate with bar duration (or tempo), in contrast with expectations. This is because tempo is first of all correlated with valence. However, if we take the relationship between valence and bar duration into account in addition to the relationship between activity and bar duration in a multiple regression model, the variations in bar duration are significantly related to activity ( $p < .05$ ): bar duration tends to decrease (tempo tends to increase) with higher levels of activity.

As mentioned, one of the tasks of the participants was to indicate the dynamics of each bar of a fragment, while in another experiment, they were asked to indicate the tension of each bar of a fragment. The correlation within one performer of indications of dynamics and tension was on average .78. This is a bit lower than the correlation of .86 between dynamics and activity reported in Table 3. Other significant correlations between perceived tension and aspects of the performance included, for four out of six singers, the correlation between tension and vibrato extent, and, for three out of six singers, the correlation between tension and vibrato rate.



In these listening experiments, a conceptual distinction was made between tension of a performance and the activity of the perceived emotion of a musical passage. The tension was assumed to vary within a musical phrase of around six bars, while the activity of the perceived emotion of a musical phrase of around six bars was assumed to be (approximately) stable. This is relevant for the interpretation of the correlations: activity correlates with average dynamics, while variations in tension correlate with the variations in dynamics within a musical phrase.

A crucial question might be whether higher activation also means that the performances were considered more emotionally affecting. In the same series of experiments, participants were also asked to judge the quality of a performance and to indicate to what extent the music affected them emotionally. Correlations were used to examine the association between affect, activity and valence. None of these correlations turned out to be significant. Affect did correlate significantly with some aspects of the performances. It correlated negatively with dynamics and positively with bar duration, suggesting a tendency to find relatively slow and soft passages more emotionally affecting. The strongest correlation was however with rated quality: most affecting were the best performances, which were the modern rather than the historical recordings. The modern performances were on average also the slower and softer performances.

## **Discussion**

What do these two case studies suggest concerning the communication of emotion in music performance? The first study suggested that communication of distinct emotional categories using ornamentation is possible. However, in the analysis

of the performances and the responses of the listeners, it became clear that strongest communication concerned high activity emotions (specifically angry) compared to low activity emotions (specifically sad, but also loving). Listeners showed sensitivity to the relationships between aspects of the performances and emotional activity. They did not show sensitivity to the means that the performers applied to communicate emotional valence. Indeed, angry and sad were best communicated, while communication of happy was least successful. Moreover, listeners' ratings of love correlated highly with ratings of sadness.

The different means of communicating activity for the two performers (and the two studies) suggest a many to one mapping. Different performance variables are interpreted along one dimension. This may be due to the experimental design in which listeners were asked to interpret the musical fragments in terms of a limited set of categories (and, in the second study, a limited set of dimensions). However, it is not necessarily an artefact. A mapping of many cues to a few concepts is in line with the notion of redundancy in performance cues (Juslin, 2000). Although redundancy limits the information capacity, it increases the chance of success of communication. Moreover, this type of mapping suggests why music provides an interesting domain for expressing emotions and emotional arousal; it offers multiple manners to say "the same thing".

The second study demonstrated, similarly to the first study, the ability of performers to communicate a personal interpretation of the emotional activity of a musical passage compared to the less successful communication of a personal interpretation of the emotional valence of a musical passage. Again, the study did show that the performers varied certain aspects of the performances in association with the va-

lence of the mood of a passage. However, listeners' sensitivity to these expressions of valence was limited.

In the second study, participants also wrote down perceived tension per bar. This provided the opportunity to examine the relationship between perceived tension and aspects of the performance. The highest correlation was between perceived tension and perceived dynamics. The other significant correlation was with vibrato extent. On the one hand, this suggests that dynamics may have (at least) two different functions. On the other hand, it suggests a connection between perceived emotional activity and perceived tension.

No connection was observed between perceived activity and reported emotional affect. In contrast, listeners reported to be more emotionally affected by the modern performances, which tended to be softer and slower overall, than by historical performances, which tended to be more intense in rubato, overall dynamics, and faster in tempo. They also found the modern performances of higher quality. This suggests the relevance of aesthetic experiences as well as the relevance of familiarity with performing style for emotional affect. Additionally, it may suggest that affect arises at calm passages that are set against arousing musical passages.

That perception of arousal and reports of emotional affect are not correlated emphasizes that perception of emotion and experience of emotion should be clearly distinguished. As Gabrielsson (2001-2002) suggested, the relationship between perceived and felt emotions may vary from positive to negative to unrelated. The results reported in the second study suggest two distinct processes responsible for the perception of activation and for actual emotional arousal. Perception is only one aspect of the appraisal processes that give rise to emotional responses (Scherer & Zentner, 2001).

How reliable and general are the results of the presented studies? The studies were limited in scope, and concerned only a few pieces and a few performers. The first study was an experimental study in which performers were asked to perform three fragments of a Handel sonata in different ways in order to express different emotions. The difficulty with this procedure is that it is partly unnatural. An emotional interpretation such as “play it angry” is imposed on music that is not itself angry, which may have introduced an interaction between notated and performed emotional cues. The second study did not have this problem. Only original performances were used. This made this study less experimental, which might have been a reason for the lack of influence of the performer on the perceived valence. If the performers were instructed to emphasize the “positive” or “negative” character of a passage, the influence of the performer might have been stronger. The combined results of the two studies are therefore stronger than the separate results.

Nevertheless, the generality of the results is suggested by parallels with other studies. For example, the relative ease of communication of activity is also apparent from the results reported in Juslin and Laukka (2003) and Scherer and colleagues (2003). Scherer and colleagues indeed observed that arousal is among the most influential components for vocal expressions of emotions. They add, however, that arousal alone cannot fully explain emotional expressions in speech. The summaries provided by Juslin and Laukka (2003) indicate that emotions of high and low activation (anger and sad) are best communicated in music performance and speech. Additionally, the reported measured cues mainly distinguish emotions with regard to their activity. For example, expressions of fear and anger often share characteristics such as high tempo, high sound level, and upward pitch contour, while sad and tenderness show opposite trends. Happiness often has an intermediate to high level. Happiness

shows opposite trends to negative emotions for some aspects of performances only. For example, it is together with tenderness more regular in microstructure than fear, anger or sadness.

In short, this paper was not aimed to test or falsify theories that propose communication of emotions to concern discrete categories of emotions. Rather, it was aimed at investigating what processes enable communication of emotions (discrete or not) in music performance. The labelling of musical passages with emotion words may be part of the communication process. The perspective of the paper was to emphasize the relative prominence of communication of activity through performance. Performers seem especially well able to communicate a sense of activation, which is proposed to be the first important step for the perception of emotion and tension. This sense of activation was in the reported studies first of all related to the dynamics of the performances, and secondly to the use of vibrato, tempo, rhythm, and glissandi in the performances.

It may be questioned if communication of activity is sufficient for communication of emotion. When emotions are considered to be first of all a valenced response, as in the definition of Ortony, Clore & Collins (1988), the communication of valence should be at least as clear as the communication of activation for emotions to be truly perceived.

Additionally, it may be questioned if it is possible to communicate emotions through music performance without varying activity. The suggestion from the perspective of this paper is that that would be complicated compared to the ease of communication of activity in performance.

It is certainly not the case that the suggestion of the primacy of communication of activity is by now demonstrated. Instead, it is a proposal that still needs real

verification. Future studies may verify the proposition by *e.g.* comparing the ease of perception of discrete emotions in performance of music with the ease of perception of activity. This could be accomplished by making a comparison between response times needed to judge emotions or emotional activity and between reported certainties with which participants provide an answer. The prediction would be that performances influence the decision for “aroused” or “calm” more effectively than the decision for “happy”, “sad” or “angry”.

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