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# **A Meta-study of musicians' non-verbal interaction**

## **Keywords**

Non-Verbal Interaction, Belief, Desire, Intention, Tacit Knowledge, Music Practice.

## **Abstract**

Music can be seen as a social skilled practice, since the creation of good music is the result of a group effort. According to current literature, communication through non-verbal cues is an important factor in securing a good performance, since it allows musicians to correct each other without interruptions. Hence, despite the fact that the skill to engage in a non-verbal interaction is described as tacit knowledge, it is fundamental for both musicians and teachers (Davidson and Good 2002). Typical observed non-verbal cues are for example: physical gestures, modulations of sound, steady eye contact, and facial expressions (Levasseur 1994, Kurkul 1997). This meta-study proposes to investigate musicians' interaction using the Belief-Desire-Intention model (Bratman 1999) that has been used in software development of planning agents (Rao and Georgeff 1995). According to Bratman, as planning agents, we act intentionally, and we form and execute (partial) plans. Future-directed intentions are further reconsidered according to the reduced set of desires and beliefs. In the BDI sense musicians interact to execute their plan, originated for instance by the desire to play good music, the belief of knowing how the music should be played and the intention to communicate through non-verbal interaction, which allows them to achieve their desire and improve the performance on-the-fly. The BDI model has proven useful in synthesising information and it is believed that this scientific-rational model will bring benefits in analysing a tacit practice.

## **1 Introduction**

Non-verbal interaction is recognised nowadays as a musical skill, supporting social and artistic aspects in the act of becoming a musician and of playing music. Many studies have been published on the subject, but they provide mostly a general overview of the phenomenon or the statistical relevance of one particular factor, like for example the wideness of conductor's arms gestures (Luck and Nte 2007). As a consequence these accounts make it difficult to reconstruct a detailed and contextualised picture of what actually happens among musicians performing together, which could provide a deeper level of understanding of music as a social-skilled practice. On the pedagogical side, however, detailed studies have been conducted, based on ethnography, and they provide a clearer understanding of what is going on between teachers and students. Therefore, this meta-study tries to set up a theoretical framework, to support an ethnographic and participatory investigation of non-verbal interaction among professional musicians.

Non-verbal interaction is discussed as tacit knowledge difficult to articulate and share, a form of communication, affected by social dynamics like schismogenesis, and a tool for group creativity, as it allows musicians to tune in and reach the "flow" by being responsive to each other. Following these perspective the authors propose a qualitative definition of non-verbal interaction, based on a wide literature survey about musical performance, communication, and education, and on preliminary analysis of video-recordings from Esbjerg Conservatorium<sup>1</sup>, Denmark. Finally, dynamics, meaning, and articulation of non-verbal interaction will be analysed in order to build a more detailed account, to be synthesised through the Belief-Desire-Intention model and tested in future studies together with musicians, hopefully providing a common ground for interaction and dialogue between researchers and musicians. The rest of the paper is organised as follows. Section 2 tries to present a definition of non-verbal interaction, through own and literature studies, as tacit knowledge and social interaction related to schismogenesis. Section 3 presents the BDI model, and relates the model to the observations of musicians.

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<sup>1</sup> <http://www.vmk.dk/>

## 2 Defining non-verbal interaction in music

### 2.1 Tacit Knowledge

According to recent studies about music and non-verbal interaction, it is possible to define music as a social skilled practice as the creation of a good sound is the result of a group effort based on social interaction. Non-verbal interaction is presented in many studies as an important component of the social interaction that emerges among musicians, as it allows them to "tune in" together, "reach a group flow" (Davidson and Good 2002), but also to "cover up mistakes" or to correct each other during a performance without any interruptions (Sawyer 2006). However, despite the recognised importance of this skill, non-verbal interaction is described as a form of tacit knowledge. By tacit knowledge we refer to the notion of Polanyi (1966), as knowledge that is difficult to share through verbal language, since practitioners themselves, in this case musicians, are not fully aware of it. It includes habits and behaviours learnt through personal contact with other practitioners, observing and interpreting their actions. According to Heikinheimo (2009) instrumental teachers use both verbal and non-verbal language to create an "understanding, in musical thought and action" in their students, who are supposed to interpret this code and respond musically. It feels as teachers and students are creating together the music, which emerges from a social exchange (Ingold and Hallam 2007, Sawyer 2006).

In this respect, authors like Levasseur (1994) aim at an articulation of non-verbal interaction, to make music teachers able to support their students in the act of becoming musicians, by fully exploiting the potential of non-verbal interaction. She reported several cases from voice studios, where teachers showing non-verbally their mistrust for the students' talent, elicited in them a state of anxiety, negatively affecting their performance. On the contrary the same teachers, when they believed in the talent of their students, were able to create a relaxed atmosphere that helped the students to be focused and sing better. Furthermore, Kurkul says that music teachers are not able to evaluate their practice and during his study expressed utterances like: "No one has ever taught me how to teach!" Or "I never thought that I should pay attention to these (non-verbal) aspects!" (Kurkul 2007 p. 31). They probably learnt about non-verbal interaction in teaching by being in contact with other teachers, as students or as assistants, in this sense they were handling non-verbal interaction as a tacit knowledge. Interestingly a private conversation with a professor from Esbjerg Conservatorium seemed to confirm that non-verbal interaction is a tacit knowledge, but there is an interest in articulating it. As a result he expects a significant contribution to musical knowledge that could make musicians more able to communicate with each other, and possibly to share this knowledge more effectively with students and colleague.

### 2.2 Non-verbal cues

A literature survey and preliminary analysis of video recordings from Esbjerg Conservatorium during classes, allowed us to reconstruct typical cues of non-verbal interaction among musicians. In his pedagogical study Kurkul (2007), referring to previous studies like Levasseur (1994), lists three main categories: *kinesics*, *proxemics*, *paralanguage*. The cues listed in the *kinesics* category are: eye contact, facial expressions, hands gestures, body leaned forward while standing or sitting, head nodding. In *proxemics* he lists: physical distance between teachers and students, touching of a part of the student's body. Finally for *paralanguage* he includes: silence and voice quality. All these cues form a complex language that the teacher uses to provide an understanding to students about how to play a particular piece, during a conversation or an execution.

Eye contact and reciprocal visibility (Davidson and Good 2002) seem fundamental, because it allows musicians to be aware of each other and communicate, if they cannot see each other then any coordination attempts will be useless. In the recordings we analysed, visibility and eye contact seem very important factors, musicians are sitting on a semi-circular line, so to face the stage or a

director, but still can see each other and interact (Fig. 1-2-3).



Fig. 1, 2. The teacher is seeking for eye contact all through the execution and he is able to connect with the accordion player, who afterwards starts to beat his instrument with the other hand.

According to Blank's and Davidson's (2007) study about piano duos, artists focus on non-verbal communication to be ready for the performance, marking exits and entrances through expressive bodily movements and positive facial expression.



Fig. 3. Teacher guiding students as a conductor.

Similar cues seem to fit every context but when considering different music genres, cues may become more specific and acquire precise meaning. In classical music the most evident case of non-verbal interaction is represented by conductors' gestures, aimed at communicating timing and mood of a particular piece. An interesting perspective is given by Cottrell (2002), who defines the conductor as a shaman interpreting and creating the music together with the orchestra, through a sort of ritual dance. Music students are exposed to these gestures by their teachers, to be trained to follow a conductor in their future professional life (Fig. 3).

However, Luck and Nte (2008) point out that in most successful orchestras musicians are able to see both the conductor and the other musicians. They in fact gain from the conductor general timing and expressive features, but for more precise indications they observe their fellows. This is especially true in small ensembles like string quartets (Davidson and Good 2002) and wind quintets (Ford and Davidson 2003), where the musicians have to depend on themselves to coordinate each other and play together as a whole. Hence rehearsals become an occasion “to learn the score, to plan the coordination of timing, and to establish general expressive features of the music” (Davidson and Good 2002 p. 197). Typical cues reported in both studies are: eye contact and expressive bodily movements, like bowing and swaying of the torso, arms and head waving. The quality of such movements change according to the desired loudness or softness of the music (Davidson and Good 2002).

Shifting towards flamenco ensembles and jazz bands, the performers are required to be particularly responsive to non-verbal interaction, as they are supposed to alternate planned and improvised passages. In the case of jazz, cues like sound modulations, feet stumping, and bodily movements are

used to “limit the options for variation to key points of potential change, at which times attention becomes highly focused on one band member” (MacDonald and Wilson 2005 p. 397). According to our observations (Fig. 4-5) and Maduell and Wing (2007) flamenco ensembles follow a structured pattern, the interaction is usually led by the dancer through expressive movements of his-her arms, head and torso, feet stumping, and hands clapping. The singer has to interpret the dancer's movements to modulate his-her voice accordingly and send the message to the other musicians (Maduell and Wing 2007).



Fig. 4, 5. Flamenco ensemble. The dancer is keeping eye contact with the musicians, stumping his feet, and clapping his hands (4). In a later passage he raises his arms to communicate the desired quality of the music (5).

Interestingly spontaneous strategies of non-verbal interaction have been observed within garage rock bands. In this case one musician communicated non-verbally to correct the others, attracting their attention by playing louder tones on his guitar (Jaffurs 2004). Considering these studies it is possible to define music as a social skilled practice, based on social interaction, where the music is the result of musicians' co-creation. According to the concept of creativity expressed by Ingold and Hallam (2007), creativity is grounded on improvisation, intended as a social temporal phenomenon. Even following a script during a performance, in the very moment artists perform they must be continually responsive to each other as the performance is being created through time (Ingold and Hallam 2007). Rephrasing this concept in our terms, performance is a sort of communication, in which artists' actions are strictly interrelated to each other; only in this way they can reach the flow and create a great performance. Non-verbal interaction can be then defined as a tool for group creativity (Sawyer 2006), as it allows this communication to happen.

## **2.4 Non-verbal interaction and schismogenesis.**

Since non-verbal interaction is a form of communication within a group of highly skilled people, its emergence is deeply related to the social relationships between the individual members, their expectation on themselves and other members. In many of the cases reported in existing literature, it appears as non-verbal interaction is mostly started by a sort of “leader”, who “knows” how the music should be played and guides the others non-verbally. Typical examples come from hierarchical ensembles, like classes or orchestras. During music classes, teachers communicate non-verbally to correct the students and improve their performance without interrupting them. In orchestras, conductors send non-verbal cues about timing and expressive features of the music to guide the musicians. In our analysis of video recordings it was always a teacher who started to interact non-verbally with students, or by simply seeking eye contact (Fig. 1-2), or by directing them (Fig. 3). Other examples of hierarchical contexts are string quartets with the first violinist as official leader, and wind quintets with the flute in the same role. In these cases the first violinist and the flute often started non-verbal interaction addressed to the other musicians. Finally in flamenco performance, which mixes improvised and planned scores, the default temporal sequence for non-verbal interaction is: dancer, singer, and guitarist or other musicians, but this pattern can be subject to change even during the same performance (Maduell and Wing 2007). However, even with a given hierarchical structure, groups have their own dynamics as each member

has individual desires, which may be conflicting with others'. These eventual frictions can be reflected by the modalities of non-verbal interaction, intended as communication. In this sense non-verbal interaction may be affected by *schismogenesis*, defined by Bateson (1972) as a progressive social differentiation within a group, according to individual aspirations and different ways of dealing with them. According to the theory of schismogenesis, individuals may have "the same aspirations and the same behavioural patterns", in this case they are told to be *symmetric*. However, individuals may also have different aspirations and behavioural patterns, in this case they are told to be *complementary* (Bateson 1972 p. 68).

This theory can help explaining many documented cases of non-verbal interaction, hence it can be a useful element of the theoretical framework for our future study. In this sense the case presented in Davidson and Good (2002) about the string quartet is quite emblematic. The two authors detected a dyadic dynamics emerging within the group, as the second violin was seeking for the attention of the cellist who in fact ignored him, while the first violin interacted productively with the viola player. It is possible that the second violin was not integrated in the group and, in his desire for leadership, he acted as symmetric instead of complementary to the first violin creating a conflict. Social differentiation may certainly emerge also within larger ensembles like orchestras, Luck and Nte's (2008) distinction about communication of general timing by the conductor and specific timing by fellow musicians seems to open an interesting opportunity for further investigation, but more details are needed to build a clearer picture.

Members of egalitarian ensembles, such as piano duos, jazz bands, and teenagers rock bands are supposed to be equal; however, it may happen that an unofficial leader emerges as an effect of schismogenesis. Interestingly jazz players claim to be part of a democratic group, since they all participate in decision making; however, they negotiate between individual and group identity all the time, and non-verbal interaction represents a strategy to deal with it on stage (MacDonald and Wilson 2005). It is possible that close observations may reveal more complex subgroup dynamics, as in Jaffurs (2004), who discusses social dynamics and music interests of a young garage rock band. In that case one member acted as a leader, playing louder tones with his guitar to correct others during rehearsals. His friends recognised his status by following him and even asking suggestions afterwards, but his leadership was never explicitly articulated. The relationship between him and the other group members was complementary in schismogenetic terms and this clearly affected modalities of non-verbal interaction in the group. In the proposed examples non-verbal interaction, intended as a tool for group creativity, is deeply influenced by social factors, eventually compromising the quality of a performance, as in the case of the string quartet in Davidson and Good (2002). In this sense the perspective of schismogenesis allows to define more precisely non-verbal interaction as an expression of the social dynamics emerging within the group, but functional to the artistic quality of group performances.

### **3 Towards a BDI modelling.**

In order to proceed our study actively involving the musicians in a reflective dialogue about non-verbal interaction, it is our intention to model non-verbal interaction through the BDI model. Our aim is to provide a sort of interactive mirror that could support articulation of non-verbal interaction from the musicians side, and also a common ground for discussion.

Belief-Desire-Intention (BDI) is a model of human rational behaviour based on Bratman (1999). In the BDI model, the belief is an acceptance that a statement is true or that something exists, confidence in someone or something, the desire is a strong feeling of wanting to have something or wishing for something to happen. And the intention is an aim or plan, to make something desired happen. The BDI is used as the model for computer simulation of multi-agent systems, as for instance in Rao & Georgeff (1995).

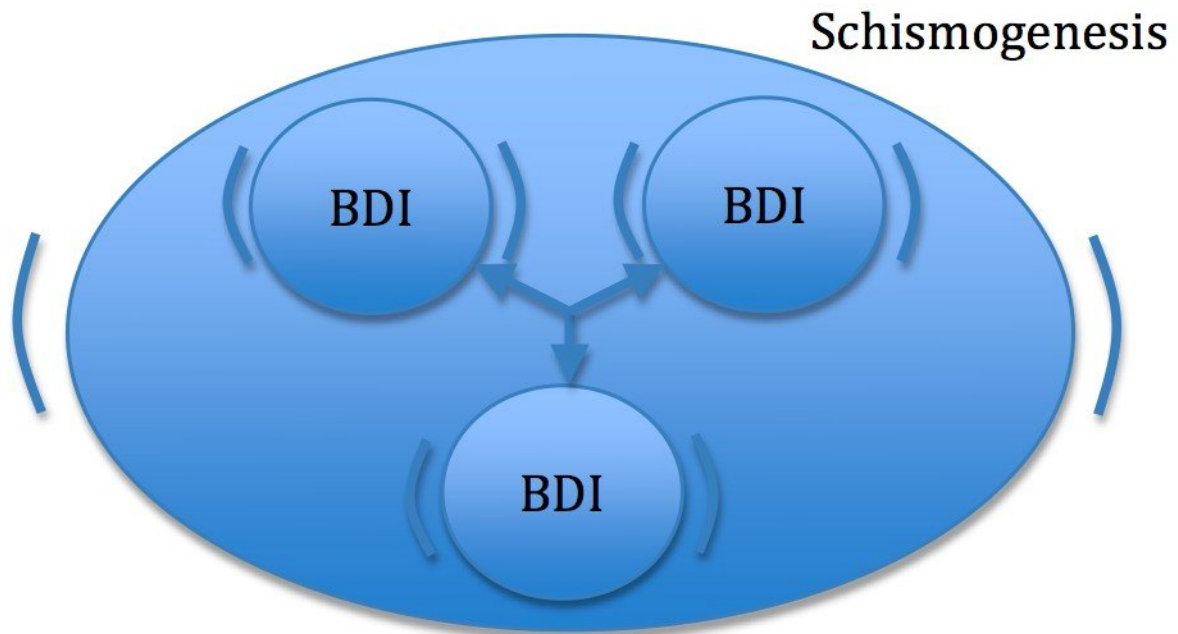


Fig. 6. Interaction between individual musicians within an ensemble. Both the musicians and the ensemble are affected by schismogenesis.

In the BDI, a representation of *who* believes, desires, or intends *what* is necessary. In human reasoning, a complication is made when the *what* is different from what oneself believes/desires/intends. Wimmer and Perner (1983) show that representation about a protagonist (wrong) belief is not available below 4 years of age. Wahl & Spada (2000) gives a review of current research along with further experiments and a computer model to simulate the results. The difficulty of obtaining correct answers is explained by operational task of explanation, along with for instance the representation difficulty (own beliefs are easier than beliefs about others (secondary representations)). Further difficulties are memorising facts in complicated scenarios.

As planning agents, we act purposively, and form and execute intentions through reasoning, intentions that are partial, as we don't know the future. Intentions and beliefs should fit together in a consistent model of the future. Intention and belief are connected; if you intend something, this presupposes that you believe you want this, or this it is possible (Bratman 1999).

The BDI model seems useful in formalising the particular situation of musicians as individuals who are also part of a group and their eventual conflicts. Adopting the perspective of schismogenesis musicians acquire roles, behaviours, and attitudes with respect to their individual desire and how to fulfil them, as members of a musical ensemble. More specifically some musicians may acquire a leading or a following role either as an official status or by effect of a progressive differentiation, schismogenesis, that happens by itself almost unconsciously. Combining the BDI model with the notion of non-verbal interaction as tacit knowledge affected by schismogenesis, a musician may *believe* to know how the music should be played and to have the right to guide other musicians through the performance, he might be a teacher, a more experienced or eventually a not well integrated player. Then the same musician may *desire* to make a good performance and *intends* to reach his-her goal by interacting non-verbally with the others in order to tune in with them reaching a flow or even to change their way of playing.

Other musicians, maybe students or less experienced, may instead *believe* that another musician or teacher knows how the music should be played, and since they *desire* to make a good performance, they *intend* to play better by being responsive to non-verbal interaction started by the more experienced musicians.

In the analysis of jazz musicians, MacDonald (2005) found that jazz musicians believe jazz is improvisation, more creative, and they desire and intend to be jazz musicians. Knowing to improvise is central to jazz, as a learned skill, or as a gift. Collective swing is defined as almost corporeal, felt in the body, and it is also found to be necessary in jazz. Fatigue, schedule and finance prevent musicians from rehearsing and playing their music. Being a classical musician gives better benefits, while playing jazz music is more satisfying. Playing other music styles (for monetary causes) show professionalism, but could compromise music motivation factors (and retain economic motivation). In jazz music, the group awareness is considered very important, while an audience is not strictly necessary in jazz.

Gaunt (2008) studied one-to-one tuition in a study involving 20 teachers, and found that teachers transmit what they learned and at the same time praise autonomy (which is dependent on student solely). Tension between the two was rarely mentioned, but it seems to exist. While the teachers *believe* that autonomy was necessary, their *intention* was more on the musical and instrumental skills. Similar conflicts occur in group teaching, the teacher *believes* that group teaching is beneficial, but rarely *intended* (due to lack of resources) to make it include peer-learning, and in practising, the teacher *believes* that the students are practising optimally, but do not *intend* to investigate the matter. The missing actions that should have been made according to the belief, can be explained for instance, by a low priority of the belief, a low relevance of the belief, or perhaps, lacking resources to carry out the intention stemming from the beliefs.

A central belief in musicians is self-efficacy. McPherson (1997) found that self-efficacy influences behaviour, and leads to success, mainly perhaps as a motivational factor. McCormick & McPherson (2003) found that self-efficacy was the best predictor for graded examination in a large test. Other beliefs that influence the musicians are related to bad performance experience, for example anxiety (Osborne 2008), which is of course related to stress. Wan & Huon (2005) examined three conditions (single task, dual task, and video monitoring) on a keyboard task performed by 72 novice musicians, and found that pressure increased performance degradation, except in the video-monitoring task, which was explained by the raised self-awareness under this task. A *belief* of success, together with the *intention* to observe oneself thus seems central to musicians development. Flow (Csikszentmihalyi 1990), is often central to the music performance. St. John (2006) examined 12 five-years old children, and found personal (imitation and self-correction, how to get to flow), material (anticipation and extension, how to sustain flow) & social (peer and adult awareness, social resources in flow) strategies for obtaining flow. In the analysis of children, St. John also found they were making meaning through challenging (self-assignment&correction), transforming behaviours (anticipation, expansion, extension), imitation (extend personal repertoire, choosing master, absorb skills, create individual style) or personal adjustment in awareness reaction. Sawyer (2006) extends Csikszentmihalyi's individual state-of-mind flow to group flow. Many studies have shown the importance of flow in music, and it can be postulated that musicians *believe* flow is central and therefore carry out their *intention* to participate in creating flow by learning all the skills necessary to perform music.

#### **4 Conclusions**

The work presented here is an exploratory meta-study, aimed at setting up a theoretical framework to support an ethnographic participatory study about non-verbal interaction in music, actively involving musicians from Esbjerg Conservatory, Denmark. Through observational and literature studies, non-verbal interaction has been discussed in relation to musicians in the act of becoming a musician and making music. Non-verbal interaction has been analysed in terms of tacit knowledge, defined as practice acquired through contact with other practitioners, that is difficult to share verbally because practitioners themselves are not totally aware of. Furthermore, we discussed how non-verbal interaction, intended as a tool for group creativity, is deeply affected by schismogenesis, a progressive social differentiation through which members of a group acquire different roles acting according to the complementary of symmetric relation of their desires and behaviours (Bateson



1972). Finally, the belief-desire-intention model is introduced to provide a tangible model of non-verbal interaction in music, involving the elements we identified. Some of the important factors that can be related to the beliefs, desires and intentions of musicians regard the pedagogical (Gaunt 2008), and professional context. Desires and intentions are best identified when in conflict, for instance between desires, and intentions caused by beliefs of the impossibility of the desires. Relating to the development phase of becoming a musician, self-efficacy has been identified as the best predictor of success, while anxiety and stress are perhaps the main inhibitor in the performance situation. Flow (Csikszentmihalyi, 1990) has been identified as the optimal condition in performance, although much work remains before all factors involved in flow has been identified. In conclusions we can say that, despite the incomplete accounts provided by existing studies about professional music practice, combining them with our preliminary observations and pedagogical studies, we were able to build a qualitative theoretical framework to reconstruct what happens among musicians playing together. Still much work is needed to reconstruct modalities of interaction and its meaning. Our aim is now to investigate non-verbal interaction through ethnography and participation, engaging in a dialogue with professional musicians and teachers. These models and theories presented here enable us to set a direction for our further investigations and are also a tool supporting musicians to better understand the non-verbal factors that are seemingly so central in their everyday practice.

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