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Second Person Attributions in Jazz Improvisation

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RESUMEN

Este artículo propone identificar las atribuciones de segunda persona realizadas por dúos de músicos de jazz y relacionarlas con los rasgos sonoro-cinéticos que expresan los estados intencionales atribuidos. Se realizó un estudio de método mixto donde los dúos produjeron improvisaciones bajo diferentes condiciones de percepción visual y auditiva mutua. Los resultados indican: (i) atribuciones realizadas mediante la 'lectura' directa del gesto sonoro del otro; (ii) rasgos idiosincráticos que persisten a través de las condiciones; (iii) las interacciones de jazz guardan similitudes con la musicalidad comunicativa temprana: la imitación-variación es un indicador de la comunicación entre los músicos.

PALABRAS CLAVE: *música, segunda persona, improvisación en jazz, interacción, atribuciones de segunda persona.*

ABSTRACT

This article aims at identifying the second person attributions carried out by duets of musicians during jazz improvisation and to relate them to the sonic-kinetic features that express the musicians' attributed intentional states. We conducted a mixed-methods study where duets produced improvisations under different visual and auditory conditions of mutual perception. Results show that (i) musicians mutually attributed musical intentions based on their direct 'reading' of the partner's sonic gestures; (ii) improvisations showed idiosyncratic features that persisted across trials; and (iii) jazz interaction bear similarities with communicative musicality in early infancy: imitation-variation emerges as an indicator of communication between musicians.

KEYWORDS: *Music, Second Person, Jazz Improvisation, Interaction, Second Person Attributions*.

I. INTRODUCTION

In this paper we present the results of an experimental study on the second person perspective of mental attribution in jazz improvisation.

The second person perspective is a theoretical proposal related to the post-cognitivist approaches to the study of the mind. The post-cognitivist turn produced significant changes in the conceptions of music. Challenging the traditional ontologies of music as idea and as text, a new conception focusing on the temporal dimension of music, the features that shape music as a social practice, and on a retrieval of the body in motion was developed [Martínez & Pérez (2021)]. These dimensions and their relationship with the materiality of sound influenced the way in which both individual and group music performance are investigated. Previous research on music performance focused mainly on the analysis of the acoustic component and, therefore, other components of the musical production like the somatic or the kinetic features were considered in relation to the analysis of the sound resulting from the performance. The embodied turn in the ontology of music *as action* expanded the window of analysis of music performance, granting a relevant role to body movement and to the interactions of musicians: human movement is now understood not only as a means for sound production but also as a way to understand both one's own and the other's actions [Lesaffre, Maes & Leman (2017)].

Although the perception of sound constitutes unequivocally the main and most direct way of grasping and understanding a piece of music, in a joint performance such as jazz improvisation the musicians' perception of the movements that the other musician displays may contribute to the communication between the two performers by disambiguating the interpretation of the musical gestures that are being produced [Eerola et al. (2018)]. Also, the perception of body movements seems to play a central role in the communication of mutual aesthetic goals that are related to musical production and to the dynamics of leadership [Davidson (2012), Bishop et al. (2019), Demos et al. (2018), Glowinski et al. (2015), Schiavio & De Jaegher (2017)]. Research on non-verbal ways of communication between music improvisers has found that cooperation and collaboration during the creation and exchange of spontaneous musical phrases contribute to the achievement of cohesive performances [Seddon (2005)].

Within the post-cognitivist framework, the enactivist approach of 5E cognition modelled social interaction based on the temporal coordination of body actions. Coordination here is the result of the constant and mutual physical adaptations of an organism, understood as a dynamic system. From this perspective, we have previously investigated the dynamics of embodied interaction during musical improvisation in terms of

participatory sense making. We found that the sound and motion patterns that emerge from the musicians' mutual adaptations play a communicative role mainly at structural locations of the performance such as turn-takings [Martínez et al. (2017)]. Similarly, other studies have found evidence of couplings between movement velocity patterns that have a regulatory function in the communication between musicians during joint interaction [Chang et al. (2019)]. However, it appears that the basic and sub-personal mechanisms of music interaction that the 5E cognition considers as relevant cannot fully account for a complex context such as the joint improvisation performance. In this paper we approach the study of the mental dimension that underlies communication between musicians during jazz improvisation from the alternative approach of the second person perspective of mental attribution.

The second person perspective of mental attribution is a post-cognitivist theory that seeks to account for the most basic ways in which a person understands the mental states of another person. Within this theoretical framework, some of the mental states that can be expressed by one person and perceived and attributed by another person are: basic emotions, body sensations (such as pain), and intentions aimed at objects that are present in the shared environment, among others [Pérez & Gomila (2021), p. 96)]. Given that body expression is constitutive of these mental states, we can access someone's mental dimension and attribute a mental state to them through the direct observation of their expressive behaviour. These basic attributions are not only direct but can even be tacit [Pérez & Gomila (2018)]. The intimate relation that exists between the non-inferential mental dimension and the body dimension underlies the communicative function of the expression.

Although the second person perspective focuses on the personal level of social cognition, sub-personal mechanisms such as those belonging to the mirror neurons system underlie the direct understanding of another person's mental states [Pérez (in press)]. Even though these sub-personal mechanisms -which are linked to the embodied and perceptual processes of mutual adaptation- are not enough to fully explain social cognition [Gomila & Pérez (2017)], they may however coexist and even enable the realisation of mental attributions during a joint musical performance.

Second person interactions are characteristically formed by contingent and reciprocal actions, in which participants mutually adjust their behaviours. During these interactions, the communicative function of expression becomes apparent each time that a person A intends to generate through their behaviour a certain response from a person B, and

when B modifies their actions as a consequence of perceiving and making attributions to the state expressed by A. When the perceptions, attributions and changes in the actions are mutual an authentic second person interaction takes place.

According to the second person perspective, human expression is frequently understood in terms of "automatic and involuntary movements that constitute the overt side of our mental states" [Pérez & Gomila (2021), p. 96]. However, the sounds that we articulate vocally also constitute expressions of the state we are currently in. The multimodal nature (vocal, tactile, kinetic, and visual) of early adult-infant interactions highlights the communicative features of these non-verbal sonic inflections. The musicality of these interactions allows for both the baby and the adult to mutually recognize in the other certain basic states such as emotions, feelings, and intentions, thus constituting a prototypical example of second person interaction. In these intersubjective exchanges occurring along the first year of an infant's life, adults unfold improvised performances directed to infants [Español et al. (in press)]. These performances are a specific type of sound-kinetic realizations in which the adult offers multimodal repetition-variation fragments to the infant to invite them to engage in reciprocal dyadic interactions. Sometimes, the sound-kinetic unfolding of the performances contains multimodal redundancy. We have observed that in some of the above-mentioned fragments, the adult employs a matching strategy to shape the directionality of both their movement (e.g., drawing an object near to the baby by moving it downwards) and their production of sound (e.g., accompanying the body movement with a vocal descendant intonation from the upper register to the bass register). This redundant combination contributes to shape imaginative structures that link temporal, spatial, sonic, and kinetic relations in early social cognition. The ultimate purpose of infant-directed performance is to communicate the intention of achieving a goal in terms of proximity, affect, and intimacy [Martínez, Español & Pérez (2018)].

In previous analyses of infant-directed performances an aesthetic component has been attributed to the peculiar way in which the adult varies the motifs that they present to the infant. Thus, infant-directed performances are assigned a character that is understood as a sort of embryo of the more elaborated and sophisticated forms of artistic expression in Western musical culture [Martínez (2014), Shifres (2014)]. These investigations suggest that the expressive modes that are part of the intuitive parenting open the door to the future enjoyment, understanding and reception of the temporal arts in adult life [Español & Shifres (2015)]. Alt-

hough the non-inferential, pre-linguistic exchanges that characterise early infancy constitute a prototypical second person case due to its ontogenetic precedence, Pérez and Gomila consider that "no human interaction is alien to some normative and cultural setting" [(2021) p. 4]. This too applies to the infant-directed performances, in which adults introduce sound and movement forms that belong to their own cultural environment [Español & Shifres (2015), Español et al. (in press)].

Given the intersubjective and embodied nature of early social cognition, it is assumed that those expressive modes of interaction are the basis for the development of communicative abilities in social contexts of musical practice, such as those inquired in the present work.

As with any musical practice, jazz is, in fact, also embedded with a set of cultural norms that define its style and which jazz musicians need to be acquainted with to be able to improvise together. Some of these norms are: (i) groove, understood as a particular form of musicians' coordination, that consists of a slightly varied temporal synchronisation; (ii) the practice of turn-taking; (iii) the use of the 'standard' that provides a rhythmic, harmonic, and formal structure serving as a base to improvise; (iv) the variety of musical languages that are part of jazz as genre; (v) the musical and interactive performative roles (solo, accompaniment) that musicians should master; and (vi) the ability to recognize in the sound of their partner the repertoire of licks, riffs, phrase patterns, dynamic contours, and vernacular, culturally shaped performativities [Gratier (2008); Pérez & Marchiano (in press)]. In jazz, it is expected that an improviser re-elaborates the basic musical patterns constrained by the above-mentioned normativities in a novel and personal style. That style is imprinted both in the sound (e.g., the ways of unfolding the musical time, and/or elaborating tension-relaxation patterns), and in the body gestures (both the ones accompanying the production of sound and those related to the communication with the partner). The practice of jazz group improvisation consists of a sound-kinetic coordination of musical gestures carried out by the musician's moment-by-moment, and face-to-face interaction based on, the shared stylistic normative patterns. In order to do this, musicians employ different musical resources such as repetition, variation, imitation, synchronisation and/or completion of the other's proposal.

In our previous research on the musicians' interaction under the 5E cognition approach we focused on the description of the sonic-kinetic profiles that are jointly created during a given performance; however, neither the intentions, emotions, sensations nor any other of the personal states that are communicated through those musical sounds and move-

ments were inquired at that time. To explore those mental states, we subsequently run exploratory interviews with performers of different styles of musical practice (chamber music, jazz, and tango). The results show that musicians perceive the intentional states of the other performers not only from the observation of their movements, but also from the sonic features of their production [Martínez & Pérez (2021); see also Gratier (2008), Moran et al. (2015)]. Hence, we posit that the changes to the course of action that an improviser makes upon grasping the other's musical intention lead to a cycle of perceptions, attributions, and actions in which both musicians mutually understand, modify and negotiate the unfolding music performance, showing that jazz improvisation is an authentic second person interaction [Pérez & Martínez (2021)].

In this paper we focus on the research of second person interactions in jazz improvisation, aiming at the identification of the production of second person attributions and their relation to the sound-kinetic component of the performance. We assume that second person interactions in jazz improvisation are like the interactive forms of early infancy.

II. METHODS

Based on previous research [Martínez & Pérez (2021)], we designed an experiment in which different duets of musicians improvised while playing over a backing jazz track. Using a mixed method, different types of experimental data were collected and analysed, and subsequent comparisons were produced [Creswell (2009)]. Regarding data collection (i) three successive performances *per* duet were recorded in audio and video; (ii) one interview *per* duet was conducted and recorded in audio and video after the duet performance; and (iii) musicians' body movements were captured using motion capture technology. Regarding data analyses three studies were run: (i) constant comparison of microgenetic observations of the recorded performances; (ii) constant comparison of verbal content of the interviews; and (iii) statistical correlations between continuous temporal series of movement. Analysis of (i) aimed at describing the expressive keys conveyed by the sound-kinetic interaction. Analysis of (ii) aimed at identifying the mutual attributions and moments of reciprocal interaction that the musicians recognized while watching their recorded improvisations. As to (iii) the analysis aimed at finding evidence of the mutual influence of the musicians' body movement during performance. The constant comparison analysis of (i) and (ii) aimed at explaining the

relation between attributions and expressive keys during joint improvised performance.

II.1 *Participants*

16 professional jazz improvisers (30-44 years old, living in La Plata, Buenos Aires, Argentina, with more than 15 years of instrumental training) took part in the experiment. 8 musicians were saxophone players (**S**) and the other 8 were guitar players (**G**). In the experiment, they were organised in 8 duets of **S**-**G** each. All musicians currently play regularly in jam sessions and are part of jazz bands that play different styles like *bebop*, *hardbop,* and contemporary jazz. Some of the musicians had previously listened to their experiment partners playing in jam sessions, but they hadn't improvised together on a regular basis. All of them expressed feeling comfortable with the backing track they were provided with to play over.

II.2 *Stimuli*

The backing track used in the experiment consisted of a version of *Watermelon Man* (Herbie Hancock, 1962), a popular song of contemporary jazz. The music – which is usually played at jam sessions – presents a harmonic organisation related to blues and funk. In the version used for the experiment, a drum and bass base emulate the version played by the Hancock group at the *North Sea Jazz Festival* in 2008. Time is 75 bpm; total duration is 3:33 minutes. Harmonic structure consists of 4 choruses of 16 bars each (F7 x 4, Bb7 x 2, F7 x 2, C7, Bb7, C7, Bb7, C7, Bb7, Ab7 x 2).

II.3 *Apparatus*

(i) Audio recording and backing track reproduction: condenser cardioid microphones Behringer C02 (stereo ORTF setting) and a sax clip JTS CX508; a Behringer UMC404HD U-phoria interface, and 3 Behringer Microap HA400. (ii) Musicians' reception of sound mix: both musicians used Sony MDR 7506 headphones in trials 1 and 2. S changed to an in-ear Stagg SPM-235 used simultaneously with a shooting hearing protector Silva (23db cancellation) in trial 3. Each musician received a personalised sound mix containing the backing track and both instruments, except for trial 3 (this will be explained later). (iii) Video recording: a Logitech C922 Pro camera for a wide shot displaying both improvisers, recorded on OBS Studio, 3 Sony-HandyCam cameras, 1 for a medium shot of both musicians and 2 close-up single shots (one of each musician), and a GoPro Hero camera Session 4 for a super wide shot captured with a fisheye lens. (iv) Screenings of the recorded performances

during the interviews: TV Samsung 32" with Thonet & Vander speakers. (v) Continuous movement capture: a complete motion capture system (MoCap – Optitrack) was used. It consists of 11 infrared cameras and 43 reflective markers (18 *per* performer's body), 3 markers in each instrument, and 1 marker located on the floor, at a spatial distance relative to each musician's location). Data were registered with Motive 1.0. In this paper we inform the results of the motion capture data of the head only.

II.4 *Procedure*

The experiment was conducted in 8 sessions (one *per* duet) at the Laboratory for the Study of Musical Experience (LEEM-FDA-UNLP). All musicians participated voluntarily and provided written consent according to the current ethical guidelines for experimental studies of Universidad Nacional de La Plata. All participants had received the backing track two days before the experimental session to become familiar with it. Once the set up was ready, **S** and **G** were placed in the experimental space facing each other in sagittal position. They were required to improvise melodic lines over the backing track. The instruction they received was as follows: "we are interested in understanding how musicians build together an improvisation. We are not asking you to improvise according to a pre-fixed form, but that you find instead some way to build the improvisation together as you play". Next, the musicians watched a segment of video footage of Hancock and Potter's improvisation of Watermelon Man at the *North Sea Jazz Festival* that had been selected since (i) it included canonical modes of interaction (turn-taking, playing together, and playing together alternating micro-turns) and (ii) it was assumed as a valid example of second person joint performance. The observation of the video footage by all the duets had the purpose of controlling for the homogeneity in the communication of the experimental task.

II.5 *Experimental Design*

The experimental session consisted of 3 improvisations *per* duet under different auditory and visual perceptual conditions between the musicians, namely:

- Trial 1: **S** and **G** have full vision and aural perception.
- Trial 2: **S** and **G** have full aural perception, but their vision is blocked (through prepared black glasses).

- Trial 3: **S** has full vision but cannot listen to **G** (the performer uses a device of sound cancellation); **G** can listen to but cannot see **S** (the performer uses prepared black glasses).

In all the trials **S** and **G** can listen to the backing track and to their own improvisation.

All performances were recorded without any previous rehearsal. During the performance session, 5 researchers observed and took notes relative to the main traits of the interaction, meant to serve as a guidance to orient the researchers-participants' interaction in the subsequent interview.

Immediately after the recording of the 3 trials, three researchers (one of them, a jazz improviser himself) conducted an interview in which both researchers and participants watched the audiovisual video recordings of the 3 trials. The interview consisted of a non-structured conversation with both musicians, oriented to describing their interactive experience during the performance. Two questions were posed to guide participants towards recalling instances in which they had produced second person attributions: "In which moments during the performance did you do something relative to your partner´s actions?" And "What did you do to encourage your partner to do something relative to your actions?"

II.6 *Predictions and Methods of Analysis*

Three predictions guided the study:

(1) Trial 1 – in which musicians have full vision and aural perception – will enable musicians' mutual engagement. Improvisation will be the result of the way in which musicians make use of their own musical background, and of the ways they come up with together to contingently build the interaction.

(2) The multimodal keys available in trials 2 (aural) and 3 (aural for **G** and visual for **S**) will enable joint improvisation differently than the keys available in trial 1.

(3) In trials 2 and 3, musicians will be able to imagine features of the missing multimodal cue.

II.7 *Observation of Audiovisual Records*

A general analysis of all duets' trials was run to attain a broad description of the performances. The analysis aimed at identifying: (i) the frequency and types of interactions; (ii) the quantity and quality of movements; (iii)

the musical features of the improvisations (motives, imitations, variations); and (iv) specific characteristics of each interaction.

Analysis of gazes: all musicians' gazes directed to their partner were annotated for trial 1 using Elan v 6.3. Duration and quantity of gazes were calculated using frame- by-frame video analysis. Gazes were differentiated in 3 types: directed at the partner's face, body, or instrument.

II.7.1 Movement analysis. Granger Influence Index

The mutual influence of the body movement velocity patterns has been studied in non-verbal communication between persons as a relevant feature of the sub-personal mechanisms involved in social cognition. It is assumed here that the velocity patterns of body movements are present in the second person exchanges and that they have an influence on the communication between musicians during the improvised performance.

The sway of the musicians' heads was analysed using the Granger method. Granger quantifies how a prediction of a certain current state of a temporal series is made based on the past state of another temporal series: the larger the size, the better the prediction. The **GGCA** algorithm was used to calculate Granger causality [Barnett & Seth (2014)]; this algorithm was previously used in studies of musical interaction to analyse leadership in joint performances [Chang et al. (2017), Badino et al. (2014)], interactions in jazz improvisation [Martínez et al. (2017)], and social intention recognition during musical improvisation [Aucouturier & Canonne (2017)].

In the present study, individual values of Granger Causality (**GC**) from **S** to **G** and vice versa were used to calculate Causal Density. This measure represents the total amount of causal interactivity of each duet. In previous studies, **GC** proved to have an effect in the way the musicians make sense during interaction [Martínez et al. (2017)]. In this study, we use the concept of *influence* instead of *causality,* based on the assumption that Granger Causal Density (**GCD**) corresponds with the influence of non-verbal communication of body interactivity that occurs throughout the unfolding of a performance [Valdez Sosa et al. (2011)]. Granger Causal Density is here relabeled as *Granger Influence Index* (**GII**). We used this measure to explore the inter-influence of body movement during interaction and to establish connections between personal and sub-personal dimensions of social cognition in music.

Two hypotheses were proposed for the Granger study, namely: (**H1**) **GII** will be smaller in trials 2 and 3 than in trial 1, due to the visual and/or auditory restrictions; and (**H2**) **GII** will increase along the tem-

poral unfolding of each trial, assuming that both communication and interaction will consolidate and become stronger throughout the improvised performance.

II.7.2 Microanalysis of Interviews and of Recorded Performances

Two passages of the interviews were selected for microanalysis. They belong to improvisations of duets 1 and 7 in trial 1. In the interviews conducted after these performances, the musicians accounted for attributions they produced during the improvisation. The analysis aims at describing: (i) the mental state that was attributed; and (ii) the multimodal keys in which the musicians based their attributions of the partner's states. Two segments were further micro-analysed [Corbin & Strauss (1996)], looking for links between the attributions identified by the musicians, and the musical and motor-kinetic attributes of the performance.

III. Results

Out of the eight duets two were dismissed because they did not fulfil the task of building/producing together the improvisation.

III.1 *General Observations*

The general analysis of the audiovisual recording of the performances shows that each duet builds its own way of interaction, and that this singularity is sustained across trials. This issue will be further addressed in future studies. Communication between musicians is related mainly to the features of musical production. Mutual imitation was identified. It was found that during imitation an improviser takes the other's musical proposal and varies the idea, producing transformations of the thematic material, and vice versa. This happens both on turn-taking and during simultaneous performance. These cycles of varied imitations are sustained until one of the improvisers proposes a new musical idea. In some cases, we observed a collaborative attitude which leads to the joint production of a single musical gesture (see later the microanalysis of segment 2).

On the other hand, in trial 3 (where **G** can't see **S**, and **S** can't listen to **G**), a change in **G**'s behaviour was observed: concerning musical production, **G** plays chords instead of melodies, or imitates **S** more than in trials 1 and 2. As to bodily actions, it was found that some guitarists tended to make wider movements. During data collection in the experimental sessions most participants mentioned that the perceptual cues

that were manipulated in trials 2 and 3 corresponded with contextual peculiarities of live performances, where musicians often can't see and/or listen clearly to their partners.

III.2 *Gazes and Smiles*

The total duration of gazing time *per* duet and the individual gazing time were measured in seconds. A t-test with 11 degrees of freedom was run in order to study the hypothesis of randomness (null hypothesis) versus the non-randomness (alternative hypothesis) of the gazing times. To achieve this, the total time of performance *per* duet was calculated, and a mean of 219.8 seconds was obtained. If the gazing times were effectively random, the null hypothesis would indicate a mean of 109.9 seconds (in accordance with a true random chance of 50% for the individual gazing time). Using a sample size of 12, both the sample mean and the sample standard deviation were computed, obtaining 68.59 seconds and 79.53 seconds, respectively. For 11 degrees of freedom, the results yielded an observed value for the t-statistic of 1.799, and a corresponding p-value greater than 0.1. Given this p-value there is enough statistical evidence to hold the null hypothesis, i.e., the true randomness of the gazing times.

Additionally, it was observed that, on average, **S**'s gazing times were larger than **G**'s gazing times. Finally, it was observed that the non-gazing times were, on average, larger than the gazing times (Figures 1, a and b).

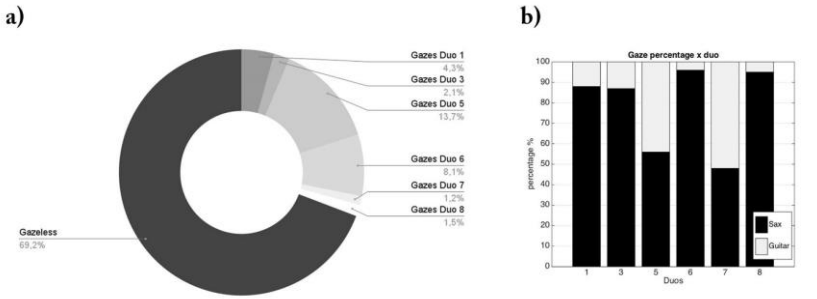

Figure 1. (a) % of gazing and no gazing time (total and separate by duet). (b) % of gazing time for **S** and **G** *per* duet, relative to the total gazing time *per* duet.

Duets 5 and 7 show the greatest similarity in each musician's gazing time. Conversely, **G**'s gazing time in all the other duets is much lower than that of **S**'s. Most gazes occur at turn-takings and at chorus changes. Gazes are more directed to the partner's instrument than to the partner's face.

Regarding smiles, both the amount of them and their durations were lower compared to the gaze's. In most of the duets, smiles occurred at the end of the performances, almost always accompanied by mutual gazing at the face. In duets 1 and 7 musicians also smiled at times during the performance.

III.3 *Granger Influence Index Analysis*

The head's movement temporal series were organised in 24 datasets, relative to 6 duets, and they were segmented according to the 4 choruses of the backing track base used in the experiment. The Euclidean velocity of the temporal series between the head marker and the spatial centre of reference between musicians was calculated for each duet. A statistical analysis of the **GII** distribution in the 24 datasets for the 3 trials was run. Results show a decrease in the **GII** magnitude in trials 2 and 3, as proposed in H1, although data did not achieve statistical significance (C1xC2, p=0.38; C1xC3, p=0,57; C2xC3, p=0,76) (Figure 2). The result might be due to the reduced sample size. We expect to increase the sample in the future to confirm or reject **H1**.

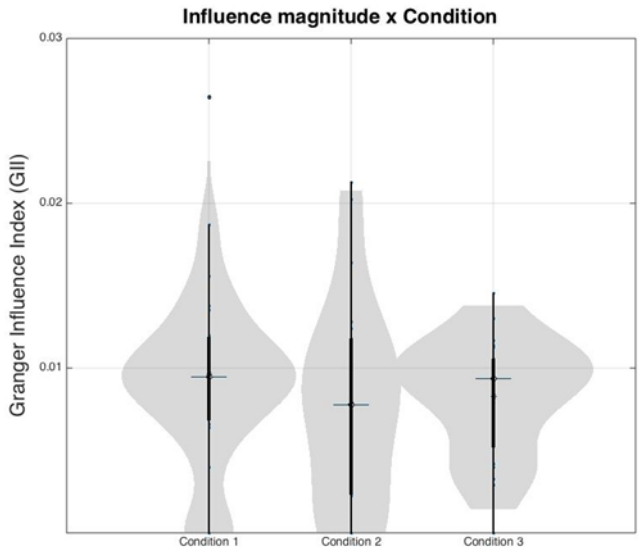

Figure 2. ***GII*** *distribution across conditions.* The median, the interquartile range (25 to 75), and the atypical values are represented in the vertical axis of the violin-plot (central cross). The **DPF** (density of probability function) of data distribution is horizontally projected towards both sides of the axis.

Regarding **H2**, data were organised to visualise the temporal evolving of **GII** chorus by chorus. Figure 3 confirms the tendency of the **GII** increment in trials 2 and 3, where significant differences were found between choirs 1 and 4 (Trial 2, p=0,04; Trial 3, p=0,02), although **H2** does not apply in trial 1 (p=0.92). It is assumed that the lower **GII** identified at the beginning of trials 2 and 3 is related to the musicians' adaptation to the visual and aural cues manipulated in both trials until reaching the **GII** levels found in trial 1.

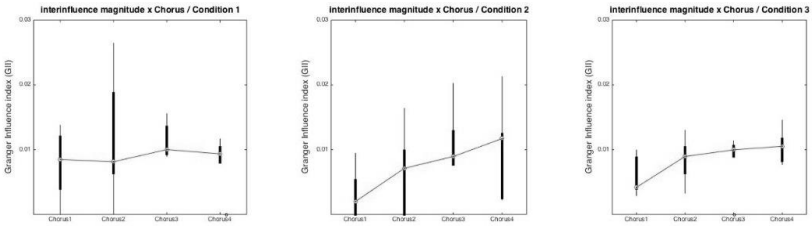

Figure 3. ***GII*** *distribution and temporal evolving.* The line connects the median of each chorus to visualise the **GII** temporal evolving.

Lastly, the total **GII** *per* duet was analysed to estimate whether the duet performance was consistent and similar along trials, under the assumption that some duets were more communicative than others (Figure 4). Total **GII** varies across trials. We may infer that the interactive and communicative efficiency *per* duet is not stable and consistent between trials.

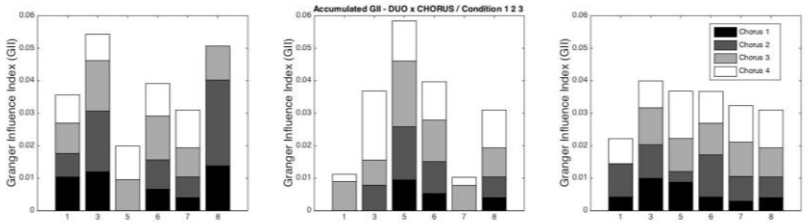

Figure 4. *Total* ***GII*** *Magnitud per duet.* Each column in the bar diagram corresponds to a duet. The piled **GII** per chorus are shown in different grey tones.

III.4 *Analysis of Two Segments of Second Person Interaction*

A microanalysis of the multimodal content (sonic and kinetic) of two segments of interaction during musical improvisation was run. The two segments correspond, respectively, to duets 1 and 7, from trial 1. During the interviews the improvisers accounted for the production of direct and

mutual attributions. The microanalysis aimed at the identification of the expressive cues that triggered the production of the attributions.

III.4.1 Segment of Interaction 1 (duet 7, trial 1)

The segment that was selected corresponds to choruses 1 and 3. Improvisation is organised based on the creation, variation and elaboration of musical motifs. The improvisers take turns and play simultaneously (Figure 5).

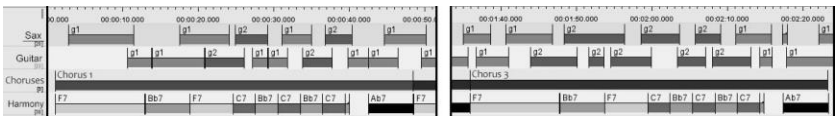

Figure 5. Turn-takings and simultaneous play by **S** and **G** during choruses 1 and 3. Gestures 1 and 2 are represented in light and dark grey, respectively.

The improvisation is elaborated based on 2 sonic gestures of a different kind, that are performed with variations throughout the choruses. Gesture 1 consists of a slow melody, with few notes, and sound attacks spaced in time. Gesture 2 presents a torrent of successive notes with attacks at very brief time intervals (Figure 6). The performers imitate and produce variations in both gestures playing with changes of register, increments in notes density, and timbre and rhythmic changes, among other expressive resources. As the improvisation unfolds, gesture 2 changes its character.

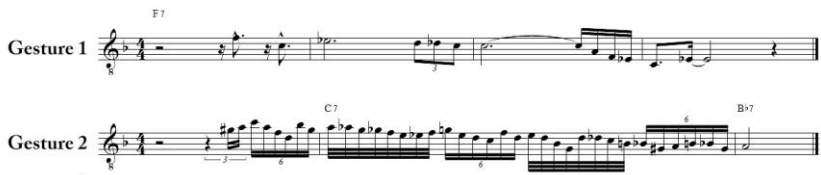

Figure 6. Transcription of two motifs: motive 1 is an example of gesture 1 (above); motive 2 is an example of gesture 2. Both gestures are played by **S**.

Concerning the analysis of chorus 1, musicians describe their initial interactive experience as exploratory. They manifest that they both had the intention of understanding the music performed by the other. They say: "we are testing each other out…" (**S**) and we are guessing at each other" (**G**). Regarding this exploratory attitude, **S** explains (while laughing):

> It's like the beginning of a football match. The defenders are watching the front player's attack. And the others…you see? Like saying: 'let's figure out what their strategy is' (...) Play ball. And see if I catch it or not [the ball].

S describes the performance of gesture 1 during the chorus as follows: "I play some, but I leave quite more space for you to interrupt me". And gesture 2 like this: "I play and I don't listen to you: 'I throw this at you…I'm going to play like this' [making an imperative hand gesture downwards]. If you like it, fine, and if you don't… (**S** and **G** laugh)".

As to the imitation of the sonic gestures during turn-taking in chorus 1, both musicians express that:

> **S**: There is a lot of imitation (...). I tried to (...) '*fish*'[1] [what Tincho was playing] and to put that in some other place, to transport it …Like trying and elaborating on it. That is, to *suggest* and to *take*.
>
> **G**: Yes, because (...) sometimes when phrases are imitated… that isn't something that works out as interaction. (...) It's like copying the other's idea and that just doesn't …it doesn't generate the adrenalin that makes you go further…

Regarding choir 3, after the initial interactive performance experience the improvisers notice changes in their intentional state. **G** expresses, for example:

> What I was saying about us intertwining a bit more… I think it's to do with us starting to become looser, like a change of attitude (...) I hear as if there is a kind of …of… release of energy (...) that has to do with information [he makes the gesture of playing the guitar moving the fingers very quickly] and also with a beginning of relaxation, right? Even bodily, perhaps…

The change in the intentional attitude of the musicians during chorus 3 modifies the sonic and interactive character relative to gesture 2. They explain this while laughing:

> INTERVIEWER 1 (improviser musician): It felt to me that it was like 'oh, so you're throwing that at me? Now, look at this! So, you want long? You want lots of notes? Then, take this!'
>
> **S**: 'I started out playing quietly, but if you want a burst of notes…Here, take this!'
>
> **G**: 'If you come to me with…'

S (interrupting G): 'Do not provoke me, because…'

INTERVIEWER 2: What was that expression you used before? The rapi…?

G and **S**: (with embodied gestures of complicity and laughs): The *rapideza*![2]

G: Remember? 'Oh, so you wanted *rapideza*? Take this!'

The attributions that musicians acknowledge to have produced during performance are related to the intention of suggesting and taking. The idea of suggestion implies the development of an expectation regarding the response of the other: when **S** plays, **G** attributes to **S** the intention of suggesting, and **S** expects from **G** that **G** attends to their suggestion, and vice versa. When the action of **G** is an answer to the suggestion of **S**, **S** attributes to **G** the intentional state towards their proposal.

At the beginning of the improvisation, when they are mutually exploring themselves, the probing attitude (of 'grasping' or 'fishing' what the other suggests) is reciprocal, given that they are both estimating the probability of the other taking or not what one is suggesting [Pérez & Gomila (2018)]. The character of *suggesting and receiving* changes when the gestural quality during the musical interaction is modified. Both musicians refer to 'loosen', to 'release energy'. Thus, the production of gesture 2 in chorus 3 exhibits an increment of the energetic content of both the musical and embodied actions, acquiring ballistic features [Martínez (2008)]. It consists of shooting a blast of sounds to the other. The other's reception and consequent production of the imitative gestural response – beyond the specific sounds that are played in those musical gestures – requires from both musicians the activation of an intentional attitude that is different from the one that triggered the production of the gesture in chorus 1. The suggestion becomes a requirement and a challenge, because if the other musician does not reply accordingly, the second person interaction will be abruptly interrupted.

III.4.2 Segment of Interaction 2 (duet 1, trial 1)

Just like the improvisers of duet 7 did, musicians of duet 1 recognized an initial attitude of mutual exploration in the musical improvisation aiming at getting to know each other. **S** indicates that, after the initial inquiry, both musicians arrive at a communion sensation that is achieved at the boundary between the end of chorus 2 and the beginning of chorus 3. **S** describes this as follows:

> **S**: At that moment, there, I noticed a… a moment of more communion when playing the theme. It's as if at the beginning we began together, playing 'ta-ta-ta-ta-ta-ta-ta', very rhythmic (they look at each other and smile). And then we started trying to get to know each other…
>
> **G**: To know… (nodding their head and smiling)
>
> **S**: …and exploring each other. And that [the communion] was like a momentum. (...) There I tried …I think I changed the density, didn't I? That is, we were playing note, note, note, note, note…
>
> INTERVIEWER 1 (to **G**): And you, there… What happened? When you noticed that…
>
> **G**: Well…I think that I received the signal from him, meaning 'let's do this…let's play'. Let's both play a bit more jointly'.
>
> INTERVIEWER 2: How do you think that you received that signal?
>
> **G**: At that time… I don't know if I was… able to… decide what was going on. But it just happened. Now I realise that there was a complete postural change, a change of sound. I believe that it generally comes from the sound (...) I don´t look much at the people when I am playing. I listen… I listen to everything that is happening, all the time and… it seems to me that something like that happened there, because I also gaze [at **S**]".

The observation of the sequence of actions that take place in the passage from chorus 2 to chorus 3 shows that **S**: (i) looks at **G**, (ii) changes their body posture, placing themself in front of **G**, and (iii) changes the musical gesture, from playing brief notes *forte*, to playing a long duration sound *piano*. Without looking at **S**, **G**: (iv) receives and takes from **S** the musical gesture of a long duration note and incorporates it to their own improvisation. From then on, both musicians produce together an ascending gesture where each one plays alternating and overlapping long sounds (Figure 7). **S** emphasises the initial intention of going towards **G** and sustains it in every note **S** plays during the ascent, (v) **S** accompanies each note with a body gesture of approaching the partner, and – at a given moment – (vi) **G** raises their head and looks at **S**. In order to produce this ascent together, it is necessary that the musicians control the timbre, dynamic, and duration parameters of sound. The joint achievement of this expressive goal requires that both instruments sound similar despite of being different, and, consequently, result in the production of a single gesture.

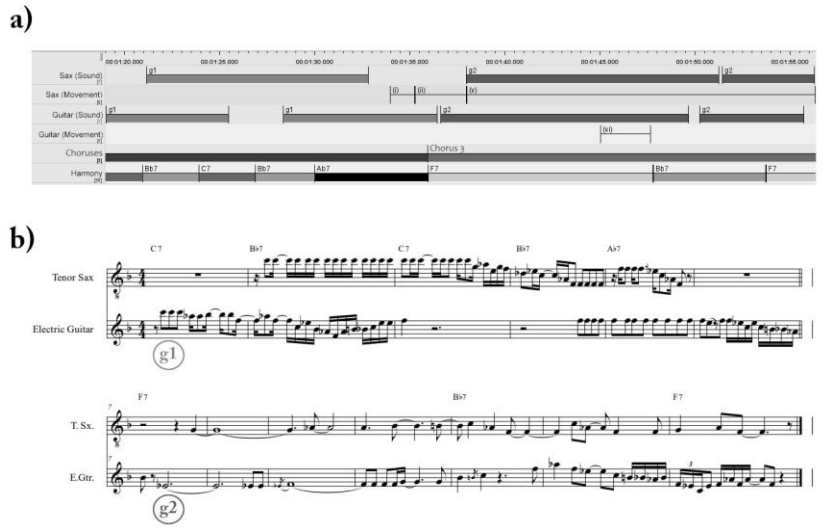

Figure 7. (a) Turn-takings and simultaneous performance of **S** and **G** during choruses 2 and 3. Gestures 1 and 2 are represented in light and dark grey, respectively. (b) Transcription of the music performed during the analysed segment.

The thesis that attributions are directly perceived in the body actions of the performers is proved when **G** states that **G** felt that **S** was giving him a sign for "playing together", a sound-kinetic sign that **G** grasped. The sign received by **G** is the result of the activation of a sound-kinetic complex by **S**. It contains, among other features, the turn in the body spatial orientation (from lateral to face-to-face position in relation to **G**), the change in the kind of musical gesture (from brief forte sounds to a long piano sound), and the embodied proximity of **S** achieved by leaning decidedly towards **G** while playing each successive sound. All these features constitute a multimodal unit that expresses the intentional attitude from **S** towards **G**. Upon receiving the signal, **G** attributes to **S** the intention of playing more jointly and responds to it, thus initiating a reciprocal interaction. *Playing more jointly* is manifested in the joint construction of the ascent by the *blue* scale of F7.

IV. Discussion and Conclusions

In this paper we aimed at deepening the analysis of the second person perspective in jazz improvisation, focusing on the identification and further description of some of the second person attributions that the improvisers

realise. Furthermore, it was our purpose to relate these attributions to the multimodal expressions of the intentional states that form part of the joint musical practice. Given that in this article we present preliminary results, we concentrate on the detailed analysis of trial 1. Nevertheless, we include in the discussion some of the general results obtained so far. Discussions and conclusions are presented below, thematically ordered.

IV.1 *Types of Second Person Attributions*

Jazz musicians mutually attribute the intention of *communicating, suggesting and taking*, and that of *producing together a single musical gesture*. *Communicating* had already been identified in previous studies [Martínez & Pérez (2021), Pérez & Martínez (2021)], and it describes a general intentional state of approaching the other that is a necessary condition for the establishment of any kind of reciprocal bond. The musicians of the two analysed duets agree in their descriptions of the beginning of the interaction as a moment for "familiarising" with each other. However, the way in which each duet approaches that moment is different: in duet 1 this initial intent has a more rhythmic character, while in duet 7 the approach is produced through the exchange of two musical gestures of a different kind (gesture 1, slow, with few notes; and gesture 2, quick, with a torrent of notes).

The intention of *suggesting and taking* proposes a more specific mode of interaction, that is configured clearly in the cycles of varied imitation during turn-takings. In duet 7, for example, gesture 2 -which had been tentatively presented in the initial exploratory moment of the improvisation- is transformed during the chorus 3: it adopts a ballistic character, turning the initial improvisation of suggesting into an intention that *demands and challenges* the other. It is assumed that this difference of intention emerges from the contingent way in which the improvisation is built up in this duet.

The intention of *making jointly a single musical gesture* is manifested in instances in which the musicians are playing simultaneously; this does not imply merely a continuous overlapping of sounds but the building of a single phrase which unfolds a two-part counterpoint. In duet 1, the rhythmic gestures of the initial communication lead to a second interactive moment where the musicians recognize themselves as being in a state of *communion*. This state is achieved by transforming the initial musical gesture of long notes, slow, and *piano* into an interactive joint performance based on the production of a simultaneous playing. The phrase does not contain turn-takings but successive and alternating entries, where both musicians introduce a new sound each time and sustain it over the sound that was previously played by their partner.

The second person theory posits that the prototypical intentional states are aimed at objects that are present in the environment; for example, when someone grabs an object, another person can see in their actions the intention of going towards that object. However, in the context of the second person theory other instances – understood as prototypical – suggest intentions of a different kind: for example, a tango dancer that is led by another dancer interprets their partner's movements as an intention for him to perform a specific dance step; or, similarly, when an adult brings an object closer to an infant, the child understands the adult's intention of going towards him or her. These intentions are not directed to objects in the environment but to the people with whom they are interacting. The intentions of suggesting and taking, provoking, communicating, and inviting which were identified in our study are all directed to the other musician through the music that they both are creating. This does not rule out that – according to the Western ontology of music in academia — music can also be conceived as an object towards which people direct their own intentions. In our study, for example, musicians focused at times on their own performance, directing their attention and their intentions to it. However, the analysed results highlight the conception of music as action, through which the intentional states directed to others are expressed.

IV. 2 *Expressive Keys of Intentional States*

The intentional attributions during a musical performance are generated based on at least two perceptive modes: the aural perception of the other's musical proposals, and the visual perception of the other's movements. Given that in this sample the total gazing time value is low, it can be inferred that the auditory keys play a central role in the mutual understanding of the musicians' intentional states. Regarding aural perception, the present results show that the improvisers' intentions are expressed in the sonic materiality of the music, e.g., in the auditory perception that **S** has of the ballistic character of **G**'s musical gesture with quick notes (chorus 3, duet 7). Such perceived intention leads directly to **S** 'reading' **G**'s 'provoking' intention which triggers in **S** the need to answer to **G** in the same way. The attribution of psychological states to the music has been studied from different perspectives, among them agency [Robinson (2005)], metaphorical thought [Martínez (in press)], and even from the second person perspective in relation to the reception of artworks [see chapter 9 in Pérez & Gomila (2021)]. But the intentional states identified in the present paper do not refer to music itself as a persona or as an idea but to the intentional attitudes that musicians mu-

tually attribute to each other which are expressed by them *in* the sonic materiality of the music *as* they perform.

Concerning visual perception, in line with the 5E perspective, this study also showed that music is not merely the sonic materiality through which the improviser's intentions are expressed but is also the product of the intentional actions performed by the musician when producing sound [Cross, Shilton & Tolbert (in review)]. The improviser's intentional state is imprinted and expressed in the embodied actions with which they produce the music. In the present study we have found that musicians gaze more at their partner's instrument than at their face. They focus their perception on the materiality of their partner´s actions, that is, on the different types of movements (epistemic, effectors, ancillaries, among others) involved in the musical production. In this sense, music is not only sound but also action; directing the visual perception to the actions produced by the other on their instrument pursues the goal of understanding or accessing the music that results from those body movements. Inversely, the features of the actions that shape the sonic materiality are imprinted on the sonic gesture (e.g., the body effort involved in the production of a sonic gesture of ballistic character).

Besides the fact that the division between sound and movement -and also between auditory and visual perception- is necessary for methodological and analytical reasons, the perception of the other intentional states in performance has a holistic character. For example, in duet 1, we observed the production of sound-kinetic gestures that are multimodally integrated. The physical closeness from **S** to **G** is slow and progressive, and it is accompanied by the production of long duration sounds that imply little body effort. In a similar way to the adult-infant interaction, during the infant directed-performances, the above-mentioned type of performance shapes a multimodal redundant unit of sound and movement. That sound-kinetic gesture expresses an intention of inviting the other to interact. The results analysed so far show that the holistic character of multimodal perception is the result of the conjunction of a variety of features belonging to the sound-kinetic complex, among others: the joint production of musical gestures, accessed mainly through listening, and the production of temporal and kinetically congruent movements, as shown in the analysis of **GII** and of the gazes and smiles and in the microanalysis of the embodied gestures of the musicians.

IV.3 *Types of Musical Interaction*

The intention of dialoguing with the other is manifested during joint musical interaction both through the actions of imitating or trans-

forming a melodic motif, and when starting or stopping to play, typical of turn-takings. In this sense, musical improvisation can be described as a non-verbal dialogue that contains the basic interactive modes that characterise early communicative musicality, where adults spontaneously build repetition-variation cycles with the infants. *Imitation* emerged as an indicator of the communication between the musicians, both in the analysis of the attributions reported by them during the interviews (duets 1 and 7) and in the general observation of the audiovisual recordings.

In future studies we will analyse the behaviour of the musician that is waiting for their turn while their partner is playing. The person who waits for their turn might show a receptive or a participative attitude towards the other's action. In the latter, it could be possible to observe different degrees of involvement, manifest for example in the production of body articulations such as movements temporally aligned with the music or with the other musician, or vocal articulations such as the production of sonic sub-vocalizations accompanying the musical production [Leman (2008)]. It is an assumption that actions of the musician who is waiting for their turn provide cues about their involvement, attention, and commitment with the music and with the musician who is currently playing. And also, that these cues allow the sustaining of reciprocity during turn-takings.

Not only is there reciprocity during turn-takings, but also during simultaneous music performance. Unlike other types of second person interactions in which it is not necessary to share the mental states in order to establish reciprocal interaction [Gomila & Pérez (2017)], in the case of jazz improvisation – and probably in musical performance in general – musicians must share the intention of constructing together the music in a certain way (for example, in the case of duet 1, the intention of building together – between **S** and **G** – an ascent of long notes *piano*). If that intention is not shared it will probably be difficult to find reciprocity. The same happens in early interaction: construction takes place spontaneously, moment- by- moment, during the interaction.

IV.4 *Idiosyncrasy*

It is interesting to observe the way in which certain sound-kinetic features are kept and certain others are transformed as the improvisation unfolds. This happens both within a given trial (from chorus 1 to chorus 4) and across trials (from trial 1 to trial 3). The general observation of the duets' musical activity showed idiosyncratic features that are characteristic of each duet across trials, highlighting the personal character of the ways of building contingently the sound-kinetic interaction in this con-

text of social practice. Although the in-depth analysis of trials 2 and 3 has not taken place yet, we could observe differences between duets in the magnitude of **GII** *per* trial (Figure 4). For example: duet 5 in trial 1 does not show significant influence in choruses 1 and 2, while it shows the maximum **GII** in all the choruses of trial 2, compared to other duets; on the other hand, duet 7 shows **GII** values in the four choruses of trial 1, while in trial 2 this indicator is only present in choruses 3 and 4. This difference was accounted for in some comments expressed by the musicians when they were informally asked about their degree of experienced easiness at the end of their performance in each trial, under the assumption that the more comfortable they felt or the greater familiarity between musicians in the performance, the greater the **GII** value [Ragert et al. (2013)].

Idiosyncrasy, as a feature that identifies the peculiar modality of exchange in each duet, might be due to two reasons. On the one hand, the multimodal keys manipulated experimentally in each trial may have had a singular effect on each musician, impacting on the ways of building the interaction with the other. On the other hand, the shapes that the exchanges adopt in second person interactions are defined contingently during the interaction. Therefore, it is expected that once a particular modality of exchange is established, it will tend to persist over time.

V. Future Directions

The method employed in the present study has allowed progress in the establishment of a more direct relation between the second person attributions recognized and verbally communicated by the musicians and the sound-kinetic features that express them, opening a fertile field of possibilities for future exploration of the second person manifestation in music. In this sense, it is necessary to increase the sample size and to continue analysing the data already collected in order to (i) further explore the possibilities that body movements offer to second person interaction; (ii) identify new second person attributions; and (iii) analyse how the multimodal constraints of trials 2 and 3 might affect the production of second person attributions during music improvisation.

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NOTES

[1] *Pescar*: in the original Spanish an informal expression meaning "to grasp".

[2] *Rapideza*: an invented word changing the grammatical gender of the original word 'rapidez' (*high speed*). The transformation adds an Italian vibe typical of Argentinian slang.

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LA MUERTE Y EL MORIR

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CÁTEDRA