

An Exploratory Study of Gazing Behavior During Live Performance

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ABSTRACT

It is known that the visual information given by performers during a performance works as a useful channel of communication to the audience. In my previous studies, many performers referred to the importance of gazing behavior or eye contact. The purpose of this research is to explore the role of gaze during live performance by measuring the timing and direction of gazing. The hypotheses are as follows: [1] Gazing behavior depends on the musical structure. [2] Gazing behavior is used for the communication between performers which is necessary during performance. [3] Performers set their gazing direction in order to contribute to the audience's understanding of the music. This research was essentially based on the observational method used in social psychological studies. A popular music band comprising four performers was observed and gazing via a behavior coding system was measured. The results showed that gazing behavior depends on the musical structure, the instruments and the respective roles of the performers. Thus, the results suggested that particular gazing behavior of performers often occurred just before important parts in the musical structure and performers directed their gaze toward the performer to whom they should pay attention in accordance with the musical structure. These results implied that gazing behavior plays important roles in both inter-performer and performer-to-audience communication.

INTRODUCTION

In musical performances, the performers and audiences communicate through musical sounds. Hargreaves, Raymond and Miell (2005) referred to music as 'a fundamental channel of communication'. Further, previous research has shown that performers' intentions can be conveyed to listeners via musical sounds (e.g., Laukka & Gabrielsson, 2000; Kendall & Carterette, 1990; Senju & Ohgushi, 1987; Nakamura, 1987).

However, visual information is also very important in helping listeners to understand the player's intent. Davidson and Correia (2002) pointed out that body movement is an important cue in the communication between performers and listeners. Furthermore, it is noted that visual information is important not only as a means of communication between players and listeners but also within the interaction between players. Williamon and Davidson (2002) suggested that gestures, body movement, and eye contact play important roles in piano duo performances.

Kawase et al. (2007) conducted research on communication channels, and surveyed which channels were most often used in music performance. The results, which were consistent with previous studies, indicated that visual information was used very frequently and its importance was very high; gaze in particular was considered to be one of the most important channels.

Previous studies have implied that gazing behavior plays an important role in music performance. For example, as cited above, Williamon and Davidson (2002) investigated the eye contact between the pianists in a piano duet. Further, they showed that the more players performed together, the more they made eye contact. They also showed that eye contact increases during an important section of the music.

Previous psychological studies have shown that gaze plays important roles in communication. Kendon (1967) pointed out that gazing has three roles: emotional or attitudinal expression, information collection, and smooth coordination of conversation. On the other hand, Baron-Cohen (1995) analyzed the role of gazing using mechanisms such as Eye-direction Detector, Intentionality Detector and Shared-attention Mechanism, from a developmental psychological perspective.

Although gazing behavior is important for daily communication, and a survey study or a qualitative study may suggest its importance in music performance, there has been no study which actually tracked and measured gazing behavior during music performance. So, what role does gazing play in music performance? The most basic way to explore this question is to analyze gazing behavior during live performance.

Given this background, the aim of this research exercise was to examine what kinds of gazing behavior will occur in a live performance situation and to analyze the ways in which gazing behavior plays roles in such performance.

The hypotheses of the present study are as follows:

[1] Gazing behavior depends on the musical structure.

[2] Gazing behavior is used for the communication between performers which is necessary during performance.

[3] Performers set their gazing direction in order to contribute to the audience's understanding of the music.

The ultimate purpose of this research is to explore the processes of various types of cross-genre non-verbal communication.

As a first step, the present study focuses on gazing behavior during a popular music performance, a situation that seemed likely to make it easier to observe non-verbal communication.

METHOD

Participants

A concert was staged specifically for the purposes of this research study. Six bands played in this live performance. Only the first band was chosen to be analyzed for our research. The analyzed band was a 4-member popular music band

comprising a female vocalist, a male guitarist, a male bassist and a male drummer. An expert piano/keyboard player who was a teacher at a music college assessed the group as being at a proficient amateur level.

Performance Venue

The performance venue was amHALL in Osaka, Japan (capacity of about 150 people).

Procedure

This research used the observational method, referring to Argyle (1999) in order to obtain the correct data without disturbing the players' performances. The performance was recorded on video cameras placed in front of the stage, and at the right and left sides of the stage (Figure 1, see Appendix for a sample view from each camera angle). The players had a rehearsal before the live performance. As it was a real live performance, the audience members were required to buy tickets to see and hear the band playing.

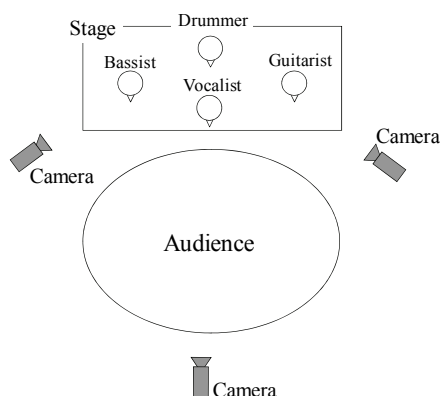


Figure 1. Setting of the live performance

Measurements

We analyzed the first song, whose duration was 171 seconds, because the lighting during this number was sufficiently bright to allow us to easily analyze the performers' behaviors. We counted how many times and for how long the vocalist, guitarist, and bassist looked toward other members, toward the audience or at their own instruments, through frame-by-frame observation using IFS-18C Behavior Coding System software (DKH, Ltd., Japan). Because the drummer was in relative shadow most of the time and was partially hidden behind the drum set, the drummer was excluded from analysis.

The cameras clearly showed the gazing directions of each of the other three performers. Part of the bassist's performance was excluded from analysis because his gazing was at times difficult to assess due to his positioning on the stage (for example, when the player was in a blind spot for all three cameras).

A proficient musician evaluated the musical structures.

RESULTS AND DISCUSSION

Timing of the Gazing Behavior

The timing of gazing was measured, i.e. at which points the vocalist, guitarist and bassist looked at other members of the band, the audience or their own instruments during the performance. The timing when the three members changed their gazing directions is illustrated in Figure 2.

The song analyzed in this research has a fundamental structure composed of a chord progression unit incorporating a 16-bar measure. This structure was analyzed by the proficient pianist mentioned above. The sixteen-bar measure labeled A1 is the fundamental theme, while A2 is the 16-bar measure in which the rhythm pattern changed. In addition, we labeled the guitar solo part A3 (the chord progressions were the same as A1 and A2 during the guitar solo), and the song had an 'intro' at the beginning and a 'coda' at the end.

The cross signs show the points at which each member looked at another member, the audience or his own instrument during the performance. The more cross signs there are, the more frequently the players changed the object of their gazing. On the other hand, less cross signs means that there were few changes in gazing direction; in short, the player concerned gazed in the same direction for that period of time.

These results suggest that the guitarist changed his gazing direction when the structure of the song changed. Moreover, the gazing of the vocalist was not constant throughout the performance; for example, gazing frequently occurred at the beginning of the first A2. On the other hand, compared to the guitarist and the vocalist, the bassist gazed less irregularly and constantly changed his gazing direction during the performance. This result implies that gaze behavior depends on the structure of the music.

Objects at which Performers Gazed and Musical Structure

Next, the objects at which the players looked were analyzed. The duration and the number of times performers gazed are shown in Table 1. Intro, A1, etc. indicate the structure of the music, and the numbers in parentheses beside them indicate the

+ Changing point of direction of gazing

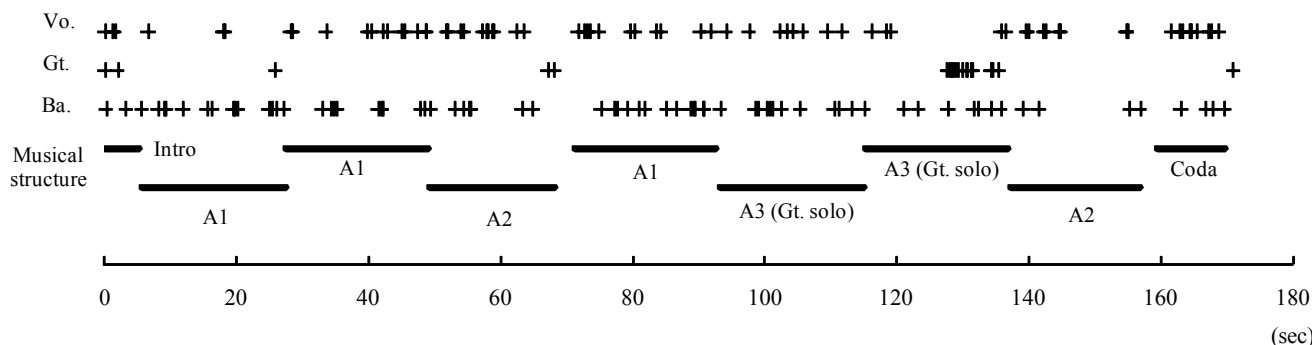


Figure 2. Timing of gazing behavior in relation to the musical structure

number of bars. Intro, A1 and other parts are arranged in playing order. The left side of the table indicates the players and the objects of their gazing. The numbers in the table indicate the duration of gazing at the object and the numbers in parentheses indicate how many times the players looked in the respective direction. In addition, if a player looked at the same object during more than one part, all the times they looked at the objects in each part were counted (for example, if the players looked at the same object from Intro to A1, the gazes occurring in both Intro and A1 were counted).

The results show that the vocalist was gazing toward the audience almost all the time. However, the gazing changed depending on the structure of the music. That is to say, the vocalist gazed less at the audience during A3 (guitar solo) than during other parts, and also, the vocalist gazed more at the guitarist. Furthermore, the vocalist looked at the audience for a long time during A1 and A2 after the guitar solo. And, the vocalist rarely looked at the drummer or the bassist.

The guitarist almost always looked at his own instrument. However, the guitarist looked more at the vocalist in the latter part of the guitar solo.

The bassist also spent a long time looking at his own instrument. However, the bassist looked more at the guitarist and the vocalist during the third A1 part. The bassist also looked more at the drummer during the guitar solo (A3). Similarly, the bassist more frequently looked at the drummer during the last part.

These results suggest that the changes of gaze direction are related to the structure of the music.

In respect of the audience, only the vocalist gazed in that direction. This enabled the audience to understand that the vocalist was the central player on the stage.

The vocalist also reduced her gazing toward the audience during the guitar solo, when the guitarist became the central player. This implies that gazing serves as a communication channel between the performers and the audience.

However, it is shown that the gazing differed among the performers. Namely, the vocalist almost always looked at the audience during the performance, while the guitarist and the bassist almost always looked at their own instruments.

This behavior is related to the etiquette or social role which is the set of behaviors expected of a person in a particular social position (e. g. Davidson, 1997; Fiske & Taylor, 1991). If the vocalist and the guitarist follow the same norm, the guitarist will gaze toward the audience to some degree during the guitar solo, in which the guitarist plays a musically central role. The guitarist who was observed in this research could easily have gazed toward the audience because he was a skillful enough musician, but he did not. This suggests that the guitarist thought that the behavior, “do not gaze”, conformed to the norm for the performance.

From this it can be inferred that in such live performances, which consist of different parts, each part acts based on his/her particular social role.

However, it also can be said that gazing will change according to the requirements of the music performance. In fact, the bassist gazed much more at the drummer than at the other performers. Generally speaking, because the drums and bass are regarded as instruments that are responsible for the basic rhythm in popular music, the result of this study may reflect the efforts of the two musicians to produce a quality musical sound.

Gazing Behavior during Performance

The results show that the timing of particular gazing behaviors and the objects at which the performers gazed are related to the musical structure. Next, the timing of changes in gaze direction, and what the performers gazed at are discussed. In Figure 3, the horizontal axis represents the duration of the performance while the vertical axis indicates the objects at which each performer looked. For example, the guitarist looked at the bassist once in the last half of first A3 part.

Table 1. Objects of players' gazing in relation to the structure of the music

Performer	Object	Intro (4)	A1 (16)	A1 (16)	A2 (16)	A1 (16)	A3 (16)	A3 (16)	A2 (16)	Coda (8)	Total
Vo.	Gt.	- (-)	- (-)	1.9 (3)	1.5 (2)	2.8 (3)	7.1 (4)	16.8 (2)	- (-)	2.3 (2)	32.5 (16)
	Ba.	0.3 (1)	0.2 (1)	1.3 (3)	0.9 (3)	1.4 (3)	- (-)	- (-)	1.2 (4)	1.3 (2)	6.5 (17)
	Dr.	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	0.6 (1)	- (-)	- (-)	0.6 (1)
	Au.	5.0 (2)	21.4 (3)	18.6 (6)	19.1 (6)	16.6 (6)	9.8 (4)	4.0 (3)	21.1 (5)	7.7 (6)	123.1 (34)
	Inst.	- (-)	- (-)	0.4 (1)	0.7 (1)	- (-)	- (-)	- (-)	- (-)	- (-)	1.1 (4)
Gt.	Vo.	0.0 (1)	- (-)	- (-)	- (-)	- (-)	- (-)	2.0 (6)	- (-)	- (-)	2.0 (7)
	Ba.	- (-)	- (-)	- (-)	0.8 (1)	- (-)	- (-)	0.3 (1)	- (-)	- (-)	1.1 (3)
	Dr.	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	1.9 (3)	- (-)	- (-)	1.9 (3)
	Au.	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	0.0 (-)
	Inst.	5.6 (1)	21.8 (2)	21.8 (1)	21.1 (2)	22.0 (1)	22.2 (1)	18.2 (5)	22.2 (1)	11.2 (1)	166.0 (7)
Ba.	Vo.	- (-)	0.4 (1)	1.3 (3)	0.2 (2)	1.5 (4)	0.4 (1)	- (-)	- (-)	- (-)	3.8 (10)
	Gt.	- (-)	0.3 (1)	- (-)	- (-)	2.6 (2)	0.1 (1)	- (-)	- (-)	0.2 (1)	5.7 (5)
	Dr.	- (-)	- (-)	- (-)	1.2 (1)	- (-)	2.6 (2)	3.4 (2)	0.7 (1)	3.6 (1)	11.6 (6)
	Au.	- (-)	2.0 (4)	1.3 (4)	1.0 (2)	3.8 (3)	2.1 (2)	0.3 (1)	1.6 (1)	- (-)	12.1 (17)
	Inst.	4.8 (2)	17.5 (8)	17.8 (3)	17.7 (3)	12.0 (5)	13.7 (7)	14.7 (5)	17.2 (3)	4.9 (3)	120.3 (35)

sec (number of times)

The measured results in Figure 3 illustrate that the vocalist's long gaze toward the guitarist caused inactive gazing behavior during last half of the guitar solo in Figure 1. Moreover, the active gazing behavior of the guitarist during the same part was a meticulous distribution of gazes toward the vocalist and the drummer.

We examined the part leading up to the guitar solo where the most significant change of performance occurred. First, in the transition into the guitar solo (between A1 and A3), the vocalist changed her gaze from the audience to the guitarist; next, she gazed back at the audience again; and, finally, she turned her gaze back to the guitarist. The bassist showed frequent gazing behavior at the end of A1. He gazed at the vocalist, and then gazed at the guitarist. After the transition into the guitar solo, he looked at his own instrument during A3. On the other hand, the guitarist gazed at his own instrument during that same transition part. At the end of the guitar solo, the vocalist looked away from the guitarist and glanced the drummer; then, she looked toward the audience. The bassist looked away from his own instrument and gazed at the drummer. The guitarist frequently gazed toward the vocalist, the drummer and the bassist at the end of the guitar solo, although he mainly looked at his own instrument.

From the perspective of communication between performers, this result shows that each performer communicates with the co-performer with whom they most need to communicate. For example, the vocalist and the bassist gazed at the guitarist at the beginning of the guitar solo because they had to adjust to the timing of the guitarist, especially when the guitarist did not gaze at co-performers. Conversely, they had to gaze at the drummer rather than the guitarist in order to adjust timing at the end of guitar solo. Moreover, at the end of the guitar solo, the guitarist had to gaze at co-performers because he needed to coordinate with other performers, although the co-performers adjusted to his timing before the end of guitar solo. These results of gazing behavior suggest that gazing plays a role in communication between performers.

However, gazing behavior during the guitar solo cannot be explained solely by communication between performers because the vocalist who gazed at the guitarist and did not sing during the guitar solo did not have to adjust her timing musically. This vocalist's behavior directed the audience's attention to the guitarist. Although she was still at center-stage, gazing could serve to indicate to the audience the object to which they should pay attention.

This result indicates that the change of gazing of a co-performer toward the guitarist shortly before the guitar solo enabled the audience to recognize the next musically central player. The active gazing behavior of the guitarist toward the vocalist who would be the next central player at the end of the guitar solo also served as a signal to inform the audience of the change of central player. As collateral analysis, the bassist, who was not the central player, did not face toward the vocalist, but might face toward the drummer for the transition into A2, which began with a characteristic rhythm.

These results suggest that the performers communicate through gazing channels and that their gazing behavior serves to enable the audience to anticipate the next musically central player.

Metrical Structure and Gazing Behavior

Finally, it was necessary to analyze in more detail the metrical structure and the changes of gaze direction. We illustrated the relationship between the metrical structure and the changing of gaze direction in Table 2. The "1st" to "4th" items indicate the beat (the rhythm of this piece was 4/4 time). The left side of the table indicates the players and the objects at which they looked. The numbers in the table indicate the duration of looking at the objects, and the numbers in parentheses indicate how many times the players looked at the respective objects. In addition, if the players looked at the same object through several beats, all these beats were counted (for example, if the players looked at the object from the first beat to the second, we counted both beats).

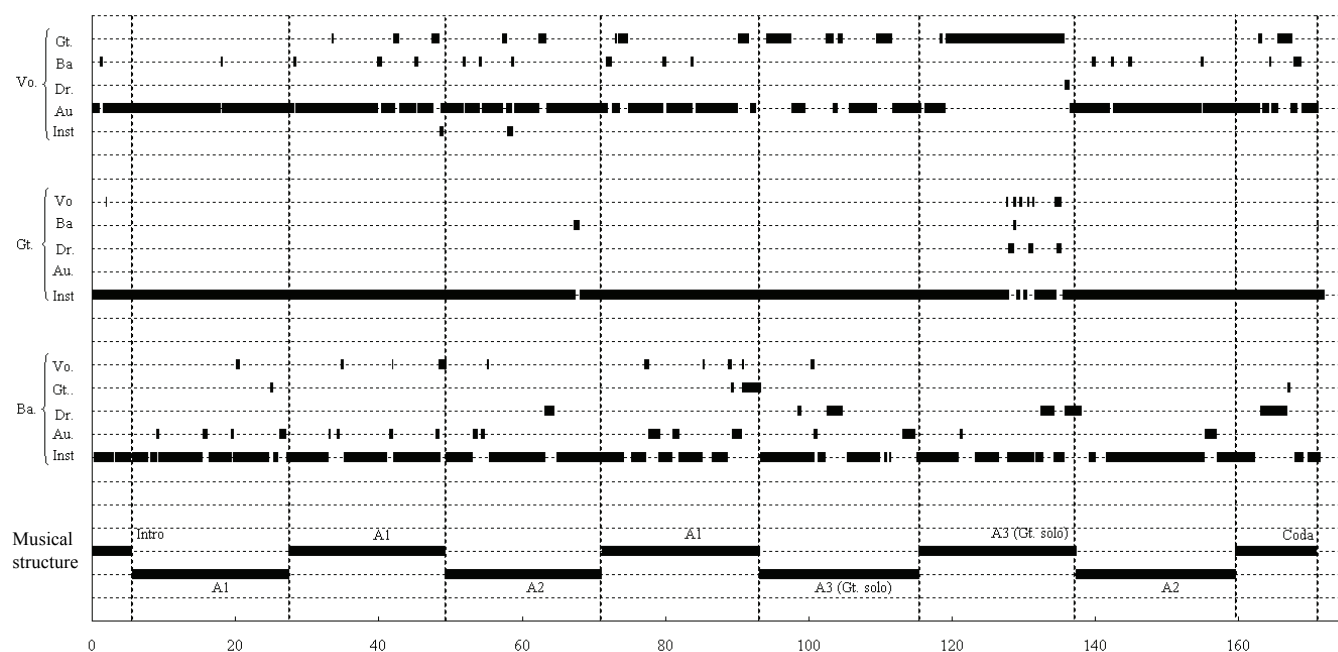


Figure 3. Gazing behavior and musical structure

The guitarist and the bassist gazed a higher number of times during the first and second beats, and gazed less during the fourth beat. From this it can be inferred that more changes of gazing direction occurred during the first half of the bar.

In the vocalist's case, it appears that there is no relationship between the metrical structure and the change of gaze direction.

The total number of gazes of the guitarist is influenced by the fact that the guitarist looked more at the vocalist and drummer during the first and second beats. This means that the guitarist looked more at the other players during the first and second beats. Moreover, the total number of gazes of the bassist is also influenced by the fact that the bassist looked more at the vocalist, guitarist and audience during the first and second beats.

Table 2. Metrical structure and gaze behaviour

Player	Object	Beat			
		1st	2nd	3rd	4th
Vo.	Gt.	8.7 (13)	8.0 (15)	7.2 (11)	8.5 (12)
	Ba.	1.5 (9)	1.7 (8)	2.0 (10)	1.7 (8)
	Dr.	0.4 (1)	- (-)	- (-)	0.2 (1)
	Au.	31.3 (31)	30.8 (32)	31.1 (34)	30.8 (32)
	Inst.	0.5 (1)	0.6 (3)	1.3 (4)	0.8 (4)
	Total	42.3 (55)	41.0 (58)	41.5 (59)	42.0 (57)
Gt.	Vo.	0.6 (4)	0.6 (3)	0.4 (2)	0.4 (3)
	Ba.	0.1 (2)	0.3 (1)	0.5 (2)	0.1 (1)
	Dr.	0.6 (3)	1.0 (3)	0.2 (2)	- (-)
	Au.	- (-)	- (-)	- (-)	- (-)
	Inst.	42.2 (6)	41.8 (6)	41.4 (6)	42.4 (7)
	Total	43.6 (15)	43.7 (13)	42.5 (12)	42.9 (11)
Ba.	Vo.	0.9 (6)	1.0 (7)	1.1 (5)	1.0 (4)
	Gt.	0.9 (3)	1.1 (4)	0.7 (1)	0.7 (1)
	Dr.	3.0 (6)	2.7 (5)	2.9 (5)	3.1 (6)
	Au.	3.1 (12)	3.6 (14)	3.3 (11)	2.4 (8)
	Inst.	30.5 (32)	30.2 (32)	29.7 (34)	30.9 (34)
	Total	38.4 (59)	38.6 (62)	37.7 (56)	38.1 (53)

sec (number of times)

CONCLUSION

From the results, it can be concluded that the gazing behavior occurred very rationally. Performers' gazing behavior served to contribute to making a good, cohesive sound, which is most important for the performers, and also to realize the important communication required between the performers and the audience.

That said, this research is an observational field study and should be regarded as only a first step in the analysis of gazing behavior during performance. For this reason, much of our research was qualitative analysis with reference to previous studies. Therefore, we will have to examine whether gazing channels still play the roles inferred from this study when analyzed under controlled experimental conditions.

For example, as shown by social psychology studies, if the social relationship between performers is poor (level of intimacy is low), the amount of gazing may decrease. In addition, gender differences among performers could affect

non-verbal behavior. Therefore, the amount of gaze may be influenced by several factors,

Analysis of gazing behavior during performance offers important findings which reveal not only the effect or the role of gaze but also how to send and receive visual information, including through body movement and expression. We intend to conduct further experimental studies as part of our ongoing research activities.

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Appendix

Examples of cropped photographs. Picture (a) was taken from right side of the stage, (b) was taken from the left side of the stage and (c) was taken from in front of the stage.



(a)



(b)



(c)