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© Psychology, Society, & Education, 2017. Vol. 9(2), pp. 283-298
ISSN 2171-2085 (print) / ISSN 1989-709X (online)
Doi 10.25115/psye.v9i2.715

Attention, communication and development of interpretation skills in chamber music pianists´education.

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(Received on February 16, 2016; Accepted on May 15, 2016)

ABSTRACT: Pianists performing chamber music require skills of conscious listening and non-verbal, body or visual communication to perfect coordination, synchrony and dynamic balance. This study hypothesize that pianists have perceptive-attentional and psychological skills that allow them to communicate with other musicians. These skills are hypothesized to be better in more experienced pianists. This survey was conducted with 278 graduate and under-graduate pianists from all parts of Spain, who reported that the attention and communication skills are important in chamber music performance. Women reported higher levels of multitask competencies pertaining to conscious listening, body language and visual efficiency. At the same time, participants who are more highly trained and experienced report higher levels of attention, communication and interpretation skills when compared to the participants with shorter training and experience. Future research and practice should focus on assessment and inclusion of these skills in the curriculum of future chamber music pianists.
Key words: conscious listening, non-verbal communication, perceptive-attentional and psychological competences.

El proceso atencional y comunicativo y el desarrollo de competencias interpretativas en la formación del pianista de cámara.

RESUMEN: Los pianistas que interpretan música de cámara requieren unas competencias de audición consciente, de comunicación no verbal, gestual y visual dirigidas al perfeccionamiento de la coordinación, sincronía, balance dinámico. Se parte de la hipótesis de que los pianistas cuentan con estas herramientas perceptivo-atencionales y psicológicas que les permiten comunicarse con otros músicos, y que, a mayor experiencia mejor uso de estas herramientas. Este estudio ha encuestado a un grupo de 278 pianistas graduados y no graduados de toda la geografía española, que declararon que las competencias comunicativas-atencionales son importantes en la interpretación camerística. Las mujeres informaron más alto nivel en competencias multitarea relativas a audición consciente, gestualidad y eficiencia visual.

Asimismo, los sujetos más experimentados y altamente instruidos informaron tener un más alto nivel de atención, comunicación y competencias interpretativas al compararlos con los sujetos con menor experiencia y formación. Futuras investigaciones y prácticas deberían centrarse en la evaluación e inclusión de estas competencias en el currículum de los futuros pianistas que interpretan música de cámara.
Palabras clave: escucha consciente, comunicación no verbal, competencias perceptivo-atencionales y psicológicas.

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INTRODUCTION

Cognition and musical perception have come to hold an important place in psychological research in recent years. Music performance, and more precisely ensemble performance, become a fruitful field of research (Davidson & Good 2002; Ginsborg & King, 2007; Goodman, 2002; Williamon & Davidson, 2002). In this respect, musicians'perceptive and attentional skills and their neurophysiological implications are the main topic of several studies (Altenmüller, Wiedendanger & Kesselring, 2006; Alonso *et al.* 2008; Schlaug, 2001). Research reveal that these skills and their neurophysiological basis directly affect synchrony (Bishop & Goebl, 2014; Goebl & Palmer, 2009), coordination (Goodman, 2002), and common elements that result from the interaction between musicians (Blum, 2000; Graybill, 2011), such as non-verbal visual communication (Albaladejo, 2007; Davidson & King, 2011; Thompson, 2005), and body language (King & Ginsborg, 2011; Williamon & Davidson, 2002).

According to Goodman (2002), ensemble performance is an activity which requires a set of perceptive-attentional and musical skills, the awareness of which, together with development via training and learning, may improve the resulting performance. Auditory perception of music has been the initial focus of research in music cognition (Baily, 1985; Storr, 1992). Later, many experiments have shown that non-verbal skills as musician´s gestures and bodily movements help to a better musical understanding (Vines, Krumhansl, Wanderley & Levitin, 2006). Accordingly, great musicians, such as Baremboim (1992), Berman (2010) and Moore (1943), among others, considered training in listening as one of the most important tasks in playing music. According to Goodman (2002), efficient listening contributes to anticipating and reacting to the sound during interaction with other players.

A suitable atmosphere of concentration is essential for preparing muscles and intellect before beginning to play. According to Reid (2002), this concentration contributes positively to auditory perception. In this atmosphere, and by way of conscious listening, parameters such as tuning are checked. Tuning perception, as many studies support, differs between string and wind instruments and the voice (Geringer, 2012; Geringer, MacLeod & Sasanfar, 2015; Kopiez, 2003; Loosen, 1995). In the case of pianists, with a tempered instrument, tuning is not constantly adjusted, and Harlow (1969) maintains that pianists normally only tune their piano twice a year.

On the other hand, one of the skills to be refined is body language and gestures between chamber musicians. These gestures, according to King & Ginsborg (2011), are not limited to the role of establishing tempi, accents, narrative of phrase and the limits of the musical structure, but also, as pointed out by Goebl & Palmer (2009), serve to coordinate entrances and synchronise sound. According to other studies, they also help to reflect internal states of consciousness and perceptive attention (Davidson, 1993; McNeill, 1992; Ussa, 2013) and communicate emotions and expressive intentions (Davidson, 2009; Schutz, 2008)

Body language and gestures among members of a chamber ensemble fall within measurable physical distances: intimate, personal, social and public spaces according to Pease (1987). This space, called proxemia by the anthropologist Edward T. Hall (1969), is smaller or larger according to the degree of approach, complicity, affective links or professional commitment. According to Clarke (2002), players interact to produce a specific sound within proxemia.

In piano duos on the same instrument, as indicated by Williamon & Davidson (2002), special features take place in the intimate zone described by Hall: breathing patterns, combination of the different joints that intervene in order to play the same instrument, synchronisation of body swaying, also described by Keller & Appel (2009). On the other hand, in larger chamber formations, Davidson (2009) advises that a suitable and respectful distance should be maintained with other players and this personal space should be such that gestural, sensory and symbolic messages may flow. Players do not endeavour to interact with the public solely as regards sound, because the visual aspect of a performance also makes up part of the musical experience, as stated by Blum (2000) after a conversation with the Guarnieri Quartet. In this public visual and auditory space, body language not only displays information regarding the character, emotions and sentiments of the players, but also as regards the music being played.

Visualisation, as stated by Schutz (2008), becomes a complement to auditory perception, since gestures are considered to be visual signals and can create patterns in sound (Windsor, 2011). Visual feedback, as pointed out by Clayton (1985), not only gives clues to tempi, entrances and take-overs, but can also significantly influence precision and expressive freedom in cooperative performances. Visual feedback is important even when auditory feedback is scarce (Goebl & Palmer, 2009; Keller & Appel, 2010). According to Berman (2010), a well directed look makes the difference between success and failure in instrumental performance.

According to Davidson (2002), there are also other related factors that influence the performance, such as dress code and acknowledging the audience, subject to consensus by the group in advance. These factors are included in the current study.

Gaining experience through training in technique and playing to perform as closely as possible to the composer's intentions are an important milestone, according to Williamon (2004). Moreover, this is shown by the increased capacity for anticipation/reaction in auditory precision as described by Neuhoff, Knight & Wayand (2002), in synchrony (Bishop & Goebl, 2014; Pecenka & Keller, 2011) in improvement in communication between peers through body language and visual and auditory communication (Badino, D´Ausilio, Glowinsky, Camurri & Fadiga, 2014).

Although there are some studies that advanced research on attention, communication and interpretation skills in musicians, this research field is still in its early stages. Some studies found that routines prior to performance, awareness of acoustics and sound production, proactive and reactive listening, body language and body communication, together with mutuality and visual correspondence can contribute to successful musical performance. Nevertheless, it is still necessary to develop instruments to measure these variables in pianists and discover whether pianists consider that these factors are important for successful performance. Previous studies measured some aspects of these variables. Among them, attention and perception of music were frecuently measured with performance tasks (e.g., Bidelman, Hutka, & Moreno, 2013; Huss, Verney, Fosker, Mead, & Goswami, 2011). Communication, body language and some aspects of sound production and perception were measured by Badino et al. (2014) using data of the musician´s head movements. Nevertheless, these measures were not specifically designed to be applied with chamber music pianists and these measured do not provide information on self-perceived skills, competencies and perceptions. Thus, it was important to develop a new measure that would fill these gaps in knowledge.

Taking as a starting point what is known to date, the first aim of this research is to describe the perceptive musical skills of pianists who perform chamber music. This aim is based on the following hypothesis: musical and perceptive-attentional skills are considered very important by chamber musicians in performance, and therefore highly valued in the educational and training process. The second aim of this research is to discover whether differences exist between genders in these perceptive-attentional skills and in body language, exploring these in auditory skills or in gestural and visual patterns when performing chamber music. Finally, we seek to verify whether these perceptive-attentional, musical and gestural skills are more highly valued among experienced musicians when compared to novices, this would suggest that these competences are considered a relevant part of the educational and training process for chamber musicians.

METHODS

Participants

The questionnaire was completed by 278 pianists, undergraduates who had not yet finished their Higher Level studies, and graduates of piano studies from different autonomous communities both on the Spanish mainland and the islands. The sample of participants enrolled in Higher Level piano studies (*students*), was 200 (71.95 %). Participants who had completed their musical studies (*professionals*), were 78 (28.05 %). In the sample, 125 participants were men and 153 were women aged between 18 and 35 (M = 23.14, DT= 3.73).

Instruments

After filling in a series of personal data, participants completed the following questionnaires designed specifically for this study:

- The scale of *Routines prior to Performance* contains three components: Adjusting the Instrument, with four items (α = .75), centred on whether the instrument is in ideal

conditions of adjustment and tuning, including touch, and silence prior to chamber performance. The component of Acoustics of the Hall and Scenario includes four items (α = .61), related to the hall's acoustics, dress code, greeting and order of the scores. One's own personal habits and tics, with three items (α = .66), include behaviour just before the performance begins. Items were answered on a 5-point Likert scale ranging from 0 (none) and 4 (total).

- The scale of *Awareness of acoustics and sound production* contains two components. Timbre and sound production awareness has 5 items (α = .82) focused on knowledge of timbre characteristics of each of the family of instruments that participate in chamber dialogue, as well as the piano. Spatial listening and to oneself contains 5 items (α = .56). These items were answered using a 5-point Likert scale ranging from 0 (none) and 4 (total).
- The scale of *Proactive and reactive listening* has two components: auditory perception with 8 items (α = .90) which focus on perceptive richness of oneself and of the group and also the parameters to be taken into account in chamber performance such as beat, dynamics, accents, phrasing and balance of patterns. The Tuning Adjustments component is made up of three items (α = .66) that focus on being out of tune oneself and the other instruments. Items were answered on a 5-point Likert scale ranging from 0 (none) and 4 (total).
- The scale of *Body Language and Body Communication* has two components. Gestural communication as a tool is made up of 4 items (α = .82), which reflect the relevance of gestural interaction to promote coordination, complicity and listening sensitiveness. Body Language Routines has 4 items (α = .78). These items were answered using a 5-point Likert scale ranging from 0 (none) and 4 (total).
- The scale of *Mutuality and Visual Correspondence,* with two components. Visual Correspondence Routines with 5 items (α = .74), provides data on the use of eye contact at different levels. Visual Efficiency, with 4 items (α = .80), which describes whether parameters such as rhythm, character, entrances and finales can be concerted through looks, and whether the facial gestures are an efficient transmitter of this information. All these items were answered using a 5-point Likert scale ranging from 0 (none) and 4 (total).

Design and procedure

The first version of the questionnaires designed by the authors of this study to be used for this research underwent revision by 13 experts: professional pianists in areas of education, performance and research. They evaluated each of the items (from 1 to 5) according to the importance of each skill in performing and in training to play chamber music. These experts were also requested to suggest other possible to be included in the instrument. Items with an average total score higher than 4.3 were retained.

Participants were recruited from the Keyboard Departments at all the Conservatories and Music High Schools in Spain through email. The response rate to the request was 53.67%, with 278 valid replies. Collaboration was voluntary, anonymous and confidential, thereby complying

with the requirements of the Declaration of Helsinki[1]. The completed questionnaires were incorporated into a database and analysed with SPPS 20 software. Descriptive and multivariate analyses were carried out.

RESULTS

Routines prior to Performance

The KMO showed a suitable structure for carrying out a factorial analysis (KMO = .75). Exploratory factorial analysis with varimax rotation showed the existence of three factors.

Table 1. *Principal Component Analysis of the Scale of Routines prior to Performance with varimax rotation*

	Adjusting the instrument	Acoustics of the hall and scenario	Tics and personal habits
Check piano touch in chamber ensemble	.89		
Adjustment and tuning of the instrument	.63		
Check piano touch as a soloist	.87		
Prior silence as ensemble	.49		
Hall acoustics as ensemble		.71	
Greeting and dress code		.77	
Organise scores		.42	
Hall acoustics as a soloist		.67	
Tics and personal habits in ensemble			.87
Tics and habits as a soloist			.83
Revision of parametres as a soloist			.47
M (SD)	13.53 (2.59)	10.72 (3.32)	8.43 (2.77)
Alpha	.75	.61	.66

These three components explain 59.130% of the variance. The Cronbach alpha´s values are acceptable for the total scale ($\alpha = .75$) and for its components.

Given that the subscale of Adjustment of Instrument contains 4 items and the replies range from 0 to 16, the results show that pianists consider that they carry out this type of routines *totally*. In the case of the subscale of Acoustics of the hall and scenario, which contains 4 items with replies ranging from 0 to 16, the results show that pianists carry out this type of routines *fairly often*. The subscale of Tics and Prior Habits has 3 items and replies range from 0 to 12, and the results show that pianists use this type of routines *fairly often.*

There are no significant differences between genders of the participants ($t_{(278)} = .75$; $p > .05$). The average on the scale of Prior Routines is higher among professionals (M = 35.08, SD = 5.98) than among students (M=31.85, SD = 6.35) with a significant statistical difference ($t_{(277)} = 3.87$; $p < .01$). On the subscale of Adjustment of instrument the average is higher among professionals (M = 14.36, SD = 1.97) than among students (M = 13.25, SD = 2.71) with a significant statistical difference ($t_{(277)} = 3.3$; $p < .01$). At the same time, on the subscale of Acoustics of Hall and Scenario, the average among professionals is higher (M = 11.92, SD =

[1] Developed by the World Medical Association as a statement of ethical principles for medical research involving human subjects**,** including research on identifiable human material and data. Accessed, November 22, 2016 from http://www.wma.net/es/30publications/10policies/b3/

3.09) than among students (M = 10.30, SD = 3.25) with a significant statistical difference ($t_{(277)} = 3.80$; $p < .01$). Finally, on the subscale Tics and personal no significant differences are found ($p > .05$).

Awareness Acoustics and sound production

The KMO test shows a suitable structure for carrying out a factorial analysis (KMO = .78). Exploratory factorial analysis with varimax rotation shows the existence of two factors.

Table 2. *Principal Component Analysis of the Scale of Awareness of Acoustics and Sound Production with varimax rotation*

	Timbre and sound production awareness	Spatial and self listening
Awareness of timbre and sound production of piano	.64	
Awareness of timbre and sound production of strings	.79	
Awareness of timbre and sound production of woodwind	.85	
Awareness of timbre and sound production of brass	.76	
Awareness of timbre and sound production of the voice	.72	
Scarce auditory perception of group		.77
Scarce auditory perception of oneself		.78
Auditory perception of scarce reverberation of the hall		.65
Auditory perception of rich reverberation of the hall		.67
Awareness of the hall's acoustic conditions for ensemble		.59
M (SD)	12.26 (3.37)	14.19 (2.77)
Alpha	.81	.56

These three components explain 53.50% of the variance ($\alpha = .72$). Given that the subscale of Timbre and sound production awareness contains 5 items and response range from 0 to 20, the result shows that pianists consider that their knowledge of this factor is *fairly high.* In the case of self and spatial listening, which has 5 items, also with a range of replies between 0 and 20, the result shows that pianists perceive this factor at a *fairly high* level.

There are only significant differences according between men and women in the subscale of Spatial and self listening, with a higher average in females (M = 14.60, SD = 2.70) than males (M = 13.70, SD = 2.79), $t_{(278)} = 2.75$; $p < 0.01$. As regards differences according to levels of Training, the score on Awareness of Acoustics and Sound Production was higher among professionals (M = 27.80, SD = 4.85) than students (M=26, SD = 4.75) with a statistically significant difference ($t_{(277)} = 2.80$; $p < .01$). On the subscale Timbre and sound production awareness, the average is higher among professionals (M = 13.33, SD = 3.35) than students (M = 11.88, DT = 3.30) with a statistically significant difference ($t_{(277)} = 3.30$; $p < .01$). Regarding Spatial auditory perception and of oneself, there are no significant differences ($p > .05$).

Proactive and Reactive Listening

The KMO test showed a suitable structure for carrying out a factorial analysis (KMO = .87). Exploratory factor analysis with varimax rotation shows the existence of two factors.

Table 3. *Principal Component Analysis of the Scale of Proactive and Reactive Listening with varimax rotation*

	Auditory perception	Tuning adjustments
Auditory perception of oneself	.60	
Auditory perception of each member of the ensemble	.69	
Auditory perception of ensemble during performance	.68	
Auditory perception of ensemble and beat	.76	
Auditory perception of ensemble and dynamics	.83	
Auditory perception of ensemble and accents	.82	
Auditory perception of ensemble and phrasing	.84	
Auditory perception of ensemble, balance and different planes	.76	
Awareness of tuning adjustment of other instruments		.44
Discomfort with other instruments out of tune		.87
Discomfort if the piano is out of tune		.88
M (SD)	23.34 (4.77)	9.08 (2,22)
Alpha	.90	.66

These two components explain 59.89% of the variance (α = .86). Given that the subscale of Auditory perception contains 8 items, with replies ranging from 0 to 32, the results show that pianists report this skill at a level of *fairly often*. In the case of the subscale Tuning adjustments, which has 3 items and a range of scores from 0 to 12, pianists estimate that they are aware of this factor *fairly often*.

There are no significant differences between males and females. On the proactive and reactive auditory scale the average among professionals is higher (M = 34.55, SD = 5.10) than among students (M=31.66, SD = 6) with statistically significant difference ($t_{(277)} = 3.75$; $p < .01$). Auditory perception is also higher among professionals (M = 25.10, SD = 4.08) than among students (M=22.71, SD = 4.82) with a statistically significant difference ($t_{(277)} = 3.86$; $p < .01$). Finally, on the subscale Tuning adjustments there are no significant differences ($p > .05$).

Body language and gestures

The KMO test showed a suitable structure for carrying out a factorial analysis (KMO = .79). An exploratory factor analysis with varimax rotation shows the existence of three factors.

Table 4. *Principal Component Analysis of the Scale of Body language and Gestures with varimax rotation*

	Body language as a tool.	Body language routines
Importance of gestural pacts	.74	
Body language and complicity	.81	
Body language and rhythmic coordination	.82	
Body language and musical sensitivity	.83	
Musical information through body language		.76
Gesture		.74
Breathing management		.77
Breathing for character and synchrony		.78
M (SD)	12.47 (3,02)	11.02 (3.01)
Alpha	.82	.78

These three components explain 65% of the variance (α = .80). Given that the subscale Body language as an instrument has 4 items and the scores range from 0 to 16, pianists report this factor *fairly often*.

There are significant differences between men and women on the subscale Body Language as a Tool, with females having a higher average (M=12.94, SD=3.03) than males (M=11.91, SD=2.94), ($t_{(278)} = 2.84$; $p < .01$). At Training levels, significant differences appear only in the subscale of Body language routines ($t_{(277)} = 2.30$; $p < .05$), with a higher average in professionals (M = 11.68, SD = 2.58), then students (M=10.76, SD = 3.14). No significant correlation has been observed between age and components that belong to this construct.

Mutuality and visual correspondence

The KMO test showed a suitable structure for carrying out a factor analysis (KMO = .82). Exploratory factor analysis with varimax rotation shows the existence of two factors.

Table 5. *Principal Component Analysis of the Scale of Mutuality and Visual Correspondence with varimax rotation*

	Visual correspondence routines	Visual efficiency
Establishing visual contact	.81	
Visual contact with peers, score, technical control	.79	
Use of peripheral vision	.74	
Looks with dynamic, character and agogic information	.58	
Need to be able to see every member of ensemble	.34	
Visual confirmation for entrances/ finals		.69
Visual confirmation for rhythmic adjustments		.82
Visual confirmation for character adjustments		.78
A look as efficient transmitter of information		.78
M (SD)	14.15 (3.33)	10.15 (3.19)
Alpha	.74	.80

These two components explain 57.583% of the variance (α = .82). Given that the subscale Visual correspondence routines has 5 items and the scores range from 0 to 20, the result shows that the participants consider that they carry out these behaviours *fairly often.* Given that the subscale Visual efficiency has 4 items and the scores range from 0 to 16, the result shows that pianists evaluate the importance of this factor as *fairly high*.

Regarding gender of the participants significant differences exist on the subscale Visual Efficiency, with a higher average for females (M=10.60, SD=3.27) than males (M=9.61, SD=3.03), ($t_{(278)} = 2.54$; $p < 0.05$). Among training levels, there are only significant differences on the subscale Visual correspondence routines ($t_{(277)} = 2.235$; $p < .05$), with a higher average among professionals (M = 14.87, SD = 3.09) than among students (M=13.88, SD = 3.38).

DISCUSSION

This study focuses on musical attention and perception in pianists who perform chamber music. The importance of these skills for the quality of performance was rated by pianists and piano teachers. The first aim of this study was to describe and organise these behavioural patterns in categories and to set out a scale of these behavioural patterns based on the rating gave by musicians in relation to chamber music performance. The results show a wide range of attentional and perceptive skills organised around five constructs: *a) Routines prior to Performance; b) Awareness of acoustics and sound production; c) Proactive and reactive listening; d) Body language and gestures,* and *e) Mutuality and visual correspondence.* These categories show behavioural patterns that chamber musicians consider necessary for efficient communication between members of a chamber ensemble. Having this study previously undergone to analysis by professional and accomplished performers this research fills gaps in knowledge combining information about actions concerned with readying of the instrument, tuning, acoustic awareness, proxemics etc. in ensemble performance, preparatory actions considered very important by the participants. Non-verbal communication at auditory, gestural and visual levels has been the focus of important studies (Davidson, 2002, 2009; Gritten & King, 2011; Vines et al., 2006), and this study seeks to add more information to the topic.

The results show that pianists attach great importance to adjusting the instrument and checking the space in which the sound will be produced, and also to agreement on greeting and dress code for the concert. In this respect, Tseëlon (1995), advises that the role of a performer is emphasised by the visual aspect lent by the way one dresses for a concert. Other researchers such as Barnard (2002) and Davidson (in Rink, 2002) maintain that this offers information on attitude towards the music and its performance.

The third aim of this study was to verify if differences between genders exist in the value given by musicians to attention perception and non-verbal skills. There is a significant difference in auditory, gestural and visual skills with higher scores for females when compared to males. In auditory perception which requires dividing attention between one's own performance and that of others (Keller, 2001; Keller & Appel, 2010; Keller & Burnham, 2005) results reveal that this is more efficient in females than in males. This confirms the results of other studies that indicate more precision in multitasking in females (Criss, 2006), and in speed of auditory reaction (Miles, Miranda & Ullman, 2016). Nevertheless, there is only limited evidence of possible higher capacity in sound location in females (Schroeder, 2010). In gestural communication, the scores are also higher for females when compared to males in the evaluation and use of accompanying gestures to reinforce musical parameters and facilitate interaction. Although some studies found that females give greater importance to dress code when compared to males (Bayton, 1998; Griffiths, 2011), the present study shows no differences between genders in this respect. It should be emphasized that these scores do not show the real skills and are only based on self-perception. Thus, females perceive themselves as more skilful than males in some dimensions but it is possible that the actual skills are the same for both genders. Future studies should be conducted to clarify this.

The second aim of this study was to verify to what extent the degree of experience affects attention, communication and development of interpretation skills. Hence, in spite of a likely lack of features, professional ensemble musicians might interpretate peer´s intentions faster than students (Badino et al., 2014). Prior experience and training are hypothesized to be related to the higher degree of importance that musicians attach to the skills analysed in this study. Indeed, this study shows that acoustic and timbre awareness increases with training which is probably related to the fact that students are trained in discrimination of different sounds from the very first stages of training. In this respect there are various studies (Martin, 1999; Srinivasan, Sullivan & Fujinaga, 2002; Van Dinter & Patterson, 2006) that uphold that it is easier to identify timbre by families of instruments, as asked about in this study, whereas timbre identification of individual instruments is considered to be a more advanced skill in the training programs. Likewise, this study found higher levels of appreciation of auditory perception among professionals than in students for musical parameters such as: beat, dynamics, accents, phrasing and balance, in the sound produced by the ensemble. This analysis shows that the perceived auditory perception, as an advanced cognitive process, improves with training (Strait & Kraus, 2011). As suggested by Claxton (2001), auditory perception involves exposure time and analysis of parameters that may not be evident on the first reading of a score

However, no significant differences appear between professionals and students in instrument tuning, with both groups attaching considerable importance to the fact that their instruments should be correctly tuned. In this respect, Platt & Racine (1985), state that the most rigorous tuning is carried out by more experienced individuals in families of instruments where this is a daily task. These musicians, according to Geringer, MacLeod & Sasanfar (2012), consider instrument tuning as highly important, always checking prior to performance, but this does not affect pianists.

According to Dahl & Friberg (2007), the body makes use of gestures to communicate very precise messages, as a relevant indicator of sensorimotor communication (Badino et al., 2014). The results obtained in this study confirm the use of the body to enhance and coordinate musical parameters, some of which have been studied by Clarke & Davidson (1998), such as maintaining beat and communicating expressive intentions. In our study a significant difference is observed between professionals and students probably showing that training incorporates gestures as a natural element of communication. Future research should confirm whether gestural communication is an important channel for improving synchrony, maintaining beat and regulating tempo as some studies in this field suggested (Clark & Davidson, 1998; Goebl & Palmer, 2009; King, 2006; Keller & Appel, 2010; Trusheim, 1993; Williamon & Davidson, 2002).

Facial expressions are an efficient communication tool in musical performance, especially in emphasising expressive intentions (Keller & Appel, 2010). Different studies confirm that pianists make successful use of visual information, as do singers and percussionists (Schutz, 2008). This is corroborated by the pianists surveyed in this study who seem to understand the benefits of well focused looks during musical performance. There are no significant differences among the groups in visual correspondence routines. Nevertheless, women and professionals score higher on visual efficiency to confirm interpretation parameters, which according to

Schutz (2008) supplements listening and afford a higher level of musical information and therefore it is a complex and sophisticated skill. In different studies (Bishop & Goebl, 2014), visual skills, together with auditory skills, are reported to be more highly integrated into perceptive intention in more experienced musicians.

Visual communication can become a distraction in shared information, as Schutz (2008) suggests, or a way of enriching communication. The results of this study suggest that chamber musicians interact visually to increase auditory perception and communication.

Musical actions have sensory effects, according to Badino et al., (2014) our gestures produce communicative signals that are sent to other individual in order to influence his/her mental state. Ensemble performance, as a multimodal non-verbal way of communication based on: listening, facial expression and gestures, which frequently solve problems when verbal communication fails or is scarce (Conlon & Murningham, 1991; Goodman, 2002). The rating given by the participants surveyed in this study regarding these three perceptive and attentional fields is relatively high. Scores on *Gestural Communication as a Tool* and *Auditory Perception* are higher than scores on *Visual Efficiency*. These results support studies that state that higher awareness is developed in auditory than in visual stimuli (Rammsayer et al., 2012).

In this study, detailed analysis is carried out with respect to musical-perceptive and attentional skills in pianists performing chamber music, no results have been found for scrutinising these categories as a whole, albeit other studies have already been made before about pianists (Clarke & Davidson, 1998; Davidson, 1993, 1994; King, 2006). Our results suggest, as proposed by Cooke (1999), that less experienced students focus their attention mainly on producing the notes, so they can pay less attention to skills required to interact with other musicians. Future studies should also explore emotional and social skills of pianists and their relation to physiological basis, psychological characteristics and musical performance.

AGRADECIMIENTOS

A todos los pianistas y profesores que han colaborado en este estudio y a Patricia Sneesby por su excelente trabajo de traducción

GRATITUDE

To all pianists and piano teachers who have collaborated on this study and to Patricia Sneesby for her excellent work of translation.

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