7th Triennial Conference of European Society for the Cognitive Sciences of Music (ESCOM 2009). European Society for the Cognitive Sciences of Music (ESCOM 2009), Jyväskylä, Finland, 2009.

Image-Schemas in Parental Performance.

Martínez, I. y Español, Silvia.

Image-Schemas in Parental Performance

Isabel Martínez,[*1] Silvia Español[#2]

[*] *Faculty of Fine Arts, University of La Plata, Argentina*

[#] *Faculty of Psychology, University of Buenos Aires, Argentina*

[1] isabelmartinez@saccom.org.ar, [2] silviaes@psi.uba.ar

INTRODUCTION

Embodied Cognition and Image-Schemas

Traditionally, embodied aspects of human experience had been ignored as a source of understanding. However, according to Lakoff (1994) human cognition is the result of the use of imaginative and embodied structures that emerge from our sensory-motor experience and guide the development of conceptualization, reason and inference. Experimental evidence collected in the field of cognitive linguistics (Gibbs, 1994; Johnson and Lakoff, 2002; Kemper, 1989; Gibbs and O'Brien, 1990; Gibbs et al, 1994) informs that those embodied structures are a part of our conceptualization system.

According to the view of embodied knowledge, basic perception is the foundation of our everyday-life basic knowledge, and involves the operation of some cognitive structures called image-schemas (Johnson, 1987; Gibbs Jr. and O'Brien, 1990; Turner, 1993; Gibbs Jr. and Colston, 1995; Kreitzer, 1997; Lakoff and Johnson, 1999). Image-schemas are preconceptual, recurrent structures that emerge in our perceptual system as a consequence of both the experience of our moving bodies and the physical manipulation of objects in the environment. That is to say, image-schemas are based in our direct, kinaesthetic activity. They represent the most basic spatial-temporal relationships, such as up-down, near-far, in-out, etc. Although they derive from motor and perceptual processes it is argued that they are not themselves sensory-motor processes (Johnson, 1987; Lakoff and Johnson, 1999); neither are they passive containers in which experience is kept. Rather, they are resources by means of which we build order in our experience. These basic units of perception are assumed not as single and isolated occurrences of components but as groups of events that unfold dynamically in time. Image-schemas have a small number of elements and relations between them that organize the sequence of events according to a specific logic. For example, the verticality schema (Johnson, 1987) is the abstract structure of those recurrent experiences in which an up-down orientation is involved. The source-path-goal image-schema is the abstract structure of those recurrent experiences in which a lineal trajectory of intended movement begins at starting point or origin and ends at its final destination.

Image-schemas are imaginative and non-propositional in nature. They operate at a level of generality that is half-way between abstract propositional structures and rich and concrete images. Johnson's definition of image-schemas shares certain commonalities with Kant's idea of schemas as structures of imagination that connect concepts with percepts. In words of Reybrouck (2001) "[imaginative projections] hold a position between the epistemological paradigms of realism and nominalism that stress either the sensory 'realia' or the imaginative reconstructions of these realia in the listener's mind" (p. 117). Image-schemas are present in different sensorial modalities, such as visual, aural, tactile and kinesthetic. In summary, image-schemas are recurrent structures that emerge of the organism-environment interaction and reveal themselves in the contours of our sensory-motor experience (Johnson 2008).

Although the use of image-schematic structures in the attribution of meaning within the linguistic domain is well acknowledged, and it has also been studied the presence of image-schematic representations in the attribution of meaning in adult music cognition (Martínez, 2007), almost nothing is known –up to our knowledge- about the way these structures begin to form in development. It is assumed here that long before infants begin to explore by themselves the spatio-temporal relations in the environment, image-schematic stimulation may be found in parental performance.

Intuitive parenting and adult multimodal performances

In developmental psychology, there is consensus that adults have a general and intuitive ability to protect, feed, stimulate and teach, through 'intuitive parenting', the attributes of their own culture to infants (Papoušek, 1996). One of the best known aspects of intuitive parenting is the particular form that adult speech adopts when parents talk to infants: it is called Infant Directed Speech (IDS). In general, the attributes of IDS include high pitch intonation, great variations of pitch and long pauses. IDS has a rhythmic organization that is rather different than normal speech; it contains short, well segmented phrases. Apart from being an excellent resource to regulate both the attentive and emotional state of the infant, IDS seems to facilitate the acquisition of language. It has been observed, for example, that parents adapt their interventions to the capacities of the baby and that they also frame baby's learning of vocalization: during the first 6-7 months since the baby is born, parents offer to the infant models of vocal sounds; they stimulate baby's imitation and adjust their moment-to-moment interventions to the infant's developmental level, in order to accompany the baby's progressive vocalizations, until the first levels of vocal mastery are achieved. At eight weeks since the baby is born, parents include the production of long and euphonic sounds with melodic modulations; at five

months, they further produce consonants and segment the vocal stream in syllables. Only after the baby achieved the canonic and repetitive bubbling, adults' interventions begin to concentrate in the declarative function of vocal symbols and the acquisition of words (Papoušek, H, 1996).

Contrary to the vocal sound qualities, the body movements that adults produce when they talk to the babies have been scarcely investigated so far. Some studies identified correspondences in the mother's vocal and kinetic performance repertoire, in terms of temporal patterns, phrasing and dynamic contours (Stern et al., 1977). It has also been observed that, during exciting stimulation, ascending melodies tend to be accompanied by tactile stimulation composed of touches with the tips of the fingers while moving upwards on the baby's body; on the contrary, during calming stimulation descending melodies tend to be accompanied by open hands sliding on the baby's body (Metchill Papoušek (1996). However, in those instances the role of movement was always understood as the mere accompaniment of vocal sounds, and its study did not achieved a level of prime importance so far.

Recent research in developmental psychology has suggested that adults bring infants not only speech but a multimodal performance. Dissanayake (2000 a y b) considers that adults model their sounds and movements in dynamic, rhythmic and transmodal ways. They bring information to the baby in all the modalities available; that is to say, they perform in visual, tactile and aural modes, offering babies a complex multimedia performance that can be considered an antecedent of the temporal arts (music and dance). In this performative way, sound and movement are frequently integrated and elaborated in the repetition-variation form.

It is probable that adult-infant interaction facilitates infant's acquisition of other abilities, besides that of the acquisition of language above mentioned. It is also possible to think that movement analysis brings new research avenues in the study of intuitive parenting. On the first place, it encourages the attention to the nature of movement reception by infants.

Infant's participant perception

According to Bråten (2007) infants develop an early ability to experience other's actions, called altercentric perception, which is revealed through an observable participant perception. The origin and manifestation of participant perception can be observed when the infant is involved in interaction with others' acts and utterances. Braten finds evidence of the intersubjective capacity of resonating between each other; he also states that this capacity is activated through development during the first months of the infant's life (Bråten, 1998, 2002; Stern 2000, 2004). Manifestations of this capacity have been observed in different instances, such as (i) the infant's learning by imitation in face-to-face situations, (ii) the sustained and reciprocal taking care between babies and adults, and (iii) during the completing course of an unfinished action that the other is perfoming. Whether an intersubjective capacity to participant perception occurs in pre-enaction, co-enaction or re-enaction (such as in imitation learning) it implies that the perceptor resonates with what the other is doing. Participant perception is implied by the infant's primary intersubjective capacity (defined by Trevarthen, 1998); this capacity is, in turn, considered by Stern in relation to the new evidence provided by the findings of neuroscience, relative to the function of adaptive oscillators and mirror neurons (2002/2003). The observation of participant perception in adult-adult, infant-infant or adult-infant interactions shows that there are anticipatory or concurrent couplings of one member of the dyad with the other's behaviour.

The analysis of multimodal performance

As stated above, movement analysis in adult-infant interaction remained generally focused on the features it shared with sound (rhythm, duration, intensity) and not in their intrinsic qualities. Nevertheless, some studies (Español, 2008) aimed at analysing the specific qualities of movement using the categories of dance analysis, in particular The Laban-Bartenieff's Movement Analysis System. This system describes dance movements by using five categories (i) Body: body parts used in the observed movement; (ii) Space: concerns the relation of the body with the surrounding space. The kinesphere is the space limited by the points reached by the limbs without changing the body position. Three 'attitudes' of the body are possible in this space: vertical (up-down), horizontal (right-left) and sagittal (front-back). (iii) Form: understood in terms of the basic the basic opening/closing opposition of breathing on vertical, horizontal and sagittal planes; in that way, three forms are obtained: rising-descending, spreading-enclosing and advancing-retiring; (iv) Effort: indicates the movement quality according to the attitude of dedication or fighting against space (direct vs. flexible), time (sudden vs. sustained) and weight (strong vs. light). While combining these factos eight basic types of Effort are obtained: (1) pressing (direct – sustained - strong), (2) flicking (flexible – sudden - light), (3) wringing (flexible – sustained - strong), (4) dabbing (direct – sudden - light), (5) slashing (flexible – sudden - strong), (6) gliding (direct – sustained - light), (7) punching (direct – sudden - strong), (8) floating (flexible – sustained - light); and finally (v) Flow: every movement may be free (it is difficult to stop it) or bound (it is easy to stop it). The five categories are usually summarized using the expression "Shape and Effort", involving Shape for the first three categories and Effort for the other two (Laban, 1971; Newlove, 2007).

Concerning the analysis of sound, on the other hand, there is a long tradition in the use of categories of music analysis applied to the study of IDS (Papoušek, M. 1996; Malloch, 1999/2000). Usually they include the spectral analysis of the voice, in terms of the melodic contour and the extraction of the fundamental frequency of pitch, the analysis of rhythm, timbre, and the use of dynamic descriptions (crescendo, diminuendo, rallentando, acelerando, stacatto, legato, dolce o agitato) and finally the use of musical notation in the transcription of some of the features of IDS.

In the present study, movement analysis, in terms of the Laban Bertenieff's System, is accomplished by means of video annotation tools that allow the categorical study of the quality of movement along a timeline. In order to perform the

annotation, the researcher uses categorical labels chosen from a set previously arranged for analysis. The moment-to-moment analysis of video signal and sound signal is performed using different tools. They generate on-line analyses of acoustical data and provide numerical outputs of the dynamic profiles of movement deployment. The on-line interpretation of the fundamental frequency in terms of standard musical notation is also possible.

AIMS

This paper explores for the first time (i) the presence of image-schemas in adult-infant stimulation, (ii) its performative nature, and (iii) its correlative infant's participant perception.

In order to do this the following steps will be accomplished:

-To identify image-schemas in adult's behavior while interacting with the infant

-To analyze image-schemas as a multimodal performance

-To identify indicators of infant's participant perception during image-schematic performance.

METHOD

A global analysis of adult-infant interaction was run, in order to identify the presence of image-schemas in adult stimulation. The material analysed belonged to a longitudinal observational study of adult-infant (six- to-seven months old) natural interaction. Several image-schemas were identified, among them, verticality, balance, force, and source-path-goal. The last one was selected in order to analyse its performative nature.

One scene of adult-infant (6.5 months old) interaction (33 sec duration), that belonged to the longitudinal study, and contained the image-schema source-path-goal (SPG) was chosen. In the scene, the adult performed the image-schema while she was playing with the baby. The description of the scene is as follows:

"The adult is sit in front of the infant, who is playing by itself on the floor. She calls for his attention both tapping on his leg twice and calling him by his name: Habib. Once eye-contact with Habib is established, the adult raises a pillow up to the ceiling with her arms. Waving the pillow to both sides of her body with her arms strengthen over her head, she sings the following phrase:"Up here Habib!" making the baby raise his head up, and focus on the pillow. Immediately after, she begins to move the pillow down towards the baby, stating the following repeated syllable in descendent pitch contour: "dadadadadada". Habib rises his arms excitedly, expecting the pillow to approach him and the adult finishes with: "and it comes towards Habib!" when the pillow finally approaches the baby down on the floor. The play is repeated once more, with small variations. On the third time, only the final part is performed, the one in which the pillow "embraces" the infant all around"

The following analyses of the selected scene were performed:

(i) Microanalysis of movement video signal and sound signal was run using Diglo 1.15 (Azzigotti, 2009). This software allows both the on-line tracking of changes in the movement and the on-line voice analysis. As long as the tracking process is run, a timeline is displayed with the dynamic profile of the tracking points, and with the unfolding of the acoustic analysis of the sound signal (the frequency spectrum and on-line interpretation of the fundamental frequency in terms of standard musical notation) all together. Once the analysis is run, numerical data of the moment-to-moment x-y location of the movement of the tracking points is obtained. Four tracking points of the adult-infant interaction were used for analysis. Two of them corresponded to the adult's body members (right and left hand). The other two points corresponded to the same body members of the baby.

(ii) An image-schematic analysis of the adult's performance was realized. Image-schematic features were analyzed according to the categories of Lakoff & Johnson's theory. Source, Path and Goal were established using Diglo 1.15.

(iii) Microanalysis of the quality of movement, in terms of Laban-Berteneieff categories, was run using Anvil 4.0. This video annotation software was developped by Michael Kipp (2004) and was previously employed in the Laban-Berteneieff analysis of movement in music performance (Campbell, Chagnon & Wanderley, 2005) and also in the analysis of adult-infant performance (Español, 2007 and 2008). The program allows (i) independent annotation of the categories on a temporal line that exhibits synchrony with the video image, and (ii) manipulation of the video speed. The five categories of Laban-Bartenieff's System Analysis were used (see above) and the annotation was performed using the annotation bar with temporal marks (seconds and cents of seconds) that the program shows.

(iv) Micronalysis of infant's participant perception was run using Diglo 1.15.

RESULTS

Movement analysis

Microanalysis of movement in adult performance

Adult-infant interaction was analysed on the first place using Diglo 1.15. Four tracking points were selected for analysis. In this paragraph only the results of the analysis of adult movement are presented. The timeline displaying the movement profile is shown in Figure1. In Channels 1 and 2, the movements of adult's hands can be followed. Ascendant and descendant movements are clearly established by the valleys and hills in the profile. They help to identify the boundaries of the fragments that correspond to Source and Goal in the performance of the image-schema. It is also clear to the observation that both Source and Goal allocations are sustained over time (see forms of valleys and hills). Ascendant and descendant Path is also noticeable (see slopes in Figure 1). As long as the form evolves in time, in the

second presentation of the image-schema, Source and Goal allocations tend to be longer. In the end, Goal is the longest. Further analysis of numerical data allowed the exact measurement of temporal allocations of the different parts of the image-schematic composition.

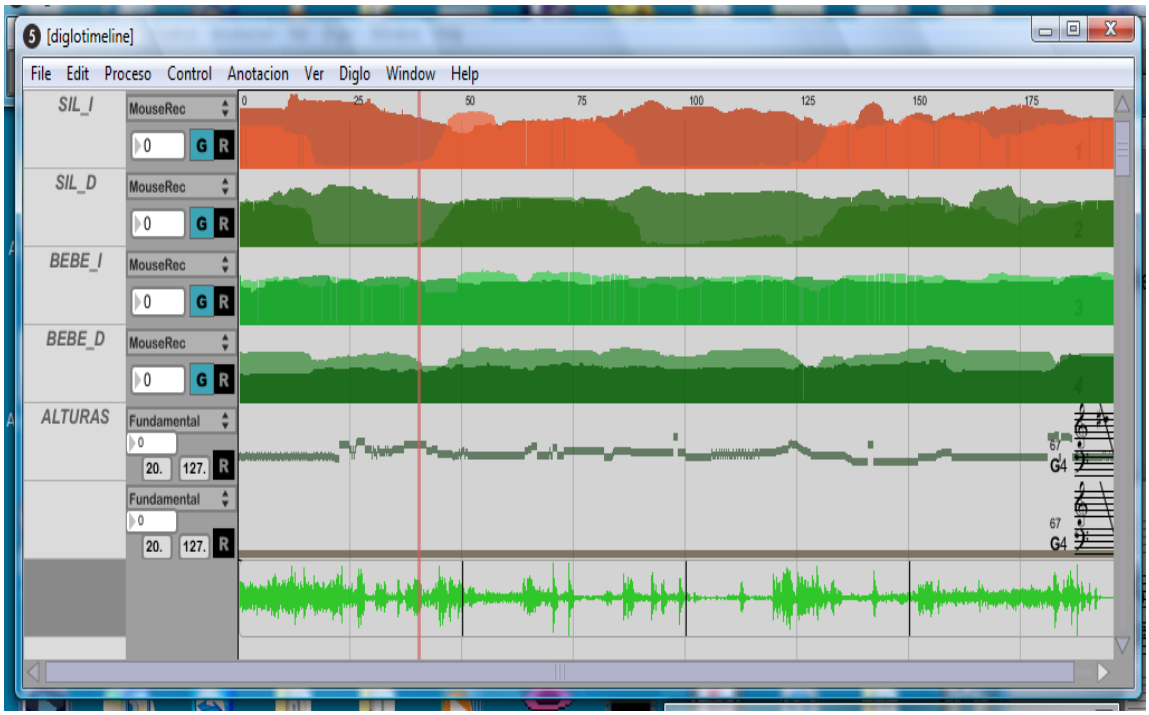

Figure 1. Timeline with data visualization, as captured by Diglo 15.1. Channels 1 and 2 display the movement profiles of left and right hands of the adult performance. Channels 3 and 4 display the movement profiles of left and right hands of the baby. Channels 5 and 6 display the melodic analysis of the voice. The frequency extraction appears in music notation at right side.

Analysis of SPG composition in adult performance

The microanalysis realized allowed the precise allocation of each of the components of the image-schematic structure unfolded by the adult. Thereafter, image-schematic features were analyzed according to the categories of Lakoff & Johnson's theory.

SPG image-schema is composed and acted to the baby on a cycle of presentation-varied repetition phrases in which the complete constituents sequence Introduction /Source/ Path/Goal is presented twice and in the end only the Path and Goal are performed.

The dynamic temporal unfolding of this image-schematic form shows that, as long as the composition evolves, more time is employed by the performer to remain in two of the structural elements of the image-schema: Source and Goal. Path has the purpose of arousing baby's participant perception and preparation to 'receive' the desired Object (the pillow) at Goal position.

A partial view of the structural analysis of SPG image-schematic parental performance is shown in Table 1.

Table 1. Image-schematic analysis of the first presentation of SPG using the categories of Lakoff & Johnson (1999). From top to bottom the temporal form SPG adopts in adult performance is presented. From left to right some of the attributes of the image-schema and the duration of the different components are listed.

Two adult's actions overlap in time during performance: while Goal is taking place and the baby is enjoying maximum pleasure with the pillow embracing him, adult's preparation and subsequent calling for baby's attention to the next SPG presentation takes place. In this way, remaining at Goal in the current performance gives place to the unnoticed baby's introduction to the next image-schematic presentation. This feature accounts for the continuity of adult-infant interaction.

Laban-Bartenieff's System Analysis of the adult´s performance

Adult's performance was analysed according to the 5 categories of Laban-Bartenieff's System Analysis with the aid of the software Anvil 4.0. In the video annotation table (see Fig. 2) it can be observed the adult's movement organization in units of (i) introduction, (ii) motive and (iii) two varied repetitions of the motive (for a description of the idea of development of phrases by motives see Español y Shifres, in this Simposium). The motive and its varied repetitions, match the performance of the image-schema SPG according to the analysis above described.

Schematic Structure	Spatial Elements	Time
Introduction 1		
Initial State	Location A (Near-Bottom)	
Final (desired) State	Location B (Far-Top)	
Action Sequence:		
(i)Remaining on Bottom	Location A	
(ii)Motion along an ascending Path (from Bottom to Top)	Movement from A to B	
Source-Path-Goal 1		
Initial State	Location A (Far-Top)	
Final (desired) State	Location B (Near-Bottom)	
Action Sequence:		
(i)Source: Remaining on Top	Location A	
(ii)Path: motion along a descending path(from Top to Bottom)	Movement from A to B	
(iii)Goal: Remaining on Bottom	Location B	

On what follows a description of the organization of movement according to the structure (i) introduction (ii)mage-schema presentation (or motive unit), (iii) first varied repetition of the image-schema (iii´) second varied repetition of the image-schema is presented.

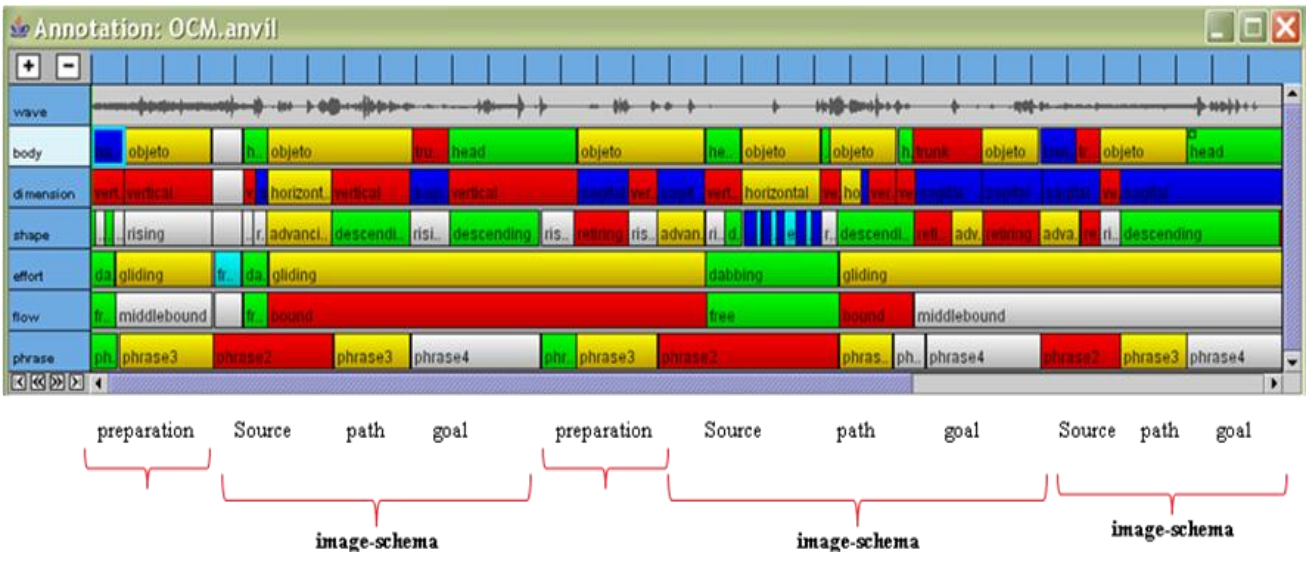

Figure 2. General view of the video annotation scene of adult-infant interaction. On the left column from top to bottom the five categories of Laban Analysis are displayed. Changes in quality of movement are highlighted with different colours. The structural components of the image-schema SPG are shown in brackets on the bottom.

(i) *Introduction* (3s.) (ia) (1s.)Two hands movements (row 1, blue) with effort (row 4) dabbing (green) and shape (row 3) rising-descending (green-gray) to call baby's attention. (ib) (2.) A rising movement (row 4, gray) and gliding effort (row 4, yellow) with the object (row 1, yelow) in the vertical plane (row 2, red) to arrive at the starting point of the image-schema. The last row indicates the two parts (phrases) (ia) y (ib) (phrase green and yellow)

(ii) *Motive: Structure of the source-path-goal image-schema* (12s.) (iia) Source (5 s.): (1s.) a frozen instant (once at origin allocation) and remark of the beginning of origin with dubbing and rising movement of head. Then (4s) movement of the object in the horizontal plane with advancing and gliding movement; (iib) Path (2s.): descendant an gliding movement in vertical plane with the object; (iic) Goal (4s.) brief rising trunk and descending head (and trunk) with a gliding movement in vertical plane.

(i) *Introduction* (3s.) (ia) rising head and establishment of ocular contact with the infant; (ib) rising and gliding movement with the object in the vertical plane to arrive at the starting point of the image-schema.

(iii) *First Repetition-variation* of the source-path-goal image-schema (11s.) (iiia) Source (5 s.): (1s) advancing and gliding movement in sagital plane with object; (1.s) rising-descending movement with head in vertical plane with dubbing effort; (3 s.) spreading-enclosing movements in the horizontal plane with objet with dabbing effort, and a brief head-object rising in the vertical plane; (iiib) Path (2s.): descending an gliding movement predominantly in vertical plane with de object; (iiic) Goal (4s.) descending head in vertical plane, retiring advancing trunk movement in sagital plane and retiring movement with object, all with gliding effort descending head (and trunk) with a gliding movement in vertical plane.

(iii´) *Second Repetition-variation of the source-path-goal image-schema* (7.s) (iiia) Source (2s.): advancing retiring movement with hands and trunk and brief rising object with gliding effort in sagital plane; (iiib) Path (1,30s.): descending an gliding movement in sagital plane with de object; (iiic) Goal (3,30s.) descending head in sagital plane with gliding effort (3s.), and retiring .

As observation shows, both the first performance of the image-schema and the first varied repetition are preceded by an introduction in which the aim is establishing ocular contact with the infant. The schema is presented with all the components and the three constituents (Source-Path-Goal) are easily expressed through the categories of Laban-Bartenieff's Movement Analysis System. During the first SPG performance Source is framed by two resources: the frozen movement and the rising of the head with dubbing effort. The rest of the schema is presented on a simple way, without any embellishments. In the second performance Source is no more framed but elaborated (embellished) moving the head with rising, descending and dubbing movements and moving the object in the horizontal plane (always on the top) with spreading-enclosing movements with dubbing effort. During the first performance (ii) and the first varied repetition (iii) the Path is realized mainly in the vertical plane, but in the second varied repetition it is realized in the sagital plane because origin is closer, given that it is no more on the top but on the bottom, near the Goal (and its duration is shorter). The Goal is always on the bottom. Both adult and infant heads are almost touching each other in that allocation.

During the first performance of the schema (ii) the infant puts immediately his head over the pillow and the adult approaches her head to his at the middle of the unit; during the first varied repetition (iii) adult and infant arrive almost at the same time to the pillow (1 s.) and the adult retires quickly from goal; on the contrary the infant stays with the head on the pillow during 3 sec. Remaining at goal is the result of the infant desire. Due to this action, it is probable that in the second varied repetition (iii´) there is no preparation and the adult allocates the origin near the goal; and the goal that always meant closeness and contact head-to-head, is produced at the moment of highest physical contact of the scene: the adult approaches her head accompanied by the movement of the trunk descending towards the allocation of the infant's head. Then she retires looking at the infant that remains with his head in the pillow.

Voice analysis

Analysis of expressive features of adult´s IDS

The analysis of the voice was performed using Diglo 1.15 and is also shown in Figure 1. The melodic contour of the voice is displayed by Channel 5 (see Figure 1). Overall observation of the vocal signal shows that peaks of frequency
are allocated at Source and Goal regions of the form, and that vocal 'glissandos' are situated in Path regions of the image-schematic performance.

What follows is a synthesis of the main findings of the voice analysis. An original finding of vocal analysis is the melodic motive the adult sings at Source-on-the-Top position, in order to encourage the infant to pay attention to that allocation. While remaining at that position, she performs an invented rhythmic cantilena using two pitches in an interval of major third (F#4-D4).

Further interesting findings – as supported by the on-line interpretation of the fundamental frequency- are the following: (i) during the first presentation of SPG schematic form, the adult accompanies the descending movement of the pillow at Path region (from top to bottom) with a descending singing/verbal phrase that is distributed in a vocal range of about one octave (D#4-D3); (ii) during preparation of the second SPG a repeated syllable "tutututu" is uttered in ascending melodic contour while she glides up the pillow. The vocal range is again about one octave (G#3-G4); (iii) descending Path from-Top-to- Bottom with the pillow in varied repetition form are accompanied by a verbal phrase in a range of a descendant double octave (E4-E2); (iv)in the end of Goal 2, the adult finishes singing a short song with the lyrics "and it comes to Habib"; it is the same verbal phrase used in a previous performance, but it is now tuned in a minor mode tonal context (A3-C3-D3-E3) and in ascendant contour in a range of a fifth.

Semantic content analysis of IDS and its relationships with SPG image-schema

The semantic content of adult's IDS is closely attached to the image-schematic content of SPG in the observed adult's performance. Semantic content accounts for a consistent description of Source and Path as spatial allocations all along the first image-schematic presentation, and also all through the varied repetition of that form. The adult utters "Up here, Habib, up here! in different ways, while she is holding and waving the pillow at the Source-on-the-Top-allocation. Thereafter, during the lapse in which Path is taking place, she pronounces "and it comes down to Habib", while she glides down the pillow with the purpose of approaching the baby. At Goal allocation, she asks the baby: "Do you want it again?" overlapping the preparation of the next image-schematic phrase to the end of the current one. The second time she pronounces the phrase to Habib it is composed in the context of a short song (see above). The last allocution occurs at Goal 3, where the varied repetition of the image-schema is accompanied by a pleasant vocal sound and smooth laughs.

Multimodal analysis

Multimodal redundancy between (i) the image-schematic components of the performance, (ii) the semantic content of IDS and (iii) the expressive features of IDS was considered for analysis. It is evident to observation that each of the constituents of the image-schematic performance is reinforced by multimodal redundancy. The synthesis of this analysis appears in Table 2.

Image-schematic Form	Semantic Content of IDS	Expressive Features of IDS	Quality of Movement	Time
Introduction 1(preparation)				
(i)Remaining on Bottom	*"Habib mirá"*			
(ii)Motion along an ascendant Path (from Bottom to Top)	*"Mirá mirá"*	Ascendant vocal contour	Rising / Gliding/ Vertical	
Source-Path-Goal 1				
(i)Source: Remaining on Top	*"A ver dónde está. Aquí arriba está Habib"*	Singing of rhythmic-melodic motive in major third cantilena at peak of high frequency	Frozen/ Rising head with dubbing effort Advancing/ Gliding	
(ii)Path: motion along a descending path(from Top to Bottom)	*"Y viene para Habibi"*	Descending melodic contour in the range of an octave	Descending/ Gliding Vertical	
(iii)Goal: Remaining on Bottom	"*¿Otra vez? ¿Sí? Je"*	High pitch intonation when calling attention	Head Descending /Gliding	
Introduction 2 (preparation)				
(i)Remaining at Bottom				
(ii)Motion along an ascending Path (from Bottom to Top)	*"Va , eh, Tu tu tu tu"*	Ascendant vocal contour	Rising-retiring-rising Sagital- Vertical/Gliding	
Source-Path-Goal 2				
(i)Source: Remaining on Top	*"Aquí está" "A" (Habib) "Aquí arriba aquí arriba.* *"Aquí está esto"*	High pitch intonation. Changes in vocal timbre and sound articulation	Head- Rising- Descendant Dubbing movement and object movement in horizontal plane (always on top) spreading-enclosing movements with dabbing effort	
(ii)Path: motion along a descending path(from Top to Bottom)	*"Aquí viene" viene*	Descendent contour	Descendiing/Gliding Vertical	
(iii)Goal: Remaining on Bottom	"*viene"*	Descendent contour	Retiring/ Advancing/ Sagital Glising/ Trunk-Object	
	"viene para Habib"	Short song in minor mode	Descending/ Gliding/ Sagital	
Goal 3				
(i)Remaining at Bottom	"U" (tal vez de Habib) "*uhjejeje"*	High pitch contour	Head Descending Gliding	

Table 2. Analysis of Multimodal redundancy between (i) the image-schematic components of the performance, (ii) the semantic content of IDS and (iii) the expressive features of ID.

Infant's Participant Perception Analysis

The analysis of infant's participant perception was run using Diglo 1.15 (see Method for a further explanation of the analytical procedure). The results of the whole tracking process are displayed in Channels 3 and 4 in Figure 1. Informal observation of the infant's head was also performed. Overall analysis shows that, in every presentation of SPG image-schema, baby's attention is at the beginning focused at the Source allocation. At that moment, the baby raises his head and eye contact with the adult is well established. Thereafter, a process of expectation arises, and increases until the pillow reaches the Goal, that is to say, until he receives from the adult the desired object. Therefore, it is during Path that participant perception is most evident. As long as the object approaches him, the infant, raising his arms, waves his hands until the pillow reaches the ground and embraces him. This sequence is replicated in the first varied repetition of the image-schema. This time Goal allocation lasts a longer lapse and in the end it is the final Goal what represents the climax in the participant perception of the baby.

CONCLUSION

Our analyses show that the Source-Path-Goal image-schema is enclosed in the repetition-variation structure of adult-infant interaction in parental performance. It is usual that sound and movement, the components of adult-infant interaction are elaborated or molded multimodally. Thus, repetition variation, together with the set of multimodal stimulation (visual, tactile, aural, verbal) are prototypical of Infant Directed Speech. This time, however, sound and movement are further plotted in the image-schematic display, which, in turn, is better communicated to the infant thanks to multimodal redundancy. Image-schematic constituents are highlighted by the temporal attunement of adult's embodied actions, and their performance is endorsed with perceptual/cognitive salience. Analysis of the infant's altercentric participation highlights the infant's sensitivity to the quality of multimodal redundancy.

It is assumed, on the other hand, that through altercentric perception, seeing someone move may be similar, to a certain extent, to moving oneself. Given this assumption it is reasonable to think that when the baby is involved in a kind of interaction such as that of the scene observed, he perceives by himself the constituent movements of those preconceptual, sensorimotor units (the image-schemas) long before he is able to perform them himself. Overall, he perceives the constituent movement of the schema components in an organized way. This structural organization is framed by temporal lapses that are similar or slightly varied. As a consequence, the perceived movement is experienced, not as chaotic, but as organized and intended movement. In this way, adult parental performance would be framing the acquisition of those sensorimotor units that are the foundation of future conceptual notions in which spatial and temporal relations are involved. The multimodal analysis also reveals the features of musical enculturation that the adult communicates to the infant. Through her image-schematic performance, she teaches some pitch-spatial correlations (high is up; low is down) to the infant. She reinforces this feature introducing the baby to spoken language: at Source position she enhances the relationship *high is up* matching the pronunciation of the word *up* with a high pitch intonation contour and simultaneously waving the pillow with her arms upwards. Besides, she traverses the Path from top to bottom accompanying the spatial journey with verbal and sonic statements in a range of an octave.

In synthesis, soon before the child develops independence to experience the spatial temporal relations in the environment, parental performance brings to his perceptual and emotional domains of experience the image-schemas, a source of basic knowledge that he will developed and will use in the future to build knowledge in the conceptual domain.

Finally, it is worth underlying that observational data encourage some future avenues of investigation. They open our inquiry around the following questions: (i) whether artistic elaboration of parental performance, that is to say, the embellishment and refining of sound and movement of adult performance endorses with perceptual cognitive salience a different type of significant units (ii) whether altercentric perception of adult's movements that frame the sensorimotor schemas does or does not have an effect on infant movements themselves, thus operating as an organizational psychological source for future infant's movement development.

REFERENCES

Azzigotti, L. (2009). Diglo 1.15. www.zztt.org

Bråten, S. (Ed.) (2007). *On Being Moved. From Mirror Neurons to Empathy*. Amsterdam/Philadelphia: John Benjamin Publishing Company.

Campbell, L., Chagnon, M.-J & Wanderley, M. M. (2005). On the use of Laban-Bartenieff techniques to describe ancillary gestures of clarinetists. *Research Report. Input Devices and Music Interaction Laboratory* (PDF document) Copyright: McGill University.

Dissanayake, E. (2000a). Antecedents of the temporal arts in early mother-infant interaction. En N. L. Wallin, B. Merker y S. Brown (Eds.). *The Origins of Music.* Cambridge, MA: The MIT Press.

Dissanayake, E. (2000b). *Art and Intimacy: How the Arts Began*. Seattle: University of Washington Press.

Español, S. (2007). La elaboración del movimiento entre el bebé y el adulto. En M. de la P. Jacquier y A. Pereira Ghiena (eds.) *Música y Bienestar Humano*. Actas de la VI Reunión de SACCoM. Buenos Aires: SACCoM, 3-13.

Español, S. (2008). La entrada al mundo a través de las artes temporales. *Estudios de Psicología*, 29 (1), 81-101.

Gibbs Jr., and O'Brien, J. (1990). Idioms and mental imagery: the metaphorical motivation for idiomatic meaning. Cognition, 36, 35-68.

Gibbs Jr., R, Beitel, D. A., Harrington, M. and Sanders, P. (1994). Taking a stand on the meanings of stand: bodily experience as motivation for polysemy. Journal of Semantics, 11, 231-251.

Gibbs Jr., R. (1994). The Poetics of Mind. Cambridge: Cambridge University Press.

Gibbs Jr., R. and Colston, H. (1995). The cognitive psychological reality of image-schemas and their transformations. Cognitive Linguistics, 6(4), 347-378.

Johnson, M. (1987). The Body in the Mind: the Bodily Bases of Meaning, Imagination and Reason. Chicago: University of Chicago Press.

Johnson, M. (2008). The Meaning of the Body: Aesthetics of Human Understanding. Chicago: University of Chicago Press.

Johnson, M. and Lakoff, G. (2002). Why cognitive linguistics requires embodied realism. Cognitive Linguistics, 13(3).

Kemper, S. (1989). Priming the comprehension of metaphors. Metaphor and Symbolic Activity, 4(1), 1-17.

Kipp, M. (2004). Anvil – a video annotation research tool http://www.dfki.de/~kipp/anvil.

Kreitzer, A. (1997). Multiple levels of schematization: a study in the conceptualization of space. Cognitive Linguistics, 8(4), 291-325.

Laban, R. (1971). *The mastery of movement*.. Boston: Plays

Lakoff, G. (1994). What is a conceptual system?, in W. Overton and D. Palermo (eds.), The Nature and Ontogenesis of Meaning. NJ: Laurence Erlbaum Ass. Chapter 3.

Lakoff, G. and Johnson, M. (1999). Philosophy in the Flesh. New York: Basic Books.

Malloch, S. (1999/2000). Mothers and infants and communicative musicality. *Musicæ Scientiæ, Special Issue*, 29-57.

Martínez, I. C. (2007). The Cognitive Reality of Prolongational Structures in Tonal Music. Unpublished doctoral thesis. Roehampton University. UK.

Newlove, J. (2007). *Laban for Actor and Dancers. Putting Laban´s Movement Theory into Practice: A Step-by-Step Guide.* New York: Routledge. Primera edición 1993.

Papoušek, H. (1996). Musicality in infancy research: biological and cultural origins of early musicality. En: I. Deliege y J. Sloboda. (Eds). *Musical Beginnings. Origins and Development of Musical Competence*. Oxford : Oxford University Press, 37- 55.

Papoušek, M. (1996). Intuitive parenting: a hidden source of musical stimulation in infancy. En I. Deliège y J. Sloboda (Eds.). *Musical Beginnings. Origins and Development of Musical Competence.* Oxford: Oxford University Press, 88-112.

Reybrouck, M. (2001). Musical imagery between sensory processing and ideomotor simulation, in R.I. Godoy and H. Jørgensen (eds.), Musical Imagery. The Netherlands: Swets & Zeitlinger. pp. 117-135.

Stern, D.N., Beebe, B., Jaffe, J. y Bennet, S.L. (1977). The Infant´s Stimulus World During *Social Interaction: A Study of Caregiver Behaviours with Particular Reference to Repetition and Timing. En H.R. Schaffer (Ed) Studies in mother-infant interaction*. Londres: Academic Press, 177-202

Trevarthen, C. (1998). The concept and foundations of infant intersubjectivity. En S. Bråten (Ed.), *Intersubjective Communication and Emotion in Early Ontogeny*. Cambridge: Cambridge University Press, 15-46.

Turner, M. (1993). An image-schematic constraint on metaphor, in R. Geiger and B. Rudzka-Ostyn (eds.), Conceptualizations and Mental processing in Language. Berlin: Mouton de Gruyter.