

Effectiveness of maternal teaching procedures in promoting cognitive achievements during mother-child interactions

Efectividad de los procedimientos de enseñanza de la madre en la promoción de logros cognoscitivos durante las interacciones madre-hijo

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Abstract

During development, in her regular interaction with the child, the mother uses some techniques or procedures (i.e. instigating, asking questions, modeling behaviors) to guide, monitor, shape and/or provide feedback to the child's behavior. Those teaching behaviors may take place in the context of normal interactions like playing or caring routines, facilitating the acquisition of different types of skills in the child. The present study analyzes the effectivity of the activities of the mother in the acquisition of new cognitive achievements in the child between 29 and 54-mo.old. It discusses the trajectory of the child achievements and the dynamics of the mother-child interaction.

Keywords: Psychological development, mother-child interactions, teaching strategies, cognitive achievements.

Resumen

El desarrollo psicológico ocurre principalmente durante las interacciones madre-hijo. En la interacción regular entre madre e hijo, la madre utiliza distintos tipos de procedimientos (e. g. instigar, preguntar, modelar conductas) para guiar, monitorear, moldear y retroalimentar la actividad del niño. Estas conductas facilitan la adquisición de diferentes tipos de habilidades por parte del niño. En el presente estudio se analiza la efectividad de las actividades de enseñanza de la madre en la manera en la que el niño alcanza distintos logros cognoscitivos entre los 29 y los 54 meses de edad. Se analiza la trayectoria de los logros alcanzados por los niños, así como la dinámica interactiva que se establece entre la conducta del niño y de la madre. Se discute el papel de la madre en la promoción de logros específicos en distintos momentos del desarrollo temprano.

Palabras clave: desarrollo psicológico, interacciones madre-hijo, estrategias de enseñanza, logros cognoscitivos.

Introduction

Linguistic behavior has been considered a dimension of child development separated from other dimensions like perception, cognition or socialization. Nevertheless, some theoretical perspectives acknowledge different kinds of relationships between language and cognition or thinking, even though the nature of those relationships had not been fully established or demonstrated. Some authors, for example, have concluded that language is a secondary element in the development of cognition (Piaget, 1926). Others have mentioned that it constitutes a basic and necessary condition for thinking and knowledge transmission (Gorski, 1996; Spirkin, 1996). There are still other authors who stated that the evolution of language and thinking, is not uniform, but follow curves crossing, separating and joining each other in different moments of development (Rieber & Carton, 1987). In a general way, there is a tendency to recognize that language is cognition in itself or that is intermingled with cognitive processes (Brooks & Kempe, 2014)

From a psychological point of view, language and cognition refer to general types of activity related to different types of actions taking place in several contexts. Linguistic behavior entails verbal and non-verbal forms of behavior. Individual activities take place in an environment constructed by language, and linguistic context provides meaning to behavior. Language always involves actions and becomes functional because of its relationship with simple and complex patterns of action. Words, movements and reactions to situations never take place in separate ways. A psychological analysis of language should consider words and utterances as part of an episode; language functions are dependent upon the context of the actions taking place (Ribes-Iñesta, 1986; Ribes, Cortés, & Romero, 1992).

Language acquisition has to do with the ways in which language is progressively articulated into behavioral development. Language is acquired through the contact of the infant with other more developed members of the group. Actually, many authors have studied language development taking the child as a learner and the mother as a transmitter or teacher of the linguistic behaviors socially accepted (e.g. Alcaraz & Martínez-Casas, 2000; Andrews, Blumenthal, Johnson, Kahn, Ferguson, Lasater, Malone, & Wallace, 1982; Bijou, 1990; Bornstein & Bruner, 1989; Fogel, 1977; Miller, 1981; Moerk, 1983b, 1990; Pancsofar & Vernon-Feagans, 2006; Rondal, 1981; Schaffer, 1984; Snow, 1977, 1979, 1989; Tomasello & Todd, 1983).

Many authors have emphasized the importance of several aspects of mother-infant interactions in language development, namely, the nurturing practices (Rogoff, 1993; Beebe, Jaff, Markese, Buck, Chen, Cohen, Bahrick, Andrews, & Feldstein, 2010); the reciprocal influence of mother and child during interactions (Rondal, 1990; Hilbrink, Gattis & Levinson 2015); the similarities between the language the child learns and the language used by the adult (Bornstein & Bruner, 1989); the changes in mother-child interactions

across time (Hart & Risley, 1999); the ways mother's behavior affects the child's development (Snow, 1989); the extent to which child-caregiver dyads engage in interactions involving episodes of joint or coordinated attention (Markus, Mundy, Morales, Delgado, & Yale, 2000; Tomasello, M. 2008; 2019; Tomasello & Farrar, 1986; Tomasello & Todd, 1983); and the adaptations of mother's linguistic behavior to child's capacities (Phillips, 1973; Rondal, 1990).

All these studies recognize that linguistic development is largely dependent on the mother's behavior. Usually, verbal morphologies of mothers and not her actions or the circumstances in which they occur are emphasized. Nevertheless, words and speech are not the only components of language. It is necessary to study speech accompanying or concurrent with actions in order to understand how mother's behavior impacts child development.

Cognition cannot be separated from the study of language (Ribes-Iñesta et al., 1992). Cognitive functions are intimately related to behavioral development and language learning. Usually, cognitive functions are improperly identified with non-observable "behaviors" or "processes" determining the course and deepness of behavioral development and language acquisition. Nevertheless, most of cognitive functions can be identified as behavioral *achievements* (Ryle, 1949). Cognition does not consist in special kinds of behavior. Rather, cognition has to do either with the manner or circumstance in which behavior takes place or with the achievements and results of behavior. Cognitive achievements cannot be traced to specific behaviors, since they may be the result of a wide variety of activities, depending on the stimulus objects and functional context to which is being responded to (Ribes & Quintana, 2002).

During development, in her regular interaction with the child, the mother uses some techniques or procedures (i.e. instigating, asking questions, modeling behaviors) to guide, monitor, shape and/or provide feedback to the child's behavior. Those teaching behaviors may take place in the context of normal interactions like playing or caring routines, facilitating the acquisition of different types of skills (i.e. motor or cognitive skills) given the presence or absence of objects or persons. Thus, in their everyday activities, children adjust to different kinds of criteria (i.e. pointing, identifying, naming, remembering) setup by the mother in different situations. The mother speaks while doing things, promoting the progressive integration of verbal and non-verbal activities in the child's behavior (Ribes & Quintana, 2002).

Many studies have pointed out the significant influence of different variables of mother-child (or mother-caregiver) interaction on different aspects of cognitive development. For example, Moreno & Robinson, (2005) showed that infant emotional vitality (EV), the lively expression of shared emotions both positive and negative, predicts cognitive and language abilities in toddlerhood. Infants who demonstrated a pattern of high emotional expression combined with high bids to their caregivers, scored significantly better on developmental and language scales at 2 years of age. Smith,

Landry, & Swank (2006) examined the relation between the pattern of maternal responsiveness that children experienced in infancy, preschool, and school-age periods and growth in cognitive skills across 3-10 years of age, and determined whether the relation differed by birth status. They found that children parented with higher levels of responsiveness across developmental periods, irrespective of birth status, showed higher levels in development than those who experienced responsiveness in only one development period or minimal responsiveness. At the same time, higher risk birth status combined with minimal responsiveness, resulted in cognitive scores, on average, 14 points lower than when parented with consistently higher responsiveness. Miller, Miceli, Whitman, & Borkowski, (1996) documented how mothers cognitively prepared for parenting had children who displayed better intellectual development and fewer behavior difficulties. Pianta (1997) assessed the unique contribution of teacher-child and parent-child relationships to the prediction of early childhood school outcomes in a high-risk sample of 55 four-year olds. Results suggest that qualities of mother-child interaction are more strongly related to preschool and kindergarten adjustment outcomes than are the qualities of the teacher-child relationship.

Additional studies have shown that the parents' characteristics promote the child's cognitive development. Mulvaney, McCartney, Bub, & Marshall (2006) assessed 92 children and their mothers in order to identify mother, child, and dyadic determinants of effective mother-child collaboration and the impact on children's cognitive development. He found that mothers' verbal intelligence and children's mental development, as well as shared sensitivity, predicted the effectiveness of scaffolding collaborations, which in turn uniquely predicted cognitive capabilities of the children. Effective mother-child scaffolding is a function of individual mother and child characteristics, as well as the nature of the mother-child relationship and scaffolding predicts children's cognitive outcomes. Similar results were found by Tamis-LeMonda, Shannon, Cabrera, & Lamb (2004), when they examined father-child and mother-child play interactions. Fathers' and mothers' supportive parenting predicted children's outcomes after covarying significant demographic factors. Moreover, fathers' education and income were uniquely associated with child measures, and fathers' education consistently predicted the quality of mother-child engagements. Noll & Gibb (2003) predicted that providing options to the child by the mother would relate to the child's cognitive development as reflected in his or her level of symbolic play. She found that children across 12 to 47 months, whose mothers created an options-promoting social context, were observed engaging in more symbolic play. Non-symbolic play, however, was not found to be significantly influenced by the mother's interactive style.

Reese (1995) examined the effects of mothers' conversations with their children on children's emergent literacy. She found a clear and fairly strong relationship

between maternal conversation and children's literacy, especially for children's print concepts, vocabulary, and story comprehension skills. Children's early conversational participation showed a stronger relationship to their later story understanding and narrative abilities than to their print and vocabulary skills. In the same order of things, several studies have pointed out how different characteristics of mother discourse and behavior enhance comprehension of some linguistic and social aspects related to semantic and conceptual understanding (Perez-Granados & Callanan, 1997), phonological awareness and learning (Conboy, Brooks, Meltzoff, & Kuhl, 2015; Silven, Niemi, & Voeten, 2002), word learning and recognition (Baldwin & Moses, 2001; Golinkoff & Hirsh-Pasek, 2006; Parise & Csibra, 2012;), comprehension of future events (Hudson, 2006), social understanding (Ensor & Hughes, 2008), understanding of biological and nonbiological changes in size (Jipson & Callanan, 2003), and the understanding of mind (Reese & Cleveland, 2006; Welch-Ross, 1997)

Some inter-cultural comparisons have demonstrated that French children usually engage more in exploratory play, whereas US children engage more in symbolic play. French and US mothers engaged in similar amounts of exploratory and symbolic play, and equally frequently solicited exploratory play. French mothers less frequently solicited symbolic play and offered less verbal praise than US mothers (Suizzo, 2006). Another study (Raikes, Pan, Luze, Tamis-LeMonda, Brooks-Gunn, Constantine, Banks, Raikes, & Rodriguez, 2006) has reported that US white mothers read more than did Hispanic or African American mothers. For English-speaking children, concurrent reading was associated with vocabulary and comprehension at 14 months, and with vocabulary and cognitive development at 24 months, suggesting reciprocal and cumulative relations between maternal book reading and children's vocabulary. These studies show some cultural patterns, dependent on specific particular raising practices, affecting directly the cognitive development of children.

Current research indicates the relevance of mother-child interactions, mother's knowledge of the situation, and cultural variations to promote specific behavioral achievements in children. Nevertheless, more information is needed regarding specific factors intervening in mother-child interaction and their particular effect on children development.

To do so, observation of mother-child dyads interacting in everyday situations is required in order to describe mother's teaching procedures, and their influence on children's developmental achievements. Behavior observational procedures allow to identify relevant variables involved in real time mother-child interactions (Cortés & Delgado, 2001).

In order to study how the mother promotes differential adjustments by the child depending on: a) the adjustment criteria specified tacitly or explicitly in the activity context, b) the teaching procedures and, c) the behavioral possibilities of the child, we selected three interactive dimensions of the

multidimensional observational system proposed by Ribes-Iñesta and Quintana (2002): 1) play-teaching interactions, 2) the mother's teaching procedures and, 3) the child's cognitive achievements. Play-teaching interactions deal with the play situations arranged by the mother to promote the acquisition or performance of different kinds of verbal and non-verbal skills. Teaching procedures are those mother behaviors explicitly teaching or guiding the child to behave in some way; cognitive achievements deal with the outcomes of behavior in the fulfillment of particular criteria specified in the situation (i.e. drawing a tree in a park representation, putting a piece in a puzzle).

Method

Subjects

A middle class mother-child dyad participated in this study. Mother had a University degree and was around 30-years-old at the beginning of the study. The child was a 30-month-old girl. Both mother and child were video-recorded when the child was 30, 33, 51, and 54-months-old.

Apparatus

Mother and child were recorded using a Handy cam Sony 2 Digital 200x. Recordings were digitalized using the Broadway system to retrieve and edit videos. Mother and child behaviors were codified using the Observer Video-Pro 5.0 software (Noldus). All hardware (capture) as software (video edition, codification) were installed on a Microstar computer with a Pentium IV microprocessor.

Design

This was a longitudinal observational study with continuous recordings and measures of mother and child behaviors in time. Mother and child were filmed during 30-minute interaction sessions when the child was 30, 33, 51, and 54-months-old.

Procedure

Mother and child were video recorded at home while they were playing at the child's room. They were recorded during a 30-minute period each time. Recordings were converted to MPEG-1 format at the laboratory, in order to fit the observational software (Observer Video-Pro 5.0).

Mother and child behaviors were codified as a continuous flow using the observational multidimensional system designed by these authors (Ribes & Quintana, 2002). Three observational dimensions were scored in this study: a) play teaching episodes involving both, mother and child, b) cognitive achievements by the child, and c) mother's teaching procedures (see appendix 1). Reliability was computed as the percentage of inter-observer agreements. Both observers discussed all the disagreements until they scored each sample, obtaining a 100% agreement for all observations.

Results

Play teaching interactions

Figure 1 shows the percentage of duration for games and non-recreational activities in each observational period, for every age. Percentages were calculated according to the overall time of the complete period (30-minutes).

30-month-old

At this age, mother and child spent most of the time (46%) in non-recreational activities, and 28% of the time drawing. Non-verbal riddles, songs and combined games (drawing/word games and drawing/simulation) lasted 10% of the time or less. Finally, other games like physical activities (i.e. throwing a ball, dancing, running), simulation and verbal riddles/songs took place 1% of the time or less each one.

33-month old

Mother and child spent 50% of the time drawing, 29% in physical activities, 18% in non-recreational activities, and only 3% in a combined game of drawing and singing.

51-month-old

Mother and child spent 50% of the time drawing, while 39% of the time they were engaged in non-recreational activities. The lasting time was divided in a simulation game (6%) and a combined drawing/simulating game (5%).

54-month-old

At this age mother and child spent most of the time (82%) shaping a boy doll with plasticine, 12% of the time in non-recreational activities, 5% telling stories and 1% in a simulation game.

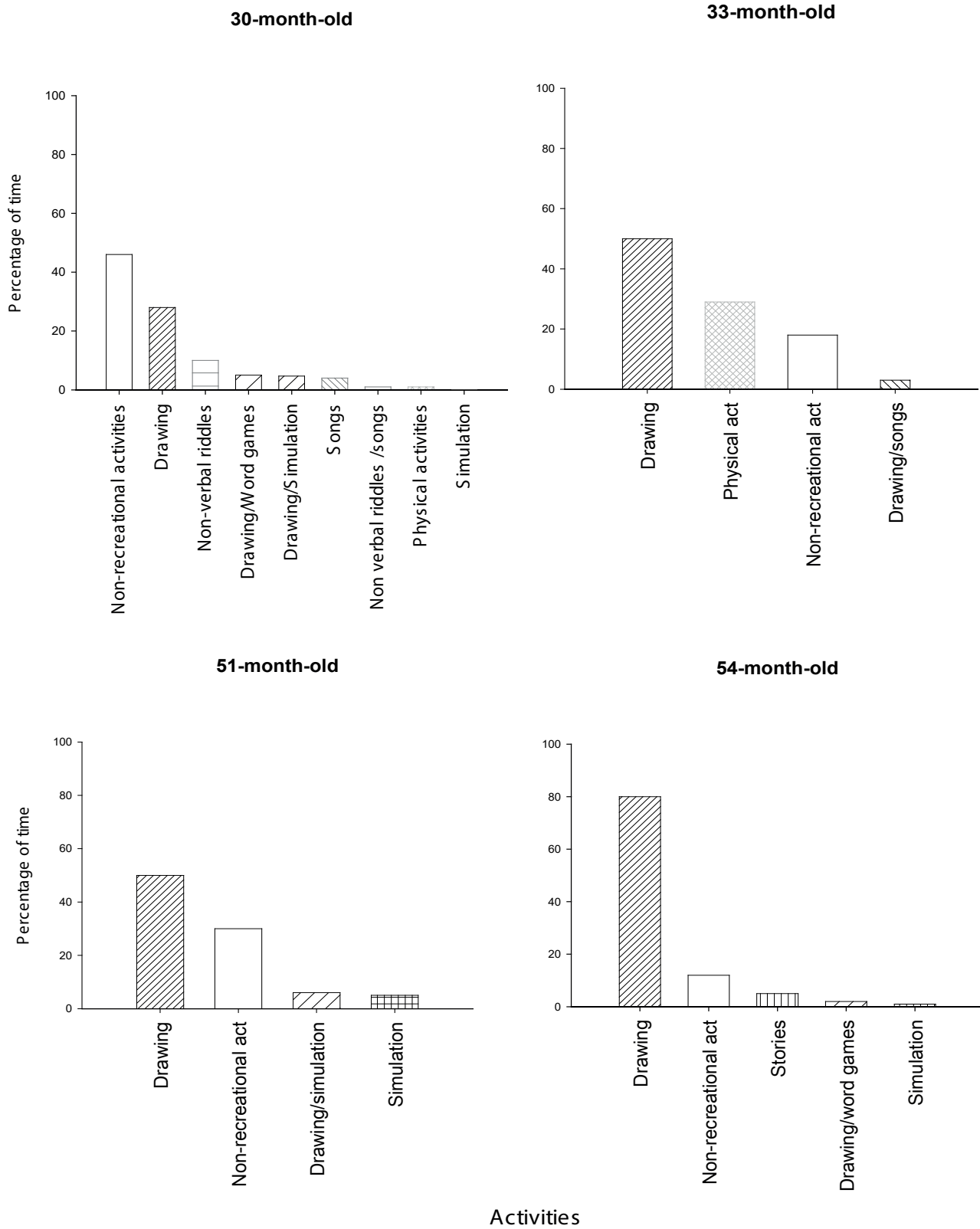


Figure 1. Percentage of games and non-recreational activities across ages.

Effectiveness of teaching procedures during play and non-recreational activities

Figure 2 shows percentages of effective and non-effective teaching procedures in each playing or non-recreational activities episode. An effective procedure is a maternal teaching behavior with an actual effect on child's behavior in terms of cognitive achievements. Teaching procedures were classified as: a) verbal, b) non-verbal, and c) simultaneously verbal and non-verbal. Percentages of effectiveness and non-effectiveness are shown for each type of teaching procedure during play and non-recreational activities. Each block of black and gray bars represents the total number of teaching procedures in each type (verbal, non-verbal, and verbal/non-verbal). Numbers on top of the bars represent the total frequency of effective and non-effective teaching procedures. Each bar represents percentage of effective (black) or non-effective (gray) procedures for play (left column) or non-recreational activity (right column).

30-month-old

At this age, 27% of the verbal teaching procedures, 36% of non-verbal procedures, and 48% of combined teaching procedures (verbal/non-verbal), were associated with some kind of cognitive achievement during play episodes. On the other hand, 31% of the verbal procedures and 26% of the verbal/non-verbal teaching procedures occurring during non-recreational activities promoted a cognitive achievement on the child. Non-verbal teaching procedures were completely ineffective when they occurred during non-recreational activity.

33 month-old

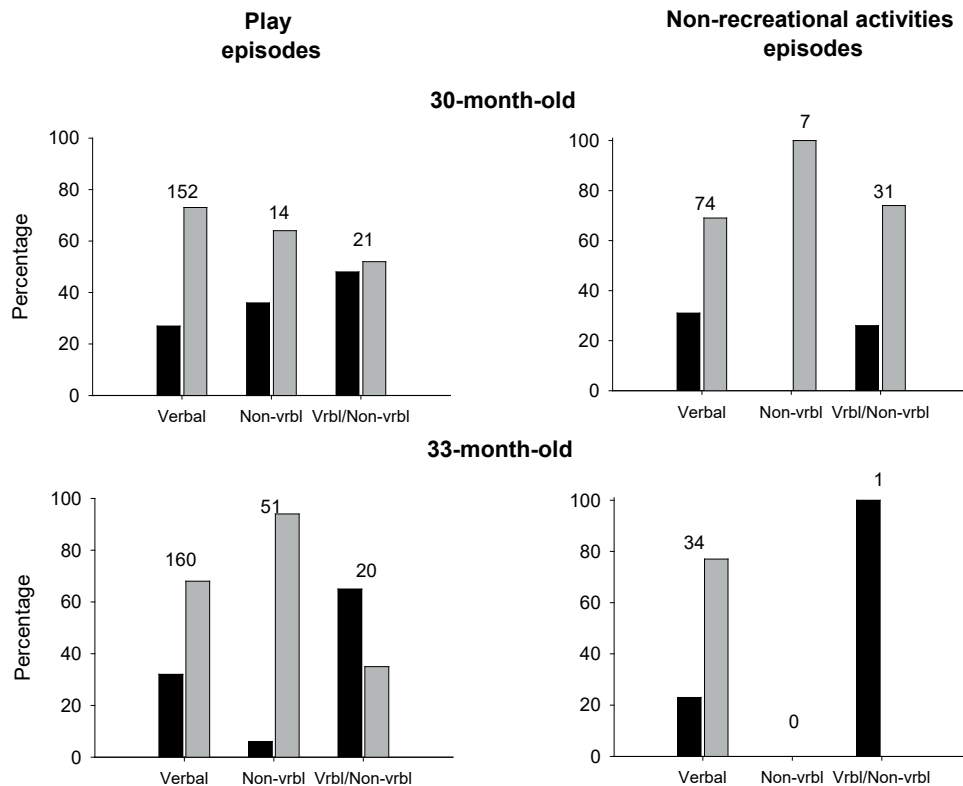
At this age, 32% of verbal teaching procedures, 6% of non-verbal procedures and 65% of verbal/non-verbal procedures were associated with cognitive achievements during play episodes. During non-recreational activities, 23% of verbal and 100% of verbal/non-verbal teaching procedures were effective. The mother did not use non-verbal teaching procedures during these activities.

51-month-old

At this age verbal teaching procedures were 44% effective, non-verbal procedures were 25% effective, and combined procedures were 74% effective during play interactions. During non-recreational-activities, 36% of verbal and 63% of combined verbal/non-verbal teaching procedures were effective. Non-verbal teaching procedures were completely ineffective in non-recreational activities.

54-month-old

At this age, 51% of the verbal teaching procedures, 39% of non-verbal, and 64% of combined teaching procedures were associated with some kind of cognitive achievement during play episodes. On the other hand, 78% of the verbal procedures during non-recreational activities promoted a cognitive achievement on the child, while 75% of verbal/non-verbal teaching procedures were effective during this type of activities. Non-verbal procedures were completely ineffective during non-recreational activities.



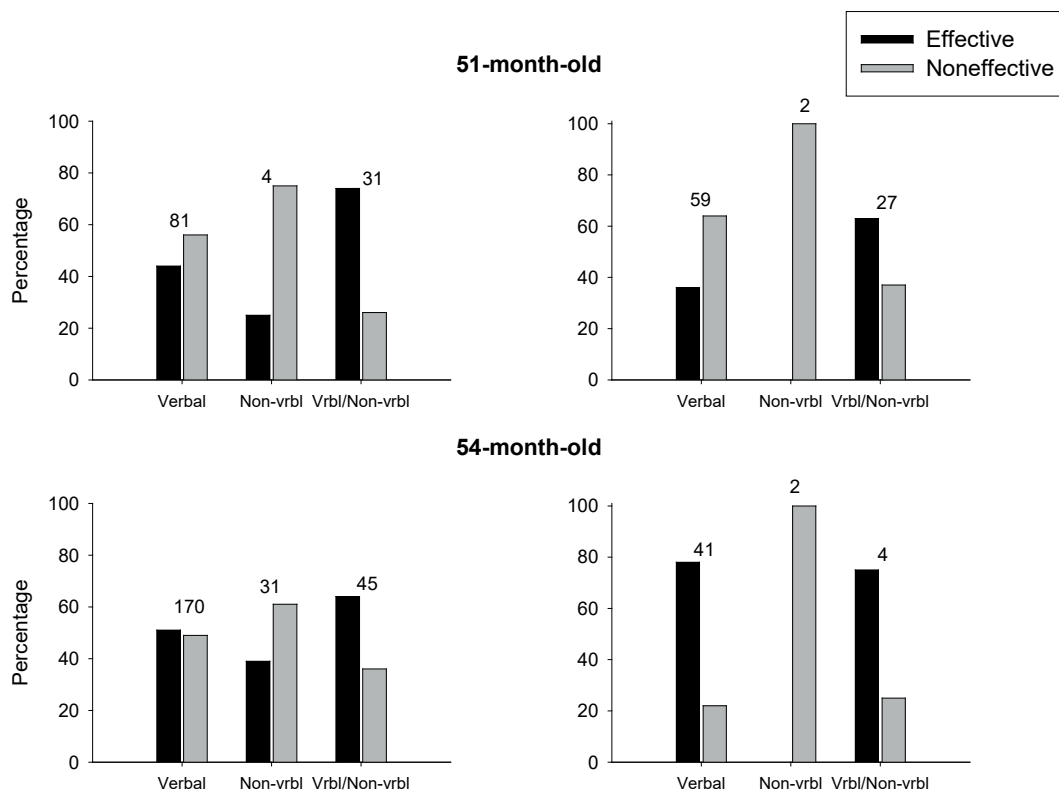


Fig 2. Effectiveness of teaching procedures during play and non-recreational activities

Teaching procedures and type of achievement on child’s behavior during different types of episodes

Figure 3 shows percentages of teaching procedures associated with a) cognitive achievements, b) errors (when the child tried to achieve the cognitive criteria and did not succeed), and c) none cognitive achievement (when the child engage in activities not corresponding to the criteria or none activity at all) during each type of playing or non-recreational activities episode. Each block of bars represents the total number of teaching procedures in the category (associated with cognitive achievements, errors or no achievement).

30-month-old

At this age, most of the joint activity of mother and child occurred during episodes of non-verbal riddles, songs, drawing, drawing/word games, drawing/simulation, and non-recreational activities. Teaching procedures were associated with cognitive achievements for those types of activities in 29, 56, 34, 33, 4, and 28% respectively. Percentage of teaching procedures associated with errors were 7% for non-verbal riddles, 6% for songs, 4% for drawing, 20% for drawing/word games, and 2% for non-recreational activities. Finally, percentages of teaching procedures associated with no

cognitive achievement were 64% for non verbal-riddles, 38% for songs, 63% for drawing, 47% for drawing/word games, and between 70 and 100% for drawing/simulation, non-verbal riddles/songs, simulation, physical activities and non-recreational activities.

33-month-old

Percentages of teaching procedures associated with cognitive achievements at this age were 30% for drawing, 24% for physical activities, 100% for drawing/songs, and 25% for non-recreational activities. Percentages of teaching procedures associated with errors were 3% for drawing and 2% for physical activities. Finally, percentages of teaching procedure with no achievement were 67% for drawing, 74% for physical activities, and 75% for non-recreational activities.

51-month old

At 51-month-old, percentages of teaching procedures associated with cognitive achievements were 41% for drawing, 79% for simulation, 87% for drawing/simulation, and 43% for non-recreational activities. Teaching procedures associated with errors were 2% for drawing and 5% for non-recreational activities. Percentages of teaching procedures occurring without achievements were 57% for drawing, 21% for simulation, 13% for drawing/simulation, and 52% for non-recreational activities.

54-month-old

At this age, percentages of teaching procedures with cognitive achievements were 49% for drawing, 33% for simulation, 67% for stories, and 37% for non-recreational activities.

Procedures associated with errors were 1% for drawing and 5% for non-recreational activities. Finally, procedures without achievements were 50% for drawing, 67% for simulation, 33% for stories, and 58% for non-recreational activities.

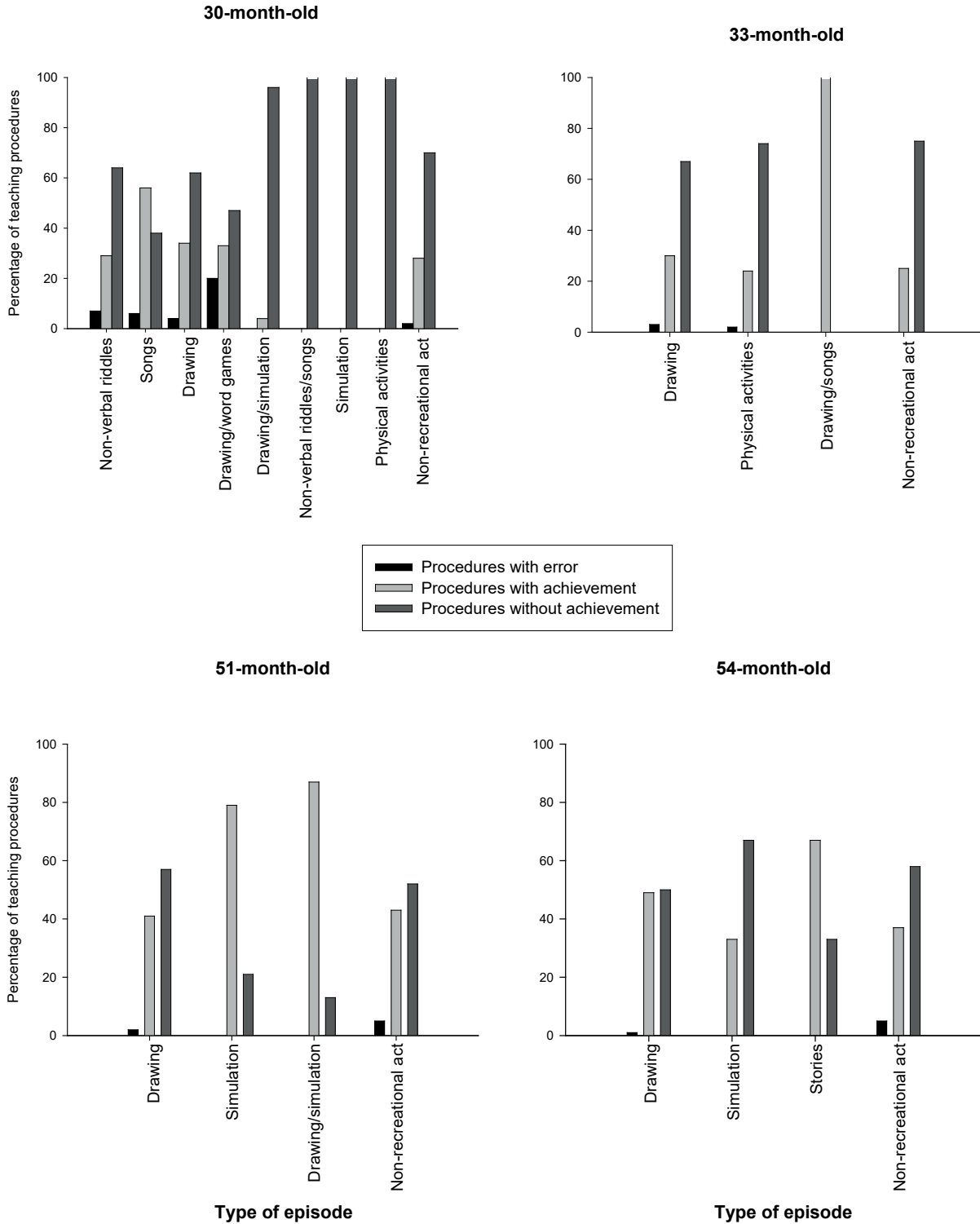


Figure 3. Percentage of teaching procedures by type of outcome across ages

Types of teaching procedures associated to cognitive achievements across ages

The teaching procedures used by the mother while interacting with her child, were classified in 14 categories (see Appendix) of the multidimensional observational system (Ribes & Quintana, 2002). Each one of the teaching behaviors of the mother can preclude, or be a consequence of the child's cognitive achievement (whether the child had attained the achievement or not). These cognitive achievements may be classified in 17 categories (see Appendix) by the same multidimensional system. The association between a teaching procedure and a cognitive achievement is not only temporal, but functional. This means that one behavior of the mother (or the child) is a condition for the occurrence of one behavior of the child (or the mother). For example, when the mother corrects the child in the moments she is writing her name incorrectly and the child corrects her writing. On the same token, one teaching procedure may take place in a variety of situations and be associated with more than one cognitive achievement. Table 1 shows all the different teaching procedures used by the mother and the associated cognitive achievements across ages.

Summing up, verbal teaching procedures showed more frequency and variety than non-verbal or verbal/non-verbal procedures, and resulted in more types of cognitive achievements at 30-month-old than at the other observation periods. Verbal prompting was the most frequent teaching procedure used by the mother. The largest number of cognitive achievements across ages was associated with this type of teaching procedure.

Discussion

The results of this study point to some important developmental changes taking place across interactions. One deals with the number and variety of play interactions that mother and child engaged in. When the child was 29-month-old the mother changed frequently the activity, being this period the one with the largest number of games (8).

A second one deals with the type and variety of play teaching interactions. Mother and child spent most of the time drawing and modeling (50% of the time for the four age segments) while they spent a minimum proportion of time (5% for all age segments) in games like simulation. At the same time, different games were identified at different ages: at 29 and 33-month-old mother and child played with puzzles, sang, threw a ball and repeated some verbal riddles while they drew. On the other hand, at later ages (51 and 54-month-old) they played to tell stories, and to simulate (role playing) in addition to drawing and plasticine modeling.

Each game provided the opportunities to the child for different cognitive adjustments. In this sense, the mother setup different adjustment criteria (i.e. repeating, reproducing, specifying, orienting) during the periods under observation (see Table 1). Mother's demands were frequent and constant along the interaction periods, but the games involved show that those demands were growing in complexity while the child developed at 29-month-old the mother sang a song expecting the child to

follow her, while at 54-month-old she prompted the child for a particular song about a detail of a drawing).

The child seemed to adapt to the demands of her mother by a) participating in a particular activity or game for longer periods and, b) adjusting (achieving cognitive criteria) to progressively complex activities. For example, percentage of time mother and child spent drawing at 30-month-old was 28%, while it raised to 82% at 54-month-old. Drawing was a more complex situation since it required a finer motor control of the hand including hand-eyes coordination, in addition to the linguistic competence allowing the child to recognize figures and colors in the case of coloring and copying, or to represent objects on the paper in the case of free drawing. Drawing occupied a minor percentage of time at 30-month-old due to: a) the lack of motor and linguistic skills in the child, and b) the continuous change of activity by the mother to keep the child interested.

The mother used more frequently verbal procedures than non-verbal or combined verbal/non-verbal teaching procedures (see Figure 2). These verbal teaching procedures increased in effectiveness starting at 51-month-old, both, at play episodes and non-recreational activities periods. Non-verbal teaching procedures were consistently less effective than other types of procedures at play episodes and completely ineffective at non-recreational activities periods. Even when combined verbal/non-verbal teaching procedures were used less frequently by the mother, they showed to be the more effective on child's behavior, except at 54-month-old in non-recreational activities. It seems that actions accompanied by words become a more efficient tool to promote the adjustment of child's behavior to achievement criteria, and that this effect is more consistent during play episodes than during non-recreational activities. During non-recreational activities, verbal procedures appeared to be more effective only at 54-month-old when the child were able to respond to verbal orders like *"bring me a pillow"*, *"clean up your hands"* *"tell me what you did this morning at school"*, etc.

Mother's behavior was very consistent within and between interactions. She used prompting most frequently than any other procedure and this was reflected on cognitive achievements (see Table 1). Other teaching procedures were used less frequently but also consistently across ages (i.e. verbal approval, verbal and non-verbal signaling, repeating, providing feedback). This regularity on mother's behavior could be related with a stable interaction pattern based on the integration of behavior between mother and child.

It is normally accepted that the mother adapts her behavior to the behavioral level of the child developing a relatively stable pattern of interaction with the child. The mother adjusts her behavior to the child's (Snow, 1989). The data of this study show that the number of teaching procedures diminished progressively across ages, suggesting that the mother became less directive as the child became increasingly competent in the different activities involving a more active and spontaneous participation of the child. At the same time,

the mother used more teaching procedures when the child was younger (315 teaching procedures at 29-month-old). The mother performed a directive role by constantly suggesting activities, prompting the child to accomplish different goals according to the activity, teaching her how to meet the criteria, and providing feedback. The mother played an active teaching role providing the child with multiple occasions for learning (Moerk, 1983a, 2000). Damast, Tamis-LeMonda & Bornstein (1996), for example, showed that mothers tend to play with their toddlers in ways that might promote their children's development, and that mothers with more knowledge about play development provide their children with appropriately challenging play interactions.

Some authors (Alcaraz, 2002) point to the consistency in mother's behavior showing that mothers emphasize specific aspects of the environment in their daily interaction with their children, according to a particular interactive style. The type of child's achievements would be a direct function of those environmental aspects that the mother decides to emphasize. In this study, several indexes of the interactive style of the mother in her consistent use of teaching procedures were identified. For example, she prompted in different activities like drawing, simulating or throwing a ball. This mother emphasized the child's actions, indicating each time the adjusting behavior by expressions like "put it here", "come here", and "look at this". The mother prompted the child to adjust to different contexts and criteria, promoting specific achievements using general teaching procedures. Another example of the mother's style is that at 29-month-old she changed frequently the game being played, instead of changing the teaching procedure when the child was not fulfilling the situational demands.

The continued repetition of a teaching procedure in different adjustment situations, might be a sign of functional generality. An example of the functional generality may be found with adapting. Even when it was not as frequent as prompting, it showed to be useful in different situations. Adapting has to do with the *motherese* directed by mothers to their children (Moerk, 1983a). *Motherese* is a special pitch of language consisting in acute tones of voice used to articulate very simple utterances. Several authors have found that the use of this kind of adaptation is much generalized among mothers; nonetheless, the role of this procedure in promoting the acquisition of particular types of language skills remains unfamiliar. (Lécuyer, Pêcheux, & Streri, 1994).

In this study, the mother used different voice adaptations to indicate errors of the child and to specify how to accomplish the same task. For example, when the child was assembling a puzzle and put a piece in a wrong place, the mother adapted her voice (like singing) and said to the child in a slow way "turn-it-around"; then, the child corrected her action. In a different episode, the mother used a verbal adaptation to teach the words of a song to the child, repeating the words with an acute tone of voice and in a slow way: "tail- tail-bro-wn-co-lor-tail". This and other types of adaptations were applied by the mother in the context of different activities. According to

this data, verbal adaptations would not have a special function regarding specific behaviors in the child. Its use would be more related to motivate the child and simplify the adaptation to new tasks.

We found that a teaching procedure can relate in several ways with cognitive achievements: a) the achievement or cognitive adjustment can be successful, b) the achievement can be an error or, c) there is no relation at all between the teaching procedure and the cognitive achievement (ineffective teaching procedures).

In this study, the number of errors across the entire sample of interactions was minimal, even though, there is a decrease in errors with increasing age. From 33-month-old on errors almost disappear. At the same time, the percentage of procedures associated with successful achievements increased along with age. Teaching procedures were less effective at 30-month-old regardless of the type of activity, and increased their effectiveness from 33 to 54-month-old. However, there was a large amount of teaching procedures not related at all with cognitive achievements in almost all activities at any sample age.

Looking at these more carefully, it may be observed, for example, that in the game of drawing-modeling and drawing-modeling/simulating there was an increasing effect of teaching procedures on cognitive achievements. At 51 and 54-month-old a larger percentage of teaching procedures were related with successful cognitive achievements when compared with 30 and 33-month-old periods. Other examples of the effectiveness of teaching procedures may be found during the activities of drawing-modeling/songs (33-month-old) and stories (54-month-old), where most of the teaching procedures were related with a successful adjustment of the child.

No consistent pattern of effectiveness or lack of effectiveness of teaching procedures across or between activities was found. It seems that effectiveness depends not on the type of activity but on other factors, like verbal and non-verbal abilities of the child, extent of agreement between those abilities and the task criteria, and the mother's skill to promote the child's adjustment.

Games seem to constitute important contexts of learning for children. Variety of games supplies the child with a large number of opportunities to learn how to adjust to different types of criteria in similar situations (Ribes & Quintana, 2002). Therefore, games are contexts for different cognitive achievements, depending on the game's goal. For instance, mothers can encourage the acquisition of verbal skills in the context of word games and telling and inventing stories, manipulation and fine coordination in puzzle and drawing games, motor coordination in ball and running games, and so on.

Given the large proportion of ineffective teaching procedures at 30-month-old, it could be thought that the child did not interact with her mother, by being inattentive. However, the child was very attentive to her mother. The child observed and listened to the mother. Listening and observing were not

immediately reflected in the effective actions of the child, but its effect may be searched at other points in development. In this study, it was observed how the effective behavior of the child increased through increasing age.

Listening and observing the mother actions might actually promote that the child developed more active and effective ways of adjustment to similar situations. Listening and observing are passive or reactive language modalities preceding other active modalities (i.e. talking and signaling or gesturing). Reactive modes precede the effectiveness and precision of active modes. They constitute complementary pairs (listening/speaking, observing/gesturing, and reading/writing) by their functional relationship (Gómez-Fuentes & Ribes-Iñesta, 2008; Ribes-Iñesta & Fuentes, 2001; Ribes-Iñesta & Quintana, 2002).

Reactive linguistic modes could precede the integration of active modalities to other non-verbal morphologies of behavior. The actual effect of those language modes (i.e. listening and observing) in the development of other linguistic skills in the child remains unknown, even though many authors have stressed their value by pointing out the complementarities of receptive and expressive language (Ackerman, Holloway, & Youngdale, 2001; Dapretto & Bjork, 2000; Hart & Risley, 1999, 2002; Long, Oppy, & Seely, 1997; Moerk, 1980; Rondal, 1980). Nevertheless, the understanding of the functions of observing and listening to mother's behavior seems to be an important source of information about how children move on from an ineffective stage of action to an active one during psychological development.

Finally, it should be remarked that the emergence of new types of adjustment in the child did not depend only on the child's behavior, but on the convergence of conditions including a) the opportunities she faced in terms of number and variety of activities, b) the ability of the mother to promote the exercise of previous performances and the emergence of new ones, based on child's abilities and, c) the actual competence of the child to adjust to continuously changing criteria along with her mother's behavior.

References

- Ackerman, P. T., Holloway, C. A., & Youngdale, P. L. (2001). The double-deficit theory of reading disability does not fit all. *Learning Disabilities Research and Practice, 16*(3), 152-160. doi: 10.1111/0938-8982.00016
- Andrews, S. R., Blumenthal, J. B., Johnson, D. L., Kahn, A. J., Ferguson, C. J., Lasater, T. M., Malone, P. E., & Wallace, D. B. (1982). The Skills of Mothering: A Study of Parent Child Development Centers. *Monographs of the Society for Research in Child Development, 47*(6), 1-83. <https://doi.org/10.2307/1165919>
- Alcaraz, V. (2002). El aprendizaje del lenguaje. In E. Ribes-Iñesta (Ed.), *Psicología del aprendizaje* (pp. 131-168). México: Manual moderno.
- Alcaraz, V., & Martínez-Casas, R. (2000). La historia natural y social del lenguaje: Indicios para explicar los procesos de adquisición de las competencias comunicativas. In V. Alcaraz (Ed.), *Una mirada múltiple sobre el lenguaje* (pp. 93-134). México: Universidad de Guadalajara.
- Baldwin, D. A., & Moses, L. J. (2001). Links between social understanding and early word learning: Challenges to current accounts. *Social Development, 10*, 309-329. doi: 10.1111/1467-9507.00168
- Beebe, B., Jaff, J., Markese, S., Buck, K., Chen, H., Cohen, P., Bahrick, L. Andrews, H., & Feldstein, S. (2010). The Origins of 12-Month Attachment: A Microanalysis of 4-Month Mother-Infant Interaction. *Attach Hum Dev. 2010 January, 12*(0): 3-141. doi:10.1080/14616730903338985.
- Bijou, S. W. (1990). Desarrollo del lenguaje en los primeros años. In E. Ribes-Iñesta & P. Harzem (Eds.), *Lenguaje y Conducta* (pp. 9-29). México: Trillas.
- Bornstein, M., & Bruner, J. (1989). *Interaction in human development*. New York: Lawrence Erlbaum.
- Conboy, B. T., Brooks, R., Meltzoff, A. N. & Kuhl, P. K. (2015). Social Interaction in Infants' Learning of Second-Language Phonetics: An Exploration of Brain-Behavior Relations, *Developmental Neuropsychology, 40* (4), 216-229. doi: 10.1080/87565641.2015.1014487
- Brooks, P., & Kempe, V. (2014). Interrelationship of Language and Cognitive Development (Overview). *UC San Diego*. <http://dx.doi.org/10.4135/9781483346441.n91> Retrieved from <https://escholarship.org/uc/item/2833j0rj>
- Cortés, A., & Delgado, U. (2001). Análisis funcional del desarrollo lingüístico. In C. G. Mares & B. Y. Guevara (Eds.), *Psicología Interconductual* (pp. 165-217). México: UNAM.
- Damast, A. M., Tamis-LeMonda, C., & Bornstein, M. H. (1996). Mother-Child Play: Sequential Interactions and the Relation between Maternal Beliefs and Behaviors. *Child Development, 67*(4), 1752-1766. doi: 10.1111/j.1467-8624.1996.tb01825.x
- Dapretto, M., & Bjork, E. L. (2000). The development word retrieval abilities in the second year and its relation to early vocabulary growth. *Child Development, 71*(3), 635-648. doi: 10.1111/1467-8624.00172
- Ensor, R. & Hughes, C. (2008). Content or Connectedness? Mother-Child Talk and Early Social Understanding. *Child Development, 79*(1), 201-216. doi: 10.1111/j.1467-8624.2007.01120.x
- Fogel, A. (1977). Temporal organization in mother-infant face to face interaction. In H. R. Schaffer (Ed.), *Studies in mother-infant interactions* (pp. 119-152). London: Academic Press.
- Golinkoff, R. M., & Hirsh-Pasek, K. (2006). Baby wordsmith from associationist to social sophisticate. *Current Directions in Psychological Science, 15*(1), 30-33. doi: 10.1111/j.0963-7214.2006.00401.x

- Gómez-Fuentes, A. D., & Ribes-Iñesta, E. (2008). Adquisición y transferencia de una discriminación condicional de primer orden en distintos modos de lenguaje. *Acta Comportamental*, 16(2), 183-210.
- Gorski, D. P. (1996). Lenguaje y conocimiento. In D. P. Gorski (Ed.), *Pensamiento y lenguaje*. México: Grijalbo.
- Hart, B., & Risley, T. (1999). *The social world of children: Learning to talk*. Baltimore: Paul H. Brookes.
- Hart, B., & Risley, T. R. (2002). *Meaningful Differences in the Everyday Experience of Young American Children*. Baltimore: Paul H. Brookes.
- Hilbrink, E.E., Gattis, M., & Levinson, S.C., (2015). Early developmental changes in the timing of turn-taking: a longitudinal study of mother–infant interaction. *Frontiers in Psychology*, 6:1492. doi: 10.3389/fpsyg.2015.01492
- Hudson, J. A. (2006). The Development of Future Time Concepts through Mother-Child Conversations. *Merrill Palmer Quarterly: Journal of Developmental Psychology*, 52(1), 70-95. doi: 10.1353/mpq.2006.0005
- Jipson, J. L., & Callanan, M. A. (2003). Mother-Child Conversations and Children's Understanding of Biological and Nonbiological Changes in Size. *Child Development*, 74(2), 629-644. doi: 10.1111/1467-8624.7402020
- Lécuyer, R., Pêcheux, M., & Streri, A. (1994). *Le développement cognitif du nourrisson*. Paris: Nathan.
- Long, D. L., Oppy, B. J., & Seely, M. R. (1997). Individual differences in readers'sentence and text.level representations. *Journal of Memory and Language*, 36(1), 129-145. doi: 10.1006/jmla.1996.2485
- Markus, J., Mundy, P., Morales, M., Delgado C. E. F., & Yale, M. (2000). Individual Differences in Infant Skills as Predictors of Child-Caregiver Joint Attention and Language. *Social Development*, 9(3), 302-315. doi: 10.1111/1467-9507.00127
- Miller, C. L., Miceli, P. J., Whitman, T. L., & Borkowski, J. G. (1996). Cognitive Readiness to Parent and Intellectual-Emotional Development in children of Adolescent Mothers. *Developmental Psychology*, 32(3), 533-541. doi: 10.1037/0012-1649.32.3.533
- Miller, G. (1981). *Lenguaje y habla*. Madrid: Alianza.
- Moerk, E. L. (1980). Relationships between parental input frequencies and children's language acquisition: A reanalysis of Brown's data. *Journal of Child's Language*, 7(1), 105-118. doi: 10.1017/S0305000900007054
- Moerk, E. L. (1983a). A behavioral analysis of controversial topics in first language acquisition: Reinforcements, corrections, modeling, input frequencies, and the three-term contingency pattern. *Journal of Psycholinguistic Research*, 12(2), 129-155. doi: 10.1007/bf01067408
- Moerk, E. L. (1983b). *The mother of Eve as a first language teacher*. Norwood, N.J.: Ablex.
- Moerk, E. L. (1990). Three-term contingency patterns in mother-child verbal interactions during first-language acquisition. *Journal of Experimental Analysis of Behavior*, 54(3), 293-305. doi: 10.1901/jeab.1990.54-293
- Moerk, E. L. (2000). *The guided acquisition of first language skills*. Ablex Publishing.
- Moreno, A. J. & Robinson, J. L. (2005). Emotional vitality in infancy as a predictor of cognitive and language abilities in toddlerhood. *Infant & Child Development*, 14(4), 383-402. doi: 10.1002/icd.406
- Mulvaney, M. K., McCartney, K., Bub, K. L., & Marshall, N. L. (2006). Determinants of Dyadic Scaffolding and Cognitive Outcomes in First Graders. *Parenting: Science & Practice*, 6(4), 297-320. doi: 10.1207/s15327922par0604_2
- Noll, L. M. & Gibb, C. (2003). The relationship of mother-child interaction and the child's development of symbolic play. *Infant Mental Health Journal*, 24(6), 557-570. doi: 10.1002/imhj.10071
- Parise, E., & Csibra, G. (2012). Electrophysiological Evidence for the Understanding of Maternal Speech by 9-Month-Old Infants. *Psychological Science*, 23(7), 728-733. doi: 10.1177/0956797612438734
- Pancsofar, N., & Vernon-Feagans, L. (2006). Mother and father language input to young children: Contributions to later language development. *Journal of Applied Developmental Psychology*, 27(6), 571-587. doi:10.1016/j.appdev.2006.08.003
- Perez-Granados, D. R., & Callanan, M. (1997). Conversations with Mothers and Siblings: Young Children's Semantic and Conceptual Development. *Developmental Psychology*, 33(1), 120-134. doi:10.1037/0012-1649.33.1.120
- Phillips, J. R. (1973). Syntax and vocabulary of mother's speech to young children: Age and sex comparisons. *Child Development*, 44(1), 182-195. doi: 10.2307/1127699
- Piaget, J. (1926). *El lenguaje y el pensamiento del niño*. Londres: Routledge & Kegan Paul.
- Pianta, R. C., Nimetz, S. L., & Bennett, E. (1997). Mother-child Relationships, Teacher-Child Relationships, and School Outcomes in Preschool and Kindergarten. *Early Childhood Research Quarterly*, 12(3), 263-280. doi: 10.1016/S0885-2006(97)90003-X
- Raikes, H., Pan, B. A., Luze, G., Tamis-LeMonda, C. S., Brooks-Gunn, J., Constantine, J., Banks, L., Raikes, A., & Rodríguez, E. T. (2006). Mother-Child Bookreading in Low-Income Families: Correlates and Outcomes during the First Three Years of Life. *Child Development*, 77(4), 924-956. doi: 10.1111/j.1467-8624.2006.00911.x
- Reese, E. (1995). Predicting Children's Literacy from Mother-Child Conversations. *Cognitive Development*, 10(3), 381-405. doi: 10.1016/0885-2014(95)90003-9

- Reese, E., & Cleveland, E. S. (2006). Mother-Child Reminiscing and Children's Understanding of Mind. Merrill Palmer Quarterly: *Journal of Developmental Psychology*, 52(1), 17-43. doi: 10.1353/mpq.2006.0007
- Ribes-Iñesta, E. (1986). Language as Behavior: Functional Mediation versus Morphological Description. In H. W. Reese & L. J. Parrot (Eds.), *Behavior Science: Philosophical, Methodological, and Empirical Advances* (pp. 115-138). Hillsdale, New Jersey: Lawrence Erlbaum.
- Ribes-Iñesta, E., & Fuentes, M. T. (2001). Un análisis funcional de la comprensión lectora como interacción conductual [A functional analysis of reading comprehension as a behavioral interaction]. Guadalajara, Jalisco: Universidad de Guadalajara, Centro de Estudios e Investigaciones en Comportamiento.
- Ribes-Iñesta, E., & Quintana, C. (2002). Mother-child linguistic interactions and behavioural development: A multidimensional observational system. *Behavior Analyst Today*, 3(4), 442-454. Recuperado de <http://www.drleashabarry.com/PBS/week09/An%20explicit%20Technology%20of%20Generalization.pdf#page=82>
- Ribes-Iñesta, E., Cortés, A., & Romero, P. (1992). Quizá el lenguaje no es un proceso o tipo especial de comportamiento: Algunas reflexiones basadas en Wittgenstein. *Revista Latina de Pensamiento y Lenguaje*, 1, 58-73.
- Rieber, R. W., & Carton, A. S. (Eds.). (1987). The Collected Works of L. S. Vygotsky: Vol. 1. *Problems of General Psychology*. New York: Plenum.
- Rogoff, B. (1993). *Aprendices del pensamiento*. Barcelona: Paidós.
- Rondal, J. P. (1980). Father's and mother's speech in early language development. *Journal of Child Language*, 7(2), 353-369. doi: 10.1017/s0305000900002671
- Rondal, J. P. (1981). On the nature of linguistic input to language learning children. *International Journal of Psycholinguistics*, 8, 75-107.
- Rondal, J. P. (1990). *La interacción adulto-niño y la construcción del lenguaje*. México: Trillas.
- Ryle, G. (1949). *The concept of mind*. New York: Barnes & Noble.
- Schaffer, H. R. (1984). *The child's entry into a social world*. London: Academic Press.
- Silven, M., Niemi, P., & Voeten, M. J. M. (2002). Do maternal interaction and early language predict phonological awareness in 3- to 4-year-olds? *Cognitive Development*, 17(1), 1133-1155. Doi: 10.1016/s0885-2014(02)00093-x
- Smith, K. E., Landry, S. H., & Swank, P. R. (2006). The Role of Early Maternal Responsiveness in Supporting School-Aged Cognitive Development. *Pediatrics*, 117(5), 1608-1617. doi: 10.1542/peds.2005-1284
- Snow, C. E. (1977). Mother's speech research: From input to interaction. In C. E. Snow & C. A. Ferguson (Eds.), *Talking to children: Language input & acquisition* (pp. 31-49). London: Cambridge University Press.
- Snow, C. E. (1979). The role of social interactions in language acquisition. In A. Collins (Ed.), *Children's language and communication* (pp. 157-182). New Jersey: Lawrence Erlbaum.
- Snow, C. E. (1989). Understanding social interaction and language acquisition: Sentences are not enough. In M. H. Bornstein & J. S. Bruner (Eds.), *Interaction in human development* (pp. 83-103). Hillsdale, N.J.: Lawrence Erlbaum.
- Spirkin, A. G. (1996). Origen del lenguaje y su papel en la formación del pensamiento. In D. P. Gorski (Ed.), *Pensamiento y lenguaje*. México: Grijalbo.
- Suizzo, M. A. & Bornstein, M. H. (2006). French and European American child-mother play: Culture and gender considerations. *International Journal of Behavioral Development*, 30(6), 498-508. doi: 10.1177/0165025406071912
- Tamis-LeMonda, C. S., Shannon, J. D., Cabrera, N. J., & Lamb, M. E. (2004). Fathers and Mothers at Play With Their 2- and 3-Year-Olds: Contributions to Language and Cognitive Development. *Child Development*, 75(6), 1806-1820. doi: 10.1111/j.1467-8624.2004.00818.x
- Tomasello M. 2008. *Origins of human communication*. Cambridge, MA: MIT Press.
- Tomasello M. 2019 *Becoming human: a theory of ontogeny*. Cambridge, MA: Harvard University Press.
- Tomasello, M., & Farrar, M. J. (1986). Joint attention and early language. *Child Development*, 57(6), 1454-1463. doi: 10.1111/j.1467-8624.1986.tb00470.x
- Tomasello, M., & Todd, J. (1983). Joint attention and lexical acquisition style. *First Language*, 4(12), 197-211. doi: 10.1177/014272378300401202
- Welch-Ross, M. K. (1997). Mother-Child Participation in Conversation about the Past: Relationships to Preschoolers' Theory of Mind. *Developmental Psychology*, 33(4), 618-629. doi: 10.1037/0012-1649.33.4.618