

# *Mediation in a Sibling Context: The Relations of Older Siblings' Mediating Behaviour and Younger Siblings' Task Performance*

Pnina S. Klein, Ruth Feldman\* and Shlomit Zarur

*Department of Psychology, Bar-Ilan University, 52900 Ramat-Ilan, Israel*

We investigated the sibling relationship as a context for cognitive development. Forty preschoolers (ages 5–6) and their younger siblings (ages 2–3) were visited at home. Four games were presented to the older siblings and they were asked (a) to estimate how well their younger sibling will perform on each game and (b) to teach the younger sibling how to use the games. The older siblings' mediating behaviours during the teaching session and the younger siblings' performance on the four tasks were coded. The frequency of mediating behaviours—including attention focusing, amplifying affect and providing meaning, fostering a sense of competence, regulating of the learning process, de-contextualization, and negative feedback in the form of mocking and laughing at errors, predicted the younger siblings' task performance. The older sibling's accurate perception of the younger child's competence was uniquely predictive of task performance. The highest amount of mediation was observed in older-brother–younger-brother pairs, in particular the behaviours of negative feedback and amplifying affect. Results contribute to the discussion on the role of siblings as moderators of cognitive development and are discussed in terms of Vygotsky's cultural–historical perspective on apprenticeship. Copyright © 2002 John Wiley & Sons, Ltd.

*Key words:* cognitive development; mediation; preschool-age children; siblings; socio-cultural perspective; toddlers

Sibling relationships provide an important context for children's development. Research on the sibling relationship has often focused on the role siblings play in each other's socialization, and examined issues such as communication skills, understanding feelings, perspective taking, conflict resolution, or aggression management (Dunn, 1988; Dunn and Kendrick, 1982; Youngblade and Dunn,

---

Contract/grant sponsor: Macchado Foundation

\*Correspondence to: Dr. Ruth Feldman, Department of Psychology, Bar-Ilan University, 52900 Ramat-Ilan, Israel. E-mail: feldman@mail.biu.ac.il

1995). Less research has addressed the sibling relationship as a context for cognitive development. In this study, we examined the contribution of sibling interactions to young children's performance and mastery. We observed the specific techniques preschoolers use while attempting to teach their toddler siblings how to perform new tasks, and examined the relations between the older children's use of these strategies and the younger child's performance.

Toddlers tend to use their older siblings for assistance in learning and mastering new skills. Two- and three-year olds turn to older siblings for help, direct more questions to siblings as compared to older peers, imitate and observe the activities of older siblings, and follow the instructions of older siblings more readily than the instructions of other children (Azmitia and Hesser, 1993; Pepler *et al.*, 1981). Older siblings in turn often teach their toddler brothers and sisters how to manipulate new toys and solve concrete problems, scaffold and help augment their attention span during play interactions, provide explanations and descriptions, and modify their instructions in accordance with the younger child's performance (Abramovitch *et al.*, 1979; Cicerelli, 1975; Dunn, 1983). Sibling interactions have shown to be associated with better performance on specific cognitive skills, particularly on skills that are typically acquired in the context of social interactions. Ruffman and colleagues (1998) showed that false belief understanding of three- and four-year olds increased linearly with the number of siblings. Preschoolers with two or three older siblings scored better as compared to children with one sibling, and those with one sibling outperformed children with no older siblings. The authors argue that since false belief understanding develops on the basis of pretend play, one older sibling provides more frequent opportunities to participate in pretend play whereas two older siblings afford the opportunity to participate as well as observe complex symbolic play between the two older siblings. These findings suggest that the sibling relationship may affect cognitive development both directly, by offering a unique context for guided participation in learning activities, and indirectly, by providing opportunities for toddlers to observe interactions among older siblings and their peers. From the older child's perspective, the path to more efficient teaching may similarly be both direct and indirect. Older siblings may be more familiar with their younger siblings' cognitive competencies and may therefore provide more accurate regulation of the learning process (Cooper and St. John, 1990; Weisner, 1989). At the same time, older siblings have more opportunities to observe and imitate the parents' interaction with the younger child, particularly the parental 'scaffolding' strategies, which are used to facilitate the acquisition of new skills.

What are the specific mechanisms that make siblings interactions a unique context for cognitive development? Azmitia and Hesser (1993), comparing preschoolers' interactions with older siblings and peers in a teaching situation, found that siblings used more frequent spontaneous guidance and provided more positive feedback. These behaviours, however, were linked to the younger siblings' pressure for explanation and requests to gain control over the performance, which were expressed more frequently toward older siblings than toward peers. Although the relations between specific behaviours of the older sibling's and the performance of the younger child were inconclusive, children taught by siblings outperformed those taught by peers. The authors interpret the findings within the framework of Vygotsky's (1978) cultural-historical theory and suggest that sibling interactions provide a context for guided participation in learning activities between children of mismatched ages, where the older child is, by virtue of age and practice, an 'expert' on various skills. In particular, Vygotsky's (1978) concept of 'apprenticeship' is meaningful in the present

context. Apprenticeship describes learning that takes place during natural daily activities, is built upon interactions between older and younger members of a cultural group where the older 'scaffolds' the abilities of the younger during a shared performance, and involve culturally relevant tasks and activities. The finding that the older siblings' efficient teaching strategies were related to the younger siblings' demand for learning underscores the bi-directional nature of learning in the sibling context, which is captured in the Vygotskian concept of apprenticeship (Rogoff, 1990; Wertsch, 1985). The greater familiarity between siblings not only facilitates the older child's teaching but also promotes the younger child's skill in eliciting concrete instructions from the experienced sibling, resulting in a more efficient process of guided participation.

The bi-directional nature of sibling interactions with its inherent asymmetry in the siblings' ages and cognitive skills may resemble the mother-child context in some aspects such as familiarity, mutuality, and tutor-tutee relationship. Mothers use various strategies to mediate between their young children and the environment: they focus the child's attention, imbue persons and processes with meaning, and foster the child's sense of competence, thereby supporting the child's cognitive development. Based on large cross-cultural studies of mother-child interactions in Western (US, Israel, Sweden) and non-western (Sri Lanka, Indonesia, Ethiopia, Zimbabwe) societies, Klein (1996; Klein and Aloni, 1993) has described the typical strategies mothers use while helping young children to master new tasks. These strategies appear to be universal and are found, in different manifestations, in both modern and traditional societies. These 'teaching' behaviours are considered to be 'mediators' of cognitive growth (Fuerstein *et al.*, 1980) as they are directed to enhance the child's attention to his surrounding, connect with the cultural meaning system, and facilitate learning within a cultural context. As compared to mediation in Western societies, which is more analytic, object oriented, and directed to the mastery of concrete tasks, learning in traditional societies is more holistic, person oriented, and often occurs without direct 'teaching' (Hundiede, 1996; Klein, 1996). However, mothers in Western and non-western cultures use similar strategies to mediate the meaning of environmental and cultural events to their young children. These strategies include focusing the infant's attention to a person, target, or event, maintaining the child's attention through amplifying the level of affect and arousal, fostering of a sense of competence in verbal and non-verbal communications, and regulating the learning process through demonstrations in actions and words. Finally, mothers naturally use the strategy of 'decontextualization', placing of the child's behaviour and experiences within a larger cultural meaning system. In non-western societies, mothers also employ the strategies of mocking, teasing, or half-laughing, which are used to maintain the infant's focus and augment arousal and affective intensity.

Several studies have demonstrated that maternal mediational strategies are related to children's cognitive development, but little data is available on the use of mediational techniques by older siblings. Klein and colleagues (1987) found that profiles of mediational behaviour during mother-infant toy interaction was stable across the first two years of life and predicted children's cognitive development at four years. Following intervention, where mothers were taught to increase the frequency of their mediation, infants scored higher on the mental scale of the Bayley (Klein and Alony, 1993), suggesting that these mediational strategies foster the development of cognitive skills in infants.

In this study we focused on mediation in the interactions between siblings. Older siblings aged five to six years were given four toys; two lotto games and two puzzles. For each game, there was a developmentally 'easy' game for

toddlers (e.g. lotto which required matching of identical pictures) and a 'difficult' one (lotto which required matching on the basis of classification, for instance, matching an apple with a pear). The older siblings were first introduced the new toys one by one and were subsequently asked to appraise how well their younger children will perform on each of these tasks. Following, the older children were instructed to 'teach' their younger siblings aged 2–3 how to 'play' these toys and their mediational behaviour during the teaching session was examined. During the toddler years children gradually shift from using the mother as their primary play-mate to using their elder siblings (Dunn *et al.*, 1998) and thus, we chose to examine teaching interactions between toddlers and their preschool-age siblings. Based on previous research demonstrating that older siblings observe and imitate the mother's interactive style (Dunn, 1988), we hypothesized that the mediating behaviours previously found during mother–child toy exploration (Klein, 1996), would also be observed in the teaching interactions between preschoolers and their toddler siblings. Similar to our previous findings for mother–child interactions (Klein *et al.*, 1987), we expected that the frequency of mediational behaviour in the older child's play will be related to the level of the younger child's success in performing the new tasks.

A second goal of this study was to examine the relations between the older sibling's perception of the younger child's performance, the younger child's actual performance, and the prevalence of mediating behaviour. We examined whether older siblings are capable of an accurate assessment of their younger siblings' performance and whether a more accurate appraisal would be associated with higher level of mediation. Relations between maternal ongoing assessment of the child's signals and children's representational abilities have been shown in studies of symbolic play in toddlers (Fiese, 1990; Melstein *et al.*, 1996; Slade, 1987). These are also in line with Vygotsky's (1978) predictions that the facilitation of cognitive development depends on a sensitive attunement between the older 'expert' appraisal of the potential and actual competencies of the novice learner. Finally, we examined gender differences in the preschoolers' moderation and in the toddlers' task performance.

## METHOD

### *Participants*

Participants were 40 sibling pairs. These included 40 toddlers aged 2–3 years ( $M=30.4$ ,  $S.D.=4.2$ ) and their 5–6 years old siblings ( $M=67.3$ ,  $S.D.=5.1$ ). All children came from intact families in households consisting of nuclear families only. The children were the first and second-born children in their families. Mothers were on average 31.2 years of age ( $S.D.=3.7$ ) and had completed 13.4 years of education ( $S.D.=2.0$ ) and fathers were on average 33.2 years of age ( $S.D.=4.1$ ) with mean years of education = 13.2 ( $S.D.=1.6$ ). All of the fathers and 72% of the mothers were employed at the time of visit in skilled or semi-skilled professions and all families were considered middle-class by Israeli standards (Harlap *et al.*, 1978).

Children were recruited from five kindergarten classes in the greater Tel-Aviv area, which served middle-class neighbourhoods. Firstborn preschoolers with younger siblings aged 2–3 years were identified by the teachers and letters were mailed to their parents. Ninety-two per cent of the families agreed to participate. Children and siblings attended the typical Israeli kindergarten and preschool setting operating between 8 AM and 1 PM. The children and their siblings were

selected to represent four balanced groups of gender. No significant differences were found between these four groups on any of the demographic variables.

### *Procedure*

Families were visited at home during the afternoon and early evening hours. Visits began with a training session for the older child alone with the experimenter. The training session lasted approximately 45 min. The older child was first given each of the four games to play alone. Following, the experimenter demonstrated the use of the four games to the older child and told him/her that after the training session he/she will present the toys to the younger sibling to complete. Following the training session, the older child was asked to estimate how well the younger child will perform on each of these games using the following three-point scale:

- 0 = the younger sibling will not succeed at all in completing the task.
- 1 = the younger sibling will succeed only with help from the older sibling.
- 2 = the younger child will be able to complete the task alone.

There were two lotto games and two puzzles, the first was considered developmentally easy for toddlers and the second was considered more difficult for this age group. Although toddlers may have not encountered these specific toys, these kinds of toys are familiar to Israeli children of middle-class backgrounds and are routinely available in preschools and kindergartens supervised by the Ministry of Education (from which the sample was drawn). The easy lotto game was a board with six large colourful pictures of objects familiar to the child (e.g. car). The child was given six separate cards and was asked to place each picture on top of the identical picture on the board. The difficult lotto required more than simple visual matching but matching on the basis of classification. The board included six pictures of objects (e.g. car, apple, ball) and children were required to match cards to the picture on the board if it belonged to the same category, e.g. an orange was to be matched with an apple. The easy puzzle included eight pieces, each representing a complete object that had to be placed on a wooden board. The difficult puzzle had a contour of one object. Sixteen separate pieces were given to the child to construct the object.

Following the older sibling's assessment he/she was told that the younger sibling will join him/her in playing these games. The older sibling was asked to teach and assist the younger brother/sister to complete these games if he/she felt the younger child is having difficulties in completing the task alone. Each game was given for 8 min. Interactions were videotaped for later coding.

### *Coding*

#### *Mediating Behaviours*

The frequency of mediating behaviours was coded from the videotapes using the observing mediational interaction (OMI) (Klein, 1997). A behaviour unit was first determined (a word, sentence, gesture), and then the coder determined whether it contained a mediational strategy, and of what type. Categories were not mutually exclusive, and a behaviour unit could contain two or more mediational elements. For instance, the older sibling can use both focusing and regulating behaviour in the same sentence (e.g. 'look, look here, see this round piece and

think where it goes'). The final score for each mediational behaviour was the frequency of its appearance throughout play.

The frequencies of the following five behavioural strategies were coded and the global mediation composite was the sum of these five behaviours.

*Focussing:* Directing the young child's attention to a target, person, or event through verbal or non-verbal behaviour.

*Amplifying Affect:* Maintaining and augmenting the child's attention by relating the object of attention to its special qualities and context in a way that imbues the target (object, person, event) with special meaning. This is often accomplished by raising the level of arousal by means of smiles, active body language, or change of intonation and exclamations.

*Regulating behaviour:* Laying the course of action required for optimal performance through verbal or non-verbal behaviour (e.g. placing four pieces in front of the child from the pile of puzzle pieces; Saying 'let's do this piece and then that piece'). Demonstrating a series of activities. Reminding the child of the sequencing of behaviour and commenting on wrong turns in the performance as they occur.

*Decontextualization;* Fostering the child's awareness to the similarities between the task at hand and other tasks in different situations familiar or unfamiliar to the child (e.g. 'this is like getting out the water in your tub') or pointing to the specific features of the performance process (e.g. 'you see, when you do this, pull the string, the bell moves and it rings'). Relating the child's actions to meaning systems in the child's culture (see these candles? We always light such candles this time of year).

*Fostering a sense of competence:* Verbal and non-verbal messages that communicate encouragement, satisfactions, and are directed to foster the child's feeling of self-efficacy. This may be accompanied by assessing the child's level of performance and explaining the course of action to accomplish goals (e.g. 'Good, you did this right because you put the red piece first').

*Negative feedback:* This behaviour is more frequent in non-western societies and refers to behaviours such as mocking, teasing, belittling (oh stupid! come on, do it right!), or name-calling. During negative feedback the general positive atmosphere of the interaction is often undisturbed. In this sample, none of the children used physically agnostic acts and negative feedback consisted of verbal criticism only. Critical words were generally used in combination with positive affect and in good humor and sometime with impatience but not in overtly mean-spirited or abusive tone. Once a behaviour was coded as negative feedback it was not coded as amplifying affect, as the latter was reserved for purely positive, affectionate interactions.

Two coders, trained to reliability with OMI coding, watched the videotapes and tallied the frequencies of each teaching strategy in the older sibling's behaviour throughout the teaching interaction.

Reliability analysis, conducted for 12 siblings pairs, averaged  $r = 0.92$  (range 0.89–0.94), yielding a  $kappa = 0.80$ . The global mediating behaviour score was the sum of all mediation behaviours.

### Task Performance

The younger sibling's performance on each of the four tasks was coded as follows:

0 = No performance, the child did not succeed in completing any portion of the task.

1 = Younger sibling completed a small portion of the task but most of the task was either completed by the older sibling or left undone.

2 = The task was completed approximately equally by the younger and older sibling with frequent moves of direct assistance, defined as the older siblings either directly tells the younger one what to do ('put this piece here') or does it for him/her.

3 = Younger sibling completed most of the task alone with or without indirect assistance. Indirect assistance was defined as assistance not involving demonstration or doing for the younger child including moves to enhance the younger child's motivation (e.g., 'you're almost done') or assist in the regulation of the performance process ('do this first and then that'). Minimal direct assistance was necessary.

4 = Younger sibling completed the task alone with or without indirect assistance.

Two coders scored the younger child's performance on each of the four tasks from the videotapes. Inter-rater reliability, computed for 12 pairs, was 94%, with  $kappa = 0.79$ . The younger sibling's performance on the four tasks was averaged into a composite termed task performance ( $alpha = 0.89$ ).

#### *Perceived Competence*

The older sibling's perception of the younger sibling's performance on the four tasks was similarly averaged into a composite termed perceived competence ( $alpha = 0.65$ ).

## RESULTS

### *Descriptive Statistics for Study Variables*

Descriptive statistics for the mediating behaviours, the younger child's task performance and the older sibling's perceived competence are presented in Table 1 according to the siblings' gender. The data presented in Table 1 indicate

Table 1. Descriptive statistics according to siblings' gender

	Older brother Younger brother		Older brother Younger sister		Older sister Younger brother		Older sister Younger sister		Range
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
Global mediation	58.7	29.3	29.7	18.1	47.8	31.09	42.3	23.6	4-125
Focusing	1.8	1.3	2.2	2.9	3.4	2.3	2.7	2.0	0-9
Amplifying affect	11.7	10.8	3.4	3.2	7.6	5.6	4.5	4.3	0-39
Regulating behaviour	25.0	13.3	16.0	9.8	23.0	10.3	22.1	13.1	4-59
Decontextualization	0.9	1.9	0.2	0.4	1.7	3.7	1.4	0.7	0-12
Fostering competence	10.2	6.5	4.3	4.5	9.9	8.2	8.1	8.9	0-40
Negative feedback	9.1	4.3	3.6	2.1	2.2	1.6	3.5	2.7	0-20
Perceived competence	1.2	0.3	1.3	0.5	1.4	0.4	1.3	0.5	0-2
Task performance	2.6	1.2	2.4	1.3	2.5	1.4	2.4	1.1	0-4

that children aged 5–6 years provided helpful guidance to their younger siblings by using mediational strategies in the teaching of new tasks.

To examine gender differences in mediation, a multivariate analysis of variance (MANOVA) with the older sibling's gender and younger sibling's gender as the between-subject factors was computed for the six mediational behaviours. A significant interaction effect was found;  $F(6, 31) = 3.35, p = 0.01$ . As seen from the means presented in Table 1, mediation was highest among older-brother-younger-brother pairs. Univariate analysis indicated significant interaction effects for amplifying affect;  $F(1, 36) = 6.36, p = 0.017$ , and for negative feedback;  $F(1, 36) = 10.42, p = 0.006$ . *Posthoc* analyses suggested that in the group consisting of a younger brother and an older brother both amplifying affect and negative feedback were significantly higher than in the other three groups. No gender differences were found for task performance and perceived competence. Taking into account power calculation in the analysis of variance (ANOVA), a sample size of 45 is sufficient for a medium effect-size and of 18 for a large effect-size when comparing differences between four groups (Cohen, 1992). Our sample of 40 should thus be sufficient, particularly when the interaction effect is significant at  $p = 0.01$ .

### *Correlates of Teaching Behaviours*

Correlations between global mediating behaviour and the six mediational behaviours with task performance and perceived competence are reported in Table 2.

As seen in Table 2, task performance was related to the frequency of mediating behaviour, particularly to amplifying affect, fostering competence, and negative feedback. Younger siblings who received more mediation during interactions with their older siblings performed better during the mastery of a novel task. Perceived competence was also related to mediation, specifically to amplifying affect, fostering competence, and negative feedback. The higher the older child's perception of the younger sibling's competence, the more mediation he/she used. Perceived competence was related to task performance,  $r = 0.30, p < 0.05$ , suggesting that preschoolers are able to appraise their younger siblings' actual level of performance. Still, the relatively low correlation suggests that preschoolers' judgement is not very reliable.

### *Predicting Task Performance*

In the final step, the relations between the younger child's task performance and the amount of mediating behaviours and perceived competence were examined

Table 2. Correlations between task performance and perceived competence with mediating behaviours

	Task performance	Perceived competence
Mediating behaviors	0.36*	0.35*
Focusing	0.14	0.21
Amplifying affect	0.35*	0.36*
Regulating behavior	0.11	0.14
Fostering competence	0.30*	0.33*
Decontextualization	0.07	0.10
Negative feedback	0.30*	0.34*

\*  $p < 0.05$ .

in a multiple regression equation. Because differences in the pattern of the correlations between mediating behaviours and task performance were not statistically significant for the easy and difficult tasks we used the composite which averaged children's behaviours and performances across all tasks. The younger siblings' age in months was entered in the first step and the older siblings' age in months was entered in the second step as covariates. Following, maternal education in years was entered as a potential covariate of cognitive abilities. Finally, perceived competence and the global mediating behaviours composite were entered.

Results of the regression equation, reported in Table 3, demonstrate that the older child's age in months, the frequency of mediating behaviours provided by the older sibling, and the level of perceived competence were each independently and meaningfully related to the younger sibling's performance on the four novel tasks. The frequency of mediating behaviours in the older sibling's play was predictive of the younger sibling's performance above and beyond the two children's ages, the mother's education, and the older child's perception of the younger sibling's abilities.

## DISCUSSION

Results of this study add to research on the unique contribution of the sibling relationship to development in general and to cognitive development in particular. Older siblings as young as five years were shown to use mediational strategies, previously observed in mother-child interactions across cultures (Klein, 1996), while presenting novel toys to their toddler siblings. The level of mediation observed in the older sibling's behaviour predicted the younger sibling's success in performing the task, suggesting that older siblings use mediation effectively to facilitate the younger children's comprehension and performance. Thus, in addition to the previously described contribution of the sibling context to the development of socialization, social cognition, friendship, and intimacy (e.g., Dunn, 1988; Hartup, 1989), the sibling relationship also seems to provide a natural setting for the practicing and mastering of new skills. Preschoolers were shown here to use the same strategies that mothers use in order to foster learning and mediate between toddlers and their environment. They attempted to focus the young children's attention, raise their level of affective involvement by imbuing activities with meaning, organize the learning process in sequential order, and promote the younger child's sense of competence

Table 3. Predicting younger siblings' task performance

	Beta	MR	Adj. R	R <sup>2</sup> change	F change
Younger child's age	0.25	0.30	0.03	0.06	2.03
Older child's age	0.32*	0.42	0.13	0.12	4.63*
Maternal education	0.15	0.42	0.11	0.00	0.04
Perceived competence	0.30*	0.52	0.18	0.09	4.23*
Mediating behaviors	0.37*	0.62	0.30	0.12	6.46*

R<sup>2</sup> total = 0.39; F (4, 34) = 4.24, p = 0.004

\*p < 0.05.

\*\*p < 0.01.

through encouragement. The findings also suggest that in settings where the learning process is more successful, more effective strategies of the older 'expert' were used. Thus, the findings are in line with research on mother-infant interactions, which point to the relations between mothers' use of various strategies that direct children's attention to the social and non-social environment and the child's cognitive competence, symbolic skills, mastery, and information processing (Feldman and Greenbaum, 1997; Feldman *et al.*, 1996; Fogel, 1993; Tamis-LaMonda and Bornstein, 1989). However, it is important to remember that these findings are correlational and do not imply causal relationships.

One difference between the mediation style of mothers, observed in previous research, and that of older siblings is the use of negative feedback. Middle-class Israeli mothers do not customarily use mocking, teasing, belittling, or name-calling while trying to teach their young children novel skills (Klein *et al.*, 1987). Older siblings, however, were found to use negative feedback and their use of such behaviour was positively related to task performance and perceived competence. The negative feedback described here does not imply physical aggression, explosion, or dysregulated behaviour, but consists of good-humoured criticism that maintains the general level of positive affect and friendship. The findings that negative feedback was related to perception of competence and task performance may be somewhat counter-intuitive. In natural observations of sibling interactions, Abramovitch and colleagues (1979) found that verbal and physical 'agonistic' behaviour is quite common among sibling pairs, particularly those separated by 2.5 years or more (as were most of our siblings). Negative feedback, criticism, name-calling, and ridiculing may afford young children a practice in the rough side of peer interactions within a relatively safe setting, thus preparing toddlers for social life in the group. The fact that negative feedback was related to higher perception of the younger child's competence suggests that older siblings may use negative feedback when they think positively of the younger child's capacities, perhaps as a benign motivating technique. Behaviours such as mocking and teasing are relatively common in traditional societies, such as Sri Lanka, Indonesia, Ethiopia or Zimbabwe (Klein, 1996). These forms of relatedness might have been lost in Western cultures as interactions between mothers and infants have become increasingly goal oriented but remained in the interactions between siblings and, as the present findings demonstrate, may contribute to learning and mastery.

An additional difference between the mediation found in our previous research on mother-infant interactions (Klein *et al.*, 1987) and the sibling relationship is the relatively low frequency of de-contextualization observed in siblings interactions. This strategy facilitates learning by transcending the immediate context and linking the skill and techniques learned in the present setting to other conditions or events. It appears that preschoolers use very little of this strategy, which calls for some form of abstraction. At 5–6 years children are still in a concrete representational stage (Piaget, 1952). Children at that age tend to focus on the here-and-now features of the situation and possibly, their ability to relate present tasks to past learning is limited. The findings that the older child's age had a unique contribution to the prediction of task performance may be interpreted in light of the shift from pre-operational to operational thinking that occurs between 5 and 6 years (Piaget, 1952). Possibly, at six years of age children are more competent at structuring, organizing, and moderating a novel learning situation for their toddler siblings as compared to five-year old preschoolers.

The highest level of mediation was found among dyads consisting of older brothers and younger brothers. Although this was not expressed in significant gender differences in task performance, examination of the means suggest that task performance was also highest in this group. Two mediational behaviours contributed to this finding, amplifying affect and Negative Feedback. Both the amplification of affect and the provision of good-humoured negative feedback serve to increase the level of affective arousal either by elaborating and increasing the level of positive affect, or by introducing shock and dissonance between the rough verbal criticism and its generally positive affective tone. Assessing the interactions of fathers and mothers with their five-month old sons and daughters (Feldman, in press) found that synchrony was highest in father-son dyads and that play contained quick shifts in arousal as well as high peaks of positive arousal. It is possible that techniques which increase the level of positive arousal during interactions between two close male partners, such as father and son or two brothers, serves to incorporate the male child's biological tendency to reach quick peaks of arousal (Osofsky and O'Connell, 1978) into the context of a shared play, and thus help maintain the young boy's focus and energy on the task at hand.

The relations found here between the mediational strategy of amplifying affect and task performance is consistent with both Vygotsky's (1978) cultural-historical perspective and the mediation perspective (Feurstein *et al.*, 1980). Hundeide (1996), examining the link between the two perspectives on the basis of his work with mediation strategies in Indonesia, suggests that establishing a meaning system for the young child is central to cognitive development. The provision of a meaning system is also the construct that integrates the Vygotskian and the mediational perspectives. This meaning system must be relevant to the child's cultural context, imbued with affect, and involve an interpersonal exchange to be effective. In infancy and early childhood, meaning systems are established by having an older member of a culture (mother, sibling) imbue the child's act with affect, intention, and meaning. The creation of a meaning system for the child's action is captured by the strategy of amplifying affect, which was found to be associated with task performance.

The amount of mediation older siblings provided was positively related to perceived competence, indicating that the more the older child perceived his younger sibling as competent the more he/she provided assistance and guidance. Yet, the unique contribution of mediation to the prediction of task performance suggests that these relations are not an artifact of the older child's favorable perception of the younger child's ability that may, in itself, provide a motivating force for better performance. The specific mediational strategies examined here probably act to regulate the learning process by focusing and providing affective meaning to the task, thereby uniquely contributing to performance and mastery.

Finally, because we were interested in the teaching behaviour of older sibling, the focus in this work was not on the behaviour of the younger children. This is clearly a limitation of the study, which should be addressed in future work. The ways by which younger siblings elicit specific mediational strategies and the relations between their request for guidance or control over the learning situation and the older child's mediation is an important topic for future research. It is also important to examine mediation in other close relationships, of mismatched or similar age. The mediation style of fathers and caretakers may resemble that of mothers yet differ in important ways. Similarly, best friends or peers may provide unique forms of mediation which should be examined in relation to sibling

interaction. Finally, the relation between the nature of the task, i.e. whether the task is primarily visual-motor, social, or linguistic, and the kind and amount of mediation it elicits requires further research in same-age dyads, sibling pairs, and adult-child interactions.

## ACKNOWLEDGEMENTS

This study was supported by the Macchado Foundation for the study of human modifiability. We thank the children who participated in the project.

## REFERENCES

- Abramovitch R, Corter C, Lando B. 1979. Sibling interaction in the home. *Child Development* **50**(4): 997-1003.
- Azmitia M, Hesser J. 1993. Why siblings are important agents of cognitive development: a comparison of siblings and peers. *Child Development* **64**(2): 430-444.
- Bjorklund DF, Frankel MT. 1989. *Sex Differences. Children Thinking, Developmental Function & Individual Differences*. Brooks/Cole: Pacific Grove, CA, Wadsworth: Belmont, CA.
- Cicirelli VG. 1975. Effects of mother and older sibling on the problem-solving behaviour of the younger child. *Developmental Psychology* **11**: 749-756.
- Cohen J. 1992. A power primer. *Psychological Bulletin* **112**: 155-159
- Cooper CR, St. John L. 1990. Children helping children in the family: Developmental perspectives on sibling relationships. In *Children Helping Children*, Foot HC, Morgan JJ, Shute RH. (eds.). Wiley: New York.
- Dunn J. 1983. Sibling relationships in early childhood. *Child Development* **54**(4): 787-811.
- Dunn J. 1988. *The beginnings of social understanding*. Harvard University Press: Cambridge, MA, USA.
- Dunn J, Crepes C, Brown J. 1998. Children's family relationships between two and five: Developmental changes and individual differences. *Social Development* **5**: 230-250.
- Dunn J, Kendrick C. 1982. *Sibling: Love, Envy, and Understanding*. Harvard University Press: Cambridge, MA.
- Feingold A. 1988. Cognitive gender differences in mathematics achievement, spatial visualization and affective factors. *American Educational Research Journal* **14**: 51-71.
- Feldman R. 2000. Infant-mother and infant-father synchrony: the co-regulation of positive arousal. *Infant Mental Health Journal* (in press).
- Feldman R, Greenbaum CW. 1997. Affect regulation and synchrony in mother-infant play as precursors to the development of symbolic competence. *Infant Mental Health Journal* **18**: 4-23.
- Feldman R, Greenbaum CW, Yirmiya N, Mayes LC. 1996. Relations between cyclicity and regulation in mother-infant interaction at 3 and 9 months and cognition at 2 years. *Journal of Applied Developmental Psychology* **17**: 347-365.
- Feurstein R, Rand Y, Hoffman MB, Miller R. 1980. *Instrumental Enrichment: An Intervention Program for Cognitive Modifiability*. University Park Press: Baltimore.
- Fiese BH. 1990. Playful relationships: A contextual analysis of mother-toddler interaction and symbolic play. *Child Development* **61**(5): 1648-1656.
- Fogel A. 1993. *Developing through relationships: Origins of communication, self and culture*. University of Chicago Press: Chicago.
- Harlap S, Davis AM, Grower MB, Prywes B. 1977. The Jerusalem perinatal study: the first decade (1964-1977). *Israel Medical Journal* **13**: 1073-1091.
- Hartup WW. 1989. Social relationships and their developmental significance. *American Psychologist* **44**: 120-126.
- Hundeide K. 1996. Facilitating cultural mediation: Indonesia. In *Early Intervention: Cross-Cultural Experiences with a Mediation Approach*, Klein PS. (ed.). Gerland: New York.
- Klein PS. 1996. *Early Intervention: Cross-Cultural Experiences with a Mediation Approach*. Gerland: New York.

- Klein PS, Alony S. 1993. Immediate and sustained effects of maternal mediation behaviours in infancy. *Journal of Early Intervention* 17(2): 177–193.
- Klein PS, Weider S, Greenspan SL. 1987. A theoretical overview and empirical study of mediated learning experience: prediction of preschool performance from mother–infant interaction patterns. *Infant Mental Health Journal* 8: 110–129.
- Linn MC, Peterson AC. 1985. Emergence and characterization of sex differences in spatial ability—a meta analysis. *Child Development* 56: 1479–1498.
- Melstein DA, Tamis LeMonda CS, Bornstein MH. 1996. Mother–child play: sequential interactions and the relations between maternal beliefs and behaviour. *Child Development* 67: 1752–1766.
- Osofsky JD, O'Connell EJ. 1977. Patterning of newborn behaviour in an urban population. *Child Development* 48: 532–536.
- Pepler DJ, Abramovitch R, Corter C. 1981. Sibling interaction in the home: a longitudinal study. *Child Development* 52: 1344–1347.
- Piaget J. 1952. *The Origins of Intelligence in Children*. International Universities Press: New York.
- Rogoff B. 1990. *Apprenticeship in Learning*. Harvard University Press: Cambridge, MA.
- Ruffman T, Perner J, Naito M, Parkin L, Clements WA. 1998. Older (but not younger) siblings facilitate false belief understanding. *Developmental Psychology* 34: 161–174.
- Sinna G. 1977. Sex differences in spatial ability in children: it's bearing on theories accounting for sex differences in spatial abilities in adults. *Unpublished Doctoral Dissertation*, University of Edinburgh.
- Slade A. 1987. A longitudinal study of maternal involvement and symbolic play during the toddler period. *Child Development* 58(2): 367–375.
- Vygotsky LS. 1978. *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press: Cambridge, MA.
- Tamis-LeMonda CS, Bornstein MH. 1989. Habituation and maternal encouragement of attention in infancy as predictors of toddler language, play, and representational competence. *Child Development* 60: 738–751.
- Weisner TS. 1989. Comparing sibling relationships across cultures. In *Sibling Interaction Cultures: Theoretical and Methodological Issues*, Zukow PW. (ed.). Springer: New York.
- Wertsch JV. 1985. *Vygotsky and the Social Formation of Mind*. Harvard University Press: Cambridge, MA.
- Youngblade LM, Dunn J. 1995. Individual differences in young children's pretend play with mother and siblings: links to relationships and understanding of other people's feelings and beliefs. *Child Development* 66(5): 1472–1492.