Research in Developmental Disabilities 95 (2019) 103497

Contents lists available at ScienceDirect

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

Mother-child and siblings' mediated learning strategies in families with and without children with intellectual disability

David Tzuriel[b,*], Dikla Hanuka-Levy[a,b]

[a] Gordon College of Education, Israel
[b] Bar Ilan University, Israel

ARTICLE INFO

Keywords:
Mediated learning strategies
Intellectual disability
Siblings' interaction
Cross-generation transmission
Mother-child interaction

ABSTRACT

The objectives of the research were to study differences in *Mediated Learning Experience* (MLE) strategies between mothers and their children in families with intellectually disabled and typically developing children and the cross-generation transmission of MLE strategies. Dyads of mother-child and siblings were observed interacting in free-play and teaching situations and their mediation strategies were analyzed by the *Observation of Mediation Interaction* scale. The child in the mother-child interaction was the older sibling in the siblings' interaction. Siblings samples were composed of two main groups: where the younger sibling (a) had an intellectual disability (ID, $n = 25$), or typically developing sibling dyads matched on (b) difference in mental age (TDM, $n = 25$) and (c) difference in chronological age (TDC, $n = 25$). The mediation strategies of older-younger siblings were compared to that of mother-child (with older sibling). The findings showed that siblings demonstrated higher level of MLE strategies than mothers in the ID group as compared with the two TD groups and that there is a cross-generation transmission of MLE strategies after controlling variables of group, mothers' years of education, level of occupation, and level of religiosity. The findings implications are related to the central role of siblings in families with a child with ID and working with families to enhance children's cognitive development.

1. Introduction

Mediated learning experience (MLE) strategies describe a special quality of interaction between a mediator and a learner (Feuerstein, Feuerstein, Falik, & Rand, 2002; Tzuriel & Caspi, 2017b; Tzuriel & Remer, 2018; Tzuriel & Shomron, 2018; Tzuriel, 2001, 2013). MLE interactions are defined as a process in which parents, substitute adults, siblings and peers interpose themselves between a set of stimuli and the human developing child and modify the stimuli so that it will be registered efficiently. In mediating the world of stimuli, mediators may use diverse strategies such as focusing, alerting attention, repeating, varying stimulus features, changing order, and relating new information to familiar contexts. Good mediators relate also to children's motivational aspects by arousing attention, curiosity, and vigilance, and providing meaning to neutral stimuli. Adequate mediation facilitates development of cognitive functions required and help in internalizing MLE processes. As children develop internalized self-mediation strategies, the mediators may gradually withdraw from learning situations and allow the learner more autonomy in implementing the acquired MLE strategies in new contexts. The internalized MLE processes allow children to benefit from novel learning experiences in diverse contexts and to modify their cognitive processes (Tzuriel, 2013).

* Corresponding author.
E-mail addresses: David.Tzuriel@biu.ac.il (D. Tzuriel), diklalevy80@gmail.com (D. Hanuka-Levy).

https://doi.org/10.1016/j.ridd.2019.103497
Received 17 December 2018; Received in revised form 6 September 2019; Accepted 12 September 2019
Available online 01 November 2019

Feuerstein's conceptualization of MLE strategies is in some respects like Vygotsky's (1978) concepts of the *zone of proximal development* and *internalization* and the concept of *scaffolding* (Wood, Bruner, & Ross, 1976). Such learning strategies have long captured the interest of educators and developmental psychologists and have been researched intensively (e.g., Kozulin, 2011; Lidz, 2002; Rogoff, 2003; Sameroff & MacKanzie, 2003; Stright, Herr, & Neitzel, 2009; Topping, 2001; Tzuriel, 2013; Tzuriel & Caspi, 2017b; Tzuriel & Hanuka-Levy, 2014; Tzuriel & Shomron, 2018; Tzuriel & Shamir, 2007; Valsiner, 1987; Wertsch, 1985).

MLE interaction is comprised of 12 strategies which were operationalized for research purpose. Lidz (2002, 2003) who developed the *Mediated Learning Experience Rating Scale* (MLERS), using all 12 criteria, applied it in parent-child and teacher-child interactions. She reported that it is more sensitive to quality than to quantity of mediation. In other studies, only five MLE criteria were operationalized and validated. In the current study we focus on the first five strategies which were studied extensively in samples of infants (e.g., Klein, 1996; Klein, Wieder, & Greenspan, 1987), kindergarten children (Tzuriel, 2013), learning disabled children (Tzuriel & Shomron, 2018), typically developing siblings (e.g., Klein, Zarur, & Feldman, 2003), intellectually disabled siblings (e.g., Tzuriel & Hanuka-Levy, 2014), and peers (e.g., Shamir & Tzuriel, 2004; Tzuriel & Caspi, 2017b; Tzuriel & Shamir, 2007). The MLE strategies, studied extensively in the literature (e.g., Tzuriel, 2013), are the focus of the current study and described in Appendix A.

1.1. Teaching behaviors among siblings

Early research with young children showed that already at the age of 7 years siblings can be efficient teachers and that they become even more efficient teachers in middle childhood and preadolescence years as their metacognitive skills become more developed (Cicirelli, 1995; Weisner, 1989). Maynard (2002) for example showed that older siblings in Maya culture learned how to adapt their teaching strategies to both the skill level of their young siblings and the type of task used. Their teaching strategies were characterized by "scaffolding" skills (e.g., use of talk with demonstration, evaluations, and explanations) and that they could adapt their communication to the developmental level of the young sibling (e.g., understanding child's perspective, provision of necessary information, direct instruction, decreasing of use of commands). Early research shows that older siblings serve as meaningful role models to their younger siblings, thus affecting their cognitive, social, and emotional development (e.g., Abramovitch, Stanhope, Pepler, & Corter, 1987; Azmitia & Hesser, 1993; Dunn & Kendrick, 1982; Lillard, 2018; Maynard, 2002; Meisner & Fisher, 1980; Montessori, 2004; Youngblade & Belsky, 1995).

Stoneman (2009) claimed that sibling interaction relies on adoption of asymmetric yet reciprocal roles (e.g., teacher *versus* learner) as well as on permitting practice of familiar roles yet allowing experimenting with novel skills. Abramovitch, Corter, Pepler, and Stanhope (1986) claim that older siblings are responsible for most of initiations of interactions whereas the younger children maintain interaction by responding positively to prosocial initiations but fall back on agonism when more positive approaches do not work. Over time, the rate of interaction increases, but the asymmetric pattern is stable throughout early and middle childhood. Similarly, in other studies it was reported that from about 14 months, younger children imitate their siblings more than they themselves are imitated (Dunn & Kendrick, 1982) and that over time, the rate of imitation in sibling dyads (especially in mixed-sex pairs) decreases markedly (Abramovitch et al., 1986).

Comparing siblings and peers Azmitia and Hesser (1993) found that siblings used more frequent spontaneous guidance and provided more positive feedback when interacting with their younger preschool siblings in a teaching situation than with peers. These teaching behaviors were related to the younger siblings' demands for explanation and requests to gain control over the performance. The young siblings' demands were expressed more frequently toward older siblings than toward peers. These findings suggest that sibling interactions provide a context for *guided participation* in learning activities (Vygotsky, 1978) between children of mismatched ages. In such dyads, the older child, who is more experienced, is more expert on various skills. Vygotsky's (1978) concept of *apprenticeship* is particularly meaningful in the present context. Apprenticeship, which describes learning that takes place during natural daily activities, is built on interactions between older and younger members of a cultural group where the older sibling 'scaffolds' the abilities of the younger during a shared performance (Montessori, 2012; Rogoff, 2003; Wertsch, 1985).

1.2. MLE interactions among siblings

Early studies on MLE strategies were carried out mainly on mother-child interactions (e.g., Klein et al., 1987; Tzuriel, 2001, 2013). These studies assume that the mother is the most meaningful figure for the child's cognitive development in the formative years. The findings in these studies strongly indicate that MLE interactions better explained the children's cognitive development than did distal factors, such as mother's socioeconomic status (SES) or intelligence (Tzuriel, 2001, 2011). Recently, there has been a growing interest in investigating the MLE processes among siblings within the family system (Klein et al., 2003; Tzuriel & Hanuka-Levy, 2014), as well as among peers (Shamir & Tzuriel, 2004; Tzuriel & Shamir, 2007).

Klein et al. (2003) reported that the most frequent MLE strategies observed in siblings' teaching interactions were regulation of behavior, that is, instructing verbally, or modeling the desired behavior nonverbally followed sporadically by mediation for feelings of competence (e.g., "you are doing well"). The authors reported also that two types of MLE strategies, previously found most predictive of children's cognitive development in mother-child interactions, were rarely found in the repertoire of siblings' teaching: (a) mediation for transcendence (e.g., expansion, "Where did we see this flower?'") and (b) feelings of competence, especially when followed by explanations or demonstrations clarifying what led to success (Klein & Alony, 1993). These findings indicate that the children are focusing on helping their younger sibling carry out the desired task rather than on long-term objectives, such as preparing them for better transfer of what was learned. The scarcity of transcendent explanations and encouragements may be related to the older siblings' (5- to 6-year-olds) relative difficulty in coping with abstract reasoning, including metacognitive understanding,

which may be required for mediation of transcendence. It is possible also that both regulation of behavior and encouraging, frequently found in siblings' teaching interactions, are probably easier to observe and imitate, within the context of parental mediation behavior, as compared with expansion, which is more abstract and removed from the immediate objective of any observed interaction (Klein et al., 2003).

In Tzuriel's studies (e.g., Tzuriel, 2013; Tzuriel & Caspi, 2017b; Tzuriel & Ernst, 1990; Tzuriel & Remer, 2018; Tzuriel & Shomron, 2018), the MLE interactions (dyads of mother-child, peers, teacher-child, grandmother-child) were videotaped during free-play or structured situations and analyzed later with the *Observation of Mediation Interaction* scale (OMI, Klein et al., 1987). Each dyad was videotaped in a familiar physical environment, such as child's kindergarten or home. In the free-play condition, which usually took 15 min, sets of games and play materials were placed on the table; and the dyad was asked to play together as they were used to doing at home. In the structured situation, which also took 15 min, the dyad was given problem-solving tasks, such as analogies. The more experienced person in the dyad (mother or older child) had to teach the younger child. The tasks were explained to the mediator before the videotaping session, but no directions were given as to how to teach the child.

1.2.1. MLE strategies in families with children with intellectual disability (ID)

Surprisingly, little research has examined the role of siblings in the development of a child with an intellectual disability (ID). Similarly, research on cross-generation transmission of teaching strategies is rare, especially comparative research of families with children with special needs. The focus of our study is on both differences in MLE strategies between parents and siblings and the cross-generational transmission of MLE strategies.

The existing studies find clear, asymmetric roles, with the child with ID taking on the role of the younger child in the pair, regardless of their birth-order position. This pattern is found in children with difficulties as diverse as Down syndrome (Abramovitch et al., 1987), cerebral palsy (Dallas, Stevenson, & McGurk, 1993), and autism (Knott, Lewis, & Williams, 2007). Children with disabilities are therefore able to participate in reciprocal interaction through a process in which the typically developing (TD) sibling 'scaffolds' and supports the interaction. Knott, Lewis, and Williams (1995) found greater levels of interaction and more complex bouts between children with learning disability than would be predicted based on previous studies on peer interactions.

Sibling interactions in families where the young child has ID have shown that the older TD siblings tend to take up the socializing role of a parent, teacher, or guide, whereas the young child adopts the role of the learner (Brody, Stoneman, Davis, & Crapps, 1991; Caro & Derevensky, 1997; Furman & Buhrmester, 1985; Gibbs, 1993; Knott et al., 1995; Stoneman & Brody, 1993; Stoneman, Brody, & Davis, 1989; Stoneman, 2009; Wilson, Blacher, & Baker, 1989). Stoneman et al. (1989) argue that although in TD siblings there is a tendency for asymmetrical relations to decrease with increase of age, in sibling pairs in which one of them has ID, the asymmetrical relations tend to increase with increasing age.

In a previous study on MLE strategies of siblings, an older child of a younger sibling with ID was compared with an older child of a TD young sibling (Tzuriel & Hanuka-Levy, 2014). The findings showed that the older siblings in the ID group showed higher MLE strategies than older siblings in the TD group. This finding was explained by the need of the older siblings to compensate for the difficulties of the younger siblings with ID to process information. They have probably developed sensitivity and awareness to the special needs of their younger siblings and therefore they spontaneously employed more frequently mediation strategies than their counterparts in the TD group. This finding is supported by earlier studies showing that siblings of children with ID tend to take on themselves the role of a helper or teacher, as compared with siblings of TD children (e.g., Gibbs, 1993; Stoneman et al., 1989).

In the current study, we use the siblings' sample of our earlier study but added a sample of their mothers as the focus is on both revealing differences between MLE strategies of mothers and siblings and investigating cross-generational transmission of MLE strategies.

1.2.2. Transmission of MLE strategies in a cross-generational perspective

The study of transmission of teaching strategies in a cross-generational perspective is a novel area of study (e.g., Gauvain, 2009; Feuerstein, 2002; Isman & Tzuriel, 2008, 2016; Neppl, Conger, Scaramella, & Ontai, 2009; Tzuriel & Caspi, 2017a). The mechanism of transmission of parents' mediation strategies is of importance as it may provide indications about children's learning processes. The bulk of research on intergenerational transmission of parenting behavior has been on child-rearing practices (e.g., Capaldi, Pears, Patterson, & Owen, 2003; Chen & Kaplan, 2001; Kovan, Chung, & Sroufe, 2009), especially on abusive behavior and harsh parenting practices (e.g., Conger, Neppl, Kim, & Scaramella, 2003; Wang, Xing, & Zhao, 2014). The findings showed impressive continuity of parenting despite use of different parenting measures, ages and methods. Kovan et al. (2009), for example, showed in a longitudinal study that parenting-quality was stable ($r = .43$) across generations even after controlling for socioeconomic status (SES), stressful life events and IQ of first and second generations. Research on cross-generation of MLE strategies *is rare especially comparative research of families with children with special needs.* Our study, which is the first known study on that topic, is of importance as it can shed light on family teaching dynamics. Siblings often act as surrogate parents and informal teachers (e.g., Davidoff, 2006; Lobato, 1990). The potent effect of MLE strategies on cognitive development and learning potential of children with ID has been shown in many studies (e.g., Feuerstein et al., 2002; Feuerstein, Rand, & Rynders, 1988; Tzuriel, 2013). Moreover, the sibling relationship represents a powerful human bond.

The current study is based on the sample of the earlier study on siblings' mediation (Tzuriel & Hanuka-Levy, 2014). However, in the current study we added the sample of the mothers interacting with the older siblings. The research goals were as follows: (a) to study the differences between mother-child MLE strategies among families with ID and families with two types of TD children: TD sibling dyads matched on difference in mental age (TDM, $n = 25$) and difference in chronological age (TDC, $n = 25$). (b) To study the differences between mother-child and siblings' MLE strategies in families with ID and families with TDM and TDC. (c) To study the

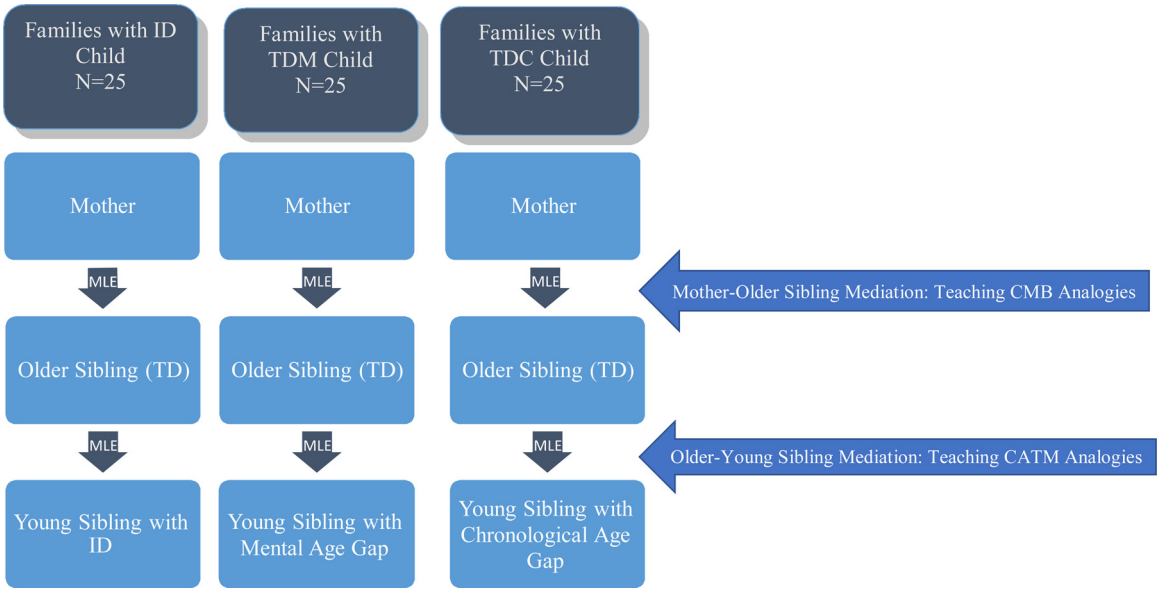

Fig. 1. The Design of the Study. *Note.* ID = intellectual disability; TD = typically developing; TDM = typically developing children with similar mental-age gap; TDC = typically developing children with similar chronological-age gaps; CMB = Cognitive Modifiability Battery; CATM = Children's Analogical Thinking Modifiability.

cross-generational transmission of MLE strategies in the whole sample. Four questions guided our investigation:

(a) Are there differences between mothers' and children's mediation strategies? We assumed, on one hand, that mothers, because of their rich experience, will show higher mediation than their children. On the other hand, because siblings are closer in age, they might demonstrate higher level of mediation in their interaction than their mothers. One of the arguments in the MLE theory is that mediation depends on the cognitive level and the specific needs of the learner (Feuerstein et al., 2002; Tzuriel & Hanuka-Levy, 2014). We assume therefore that mediation of older children to their young siblings (with ID) is higher than that demonstrated by their mothers (with older sibling). The reason is that the older siblings spontaneously adjust their mediation strategies when interacting with their siblings with an ID. In contrast, mothers mediating to their children (i.e., older sibling who is typically developing child), do not have to make such adjustments and therefore will show relatively less mediation strategies than the older sibling.
(b) Does the fact that there is a child with ID in the family affects the mothers' mediation strategies with their TD children? In other words, will mothers in families with an ID child show higher level of mediation than mothers in TD children? Our assumption is that existence of a child with ID in the family affects mothers' mediation strategies so that they use more frequently MLE strategies with their children than mothers of TD children. The rationale for this assumption is that exposure of children to patterns of MLE strategies within the family with an ID child raise the sensitivity and awareness to the needs to apply MLE strategies in their interactions with all children in the family.
(c) Is there a cross-generational transmission of mediation strategies? Our assumption was that basically we will find a cross-generational transmission of MLE strategies.

To study our assumptions, we designed a study where we could compare mother-child mediation with siblings' mediation (see Fig. 1).

As can be seen in Fig. 1, in three groups (ID, TDM and TDC) mother-child mediation was observed with the older sibling. The difference between the three groups is that in the ID group the older sibling is mediating to a young sibling with ID. In the first comparison group (TDM group) the older sibling is mediating to a young TD sibling with a mental age difference. In the second comparison group (TDC group) the older sibling is mediating to a young TD sibling with a chronological age difference (See Table 1 below). In that context, we assume that in the ID group the mothers will show higher MLE strategies than mothers in families with TDM and TDC children. The rationale for this assumption is that exposure of children to patterns of MLE strategies within the family with an ID child raise the sensitivity and awareness to the needs to apply MLE strategies in their interactions with all children in the family.

Table 1
Age and Gender Characteristics of the Sample (ID = intellectually disabled, TDM = typically developing, mental age match, TDC = typically developing, chronological age match).

Group	Older Siblings	Young Siblings	Gender of Older Sibling	Gender Balance Old/Young
ID (n = 25)	10:6—14 Yrs. M = 12:1	6:6—11:6 Yrs. M = 8:4	Boys (n = 11) Girls (n = 14)	Boy/Boy = 6 Boy/Girl = 5 Girl/Girl = 6 Girl/Boy = 8
TDM (n = 25)	10:6—14 Yrs. M = 12:0	3:6—6 Yrs. M = 4:10	Boys (n = 9) Girls (n = 16)	Boy/Boy = 3 Boy/Girl = 6 Girl/Girl = 8 Girl/Boy = 8
TDC (n = 25)	10:6—14 Yrs. M = 11:9	7—11 Yrs. M = 8:3	Boys (n = 12) Girls (n = 13)	Boy/Boy = 6 Boy/Girl = 6 Girl/Girl = 10 Girl/Boy = 3
	$F_{(2,\ 72)} = .43$, *ns*	$t_{(48)} = 1.13$, ns[a]	$\chi^2_{(2)} = .76$, *ns*	$\chi^2_{(6)} = 4.95$, *ns*

Copied by permission from Tzuriel and Hanuka-Levy (2014). Siblings' mediated learning strategies in families with and without children with intellectual disabilities. *American Journal on Intellectual and Developmental Disabilities, 119, 565-588.* DOI: 10.1352/1944-7558-119.6.565.

[a] The *t*-test was carried out between the ID and TDC groups.

2. Method

2.1. Sample

2.1.1. Children's sample

The sample was composed of dyads of siblings (n = 75) and dyads of mother-child (n = 75); the older sibling was the child in the mother-child dyad. The sample was recruited during 2010–2012. The siblings' sample was divided into three groups, 25 dyads of older-younger siblings in each. In the first group, the younger siblings were children with ID and the older siblings were TD. In the first comparison group, the mental-age gap between dyads of siblings is equivalent to the mental-age gap between dyads where the younger sibling is a child with ID (TDM group). In the second comparison group, the chronological gap between dyads of siblings is equivalent to the chronological-age difference between dyads where the younger sibling is a child with ID (TDC group). The mental-age difference was based on instruction of the Institute for Child Development (in a central Israeli hospital) for estimation of mental age of children with mild intellectual disability. The formula of mental age of the young sibling in the TDM group was: (Chronological Age [years] of Young Sibling in ID Group/2) + 6 Months.

In all groups, the older sibling was the mediator and the younger sibling was the learner. The goal was to study mediation patterns in dyads in which the younger siblings were children with ID, as compared with dyads in which the younger siblings are TD; therefore, we asked to what degree differences in mediation patterns may be attributed to the lower mental age levels of younger siblings with ID.

The rationale for including two comparison groups is as follows. If we would choose only a comparison group of TD siblings with similar chronological-age difference (i.e., TDC), one could attribute differences in mediation pattern to the mental-age difference and not necessarily to the intellectual disability of the ID group. On the other hand, if we would choose only a comparison group of TD siblings with similar mental-age difference (i.e., TDM) one could attribute differences in mediation pattern to the chronological-age gap and not necessarily to the intellectual disability of the ID group. It was necessary, therefore, to use both comparison groups to focus on the effects of ID as a major determinant of sibling mediation pattern.

The age range of the older siblings in all groups was similar, but different from that of the younger siblings (see Table 1). In the TDM comparison group the average younger sibling age was about one-half of the age of the younger siblings in the ID group, whereas in the TDC group the chronological age was comparable. For each dyad in the ID group we matched a dyad in the comparison groups based on the siblings' age gap and gender. As can be seen in Table 1, no significant group differences were found on age and gender composition.

The selection of children with ID was done with the cooperation of the Ministry of Education and organizations serving children with ID. In the first step, we approached 27 schools and voluntary organizations of special education across Israel serving children with ID and with higher functioning abilities. After identifying the appropriate children in each school based on age and gender characteristics, we approached their parents with a letter explaining the goals of the study followed with a personal telephone call.

Out of 90 children whose characteristics fit the requirements of the study (age of siblings and gender) only 25 families gave consent to participate in the study. The reasons for refusal were lack of time (e.g., parents are working late) and concern about exposure (this concern was given despite promise of confidentiality and use of observations only for research purposes). Thus, the final sample was composed of 25 children with ID who have an older sibling. The range of their IQs, based on *Wechsler Intelligence Scale for Children-Revised* (WISC-R) scores obtained from school records, was between 55 and 69 ($M = 63$, $SD = 8.50$).

The comparison TDM and TDC groups were selected from 10 schools in the central part of Israel. The schools' principals were assured that the observations would be carried out at the homes of participants and not in the schools. As a result, we approached 300

families, out of which 240 families agreed to participate. From the 240 families, 50 families were selected, 25 based on pair-matching to the chronological-age difference of the pairs of siblings with ID (TDC group), and 25 on the basis of pair-matching to the mental-age difference of the pairs of siblings with ID (TDM group). In addition, in each group the gender and age of siblings were counterbalanced (see Table 1). A short screening interview of parents and teachers revealed that none of the TD children had any diagnosed learning disability or learning delay.

For the younger siblings in the ID group, 72% had Down syndrome and 28% had ID of undetermined etiology. Preliminary analyses failed to show any significant differences in mediation strategies between children with Down syndrome and those with ID of unknown etiology in both free-play, $F_{(1, 19)} = 2.53$, *ns*, and structured situations, $F_{(1, 19)} = 1.30$, $p > .05$. We decided therefore in further analyses to combine the two subgroups. Children were drawn only from families with no (obvious) health problems.

2.1.2. Mothers' sample

The age of mothers in the ID, TDM and TDC groups was 38.5, 37.6 and 38.3, respectively; no significant differences ($p > .05$) were found for mothers' age. Mothers' education level showed that number of mothers graduating high-school versus university level was as follows: ID group - 9 and 16, respectively, TDM group – 10 and 15, respectively, TDC group – 10 and 15, respectively. No significant differences were found for mothers' education level, $\chi^2_{(3, 75)} = 0.11$, $p > .05$. The occupation level of mothers based on a scale from 1 (e.g., janitor, unemployed) to 5 (e.g., academician, manager) however showed significant differences, $\chi^2_{(4, 75)} = 2.31$, $p > .05$. More mothers with low level professions were in the ID group than in the other two groups. The religiosity level of mothers was measured on a 3-levels scale: Religious (1), traditional (2) and secular (3). This variable was found in another study as significant in predicting cross-generational transmission of MLE strategies (Isman & Tzuriel, 2016). No significant differences were found between the three groups on religiosity level, $\chi^2_{(3, 75)} = 1.13$, $p > .05$.

2.2. Measures

2.2.1. Observation of mediation interaction (OMI)

The *OMI* was originally developed for observation of parent-child mediated learning interactions at infancy (Klein et al., 1987; Klein, 1996) and later adapted for observation of parent-child interactions of kindergarten and school age children (Isman & Tzuriel, 2007, 2008; Tzuriel, 2013; Tzuriel & Caspi, 2017a, 2017b; Tzuriel & Eran, 1990; Tzuriel & Ernst, 1990; Tzuriel & Shomron, 2018; Tzuriel & Weiss, 1998), peer-mediation with school-age children (e.g., Shamir & Tzuriel, 2004; Tzuriel & Shamir, 2007), and teacher-child interactions (Tzuriel & Remer, 2018; Tzuriel, Kaniel, Zeliger, Friedman, & Haywood, 1998; Tzuriel, 2001).

The OMI is based on five behavioral categories that represent the five MLE strategies: Intentionality and Reciprocity (Focusing), Meaning (affect), Transcendence (expanding), Feelings of Competence (rewarding), and Regulation of Behavior. Each mediation strategy had been operationalized in terms of mutually exclusive specific behaviors as shown in Appendix A.

One of the basic assumptions behind the OMI is that observation of MLE processes in a familiar physical environment context reflects the spontaneous MLE processes at home. This assumption has been supported in several studies (e.g., Klein, 1996; Klein & Alony, 1993). In the present study, MLE interactions were sampled in two distinct situations: free-play and structured. These contexts were thought to represent typical and major parent-child interactions (Tzuriel, 2013). A similar distinction between these two contexts has been made earlier by others (e.g., Valsiner, 1987; van Geert, 1994; Vygotsky, 1978; Wertsch, 1985).

The reliability of the MLE interaction scores was tested in the current study by two experienced raters who were blind to the study hypotheses. The raters were trained for about 25 h how to observe and code the different behavioral categories of each MLE strategy. The inter-rater reliability was carried out by Pearson correlations on a subsample of children ($n = 10$). The correlations were between 0.77 and 0.97 for the various MLE strategies. The interrater reliability of the OMI was established previously on different samples of infants (e.g., Klein et al., 1987). Interrater reliabilities in different infant studies ranged between 0.62 and .92. Interrater reliabilities of mother-child interactions using samples of kindergarten and school-age children ranged between 0.54 and 0.95 for different MLE strategies (e.g., Isman & Tzuriel, 2007; Tzuriel, 2013; Tzuriel & Caspi, 2017b; Tzuriel & Eran, 1990; Tzuriel & Ernst, 1990; Tzuriel & Weiss, 1998). Interrater reliabilities were found to range between 0.85 and 0.95 for the different strategies of peer-mediation (Shamir & Tzuriel, 2004; Shamir, Tzuriel, & Rozen, 2006; Shamir, Tzuriel, & Guy, 2007; Tzuriel & Caspi, 2017b; Tzuriel & Shamir, 2007).

2.3. Procedure

Each pair of mother-child and of siblings participated in two interaction situations, free-play and structured, each condition sampling a different interactional situation. The free-play and structured situations, each lasting for 10 min, were given in that order. In both situations, the mediator (i.e., mother or older sibling) was asked to take the leading role of teaching or playing with the learner. Both sessions, carried out at the children's homes, allowed observation of mediation processes across different typical situations.

2.3.1. Free play situation

In the free-play situation, mothers were asked to play with their child (older sibling) using games and play materials that were placed on a table (e.g., puzzles, Tricky Fingers, mazes, completion of face drawings). Similarly, the older siblings were asked to play with their younger siblings using compatible games and play materials. Based on a pilot study on games level appropriate for each group, similar type of games was used for the mother-child and for siblings' interactions as well as for the three groups, with adjustment to the learner's age level. Each dyad of mother-child and of siblings was told that the goal of the study was "to explore

how mothers (siblings) play and learn together." The mothers (siblings) were instructed before the interaction to play with their children as they are used to playing every day at home.

2.3.2. Structured situation

In the structured situation, the mothers were asked to teach their children analogies from the *Analogies Subtest* of the *Cognitive Modifiability Battery* (CMB, Tzuriel, 2000). The Analogies Subtest is constructed of a wooden plate with four squared "windows" arranged in a 2 × 2 pattern, a set of 64 colored blocks, and a series of analogy problems. The mother places blocks in three of the open "windows" on the plate and asks the child to complete the analogy in the last open "window," which always is to the bottom right of the plate. All analogies are based on four dimensions: Color, height, number, and position. The problems require cognitive functions such as simultaneous consideration of the four dimensions, systematic exploratory behavior, use of high-order concepts, anticipatory verbalization, control of impulsivity, need for precision and use of transformational rules. In the current study, we used six problems. Before the interaction with her child, each mother was instructed on how to solve the analogies and practiced five problems of different difficulty level. No instruction however was given as to *how* to teach the child.

The older siblings were asked to teach their younger siblings two analogical problems from the *Children's Analogical Thinking Modifiability* (CATM) test (Tzuriel & Klein, 1985, 1990). *The CATM was used in the current study only as a tool for teaching of analogies by older siblings.* The CATM is composed of 18 blocks divided to three dimensions (color, size, and shape). In each problem, three blocks are presented horizontally, and the learner is asked to compare the first two blocks (A : B) and find which block should be placed to match the third one (C : D). The problems require simultaneous consideration of the three dimensions, systematic exploratory behavior, use of high-order concepts, anticipatory verbalization as a self-guide, sorting out irrelevant dimensions, control of impulsivity, and need for precision and accuracy. Before the siblings' interaction, each older sibling was familiarized with the blocks' dimensions, was instructed on how to solve the analogies and practiced five problems of different difficulty level. No instruction however was given as to *how* to teach the younger sibling. We chose two different instruments of analogies (for mother-child and for siblings) to avoid repetition of experience for the older siblings, but also to equalize the two interaction situations; solving problems requiring analogical reasoning.

This context of observation (i.e., home) allows conditions of familiarity and enables better cooperation and smoothness of data gathering procedures. The video camera was placed in a static position, in a corner of the living room and was focused on a prearranged area of a table and two chairs, where the dyads were invited to sit and interact. The structured situation was given after the free-play situation to control for possible effects of the structured situation on the mediators' behavior in the free-play situation. This predetermined order was done to control for implicit and explicit expectations created during the structured situation, and possibly for carrying on and transferring mediation strategies used during the problem-solving activity (structured) to the free-play situation.

3. Results

In the following sections, we present (a) the differences in MLE strategies between mothers (interacting with older sibling) and older siblings (interacting with younger siblings) in families with ID and families with TD children, (b) the cross-generational transmission of MLE strategies in the whole sample as well as in each of the ID and TD groups.

3.1. Mother-child and siblings' MLE strategies among ID, TDM, and TDC groups

To examine whether we need separate analyses for the free-play and structured conditions we carried out canonical correlations between MLE strategies of both conditions. The findings reveal high to medium correlations between the two conditions for both, mother-older sibling, Rc = .62, $p < .001$, and for siblings, Rc = .75, $p < .001$. It was decided therefore to compile the MLE strategies in the structured and the free-play situations.

3.1.1. Differences between mothers' and siblings' MLE strategies in each of the ID, TDM and TDC groups

The means and standard deviations of MLE strategies of mothers and siblings in each group are presented in Table 2.

To examine the differences in MLE strategies between mothers (interacting with older sibling) and siblings (interacting with younger sibling) we applied MANOVA of Mediation Agent (Mother/Sibling) by Group (2 × 3) with MLE strategies as dependent variables.

The MANOVA findings reveal significant main effect for Mediation Agent (mothers/siblings), $F_{(10,138)} = 6.27$, $p < 0.001$, $\eta^2 = .31$, indicating higher level of mediation for siblings than for mothers. Further analyses showed that the differences were uniquely derived from each of the MLE strategies: Intentionality and Reciprocity, $F_(1,72) = 6.30$, $p < 0.05$, $\eta_p^2 = .08$; Meaning, $F_(1,72) = 32.45$, $p < 0.001$, $\eta_p^2 = .31$; Transcendence, $F_(1,72) = 9.90$, $p < .01$, $\eta_p^2 = .12$; Feelings of Competence, $F_(1,72) = 47.97$, $p < 0.001$, $\eta_p^2 = .40$; Regulation of Behavior, $F_(1,72) = 19.36$, $p < 0.001$, $\eta_p^2 = .21$. The findings revealed also a significant overall interaction of Mediator by Group, $F_{(10,138)} = .35$, $p < 0.001$, $\eta_p^2 = .41$. A similar covariance analysis with mother's years of education, occupation level and religiosity level showed similar significant main effects and interaction. To examine which of the specific MLE strategies contribute to the overall interaction we conducted univariate analysis for each MLE strategy (see Table 2). The findings in Table 2 show that the overall interaction derives from 4 out of 5 MLE strategies: Intentionality and Reciprocity, Meaning, Feelings of Competence, and Regulation of Behavior. The interactions are presented in Fig. 2.

As can be seen in Fig. 2, group differences in the mothers' group are small and negligible as compared with distinctive group

Table 2
Means, Standard Deviations and F Statistics of MLE Strategies for Mothers and Siblings in the ID, TDM and TDC Groups (ID = intellectually disabled, TDM = typically developing, mental age match, TDC = typically developing, chronological age match).

MLE Strategy		ID		TDM		TDC		Mediator X Group	
		Mother	Sibling	Mother	Sibling	Mother	Sibling	F(2,72)	η^2
Intentionality & Reciprocity	M	43.64	67.12	44.72	50.12	45.76	35.52	15.41***	.30
	SD	13.11	19.83	15.65	16.33	14.31	9.94		
Meaning	M	8.44	31.68	7.44	16.68	7.28	4.08	19.87***	.36
	SD	5.64	15.20	5.29	18.26	5.10	2.78		
Transcendence	M	3.48	5.64	5.08	6.92	5.12	7.24	.02	.00
	SD	2.60	3.40	4.41	5.50	4.31	5.93		
Feelings of Competence	M	18.12	53.44	19.76	25.76	17.32	15.64	34.92***	.49
	SD	12.00	19.49	10.71	10.77	12.42	7.61		
Regulation of Behavior	M	39.16	75.84	39.40	42.80	40.00	30.92	33.82***	.48
	SD	17.01	16.86	21.19	15.21	13.84	12.75		

*** $p < .001$.

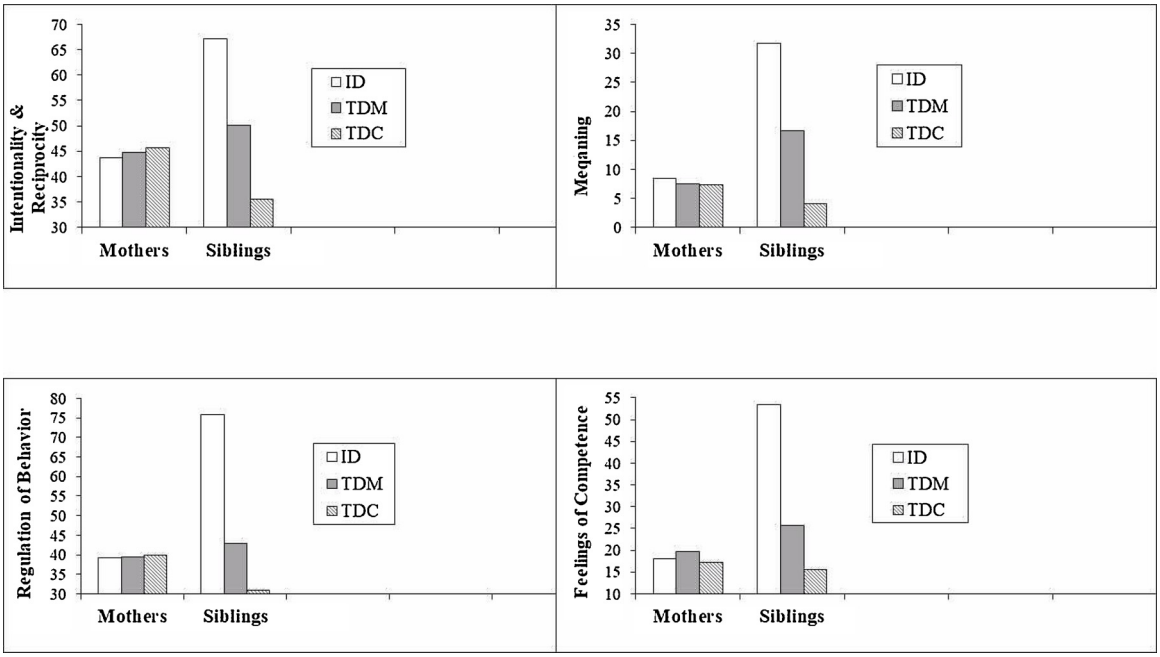

Fig. 2. MLE Strategies of Mothers and Siblings in the ID, TDM, and TDC Groups. *Note:* ID = intellectual disability; TD = typically developing; TDM = typically developing children with similar mental-age gaps; TDC = typically developing children with similar chronological-age gaps.

differences in the siblings' group. Comparison of groups in both the mothers' sample and in the siblings' sample was carried out by Scheffe analyses (see Table 3).

Table 3 shows very clearly that group differences in all MLE strategies were found only in the siblings' group.

3.1.2. Differences between mothers and siblings' MLE strategies in each of the ID, TDM and TDC groups

Comparison of mothers' and siblings' MLE strategies in each of the ID, TDM and TDC groups are presented in Table 4.

Table 3
Scheffe Analyses of MLE Strategies among Groups (ID, TDM, TDC) in Mothers and Siblings Samples.

MLE Strategy	Mothers F(2,72)		Siblings F(2,72)	
Intentionality and Reciprocity	.14	ID = TDM = TDC	24.40***	ID > TDM > TDC
Meaning	.35	ID = TDM = TDC	25.02***	ID > TDM > TDC
Feelings of Competence	.28	ID = TDM = TDC	51.90***	ID > TDM > TDC
Regulation of Behavior	.02	ID = TDM = TDC	61.94***	ID > TDM > TDC

*** $p < .001$.

Table 4
Univariate Analyses of Differences in MLE Strategies between Mothers (M) and Siblings (S) in the ID, TDM and TDC Groups (ID = intellectually disabled, TDM = typically developing, mental age match, TDC = typically developing, chronological age match; M-S = Mother-Sibling).

	ID			TDM			TDC		
MLE Strategy	F(1,24)	η^2	M-S	F(1,24)	η^2	M-S	F(1,24)	η^2	M-S
Intentionality and Reciprocity	24.14***	.50	M < S	1.21	.04	M = S	12.77**	.35	M > S
Meaning	49.40***	.67	M < S	6.06*	.20	M < S	7.33*	.23	M > S
Transcendence	.49	.02	M = S	.13	.00	M = S	.41	.00	M = S
Feelings of Competence	61.65***	.72	M < S	5.31*	.18	M < S	.49	.02	M = S
Regulation of Behavior	91.12***	.79	M < S	0.42	.02	M = S	11.03**	.32	M > S

* $p < .05$.
** $p < 0.01$.
*** $p < .001$.

The findings in Table 4 present a very interesting pattern of differences across the three groups. Mediation for transcendence was about equal for both mothers and siblings in all groups. In the ID group mothers showed lower mediation than siblings in 4 out of 5 MLE strategies. In contrast, in TDC group mothers showed higher mediation than siblings; it was significant in 3 out of 5 strategies (i.e., Intentionality and Reciprocity, Meaning, Regulation of Behavior). In the TDM group mothers showed lower mediation strategies than siblings in 2 out of 5 MLE strategies (Meaning and Feelings of Competence)

In summary, older siblings demonstrate higher level of mediation than mothers in each of the MLE strategies. Mediator by Group interactions indicate, (except for mediation for Transcendence), that siblings in the ID group demonstrated significantly higher mediation than siblings in TD groups. Similarly, in the TDM group siblings showed higher mediation on strategies of Meaning and Feelings of Competence than their mothers. In contrast, in the TDC group mothers showed higher level of mediation than siblings on strategies of Intentionality and Reciprocity, Meaning and Self-Regulation. Mothers in all groups showed the same level of mediation for Transcendence.

3.2. Cross-generational transmission of MLE strategies

The cross-generational transmission of MLE strategies was analyzed by a hierarchical regression analysis where siblings' MLE Strategies was predicted by mothers' MLE strategies.

For the hierarchical regression analysis, we used a composite index of *quality of mediation* (QMI) develop by Tzuriel and Caspi (2017b). Since each strategy was found in earlier studies to have differential significance in predicting cognitive modifiability (e.g., Tzuriel, 2013) a simple average of the criteria would cause a bias. To construct the QMI we asked five clinicians with expertise in use of the MLE approach to rate each of the MLE strategies for their contribution to children's cognitive modifiability. Each of the clinicians had at least 15 years of clinical and research experience. Ratings were on a Likert-type scale from Low Prediction (1) to High Prediction (5). Interclass correlation showed an inter-rater reliability coefficient of .83. The average weighted score for the different MLE strategies were as followed: Intentionality and reciprocity (I), 1.60; meaning (M), 2.60; feelings of competence (C), 3.06; regulation of behavior (B), 3.20; transcendence (T), 3.60. The QMI was finally computed by multiplying the MLE score of each criterion by the weighted score and dividing it by the total MLE score. The computation is carried out by the following equation:

$$\mathbf{QMI} = \frac{\Sigma(\mathrm{I}\times 1.60 + \mathrm{M}\times 2.60 + \mathrm{C}\times 3.06 + \mathrm{B}\times 3.20 + \mathrm{T}\times 3.60)}{\Sigma(\mathrm{I}+ \mathrm{M}+ \mathrm{C}+ \mathrm{B}+\mathrm{T})}$$

The division of the multiplied weighted score by the total sum of MLE scores enables the construction of an index that expresses the quality of mediation relative to its contribution to cognitive modifiability while controlling for mediation in each MLE strategy.

To study the prediction of siblings' QMI by mothers' QMI, we applied a two-step hierarchical regression analysis where the criterion variable was the older sibling's QMI. In step-I we entered the group belonging and three demographic variables to control for their possible effects on mediation. For the group belonging variable we assigned all TD children to one group (2) as compared to children in the ID group (1). The three demographic variables were mother's level of occupation (sorted from low [1] to high [5]), years of education, and religiosity level. These variables were found in previous research to influence mother-child MLE strategies (e.g., Isman & Tzuriel, 2016; Tzuriel, 2013). In step II the variable of mothers' QMI was entered. The findings, presented in Table 5, indicate clearly that the QMI of the mother significantly predicted the QMI of siblings beyond the variance contributed by other variables, especially the variable of Group.

4. Discussion

The findings showed in the whole sample that siblings demonstrated higher level of MLE strategies than mothers and that the differences were uniquely contributed by each of the MLE strategies. This finding, however, was modified by the significant interaction of Mediation Agent and Group. The interaction indicates that the group differences derive mainly from the mediation in the ID group. Siblings in the ID group showed much higher mediation than their mothers (see Table 4 and Fig. 2). This finding may be explained by the fact that the subject of mediation was different in the mothers-child dyads and the siblings' dyads. Mothers in all

Table 5
Hierarchical Regression Analysis of Siblings' QMI by Group, Mothers' Years of Education, Occupation Level, and Religiosity Level (Step I), and Mothers' QMI (Step II). QMI = Quality of Mediation Index.

Step	Variable	β	t
1	Mothers' Years of Education	−.05	−.51
	Mothers' Occupation Level	−.13	−1.44
	Mothers' Religiosity Level	.06	.66
	Group	−.69	−7.74***
$F(469) = 20.29, p < .0001$ $R^2 = .54$			
2	Mothers' Years of Education	−.07	−.77
	Mothers' Occupation Level	-/13	−1.49
	Mothers' Religiosity Level	.03	.39
	Group	−.69	−8.09***
	Mothers' QMI	.22	2.73**
$F(1,68) = 7.44, p < .0001$ $R^2 = .59$ $\Delta R^2 = .05$			

** $p < .01$.
*** $p < .0001$.

groups mediated to the older siblings; all were TD children at the same age. In contrast, in the siblings' dyads, the older siblings mediated to their younger siblings, who were either with ID (ID group), or TD younger sibling with a chronological age equivalent to the age gap of the ID group (TDC group), or TD younger sibling with a mental age equivalent to the mental age gap of the ID group (TDM group). It seems that when children mediate to their sibling with ID they use an elaborated style of mediation developed earlier in their daily interactions with their sibling. This finding, reported earlier by Tzuriel and Hanuka-Levy (2014), was explained by the need of the older siblings to compensate for the difficulties of the younger siblings with ID to process information and to their sensitivity and awareness developed as a response to the special needs of their younger siblings. The older siblings in the ID group spontaneously developed and employed higher level of mediation strategies than the older siblings in the other TD groups.

It is interesting to note that in contrast to the ID group, the differences between mother and siblings MLE strategies were in the opposite direction to those found in the ID group; mothers showed higher MLE strategies than siblings. As can be seen in Table 3, siblings showing higher mediation than their mothers across all MLE strategies were only in the ID group (4 out of 5 strategies). On the other hand, in the TDC group mothers showed higher mediation than siblings (3 out of 5 strategies). In the TDM group mothers showed lower level of mediation than siblings, though only in two MLE strategies the difference was significant. These findings clearly support our expectation that the higher the "mental gap" between learner and mediator, the highest is the mediation provided. These findings confirm our hypothesis that the subject of mediation is a crucial factor that determines the level of mediation. In other words, the mothers showed higher level of mediation than their siblings when mediating to TD children, but when mothers were compared with siblings mediating to their sibling with ID, the siblings showed higher level of MLE strategies. Support for these findings may be found in earlier studies showing that siblings of children with ID tend to take on themselves the role of a helper or teacher, as compared with siblings of TD children (e.g., Gibbs, 1993; Stoneman et al., 1989).

Our initial rationale for comparing mothers in the three groups was that the existence of a child with ID might sensitize mothers to use high level of mediation with all children in the family including with their TD children. Our findings however show clearly that it is not the case and that what determines the level of mediation is the cognitive level of mediated child. These findings coincide with Feuerstein's theory according to which the cognitive level of the child, as perceived by the mediator, affects the mediation strategies used by the mediator. Support for our findings could be indicated by the findings of Tzuriel and Shamir (2007) in a study carried out in a peer-mediation context. Their findings indicate that when the mediator-learner cognitive levels *do not* match, learners who were taught by trained peers (i.e., older peers who were trained in a peer-mediation program) received higher scores than the control non-trained learners. The higher scores of the learners were attributed to a better mediation given by their peers. Since only few studies are known to investigate the effect of mediator-learner mental gap on MLE strategies (e.g., Tzuriel & Shamir, 2007) more research is required to establish findings.

The findings on cross-generation of mediation processes support our expectations that MLE strategies are transmitted across generations. The findings indicate clearly that after controlling for the variables of group, mothers' years of education, level of occupation, and level of religiosity, the children's MLE strategies were significantly predicted by the mothers' MLE strategies. Similar findings were reported by earlier studies on cross-generational transmission of MLE strategies (Isman & Tzuriel, 2007, 2008, 2016). For example, Tzuriel and Caspi (2017a) studied cross-generational transmission of mother-child MLE strategies and the moderating role of intervention for peer-mediation. Mother–child interactions were videotaped in a teaching situation and analyzed for MLE strategies as well as non-scaffolding activation behavior (NSAB) using the OMI scale. Children in Grade 3 were assigned to an experimental (n = 49) group who received a peer-mediation program and a control (n = 51) group who received an alternative program. All children were assigned to peers in Grade 1 and were taught inferential type of problems by their older peers. The findings revealed that cross-generational transmission of MLE strategies, were transmitted only in a group trained for peer-mediation. The differences between the findings of the current study and the study of Tzuriel and Caspi (2017a) can be attributed mainly to differences in the learner's samples (peers versus siblings). More research is required to establish cross-generational transmission in different samples of parents and children.

The findings of the current study have two interrelated implications, one is related to the role of siblings and parents for

enhancement of their MLE strategies and the second is related to cross-generational transmission of mediation strategies. The findings of the current study indicate clearly that siblings in families with a child with ID use significantly much more mediation strategies than their mothers and significantly much more than siblings in families with TD children. Previous studies showed that MLE strategies within the family system are crucial for facilitating cognitive development of children in the family (e.g., Tzuriel, 2013). The direct implication of this finding is that more efforts should be directed to provide siblings with mediation strategies, especially in families with children with special education needs (SEN). Considering the impact of mediation strategies on cognitive modifiability it seems that training of children to mediate might facilitate cognitive modifiability of their siblings as well as their own above and beyond the impact of spontaneous natural mediation processes within the family. Siblings with mediation skills could compensate for parental deficient of lack of mediation. Because parents frequently do not have the time and resources to interact with their SEN children, siblings in the family fulfills that role. In further studies it is suggested to explore the effects of training of children to mediate on development of learning skills of their siblings, especially in families of children with special needs.

The second implication is related to the cross-generational transmission of mediation skills. Investment in development of training programs for parents and children can be carried out to the next generation and may break the cycle of low cognitive functioning characterizing many families.

Acknowledgement

This research was funded by the Bar-Ilan President's Stipend, Israel's Ministry of Education, and Kounin Lownenfeld Chair.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ridd.2019.103497.

References

Abramovitch, R., Corter, C., Pepler, D. J., & Stanhope, L. (1986). Sibling and peer interaction; A final follow up and comparison. *Child Development, 57*, 217–229. https://doi.org/10.2307/1130653.

Abramovitch, R., Stanhope, L., Pepler, D. J., & Corter, C. (1987). Influence of Down's syndrome on sibling interaction. *Journal of Child Psychology and Psychiatry, 28*, 865–879.

Azmitia, M., & Hesser, J. (1993). Why siblings are important agents of cognitive development: A comparison of siblings and peers. *Child Development, 64*, 430–444. https://doi.org/10.2307/1131260.

Brody, G. H., Stoneman, Z., Davis, C. H., & Crapps, J. M. (1991). Observations of the role relations and behavior between older children with mental retardation and their young siblings. *American Journal on Mental Retardation, 95*, 527–536.

Capaldi, D. M., Pears, K. C., Patterson, G. R., & Owen, L. D. (2003). Continuity of parenting practices across generations in an at-risk sample: A prospective comparison of direct and mediated associations. *Journal of Abnormal Child Psychology, 31*, 127–142.

Chen, Z., & Kaplan, H. B. (2001). Intergenerational transmission of constructive parenting. *Journal of Marriage and the Family, 63*, 17–31.

Conger, R. D., Neppl, T., Kim, K. J., & Scaramella, L. (2003). Angry and aggressive behavior across three generations: A prospective, longitudinal study of parents and children. *Journal of Abnormal Child Psychology, 31*, 143–160.

Caro, P., & Derevensky, J. L. (1997). An exploratory study using the sibling interaction scale: Observing interactions with siblings with and without disabilities. *Education and Treatment of Children, 20*, 383–403.

Cicirelli, V. G. (1995). *Sibling relationships across the life span.* New York, NY: Plenumhttps://doi.org/10.1007/978-1-4757-6509-0.

Dallas, E., Stevenson, J., & McGurk, H. (1993). Cerebral-palsied children's interactions with siblings – II. Interactional structure. *Journal of Child Psychology and Psychiatry, 34*, 649–671. https://doi.org/10.1111/j.1469-7610.1993.tb01063.x.

Davidoff, L. (2006). The sibling relationship and sibling incest in historical context. In P. Coles (Ed.). *Sibling relationships*. London, UK: Karnac Books.

Dunn, J., & Kendrick, C. (1982). *Siblings: Love, envy and understanding.* Cambridge, MA: Harvard University Presshttps://doi.org/10.4159/harvard.9780674330597.

Feuerstein, S. (2002). *Biblical and Talmudic antecedents of mediated learning experience theory: Educational and didactic implications for intergenerational cultural transmission.* Jerusalem: The International Center for the Enhancement of Learning Potential.

Feuerstein, R., Feuerstein, R. S., Falik, L. H., & Rand, Y. (2002). *The dynamic assessment of cognitive modifiability: The Learning Propensity Assessment Device: Theory, instruments, and techniques.* Jerusalem: ICELP Press.

Feuerstein, R., Rand, Y., & Rynders, J. E. (1988). *Don't accept me as I am.* New York, NY: Plenum.

Furman, W., & Buhrmester, D. (1985). Children`s perceptions of the qualities of sibling relationships. *Child Development, 56*, 448–461. https://doi.org/10.2307/1129733.

Gauvain, M. (2009). Social and cultural transactions in cognitive development: A cross generational view. In A. Sameroff (Ed.). *The transactional model of development: How children and contexts shape each* (pp. 163–182). Washington, D.C: American Psychological Association. https://doi.org/10.1037/11877-009.

Gibbs, B. (1993). Providing support to sisters and brothers of children with disabilities. In G. H. S. Singer, & L. E. Powers (Eds.). *Families, disability, and empowerment* (pp. 343–363). Baltimore, MD: Paul H. Brookes.

Isman, E., & Tzuriel, D. (2007). The mediated learning experience (MLE) in a three- generational perspective. *The British Journal of Developmental Psychology, 26*, 545–560.

Isman, E., & Tzuriel, D. (2008). Relationship between mother-child mediated learning experience (MLE) strategies and mothers' attachment style and mental health. *Journal of Cognitive Education and Psychology, 7*, 388–410. Retrieved from http://www.iace-coged.org/journal.

Isman, E. B., & Tzuriel, D. (2016). Correlations between mediated learning experience strategies and the religiosity of Jewish women in a three-generational perspective. *Megamot, 3*, 81–107 (In Hebrew).

Klein, P. S. (Ed.). (1996). *Early intervention: Cross cultural experiences with a mediational approach*. New York: Garland.

Klein, P. S., & Alony, S. (1993). Immediate and sustained effects of maternal mediation behaviors in infancy. *Journal of Early Intervention, 17*, 177–193. https://doi.org/10.1177/105381519301700208.

Klein, P. S., Wieder, S., & Greenspan, S. I. (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.

Klein, P. S., Zarur, S., & Feldman, R. (2003). Mediational behaviors of preschoolers teaching their younger siblings. *Infant and Child Development, 12*, 233–242. https://doi.org/10.1002/icd.287.

Knott, F., Lewis, C., & Williams, T. (1995). Sibling interaction of children with learning disabilities: A comparison of autism and Down's syndrome. *Journal of Child*

Psychology and Psychiatry, 36, 965–976. https://doi.org/10.1111/j.1469-7610.1995.tb01343.x.
Knott, F., Lewis, C., & Williams, T. (2007). Sibling interaction of children with autism: Development over 12 months. *Journal of Autism and Developmental Disorders, 37*, 1987–1995. https://doi.org/10.1007/s10803-006-0347-z.
Kovan, N. M., Chung, A. L., & Sroufe, A. (2009). The intergenerational continuity of observed early parenting: A prospective, longitudinal study. *Developmental Psychology, 45*, 1205–1213.
Kozulin, A. (2011). Learning potential and cognitive modifiability, Assessment in Education: Principles. *Policy & Practice, 18*, 169–181. https://doi.org/10.1080/0969594X.2010.526586.
Lidz, C. S. (2002). Mediated learning experience (MLE) as a basis for an alternative approach to assessment. *School Psychology International, 23*, 68–84.
Lidz, C. S. (2003). *Early childhood assessment.* Hoboken, New-Jersey: Weily.
Lillard, A. S. (2018). Rethinking education: Montessori's approach. *Current Directions in Psychological Science, 27*, 395–400. https://doi.org/10.1177/0963721418769878.
Lobato, D. (1990). *Brothers, sisters and special needs.* Baltimore, MD: Paul H. Brookes.
Maynard, A. E. (2002). Cultural teaching: The development of teaching skills in Maya sibling interactions. *Child Development, 73*, 969–982. https://doi.org/10.1111/1467-8624.00450.
Meisner, J. S., & Fisher, V. L. (1980). Cognitive shifts of young children as a function of peer interaction and sibling status. *The Journal of Genetic Psychology, 136*, 247–253. https://doi.org/10.1080/00221325.1980.10534118.
Montessori, M. (2004). *The discovery of the child.* Oxford, England: Clio Press.
Montessori, M. (2012). *The 1946 London lectures (the Montessori series vol. 17).* Amsterdam, The Netherlands: Montessori-Pierson.
Neppl, T. K., Conger, R. D., Scaramella, L. V., & Ontai, L. L. (2009). Intergenerational continuity in parenting behavior: Mediating pathways and child effects. *Developmental Psychology, 45*, 1241–1256.
Rogoff, B. (2003). *The cultural nature of human development.* New York: Oxford University Press.
Sameroff, A. J., & MacKanzie, M. J. (2003). Research strategies for capturing transactional models of development: The limits of the possible. *Development and Psychopathology, 15*, 613–640.
Shamir, A., & Tzuriel, D. (2004). Children's mediational teaching style as a function of intervention for cross-age peer-mediation. *School Psychology International, 25*, 58–97. https://doi.org/10.1177/0143034304024782.
Shamir, A., Tzuriel, D., & Guy, R. (2007). Computer-supported collaborative learning: The cognitive effects of a peer mediation intervention. *Journal of Cognitive Education and Psychology, 6*, 373–394. Retrieved from http://www.iace.coged.org/journal.
Shamir, A., Tzuriel, D., & Rozen, M. (2006). Peer mediation: The effects of program intervention, math level, and verbal ability on mediation style and improvement in math problem solving. *School Psychology International, 27*, 209–231. https://doi.org/10.1177/0143034306064548.
Stoneman, Z. (2009). Siblings of children with intellectual disabilities: Normal, average, or not too different? In L. M. Glidden, & M. M. Seltzer (Vol. Eds.), *International review of research on mental retardation: Vol. 37*, (pp. 251–296). New York, NY: Elsevier.
Stoneman, Z., & Brody, G. H. (1993). Sibling relations in the family context. In Z. Stoneman, & P. W. Berman (Eds.). *The effect of mental retardation, disability, and illness on sibling relationships* (pp. 3–30). Baltimore, MD: Paul H. Brookes.
Stoneman, Z., Brody, G. H., & Davis, C. H. (1989). Role relations between mentally retarded children and their older siblings: Observations in three in home contexts. *Research in Developmental Disabilities, 10*, 61–76. https://doi.org/10.1016/0891-4222(89)90029-2.
Stright, A. D., Herr, M. Y., & Neitzel, C. (2009). Maternal scaffolding of children's problem solving and children's adjustment in kindergarten: Hmong families in the United States. *Journal of Educational Psychology, 101*, 207–218.
Topping, K. J. (2001). *Peer assisted learning: A practical guide for teachers.* Cambridge, MA: Brookline Books.
Tzuriel, D. (2000). The cognitive modifiability battery: Assessment and intervention. In C. S. Lidz, & J. Elliott (Eds.). *Dynamic assessment: Prevailing models and applications* (pp. 375–406). New York: Elsevier Science.
Tzuriel, D. (2001). *Dynamic assessment of young children.* New York, NY: Kluwer Academic/Plenum Presshttps://doi.org/10.1007/978-1-4615-1255-4.
Tzuriel, D. (2011). *Mediated learning and cognitive modifiability. Encyclopedia of sciences of learning.* New York, NY: Springer Publishing2154–2157.
Tzuriel, D. (2013). Mediated learning experience and cognitive modifiability. *Journal of Cognitive Education and Psychology, 12*, 59–80. https://doi.org/10.1891/1945-8959.12.1.59.
Tzuriel, D., & Caspi, R. (2017b). Intervention for peer-mediation and mother-child interaction: The effects on children's mediated learning strategies and cognitive modifiability. *Contemporary Educational Psychology, 49*, 302–323. https://doi.org/10.1016/j.cedpsych.2017.03.005.
Tzuriel, D., & Caspi, R. (2017a). Cross-generational transmission of mediated learning strategies and intervention for peer-mediation. *Journal of Applied Developmental Psychology, 52*, 138–148. https://doi.org/10.1016/j.appdev.2017.07.006.
Tzuriel, D., & Eran, Z. (1990). Inferential cognitive modifiability of kibbutz young children as a function of mother-child mediated learning experience (MLE) interactions. *International Journal of Cognitive Education and Mediated Learning, 1*, 103–117.
Tzuriel, D., & Ernst, H. (1990). Mediated learning experience and structural cognitive modifiability: Testing of distal and proximal factors by structural equation model. *International Journal of Cognitive Education and Mediated Learning, 1*, 119–135.
Tzuriel, D., & Hanuka-Levy, D. (2014). Siblings' mediated learning strategies in families with and without children with intellectual disabilities. *American Journal on Intellectual and Developmental Disabilities, 119*, 565–588.
Tzuriel, D., Kaniel, S., Zeliger, M., Friedman, A., & Haywood, H. C. (1998). Effects of the "Bright Start" program in kindergarten on use of mediated learning strategies and children's cognitive modifiability. *Child Development and Care, 143*, 1–20. https://doi.org/10.1080/0300443981430101.
Tzuriel, D., & Klein, P. S. (1985). Analogical thinking modifiability in disadvantaged, regular, special education and mentally retarded children. *Journal of Abnormal Child Psychology, 13*, 539–552. https://doi.org/10.1007/BF00923140.
Tzuriel, D., & Klein, P. S. (1990). *The children's analogical thinking modifiability (CATM) test. Instruction manual.* Ramat-Gan, Israel: Bar Ilan University.
Tzuriel, D., & Remer, R. (2018). Mediation with a puppet: The effects on teachers' mediated learning strategies and children's motivation in regular and special education kindergartens. *Journal of Learning and Instruction, 58*, 295–3004.
Tzuriel, D., & Shamir, A. (2007). The effects of peer mediation with young children (PMYC) on children's cognitive modifiability. *The British Journal of Educational Psychology, 77*, 143–165. https://doi.org/10.1348/000709905X84279.
Tzuriel, D., & Shomron, V. (2018). The effects of mother—Child mediated learning strategies on cognitive modifiability and psychological resilience of children with learning disability. *The British Journal of Educational Psychology, 88*, 236–260. https://doi.org/10.1111/bjep.12219.
Tzuriel, D., & Weiss, S. C. (1998). The effects of mother's acceptance/rejection attitudes, children's personality and mother's mediated learning strategies on cognitive modifiability. *Early Development & Parenting, 7*, 79–99. https://doi.org/10.1002/(SICI)1099-0917(199806)7:2%3C79::AID-EDP166%3E3.0.CO;2-%23.
Valsiner, J. (1987). *Culture and the development of children's action.* New York, NY: Wiley.
van Geert, P. (1994). Vygotskian dynamics of development. *Human Development, 37*, 346–365. https://doi.org/10.1159/000278280.
Vygotsky, L. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.
Wang, M., Xing, X., & Zhao, J. (2014). Intergenerational transmission of corporal punishment in China: The moderating role of marital satisfaction and gender. *Journal of Abnormal Child Psychology, 42*, 1263–1274. https://doi.org/10.1007/s10802-014-9890-9.
Weisner, T. S. (1989). Comparing sibling relationships across cultures. In P. W. Zukow (Ed.). *Sibling interaction cultures: Theoretical and methodological issues* (pp. 11–25). New York, NY: Springer-Verlage.
Wertsch, J. V. (1985). *Culture, communication and cognition: Vygotskian perspectives.* London, UK: Cambridge University Press.
Wilson, J., Blacher, J., & Baker, B. L. (1989). Siblings of children with severe handicaps. *Mental Retardation, 27*, 167–173.
Wood, D. J., Bruner, J., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89–100.
Youngblade, L. M., & Belsky, J. (1995). From family to friend: Predicting positive dyadic interaction with a close friend at 5 years of age from early parent-child relations. In S. Shulman (Ed.). *Close relationships and socio-emotional development* (pp. 35–62). NJ: Ablex.