

A Randomized Control Study of Responsive Teaching With Young Turkish Children and Their Mothers

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Abstract

A randomized control study was conducted to evaluate the effectiveness of responsive teaching (RT) with a sample of 19 Turkish preschool-age children with disabilities and their mothers over a 6-months period. RT is an early intervention curriculum that attempts to promote children's development by encouraging parents to engage in highly responsive interactions with them. Participants were randomly assigned to treatment conditions: The control group consisted of standard preschool classroom services and the RT group received biweekly RT parent-child sessions in addition to standard services. Compared with the control group, RT mothers made significantly greater increases in Responsiveness and Affect, whereas their children made greater changes in their engagement or pivotal behavior. There were also significant group differences in children's developmental outcomes. Children in the RT group improved their developmental quotient scores by an average of 42% compared with 7% for children in the control group.

Keywords

early intervention, relationship-focused intervention, parental responsiveness, developmental learning

Responsive teaching (RT) is a relationship-focused intervention (RFI) that is designed to enhance the development and social-emotional functioning of preschool-aged children with developmental risks and disabilities. Based on child development research, which indicates that parental responsiveness is associated with children's cognitive (Landry, Smith, Swank, Assel, & Vellet, 2001), language (Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tamis-LeMonda, Bornstein, & Damast, 1996), and socioemotional functioning (Kochanska, Aksan, & Carlson, 2005; Kochanska, Forman, & Coy, 1999; van den Boom, 1994), RT focuses on encouraging parents to engage in highly responsive interactions with their children throughout the course of daily routines and activities. This curriculum promotes responsiveness by teaching parents to use RT strategies such as *take one turn and wait*, *follow my child's lead*, or *imitate my child's actions and communications*, which promote five components of responsive behavior, including reciprocity, contingency, nondirectiveness, affect, and interactive match.

There is increasing empirical evidence that parental responsiveness plays a critical role in mediating the effects of early developmental intervention and that interventions which focus on teaching parents to interact more responsively with their children can be an effective means of enhancing children's development (Mahoney & Nam, 2011). For example, in a secondary analysis of developmental outcomes observed from four early intervention research

projects, Mahoney, Boyce, Fewell, Spiker, and Wheeden (1998) reported that interventions resulted in significant developmental improvements when mothers' level of responsiveness increased during intervention. However, interventions resulted in no improvements in children's developmental functioning when mothers' responsiveness did not change during intervention regardless of the quality and intensity of services children received.

In addition, several RFI studies have evaluated the effects of teaching parents to use responsive interaction strategies with their children (McCullum & Hemmeter, 1997; Trivette, 2003). Results from these studies indicate that parents' use of these strategies enhances children's interactive engagement (e.g., Hemmeter & Kaiser, 1994; Kim & Mahoney, 2005; McCullum, 1984) and improves children's rate of development, particularly when parents implement these strategies for 6 months or longer (e.g., Landry, Smith, & Swank, 2003, 2006; Mahoney & Powell, 1988; Seifer, Clark, & Sameroff, 1991).

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RT incorporates most of the interactive strategies described in previously published RFI curricula (e.g., Hanen [Sussman, 1999], ECO [the Ecological Language program; MacDonald, 1989], Floortime [Greenspan & Weider, 1998], INREAL [IN-class REActive Language; Weiss, 1981]). However, RT differs from other RFIs in two ways. First, it is a comprehensive curriculum that is designed to address three areas of development—cognition, communication, and social-emotional functioning—using the goals and objectives framework required for IEPs or IFSPs. Second, it is based on the assumption that the child engagement behaviors that the responsive interaction strategies have been reported to promote such as initiation, exploration, joint attention are the learning processes that mediate the impact of parental responsiveness on children's development (Mahoney, Kim, & Lin, 2007). That is, RT asserts that as parents learn to interact more responsively, they enhance their children's learning efficiency by encouraging them to increase the frequency of using those behaviors that are the foundations for developmental learning. Parents' influence on children's development is believed to have less to do with the specific developmental behaviors they directly teach their children, and more to do with their supporting and encouraging children's use of those "pivotal" behaviors, which many believe to be crucial for developmental learning. These include behaviors such as attention, persistence, initiation, cooperation, joint attention, and affect (Mahoney et al., 2007).

RT attempts to promote children's acquisition of higher level developmental skills and competencies primarily by enhancing the frequency that children produce the pivotal behaviors or learning processes that underlie their ability to acquire these behaviors. As a result, children's intervention objectives in RT are one or more of the pivotal behaviors that are most relevant to their individual developmental needs (www.ResponsiveTeaching.org lists the pivotal behaviors that are targeted as children's intervention objectives in RT). During RT sessions, parents receive information about how pivotal intervention objective(s) contribute to developmental learning, and are coached to use one to two RT strategies to enhance their children's use of this behavior during daily activities and interactions. Child development assessment instruments are used to determine the degree to which RT helps children attain the overall intervention goal of increasing their rate of acquiring the skills and competencies that characterize higher levels of developmental functioning.

Two quasiexperimental studies have been reported with preschool-aged children with disabilities that provide partial support for the effectiveness of RT. In the first study, Mahoney and Perales (2003) evaluated the effects of RT on the social-emotional functioning of 20 children with Autism. Pre-post comparisons indicated significant improvements in mothers' responsiveness as well as in children's pivotal developmental behaviors. In addition, there were

overall improvements in children's regulatory behaviors as well as their social competence. In the second study, Mahoney and Perales (2005) evaluated the developmental changes made by 50 children who participated in RT for 12 months. The sample included groups of children with Pervasive Developmental Disorders as well as children with other types of developmental disabilities. Pre-post comparisons indicated that for both groups there were significant increases in mothers' responsiveness and children's pivotal behaviors as well as substantial increases in children's cognitive and communication development.

In both of these studies, improvements in children's pivotal behaviors and development were associated with the degree to which intervention enhanced mothers' responsiveness. In addition, children's developmental improvements were more strongly associated with increases in their pivotal behavior than with maternal responsiveness, suggesting that the effects of RT were mediated by children's pivotal behavior (Mahoney & Perales, 2005). While these results provide further evidence that the elements of parental responsiveness promoted through RT are causally related to children's development improvements, experimental research studies are needed to establish the efficacy of RT.

Insofar as RFIs, such as RT, might be effective, they provide a cost-effective method for providing early intervention services in countries, such as Turkey, which have enacted legislation mandating services for preschool children with disabilities but have limited resources for this (Er-Sabuncuoglu & Diken, 2010). RFIs such as RT can be provided in home- or center-based settings during sessions that last approximately 1 hr. RFIs are less expensive than center-based services because they require smaller facilities and less professional support and time. As the intensity of RFIs are dependent on the ability of parents to follow through with these interventions during daily activities with their children, RFIs can be provided in sessions conducted on a weekly or semiweekly basis and have been reported to be effective with as few as 10 sessions (Mahoney & Nam, 2011). Yet, the viability of RFIs in countries such as Turkey is dependent on the ability of mothers to accept the role as the primary interventionist as well as their ability to learn and use intervention strategies that may differ from traditional cultural and religious parenting values and practices.

This study evaluated the effectiveness of RT with a sample of Turkish mothers and preschool-aged children with disabilities. A randomized control group design was used to determine whether the addition of RT to the standard early intervention services typically provided in Turkey might be more effective at promoting child development than standard early intervention services. This study addressed four questions. First, would RT be effective at enhancing mothers' responsiveness with their children? Second, would mothers' use of RT result in improvements in children's pivotal developmental behaviors? Third, would the children who participated in RT attain higher rates of developmental

Table 1. Demographic Characteristics of Mothers and Children at Start of Intervention.

Variable	Responsive teaching (<i>n</i> = 10)		Control group (<i>n</i> = 9)		Total sample (<i>n</i> = 19)		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Mother's characteristics							
Mother's age (years)	35.20	8.93	35.00	6.36	35.11	7.61	0.56
Mother's education (years)	9.50	4.74	9.44	3.57	9.47	4.12	0.03
Mother's marital status (% married)	100			77.8	89.5		-1.59
Children's characteristics							
Children's age (months)	50.30	1.28	47.22	1.33	48.84	12.76	0.51
% males	50.0		56.6		52.6		-0.29
Child development							
Personal-social ^a	18.90	6.12	20.00	9.43			-0.31*
Language ^a	19.20	7.49	18.78	8.01			0.12*
Language-cognitive ^b	16.40	4.38	17.00	6.23			-0.25*

Abbreviation: ADSI, Ankara Developmental Screening Inventory. Denver refers to Turkish Version of the Denver Developmental Screening Test-II.

^aDenver developmental age. ^bADSI developmental age.

**p* < .05.

functioning than children who only received standard early intervention services? Fourth, would the developmental changes observed for all children in this study be associated with changes in mothers' responsiveness and children's pivotal behavior?

Method

Participants

Participants included 19 children with developmental disabilities between 3 and 6 years of age and their mothers. Participants were recruited from two special education rehabilitation centers in Turkey. Three criteria were used for participant selection: children were below 6 years of age, children had a diagnosed disability, and mothers had not been involved in a parent-mediated intervention. Out of 50 dyads that met these criteria, 19 agreed to participate. A total of 6 children had Down syndrome, 9 had autism and, 4 had intellectual disabilities.

A stratified randomization procedure in which children were blocked according to their disability was used to assign dyads to either the RT or standard treatment control groups. Table 1 presents the demographic characteristics of the participants. Mothers' average age was 35.1 years; they had an average of 9.5 years of education and most were married (89.5%). At the start of the study, the average age of the children was 48.8 months and one half of the children were males (52.6%). Results from *t* tests indicated no significant group differences on mothers' age, education, and marital status as well as the age and gender of the children. In addition, there were no significant group differences in children's development and social-emotional functioning as measured by the Turkish Version of the *Denver*

Developmental Screening Test-II (Denver-II) and the *Ankara Developmental Screening Inventory* (ADSI).

Procedures

Responsive teaching. Participants in the RT group received individual parent-child sessions either in family's homes or at a center-based facility. The intervention was based on procedures prescribed in the RT curriculum (Mahoney & MacDonald, 2007), which had been translated into Turkish by the first two authors (responsive teaching-Turkish version [RT-TV]). Sessions were conducted twice a week for 4 months and lasted approximately 90 min. During the session, the interventionist asked mothers to enhance their child's use of a pivotal behavior by using certain RT strategies (for descriptions of the RT curriculum go to www.ResponsiveTeaching.org). The interventionist conducted the following activities during each session: (a) explained how the pivotal behavior objective was associated with the child's developmental concerns, (b) described and demonstrated one to two RT strategies for parents to use to promote this pivotal behavior, (c) coached mothers while they attempted to implement the strategies with the child, and (d) helped mothers develop a Family Action Plan to integrate these strategies into their routine activities and social interactions with their child.

The interventionist was a doctoral student who had received 3 months of practical training on RT with the author of this curriculum in the United States.

Standard intervention. Children in the RT and control groups received early intervention services at their local special education rehabilitation centers 2 days per week.

In the Republic of Turkey, the Minister of National Education (MNE) Special Education Services Legislation,

which was first issued in 2000 and revised in 2009, authorizes special education services for all children with certified disabilities who are between birth and 6 years of age. These services may be carried out in schools (preschools), government run institutions for children with disabilities, or children's homes if needed. Due to the lack of "child find" activities as well as the limited resources for early intervention services, parents must initiate the process of determining their child's eligibility and of actually enrolling their child in an early intervention program (Er-Sabuncuoglu & Diken, 2010).

Early intervention services are provided according to MNE special education regulations for two half days per week in schools and institutions (Er-Sabuncuoglu & Diken, 2010). One day is devoted to individual, one-to-one instruction related to the outcomes listed on the child's Individualized Educational Plan. Instruction entails a special education teacher using behavioral instructional methods to teach the skills and behaviors that have been prescribed for the child. The second day is devoted to group instruction (2 hr) with approximately 10 children, including children with and without disabilities. Through group instruction, teachers help children learn social and adaptive living skills typically through the use of picture exchange communication system and applied behavioral analysis procedures. Parents may observe but do not participate actively in their children's intervention.

Data collection. Developmental assessments and mother-child observations were collected at the beginning of intervention and after 6 months.

Child development. As there are no Turkish standardized child development measures, developmental screening tests that had been translated and standardized with Turkish children were used to assess child development. These included the Denver-II and the ADSI. These instruments were administered by independent certified clinicians.

Denver-II. The Denver-II (Anlar & Yalaz, 1996) is a developmental screening assessment for children from birth to 6 years of age. It is completed mostly by a test administrator observing the child, although parents are asked to be informants for items that cannot be observed. The *Denver Developmental Screening Test* (DDST) was originally developed by Frankenburg and Dobbs in 1967 and revised in 1990. Correlations of DDST developmental ages with mental age scores obtained from the Stanford Binet, Yale Developmental Schedule, and Bayley Infant Development Scale range between .86 and .97 (Frankenburg, Camp, & Van Natta, 1971). The DDST was first adapted into Turkish by Anlar and Yalaz in 1980 and revised by these authors in 1996 (Anlar & Yalaz, 1996). This instrument includes 116 items that assess four domains of developmental functioning: personal-social, language, fine motor, and gross motor development. The Turkish standardization sample included 990 children between 1 to 78 months of age. Interrater and

test-retest reliabilities of the Denver-II are 90% and 86%, respectively (Anlar & Yalaz, 1996).

ADSI. The ADSI (Savaşır, Sezgin, & Erol, 2005) is designed to assess the development of children between birth to 6 years of age by gathering information from mothers or other primary caregivers. It includes 154 items that assess children's cognitive-language (65 items), fine motor (26 items), gross motor (24 items), and social/self-care skills (39 items). The Turkish standardization sample included 860 children. Cronbach's alpha was .98 for children from 0 to 12 months, .97 for children from 13 to 44 months, and .88 for children from 45 to 72 months. The standardization study of the ADSI included item analyses for each subscale as well as discriminant analyses and criterion-related validity data. Overall, these data indicated that it is a reliable and valid inventory for children up to 72 months (Savaşır et al., 2005).

Mother-child interaction. Each mother-child dyad was video recorded while playing together for 20 min with a set of developmentally appropriate toys. Toys included stacking rings, nesting blocks, toy car, toy airplane, toy train, and picture books. Mothers were instructed to play with their children as they normally do.

Maternal Behavior Rating Scale (MBRS). The MBRS (Mahoney, 1999) is a 12-item scale global rating that assesses characteristics of parents' interactive style using 5-point Likert-type ratings. This scale has been used extensively in research assessing mothers' interactions with young children with disabilities. Results from this research indicate that MBRS ratings of mothers' interactive style are associated with children's rate of developmental growth (Kim & Mahoney, 2004; Mahoney, Finger, & Powell, 1985) and are sensitive to the effects of parent-mediated interventions (Mahoney & Perales, 2003, 2005; Mahoney & Powell, 1988).

The TV-MBRS, which is a Turkish translation of this scale (Diken, 2009), was used to code mother's interactive style. Research with Turkish mothers and children with disabilities indicates that this version of the scale measures three factors: Responsiveness (responsivity, sensitivity, effectiveness, inventiveness), Affect (acceptance, enjoyment, expressiveness, warmth, praise), and Achievement Orientation/Directiveness (directiveness, achievement, and pace). Cronbach's alphas for these scales were .86, .87, and .61, respectively (Diken, 2009).

Child Behavior Rating Scale (CBRS). The CBRS (Mahoney & Wheeden, 1998) consists of seven global rating items that assess children's pivotal behavior in interactive activities. This scale has been used to assess children's interactive behavior with their mothers and other adults (Kim & Mahoney, 2004; Mahoney et al., 2007; Mahoney, Wheeden, & Perales, 2004). It has been reported to be sensitive to the effects of RFIs (Mahoney & Perales, 2003; 2005).

The *Turkish Version of the CBRS* (TV-CBRS; Diken, 2009) is a Turkish translation of this scale (Diken, 2009).

Table 2. Before and After Data on Mother's Interactional Behaviors.

Variable	Responsive teaching				Control group				F(Time)	F(Time × Treatment)
	Pre		Post		Pre		Post			
	M	SD	M	SD	M	SD	M	SD		
MBRS ^a									51.80*	23.32***
Responsiveness ^b	2.03	.55	3.92	.47	1.83	.40	2.19	.81	120.59***	55.86***
Affect ^b	2.02	.41	3.46	.70	1.96	.59	2.22	.76	118.22***	55.88***
Achievement Orientation/Directiveness ^b	3.37	.71	3.23	.47	3.15	.78	3.44	.66	1.27	8.66**

Abbreviation: MBRS, Maternal Behavior Rating Scale.

^aMANOVA. ^bANOVA.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Research with Turkish children with disabilities indicates that this scale measures two pivotal behavior factors: Attention (attention, persistence, interest, cooperation) and Initiation (initiation, joint attention, affect). Cronbach's alphas for these scales were .79 and .91, respectively (Diken, 2009).

Coding and reliability of mother-child observation. Videotaped observations were scored separately for the TV-MBRS and the TV-CBRS. Following procedures described in previous studies, maternal behaviors were coded with the TV-MBRS by the first author and an independent rater who was blind to group assignment. The same procedure was used for the TV-CBRS. Both coders received training on the TV-MBRS and TV-CBRS from the author of the Turkish Versions of these scales. After attaining 80% exact agreement on training for the TV-MBRS and the TV-CBRS, they started to code the data. Interrater agreement calculated for 30% of the observations for the TV-MBRS ranged from 74% to 100% averaging 85.8% on the TV-MBRS and ranged from 84% to 100% with an overall agreement of 89.3% on the TV-CBRS.

Treatment fidelity. Video observations of 10 RT sessions (about 30% of all sessions) were evaluated by an independent coder by using the RT Intervention Session Guide (Mahoney & MacDonald, 2007) to assess treatment fidelity. The coder gave a plus (+) when any item of the form was followed as intended and a minus (-) when any item of the form was not followed. Treatment integrity was judged to be 100% for all sessions.

Results

Intervention Effects on Mothers' Interactive Behaviors

Pre-post data for the MBRS are presented in Table 2. While both groups of mothers had average ratings on

Responsiveness and Affect that were approximately "2" at the beginning of intervention, during intervention, mothers in the RT group made a 93% and 71% increase on these two measures respectively, whereas mothers in the control group made a 20% and 13% increase. At the beginning of intervention, both groups had average ratings on Directiveness/Achievement Orientation that were slightly above the midpoint. After intervention, ratings on this measure for RT mothers decreased by 4%, whereas ratings for control group mothers increased by 9%.

A repeated-measures MANOVA examined group differences across the three MBRS subscales. There were significant Time and Time × Treatment effects. Although both groups made significant changes in MBRS ratings from pre- to postintervention, mothers in the RT group made greater improvements than mothers in the control group, $F(3, 15) = 23.32, p < .001, \eta^2 = 0.82$.

Univariate ANOVA indicated that Time × Treatment differences were significant for all three MBRS factors: Responsiveness, $F(1, 17) = 55.86, p < .001, \eta^2 = 0.76$; Affect, $F(1, 17) = 55.88, p < .001, \eta^2 = 0.77$; and Achievement Orientation/Directiveness, $F(1, 17) = 8.66, p < .01, \eta^2 = 0.34$. At postintervention, mothers in the RT group had significantly higher ratings on Responsiveness and Affect and lower ratings on Achievement Orientation/Directiveness than mothers in the control group.

Intervention Effects on Children's Pivotal Behavior

Pre-post data for the CBRS are presented in Table 3. Both groups of children displayed low levels of pivotal behavior at the beginning of intervention, averaging ratings of "2" or lower. By the end of intervention, the average increases in pivotal behavior ratings for children in the RT group were more than 100% compared with 25% for children in the control group.

A MANOVA was computed to compare the effects of intervention on children's pivotal behavior. As depicted on

Table 3. Before and After Data on Children's Behavior.

Variable	Responsive teaching				Control group				F(Time)	F(Time × Treatment)
	Pre		Post		Pre		Post			
	M	SD	M	SD	M	SD	M	SD		
CBRS ^a									80.39**	38.20**
Attention ^b	2.07	.69	4.12	1.06	1.78	.67	2.30	.92	98.99**	34.52**
Initiation ^b	1.90	.52	4.03	0.79	1.89	.76	2.18	.82	114.59**	65.43**

Abbreviation: CBRS, Child Behavior Rating Scale.

^aMANOVA. ^bANOVA.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. Before and After Data on Children's Development.

Variable	Responsive teaching				Control group				F(Time)	F(Time × Treatment)
	Pre		Post		Pre		Post			
	M	SD	M	SD	M	SD	M	SD		
Child development ^a									11.52***	5.38*
Personal-social ^{b,c}	39	12	57	16	42	17	47	20	33.14***	12.63**
Language ^{b,c}	38	12	55	18	40	14	42	13	23.84***	13.74**
Language-cognition ^{b,d}	34	9	46	14	36	9	38	10	30.77***	14.43**

Abbreviation: ADSI, Ankara Developmental Screening Inventory. Denver refers to Turkish Version of the Denver Developmental Screening Test-II.

^aMANOVA. ^bANOVA. ^cDenver developmental quotient. ^dADSI developmental quotient.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3, there were significant effects for Time and Time × Treatment ($ps < .001$). Both groups of children made significant improvements in their CBRS ratings from pre- to postintervention, with children in the RT group making greater increases than children in the control group, $F(2, 16) = 38.20, p < .001, \eta^2 = 0.83$. Univariate analyses indicated that the Time × Treatment effects were significant for both CBRS factors: Attention, $F(1, 17) = 34.52, p < .001, \eta^2 = 0.67$, and Initiation, $F(1, 17) = 65.43, p < .001, \eta^2 = 0.79$. Children in the RT group made greater improvements on these factors than children in the control group.

Intervention Effects on Child Development

Table 4 reports pre- and postintervention measures of children's development as measured by the Denver-II and ADSI. Prior to intervention both groups of children had average developmental quotients of 40 or lower indicating moderate to severe levels of developmental delay. At the completion of intervention, the average developmental quotients across the three measures increased by 42% for

children in the RT group compared with 7% for children in the control group.

A repeated-measures MANOVA indicated that the effects of Time and Time × Treatment were both significant. Postintervention developmental quotients on both of these instruments were significantly higher than preintervention scores for both groups, with children in the RT group making greater improvements than children in the control group, $F(3, 15) = 5.38, p < .05, \eta^2 = 0.52$. Univariate analyses of the Time × Treatment effect indicated that children in the RT group made significantly greater improvements on the two Denver-II subscales, including Personal-Social, $F(1, 17) = 12.63, p < 0.01, \eta^2 = 0.43$, and Language, $F(1, 17) = 13.74, p < .01, \eta^2 = 0.45$, as well as on the ADSI Language-Cognitive Scale, $F(1, 17) = 14.43, p < .01, \eta^2 = 0.46$.

Predictors of Child Development Outcomes

Post hoc, exploratory analyses were conducted to examine whether the developmental gains made by all children were associated with the logic model underlying RT. Hierarchical

Table 5. Relationship of Pivotal Behavior at Postintervention to Developmental Intervention Effects.

Dependent variable	Model	β	t value	Significance	R^2	R^2 change
Denver Personal–Social T2	Denver Personal–Social T2	.82	5.81	.000	.65***	
	Group	.38	3.51	.003	.79***	.14**
	Denver Personal–Social T2	.84	7.74	.000		
	Pivotal behavior T2	.51	2.77	.014	.85***	.06*
	Group	-.01	-0.08	.935		
Denver Language T2	Denver Personal–Social T2	.61	4.81	.000		
	Denver Language T2	.86	7.09	.000	.75***	
	Group	.36	4.12	.001	.86***	.09**
	Denver Language T2	.85	9.74	.000		
	Pivotal behavior T2	.50	4.04	.001	.93***	.07*
ADSI Language/Cognitive T2	Group	.00	-0.00	.998		
	Denver Language T2	.63	7.58	.000		
	ADSI T2	.85	6.75	.000	.71***	
	Group	.36	3.75	.002	.84***	.13**
	ADSI T2	.88	9.19	.000		
ADSI T2	Pivotal behavior T2	.47	2.68	.017	.88***	.04*
	Group	-.00	-0.01	.990		
	ADSI T2	.64	5.42	.000		

Abbreviation: ADSI, Ankara Developmental Screening Inventory. Denver refers to Turkish Version of the Denver Developmental Screening Test–II. * $p < .05$. ** $p < .01$. *** $p < .001$.

multiple regressions were used to explore: (a) how changes in mother's responsiveness were associated with changes in children's pivotal behavior and (b) how children's pivotal behavior use at the completion of intervention were associated with intervention changes in children's development.

For the first analysis, pre- and postintervention composite pivotal behavior scores were computed based on the average of children's seven pivotal behaviors at each observation. Results from the hierarchical regression analysis indicated that children's pivotal behavior at T1 accounted for 47% of the variability of their pivotal behavior rating at T2 (i.e., pivotal behavior T1 + pivotal behavior change; $t = 4.41, p < .001$). Change in responsiveness, which was entered in the second step, accounted for an additional 36% of the variability in their pivotal behavior at T2, which was significant ($t = 6.32, p < .000$).

The second set of analyses investigated how children's composite pivotal behavior ratings at T2 were associated with intervention changes for each of the three child development scales. For each regression model, children's developmental quotient scores at T1 were entered in the first step, children's intervention group was entered in the second step, and changes in children's pivotal behavior at T2 were entered in the third step. Results from these analyses (see Table 5) indicated the following. First, as expected each of the three developmental quotients at T2 was significantly associated with T1 child development measures, with R^2 s ranging from .65 to .73. Second, children's intervention group, which was entered in the second step, resulted in significant R^2 changes ranging from 9% to 14% of the variability. Third, children's pivotal behaviors at T2, which

were entered in the third step, also resulted in significant R^2 changes ranging from 4% to 7% of the variability. However, for each analysis the effects of intervention group were no longer significant in the third step of this analysis, suggesting that the effects of groups were mediated by changes in pivotal behavior that occurred during intervention.

Discussion

This study evaluated the effectiveness of RT with Turkish preschool children with disabilities and their mothers. Significant intervention effects were observed for RT and control group participants. These included increases in mothers' responsiveness, children's pivotal behavior, as well as children's cognitive, language, and social development. However, as hypothesized, all intervention outcomes were considerably greater for participants in the RT group. RT group changes in maternal responsiveness and children's pivotal behavior were 3 times greater while increases in developmental quotients were 4 times greater than observed among control group participants.

While these results parallel the developmental improvements reported by Mahoney and Perales (2005), this is the first evaluation of RT to be reported with a randomized control research design. In addition to controlling for several threats to validity such as participant selection bias and history, the randomization procedure was effective at controlling some of the key demographic variables that could have confounded the outcomes of this study, including the age, education, and marital status of mothers as well as the age,

gender, and developmental functioning of the children. Consequently, results from this study provide strong evidence that the procedures used in RT are effective at enhancing children's developmental functioning, at least over short periods of time.

Each of the families in the RT group received an additional 3 hr per week of services from the RT interventionist that families did not receive in the control group. While the focus of these services was on RT, families may have also received other information and support that could have contributed to their intervention outcomes. As a result, it was important to demonstrate that the intervention outcomes for the RT group were associated with improvements in mothers' responsiveness and its resulting influence on children's pivotal behavior rather than the added support they also received.

In addition, while the children in the control group did not achieve the same magnitude of improvements as observed in the RT group, still several made positive developmental gains. Research reported previously by Mahoney et al. (1998) suggested that the developmental gains children make in all types of developmental intervention are mediated by increases in their mother's responsiveness. The treatment received by the control group focused on teaching children basic developmental, social, and adaptive behaviors in individual and group settings. Yet, although parents neither participated in their children's intervention nor received any type of services to influence their interactions with their children, a number of control group mothers increased their responsiveness during intervention. This raises the question of whether the developmental improvements observed in the control group may have also been mediated by changes in maternal responsiveness and children's pivotal behavior.

Exploratory regression analyses were conducted to examine these issues. Results indicated that changes in maternal responsiveness and children's pivotal behaviors were associated with the developmental improvements observed for both groups. That is, for the entire sample, changes in children's pivotal behavior were significantly associated with changes in mothers' responsiveness, and the developmental improvements children made during intervention were associated with changes in children's pivotal behavior. Although children in the RT group made greater child development improvements than children in the control group, these group effects appeared to be mediated by changes in children's pivotal behavior. This was indicated by results from the hierarchical regression analysis, which indicated that although the variable "groups" was highly associated with children's developmental improvements, when children's pivotal behavior ratings at postintervention were entered into the analysis, children's developmental changes were associated with pivotal behavior changes but not with their treatment group.

Because of the limited statistical power of these post hoc analyses, these results must be treated as preliminary findings. Nonetheless, they provide additional evidence that the impact of RT on children's development is associated with the underlying RT logic model, which postulates that parental responsiveness promotes children's development by enhancing their use of the pivotal behaviors or learning processes that are the foundations for developmental learning. In addition, they suggest that the developmental improvements observed for control group children were also mediated by the improvements in maternal responsiveness, even though this was not the focus of the intervention services these participants received. Results for control group participants provide further support for the proposition that parents have a significant mediating effect on developmental intervention outcomes, regardless of whether this is an intended intervention outcome (Mahoney and Nam, 2011).

One of the more notable findings of this study was that even though RT was developed and validated with parents and children from the United States, it is effective with mothers and children from Turkey. In fact, a comparison of the effects of RT on mothers from the United States as reported by Mahoney and Perales (2005) with the effects on mothers who participated in this study indicates that Turkish mothers and children did better than U.S. mothers and children. Using the same procedures to code mothers' style of interaction used in this study, Mahoney and Perales reported that approximately two thirds of their sample of 50 mothers increased their Responsiveness over the course of 12 months of weekly intervention sessions and that average ratings on Responsiveness increased by 44%. In this study, 90% of the mothers in the RT group increased their responsiveness over 6 months of biweekly intervention and that the average increase was approximately 100%. In addition, although Mahoney and Perales reported that children's pivotal behavior increased by 25% during intervention, in this study, pivotal behavior increases in the RT group were more than 100%. At the very least, this comparison indicates that Turkish mothers were not only successful at learning RT strategies but that they also had little difficulty incorporating these strategies into their routine interactions with their children. Thus, findings from this study indicate that the same RFI can be used effectively with families from Turkey as well as the United States, even though these countries have different cultural and family child rearing values, customs, and routines.

There are several limitations to this study that need to be addressed in future research. These include the small sample size, the reliance on parent-report assessments of child development, and the brief duration of the study. Evaluations of RT with larger samples would facilitate explicit formal tests of mediation and would help to identify which characteristics of families and children are best suited for participating in RT. Now that there have been several studies indicating that

RFIs that are carried out over a 3- to 6-months period can have significant intervention effects (Mahoney & Nam, 2011), it is critical to determine whether the changes in parenting and child development reported in these interventions will have enduring effects. Insofar as RFIs encourage parents to adopt a style of interacting with their children that for many parents is neither natural nor intuitive, it is possible that parents will need follow-up supports to prevent them from reverting to more natural styles of parenting, particularly as their children confront different types of social or developmental challenges. Yet despite these unanswered questions, results from this study point to RT as an effective alternative for addressing the developmental needs of young children with disabilities that can be used with parents and children from diverse cultural and family backgrounds.

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