J Child Fam Stud
DOI 10.1007/s10826-012-9619-8

ORIGINAL PAPER

Personal and Environmental Factors Predict Participation of Children With and Without Mild Developmental Disabilities

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Abstract Enhancing participation in age-related activities is a key goal in the education and rehabilitation of children with diverse disabilities. The aim of this study was to explore a multidimensional and ecological model of participation for young children. Seventy eight children with mild developmental disabilities (MDD, such as motor and visual-motor difficulties), and 110 children without disabilities, between the ages 4 and 6 years old, participated in the study together with their parents. Data were collected using standardized assessments for child capacities and newly developed questionnaires for child participation and for human and physical environmental factors. Associations were found between personal and environmental factors and the participation dimensions amongst young children, thus supporting the validity of the proposed model of participation. Moreover, the study results outline different pathways for the participation of children with and without MDD. Child factors (e.g. process skills) were found to be crucial predictors of participation particularly for children with MDD, whereas human environmental factor (e.g. maternal self-efficacy beliefs) was associated with higher participation scores especially for children without disabilities. These findings may facilitate the development of effective intervention programs which focus on environmental factors as well as on child factors.

Keywords Child participation · Child personal factors · Environmental factors · Ecological model · Process skills · Parenting efficacy beliefs

Introduction

Child development and participation in daily activities are closely interlinked. Participation is defined as involvement in life situations (WHO 2001), is essential for life experience and promotes the development of sensory-motor, cognitive and social skills. Skill improvement, in turn, enables children to fully participate in age-appropriate activities and occupations (Davis and Polotajko 2004; Edwards and Christiansen 2005; Law 2002). For example, gradual improvement in motor planning, fine motor and visual-motor skills enables children to dress themselves, use cutlery or write letters efficiently. Studies highlight changes in participation patterns throughout childhood. For example, as children grow older, they are more engaged in informal spontaneous social activities, while younger children spend more time in formal settings and structured or preplanned activities (e.g. Henry 1998; Jarus et al. 2010). However, a literature review reveals that children with developmental difficulties participate less than their typical peers in domestic, leisure, educational, and social activities (e.g. Engel-Yeger et al. 2009; Jarus et al. 2011; Mancini and Coster 2004; Rosenberg et al. 2010a; Schenker et al. 2005). Authors claim that participation has a vast influence on well-being and life satisfaction (Forsyth and Jarvis 2002; Law 2002), therefore enhancing children's participation, in a way that is age-appropriate and meets

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Published online: 24 June 2012

their parents' expectations, should be a key goal in the education and rehabilitation of children with diverse disabilities (Coster and Alunkal Khetani 2008; Law 2003).

In order to facilitate children's participation, there is a need to better understand the nature of this multifaceted concept. The international classification of functioning, disability and health (ICF, WHO 2001) ecological model posits that participation is affected by personal factors (e.g. gender, chronological or developmental age) and environmental factors (e.g. accessibility, supportiveness, socio-economic status Chen and Cohn 2003; King et al. 2003; Simeonsson et al. 2003). In addition, authors describe participation as a multidimensional construct characterized by various dimensions such as diversity (how many activities), intensity (frequency), independence and satisfaction (Forsyth and Jarvis 2002; Law 2002; McConachie et al. 2006).

Beyond prevailing theoretical discussions about the concept of participation (Forsyth and Jarvis 2002; Law 2002, 2003; Simeonsson et al. 2003), some authors have also explored and measured the participation of children with diverse disabilities (King et al. 2006; Law et al. 2006; Mancini and Coster 2004; Schenker et al. 2005). However, only a few of these studies have explored the participation model as a whole by simultaneously studying various child personal and environmental predictors of child participation. The most comprehensive study, conducted by King et al. explored the factors affecting the recreation and leisure participation of school-aged children with severe physical disabilities. The findings highlight the contribution of human environmental factors (such as family participation in social activities) to participation intensity, beyond the child's functional capacity. In their study of participation in leisure activities of school-aged children with cerebral palsy, Majnemer et al. (2008) reported on the contribution of both parental and child factors to participation diversity, intensity and enjoyment. However another study (Imms et al. 2009) of children with cerebral palsy failed to predict child participation diversity using environmental (socio-economic) factors such as type of household, income, place of residence, or type of school. Dunn et al. (2009) studied whether child and environmental factors were associated with participation of children with attention deficit hyperactive disorder (ADHD) in household tasks. They found that child factors (i.e. age and health status) and environmental factors (i.e. presence of older siblings and parental stress) predicted children's participation and assisted them in performing their daily chores. In a different population of children with acquired brain injuries (ABI), Bedell and Dumas (2004) found that the child self-care scores at discharge accounted for 50 % of the total explained variance of child participation. Human environmental factors (such as lack of support at school) accounted for another 9 %. Beside the significant contribution of child factors, the above-mentioned studies reported a significant but modest contribution of environmental factors. Conversely, Forsyth et al. (2007) found that the child and environmental factors contributed almost equally to prediction of child participation for children with severe developmental disabilities (such as autistic or severe behavior difficulties, learning disabilities, cerebral palsy) from low socioeconomic backgrounds.

In one of our earlier studies (Rosenberg et al. 2011a) of the participation of preschool children without developmental disabilities, our findings suggest that child and environmental factors have distinct effects upon the different dimensions of participation. Nevertheless, the contribution of environmental factors to child participation was much smaller than the contribution of children's capacities and their personal factors. Summaries of the studies and their key findings are presented in Table 1.

These studies focused largely on the participation of school-aged children with and without severe physical disabilities. Therefore, additional empirical support is needed for using this model in earlier stages of development and in children with diverse developmental disabilities. The purpose of the current study was to explore the contribution of child factors (motor capacity, cognitive process skills, perceived competence) and environmental factors (parenting self-efficacy beliefs, perceived environmental restriction, socio-demographic indicators) to five different participation dimensions (diversity, intensity, child independence, child enjoyment, and parental satisfaction) for preschool children with and without mild developmental disabilities (MDD) such as motor and visual-motor difficulties.

Based on all the above mentioned and on our previous studies' results (Rosenberg et al. 2010a, 2011a, b) we articulated three hypotheses. First we hypothesized that differences will be found in participation dimensions between children with and without MDD. Second, we hypothesized that environmental factors will predict participation dimensions, and that child factors will significantly add to the total explained variance in each of the participation dimensions. Finally, environmental and child factors will differentially predict the participation of children with and without MDD (interaction effects).

Method

Participants

The sample size was set to provide enough power to test around 15 explanatory variables (Bartlett et al. 2001). In all, 188 children (mean age 5.27 ± 0.60 years) and their

Table 1 Results of prior studies

Study	Participants	Age	Outcome measures	Results
King et al. (2006)	427 children with severe disabilities	6–14 years	CAPE—participation intensity in out of school formal and informal activities	Best predictors were child functional ability, family participation in social and recreational activities, and child preferences. Other environmental factors found to have additional indirect effects on participation
Majnemer et al. (2008)	67/95 children with cerebral palsy	Mean age 9 years 7 months ± 2 year 1 month	CAPE—participation intensity, diversity, and child enjoyment in out of school activities	Best predictors were various child motor and cognitive variables; among the environmental variables, parental stress and rehabilitation services had significant contribution
Imms et al. (2009)	108/114 children with cerebral palsy	Mean age (years) 11.7 ± 0.54	CAPE—participation diversity	Best predictors were gender, manual ability and child preferences. In the final model environmental factors failed to explain child participation
Bedell and Dumas (2004)	60 children with ABI	3–22 years	CASP—level of participation in social, family chores and educational activities	Best predictors were self-care at discharge, child related problems (e.g. attention, memory, movement) and environmental problems (e.g. inadequate information about brain injury, lack of support at school)
Dunn et al. (2009)	44 parents of children with and without ADHD	9–11 years	CHORES—children's participation in household tasks	Best predictors were child age and diagnosis. In addition, environmental factors such as having an older sibling, the importance of family routines and parental stress were found to be determinants of child participation and assistance needed in household tasks
Forsyth et al. (2007)	600 severely disabled children with low income families	1–12 years	LAQ—children's participation according to ICF categories	The contribution of the child's factors (e.g. intrinsic impairment) and environmental factors (e.g. community support) were comparable
Rosenberg et al. (2010a, b)	70 children with typical development	Mean age (years) 5.18 ± 0.71	CPQ—participation diversity, intensity, child's independence, child's enjoyment, and parental satisfaction	Child's factors, i.e. motor and cognitive ability, affect participation diversity. Performance skills and perceptions of competence affect their independence levels, while environmental factors contribute to frequency of participation and parental satisfaction. These factors on their own do not fully explain the degree of enjoyment experienced by children

CAPE children's assessment of participation and enjoyment, *CASP* child and adolescent scale of participation, *ABI* acquired brain injuries, *ADHD* attention deficit hyperactive disorder, *CHORES* children helping out: responsibilities, expectations, and supports, *LAQ* lifestyle assessment questionnaire, *CPQ* children's participation questionnaire, *ICF* international classification of functioning, disability and health

parents participated in the study. Eighty four children who had been referred to occupational therapy for evaluation, following sensory-motor or visual-motor difficulties were approached and their parents signed a consent form. To confirm the need for OT intervention, all children underwent an individual standardized evaluation by trained certified occupational therapists. The evaluation included the following tests: VMI subtest—copy forms, K-ABC subtest—copy model, K-ABC subtest—digit memory span, TVPS subtest—visual sequencing memory. For the purpose of the current study, performance below the average was considered as mild developmental disability and it was confirmed by a score $\leq$37th percentile in at least one test, or a score $\leq$50th percentile in at least two tests. 78 children (63 boys, 15 girls) were found to be eligible for the study (clinical group–children with MDD). The second group was recruited through convenience sampling and included 112 children (78 boys, 34 girls) who had never been referred to OT or any other health professional (comparison group–children without MDD). To confirm lack of any developmental disabilities, these children underwent the same evaluation procedure. Two children were excluded from the study as they did not meet this criterion. There were no differences between the groups as regard to child age, gender, family income, and living setting (urban or rural) (see Table 2).

Table 2 Characteristics of samples of children with and without MDD

The variable	Children with MDD	Children without MDD		*p*
N	78	110		
Gender				
Boys	63 (81 %)	76 (69 %)	$\chi^2(1) = 3.23$	NS
Girls	15 (19 %)	34 (31 %)		
Children's age				
Mean ± SD	5.20 ± 0.52	5.32 ± 0.65	$t(186) = 1.38$	NS
Number children in family				
Mean ± SD	3.01 ± 2.20	2.91 ± 1.55	$t(185) = -0.38$	NS
(range)	(1–17)	(1–10)		
Parental education (years)				
Mean ± SD				
(range)				
Father	13.87 ± 2.74	15.10 ± 3.19	$t(166) = 2.54$	NS
	(10–23)	(10–24)		
Mother	14.50 ± 2.37	15.55 ± 2.62	$t(175) = 2.69$	NS
	(11–20)	(10–22)		
Parental age				
Mean ± SD				
(range)				
Father	37.34 ± 7.17	37.54 ± 5.56	$t(179) = 0.21$	
	(26–71)	(26–52)		
Mother	34.00 ± 5.38	34.93 ± 4.51	$t(180) = 1.26$	NS
	(24–47)	(25–47)		
Income				
Under average	14 (18 %)	11 (10 %)	$\chi^2(2) = 2.82$	NS
Average	12 (15 %)	18 (16 %)		
Above average	49 (63 %)	80 (73 %)		
Missing	3 (4 %)	1 (1 %)		
Living setting				
City	67 (86 %)	97 (88 %)		
Other	11 (14 %)	13 (12 %)		

NS not significant

Measurements

Children Participation Questionnaire (CPQ; Rosenberg et al. 2010a)

The CPQ is a questionnaire for parents of children ages 4–6 years. It is designed to measure a child's participation patterns in six occupational domains: activities of daily living (ADL), instrumental activities of daily living (IADL), play, leisure, social participation, and education. The questionnaire incorporates five participation measures: participation diversity—is the number of activities in which a child participates (max 44); participation intensity—is the child's mean participation frequency ranging from 0 (never) to 5 (everyday); child's independence is the mean assistance level needed by the child ranging from 1 (dependent) to 6 (fully independent); child's enjoyment and parental satisfaction are the mean level of the child's enjoyment and parental satisfaction with their child's performance respectively, ranging from 1 to 6 (the highest enjoyment or satisfaction). In the current study, these measures were calculated as total scores based upon all the activities in which a child participated. Preliminary findings suggest that the CPQ measures have good internal reliability, temporal stability, and validity. As such the CPQ is considered to be a promising new tool with which to assess child participation (Bart et al. 2011; Rosenberg et al. 2011a).

Bruininks–Oseretsky Test of Motor Proficiency (BOT2; Bruininks and Bruininks 2005)

The BOT2 is a well-known standardized performance test that is designed to assess gross and fine motor skills of children aged 4–21 years. For the purpose of the current study, we used the short version of the test which includes 14 items in eight domains: fine motor precision, fine motor integration, manual dexterity, bilateral coordination, balance, running speed and agility, upper limb coordination, and strength. Each item's raw score is translated into a point score, and the individual point scores are calculated for a total point score between 0 and 88. The total point score can be transformed, according to child age, into a standard score or percentile. The BOT2 has good internal reliability and temporal stability. The test's content and construct validity are well established.

Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (PSPCSA, Harter and Pike 1984)

The PSPCSA is a well-known test that is designed to assess children's perceptions of their own cognitive and physical competence, and their social and maternal acceptance (i.e. mother–child relationship). The child verbally responds to 24 pictures depicting children performing diverse activities in the four mentioned domains. For the purpose of the current study, a total mean score across the 24 items was computed with higher scores indicating greater levels of perceived competence by the child. Good reliability and validity have been reported in previous studies (Harter and Pike 1984; Jambunathan and Burtis 2003; Mantzicopoulos 2004).

Child Performance Skills Questionnaire (PSQ, Bart et al. 2010)

The PSQ is a 34 items questionnaire for parents designed to assess child's performance skills. This term is used to describe the child's observed performance when engaging in a range of activities. The PSQ measure three skill domains: motor skills (e.g. sits stable, stands straight maintains trunk control and balance; efficiently uses small objects), process skills (e.g. selects and uses appropriate tools and materials for a task; performs activity in the right sequence order), and communication skills (e.g. expresses himself easily; negotiates, resolves conflicts, collaborates with peers). Parents are asked to rate how well each item describes their child on a Likert scale from 1 (does not describe my child at all) to 6 (describes my child very well), where a higher score indicates stronger performance skills. Preliminary findings suggest that the PSQ has good internal reliability (Cronbach's coefficient alpha 0.84–0.92) and good temporal stability (ICC 0.92–0.96). The PSQ has established convergent and divergent validity (Bart et al. 2010; Rosenberg et al. 2011a). To avoid the possibility of multicollinearity, for the purpose of the current study, we used only the process skills mean total score (PSQ-process). Process skills are elements of functional performance which include knowledge, energy, temporal organization, organizing space and objects, and adaptation. They are observable actions used to logically organize and adapt operations which, in sequence, enable the effective completion of daily life tasks (Fisher and Kielhofner 2005; Fisher 2006).

Environmental Restriction Questionnaire (ERQ, Rosenberg et al. 2010b)

The ERQ was designed to measure parental perceptions of environmental factors impacting on their child's performance. The ERQ is comprised of 35 items covering a broad range of physical and human environmental factors at home, in the family's neighborhood, and in the educational setting (e.g. where we keep crayons and paper in our house, the distance between home and a recreational center, the equipment and toys in my child's preschool). Parents are asked to rate the extent to which, in their opinion, each item restricts their child's participation. Each item was scored from 1 to 6 on a Likert scale, where higher scores indicate a higher degree of participation restriction. The ERQ total score is the mean score of participation restriction for all items, excluding items marked as 'non-relevant'. Preliminary findings suggest adequate psychometric properties. Cronbach's alpha internal reliability, ranged between 0.75 and 0.91. Factor Analysis yielded three factors that explained almost 48 % of the total variance. Construct validity was supported by known groups differences (Rosenberg et al. 2010b, 2011b).

Parental Self-Efficacy Beliefs Questionnaire (Parental SEB Raviv and Bartal 1995)

The parental SEB questionnaire designed to assess specific parenting self-efficacy believes. It addressed to parents and comprises 15 items regarding parenting only. The items are phrased as statements (e.g. frequently, I reproof my child without a sensible reason) or questions (e.g. to what extant are you satisfied with yours child's rearing skills?). The items are measured on a 6-point Likert scale from 1 (not at all) to 6 (very much). The total score is the sum of all scores for individual items, where high scores indicate higher parental SEB. The questionnaire has high internal validity (Cronbach's coefficient alpha higher than 0.80), it has been shown to differentiate between mothers of children with motor difficulties or hyperactivity, and control

mothers (unpublished theses). Factor analysis yielded four factors that accounted for 18.5 % of the variance of a mother's ability to set limits for her child. Thus, the construct validity of the questionnaire has been supported. In the current study the parental SEB questionnaire was completed separately by mothers and fathers.

Socio-Economic Questionnaire

Information on the demographic, social and economic background of the child's family was collected using a structured questionnaire completed by the primary caregiver (e.g. mothers). This information included age, gender, education and occupation of both parents; socio-demographic factors (religion and ethnicity); living conditions (dwelling and number of rooms); family structure (type, size, and siblings); and family income.

Procedure

Following approval from the Behavioral Research Ethics Board of Tel-Aviv University and the relevant community health services, data for the clinical group were collected at four pediatric outpatient occupational therapy clinics located in central Israel. Twelve certified pediatric occupational therapists (OTs) took part in this phase. Data for the comparison group were collected by 6 occupational therapy students as part of their coursework requirements. Prior to data collection, all OTs (students and certified OTs) participated in training sessions conducted by the first author. The sessions included a presentation of the study's theoretical background, objectives, and measurements. Inter-rater reliability was calculated between raters, and exceeds 70 % of agreement in all measurements. The first author supervised the teams throughout the study.

Parents who agreed to participate in the study received information about the purpose and the methods of the study and signed a consent form. All parents completed the socioeconomic, CPQ, PSQ, ERQ, and parental SEB questionnaires independently. Each child (clinical and comparison group) underwent an individual standardized evaluation in a quiet and suitably sized room at the outpatient clinic or at their own home, using the BOT2, and PSPCSA in a fixed order. Scoring was conducted by the examiners and supervised by the primary researcher.

Data Analysis

To test differences between the developmental status groups (children with and without MDD) for all the dependent and independent variables, we computed a multivariate analysis of variance. To test the association between the various predictors (child's and environmental factors), we computed Pearson correlations. Linear regressions were conducted to assess the extent to which variance in participation measures (diversity, intensity, independence, enjoyment, and parental satisfaction) could be accounted for by the predictors. We computed five multiple linear regressions using an Enter method. Dummy variables were used for categorical variables. To examine our hypotheses, in each regression model, the following three steps were performed: first, we evaluated environmental factors using the socioeconomic questionnaire, the parental SEB questionnaire and the ERQ; next, we assessed child factors using standardized, hands-on tests (BOT2, PSPCSA), a parental questionnaire (PSQ), the child's age, and developmental status group (with or without MDD); finally, interactions among the predictive variables were examined. Interaction terms were created by converting continuous variables into z-scores and then multiplying them to create an interaction variable. The variable selection and the order in which they were entered are based upon theory and previous findings (Bart et al. 2007; Case-Smith 2005; Chen and Cohn 2003; Law 2002; Rosenberg et al. 2011a). *The simple slopes in MLR 2-way interaction* program (Preacher et al. 2006) was used whenever an interaction effect was found, in order to assess the source of the interaction. The level of significance was set at 0.05 for all statistical tests.

Results

Participation and Personal and Environmental Factors

The participants' raw scores for the outcome measures and the predicting variables are presented in Table 3. Multivariate analysis of the CPQ participation measures revealed a significant difference between the developmental status groups [F (5,182) = 6.74, $p < 0.001$, $\eta^2 = 0.156$]. This revealed that children with MDD scored lower than their peers without MDD on all participation measures except for participation intensity. Multivariate analysis of the predicting variables revealed a highly significant difference between the developmental status groups [F (6,170) = 16.52, $p < 0.001$, $\eta^2 = 0.368$]. Children with MDD scored lower than their peers without MDD on motor capacity and process skills. However, the groups did not differ in respect to the child's perceived competence, parenting self-efficacy beliefs and environmental restrictions. As a whole, parents reported a relatively high level of parenting self-efficacy beliefs and a low level of environmental restrictions.

Regression Analyses

To avoid the possibility of multicollinearity, we computed Pearson correlations between all the explanatory variables

Table 3 Means, standard deviations, range and MANOVA results of outcome measures and the predictor variables by developmental status

CPQ measures (range)	Total ($N = 188$) Mean ± SD Min–max	Children with MDD ($N = 78$) Mean ± SD Min–max	Children without MDD ($N = 110$) (Mean ± SD) Min–max	F (1,187)	μ^2
Diversity	38.10 ± 3.39	37.45 ± 3.68	38.56 ± 3.11	5.02*	0.026
(0–44)	27–44	27–43	31–44		
Intensity	3.91 ± 0.29	3.89 ± 0.29	3.91 ± 0.30	0.44	0.002
(0–5)	3.00–4.83	3.26–4.83	3.00–4.79		
Child's independence	5.20 ± 0.48	5.04 ± 0.50	5.31 ± 0.44	15.23**	0.076
(1–6)	3.22–5.89	3.76–5.88	3.22–5.89		
Child's enjoyment	5.46 ± 0.35	5.37 ± 0.38	5.53 ± 0.32	9.13**	0.047
(1–6)	4.29–6.00	4.29–6.00	4.29–5.98		
Parental satisfaction	5.36 ± 0.49	5.16 ± 0.55	5.50 ± 0.39	24.60**	0.117
(1–6)	3.79–6.00	3.79–5.98	3.88–6.00		
Predictor variables (range)				F (1,176)	μ^2
BOT2	42.93 ± 14.20	33.72 ± 11.60	49.57 ± 12.17	71.89**	0.291
(0–88)	8–75	8–57	20–75		
PSPCSA	3.55 ± 0.40	3.50 ± 0.42	3.59 ± 0.39	1.07	0.006
(0–4)	2.98–4.00	2.38–4.00	2.54–4.00		
Process skills	4.91 ± 0.78	4.57 ± 0.94	5.15 ± 0.55	28.26**	0.291
(1–6)	2.07–6.00	2.1–6.00	3.4–6.00		
Maternal SEB	5.04 ± 0.63	5.03 ± 0.63	5.05 ± 0.64	0.001	0.000
(1–6)	2.86–6.00	2.87–6.00	2.86–6.00		
Paternal SEB	4.98 ± 0.57	4.89 ± 0.58	5.05 ± 0.56	3.41	0.019
(1–6)	2.53–6.00	3.53–6.00	2.53–6.00		
ERQ	1.79 ± 0.57	1.84 ± 0.51	1.75 ± 0.61	0.42	0.002
(1–6)	1.00–3.57	1.06–3.25	1.00–3.57		

CPQ child participation questionnaire; *BOT2* Bruininks–Oseretsky test of motor proficiency, *PSPCSA* pictorial scale of perceived competence and social acceptance for young children, *SEB* self efficacy beliefs, *ERQ* environmental restriction questionnaire

* $p < 0.05$; ** $p < 0.01$

(Table 4). The results indicated that some variables had a moderate or less-than-moderate correlation, which permitted us to apply them together for calculations of regression.

The regression results presented in Table 5 indicate that child factors and environmental factors had distinct associations with each of the five participation measures. The results revealed that, following the first step in analysis, the environmental factors (i.e. income, maternal education, maternal and paternal self-efficacy beliefs, and environmental restrictions) made a significant contribution of 13–21 % to the total explained variance of all participation dimensions. In the second step of analysis, child factors greatly increased the total explained variance for all dimensions of participation except for participation intensity. All the transitions (F changes) between the first, second and third steps of analysis were significant, except the change between the first and second step for analysis of participation intensity. The interaction effects at the third step added 3–6 % to the total explained variance of the various participation dimensions. As demonstrated in Table 5, nine interaction effects were identified, and these effects were further analyzed using the *simple slopes in MLR 2-way interaction* program (Preacher et al. 2006) to identify their source. The regression analysis results are visually summarized in Fig. 1.

Developmental Status as Moderator

Developmental Status and Maternal SEB on Child Independence (Fig. 2a)

Analyses of simple slopes revealed that participation independence was positively and significantly related to

Table 4 Pearson correlations between the child and environmental factors ($N = 188$)

	Income	Maternal education	Maternal SEB	Paternal SEB	ERQ	Age	Developmental status	BOT2	Process skills
Maternal education	0.157*								
Maternal SEB	−0.034	−0.171*							
Paternal SEB	0.009	−0.051	0.407**						
ERQ	−0.090	0.089	−0.472**	−0.245**					
Age	−0.008	−0.087	−0.006	−0.024	−0.066				
Developmental status	−0.114	−0.175*	−0.016	−0.138	0.080	−0.097			
BOT2	0.064	0.055	−0.056	0.079	−0.114	0.571**	−0.550**		
Process skills	0.069	−0.014	0.391**	0.286**	−0.394**	0.127	−0.369**	0.291**	
PSPCSA	0.080	−0.165*	0.098	0.062	0.018	−0.156*	−0.113	−0.132	0.106

SEB self efficacy beliefs, *ERQ* environmental restriction questionnaire, *BOT2* Bruininks–Oseretsky test of motor proficiency, *PSPCSA* pictorial scale of perceived competence and social acceptance for young children

* $p < 0.05$; ** $p < 0.01$

increasing maternal self-efficacy beliefs for children without MDD [$b = 0.103$, SE = 0.043, $t = 2.3953$, $p = 0.0179$]. Conversely, for children with MDD, participation independence was negatively but not significantly related to increasing maternal self-efficacy beliefs [$b = -0.122$, SE = 0.0761, $t = -1.6026$, $p = 0.1111$].

Developmental Status and Child Process Skills on Independence, Enjoyment and Parental Satisfaction

Analyses of simple slopes revealed that a child's independence (Fig. 2b) was significantly associated with greater process skills for children without MDD [$b = 0.175$, SE = 0.046, $t = 3.8043$, $p = 0.0002$]; the correlation was even stronger for children with MDD [$b = 0.333$, SE = 0.0769, $t = 4.3331$, $p = 0.0001$]. Similar correlations were found for child enjoyment [children without MDD: $b = 0.117$, SE = 0.0374, $t = 3.127$, $p = 0.0021$; children with MDD: $b = 0.231$, SE = 0.0648, $t = 3.5644$, $p = 0.0005$] and for parental satisfaction [children without MDD: $b = 0.121$, SE = 0.049, $t = 2.4699$, $p = 0.0147$; children with MDD: $b = 0.299$, SE = 0.0826, $t = 3.6206$, $p = 0.0004$].

Developmental Status and Children's Perceived Competence on Participation Diversity

Analyses of simple slopes revealed that participation diversity (Fig. 2c) was significantly related to greater perceived competence for children with MDD [$b = 1.395$, SE = 0.5422, $t = 2.5728$, $p = 0.0111$], whereas there was no significant correlation for children without MDD [$b = 0.293$, SE = 0.3, $t = 0.9767$, $p = 0.3303$].

Child Process Skills as a Moderator

Child Process Skills and Maternal SEB on Participation Diversity, Enjoyment and Parental Satisfaction

Participation diversity was significantly correlated with increasing maternal self-efficacy beliefs for children with low process skills [$b = 1.663$, SE = 0.4462, $t = 3.7273$, $p = 0.0003$], but not for children with high process skills [$b = 0.487$, SE = 0.4474, $t = 1.0886$, $p = 0.2781$] (Fig. 2d). Enjoyment was not associated with increasing maternal self-efficacy beliefs for children with low process skills [$b = -0.011$, SE = 0.0911, $t = -0.1208$, $p = 0.904$] or for children with high process skills [$b = 0.005$, SE = 0.0911, $t = 0.0549$, $p = 0.956$]. Parental satisfaction was positively associated with increasing maternal self-efficacy beliefs for children with high process skills [$b = 0.133$, SE = 0.0575, $t = 2.3122$, $p = 0.0221$]. Conversely, parental satisfaction was negatively associated with increasing maternal self-efficacy beliefs for children with low process skills [$b = -0.127$, SE = 0.0574, $t = -2.2137$, $p = 0.0284$] (Fig. 2e).

Discussion

The findings of our study support the multidimensional ecological model of participation, provide insight into the nature of child participation, and reveal that even MDD are associated with more limited participation of preschoolers. The multivariate analysis revealed interactions (although small in magnitude) between child's and environmental factors which differentially affected five participation dimensions, and thus deepen our theoretical understanding of the concept of participation.

Table 5 Model summary for predicting diversity, frequency, child's independence, enjoyment and parental satisfaction dimensions of participation ($N = 188$)

Participation's measures	Diversity β	Intensity β	Child's independence β	Child's enjoyment β	Parental satisfaction β
First step					
Income	0.27***	−0.19*	−0.09	−0.11	−0.09
Maternal education	−0.05	0.03	−0.07	−0.05	−0.03
Maternal SEB	0.34***	0.17	0.06	−0.09	−0.03
Paternal SEB	−0.12	0.05	0.19*	0.35***	0.30***
ERQ	−0.02	−0.22*	−0.30***	−0.30***	−0.29**
F (5,159)	6.47***	5.78***	8.28***	9.49***	8.47***
R^2 adj.	0.14	0.13	0.18	0.21	0.19
Second step					
Income	0.27***	−0.19*	−0.07	−0.08	−0.06
Maternal education	−0.04	−0.03	−0.14*	−0.11	−0.12
Maternal SEB	0.29**	0.13	0.02	−0.15	−0.05
Paternal SEB	−0.15	−0.03	−0.12	0.27***	0.20**
ERQ	0.08	−0.15	−0.07	−0.12	−0.10
Child age	0.20*	0.00	0.12	−0.09	−0.16
Developmental status	−0.07	−0.01	−0.17*	−0.16*	−0.24**
BOT2	0.22	0.01	0.13	0.10	0.21
Process skills	0.01**	0.20*	0.46***	0.45***	0.41***
PSPCSA	0.24**	0.05	−0.03	−0.10	−0.08
F (10,154)	7.21***	3.52***	14.34***	11.00***	12.69***
R^2 adj.	0.28	0.13	0.45	0.38	0.42
F change (5,154)	6.78***	1.23 ns	16.40***	9.87***	13.55***
Third step					
Income	0.28***	−0.22**	−0.08	−0.10	−0.60
Maternal education	−0.03	0.30	−0.14*	−0.12	−0.13*
Maternal SEB	0.33**	0.13	0.22*	−0.08	0.06
Paternal SEB	−0.18*	0.00	0.06	0.26***	0.19**
ERQ	0.01	−0.26*	−0.05	−0.13	−0.10
Child age	0.20*	0.05	0.16*	−0.05	−0.12
Developmental status	−0.04	−0.01	−0.18*	−0.19*	−0.27***
BOT2	0.03	−0.04	0.12	0.06	0.20*
Process skills	0.14	0.17	0.36***	0.31**	0.24*
PSPCSA	0.09	0.01	−0.05	−0.05	−0.06
Developmental status × ERQ	0.05	0.15	−0.03	0.04	0.03
Developmental status × maternal SEB	−0.10	−0.01	−0.29**	−0.06	−0.10
Developmental status × process skills	0.14	0.12	0.21*	0.20*	0.23*
Developmental status × PSPCSA	0.20*	0.07	0.05	−0.02	0.03
Maternal SEB × process skills	−0.17*	0.16	0.08	0.22**	0.26***
ERQ × process skills	−0.13	−0.12	−0.80	0.09	0.17*
F (16,148)	5.56***	3.12***	11.59***	8.16***	10.40***
R^2 adj.	0.31	0.17	0.51	0.41	0.48
F change (6,148)	2.23*	2.18*	4.11***	2.42*	4.07*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.0001$

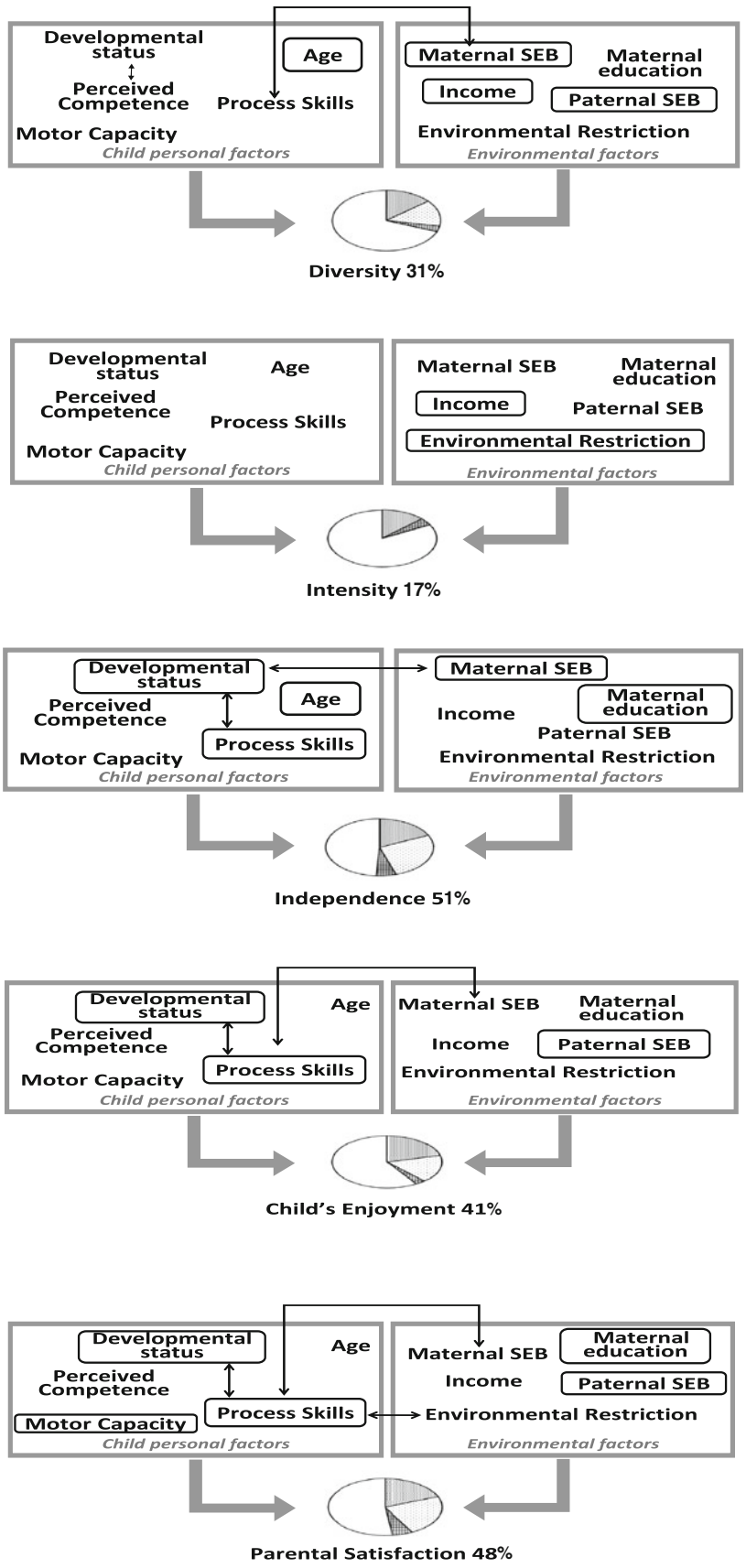

Fig. 1 Summary of regression results. ▭ Significant predictor, ◂▸ interaction, ▥ % step 1 (environment), ▭ % step 2 (child), ▦ % step 3 (interaction), ▭ % unexplained variance

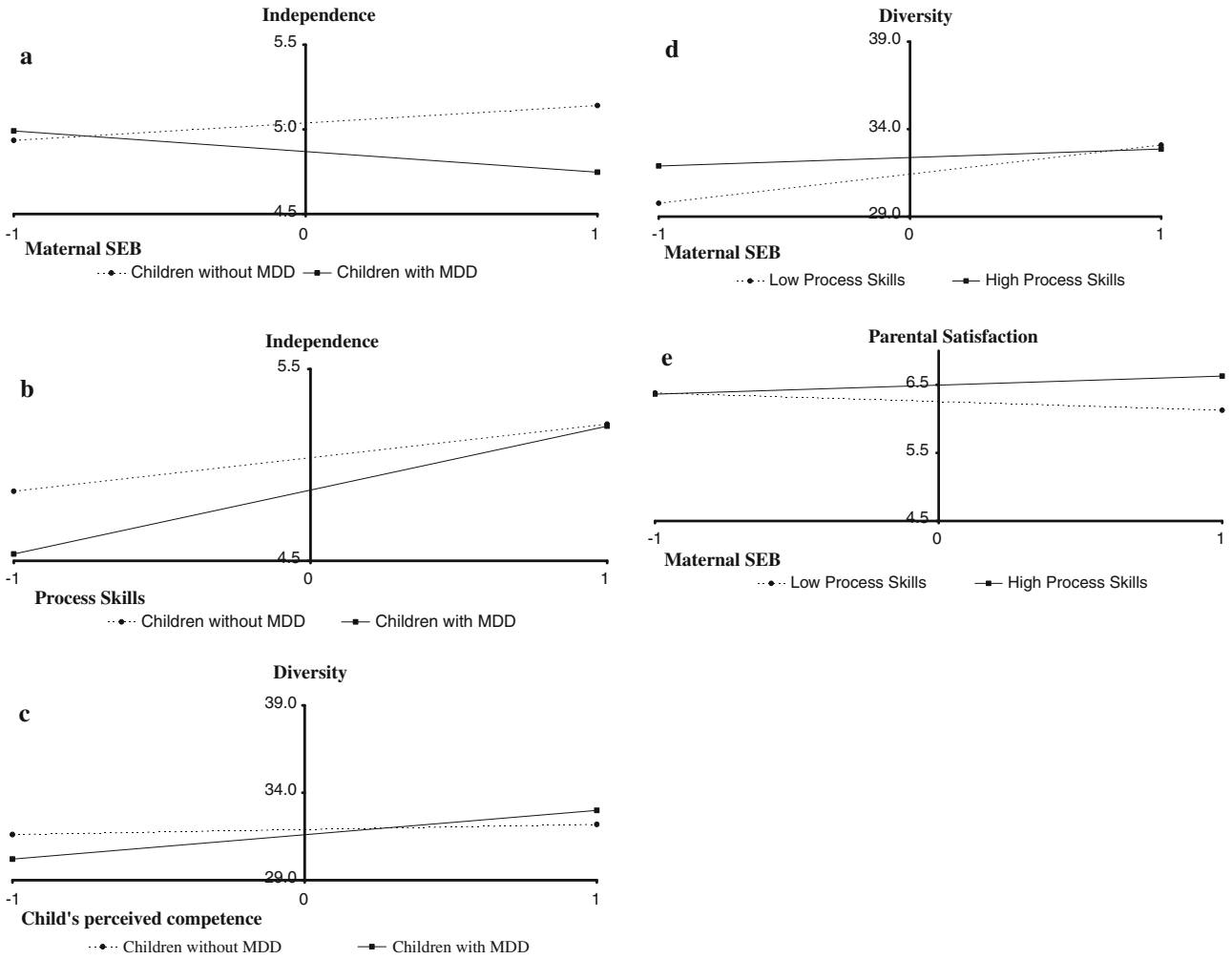

Fig. 2 **a–e** *Regression lines* for the associations between dimensions of participation and the predictors' variables, by developmental status or process skills as moderators

Environmental Factors

Our findings revealed that environmental factors were significant predictors of all participation dimensions, especially the objective dimensions (diversity and intensity), although their contribution was limited to 21 % of the variance or less. Of note, environmental factors were the sole predictors of participation intensity (see Fig. 1). Various perceived environmental restrictions (physical factors—e.g. distance from the child's house to the local park or to a friend's house, or human factors—e.g. parents' preferences or parents' lack of awareness of the importance of physical activity to their child's development) were associated with decreased participation intensity in leisure and social activities for all subjects. In contrast, previous studies (King et al. 2006; Majnemer et al. 2008) found that participation intensity was predicted by child factors such as motor or cognitive capacity. These dissimilarities may result from differences in participants' age and health status.

In the current study, parenting self-efficacy beliefs predicted more than the other environmental variables (i.e. family income, perceived environmental restrictions) to the explained variance of the diverse dimensions of child participation. While maternal self-efficacy beliefs were associated with higher participation diversity, especially for children with low process skills, it was associated with lower independence of children with MDD. In contrast, paternal self-efficacy beliefs were significantly associated with higher enjoyment for all children. Sociologically driven differences between the two parents may help explain these findings, as reflected in a broad range of literature which suggests differences in parenting self-efficacy beliefs and activities between mothers and fathers. Meunier and Roskam (2009) reported higher nurturance and instrumental care self-efficacy beliefs in mothers, and higher discipline self-efficacy beliefs in fathers. Accordingly, mothers tend to be more involved in physical care activities and activities which are time-sensitive (e.g. meal

time, transportation to afternoon class) and linked to family routine. Fathers, on the other hand, tend to be more involved in other child care activities such as play, talking or recreation (Craig 2006; Weininger and Lareau 2008). In the context of this study we see that mothers with higher parenting self-efficacy beliefs might have adjusted their parental behaviors to accommodate the special needs of their children. Consequently, maternal self-efficacy beliefs were associated with higher participation in diverse age-related activities but with lower child's independence at the same time. This is supported by previous qualitative studies (Missiuna et al. 2006; Summers et al. 2008) where mothers of children with motor difficulties describe the need to supervise, rush, or physically assist their children in order to complete self-maintenance ADL (e.g. dressing, eating), thus inadvertently hampering independence while promoting participation. Additionally, it might be that as maternal self-efficacy beliefs increases, so does awareness of their child's limitations—and parental satisfaction decreases. Fathers with higher self-efficacy beliefs on the other hand, might promote child enjoyment and parental satisfaction as a consequence of their greater involvement in father-child leisure activities. Overall strong parental self-efficacy beliefs are associated with effective parenting practices, which in turn may promote positive coping and adjustment amongst children (Jones and Prinz 2005; Yeung et al. 2001). These findings illuminate the mutual relationships between parenting self-efficacy beliefs and child participation.

Child Factors

By adding the child factors (i.e. developmental status group, age, motor capacity, cognitive process skills, perceived competence) to the regression model, the total explained variance was doubled for all participation dimensions (excluding intensity). Belonging to the clinical group (children with MDD) predicted lower participation on dimensions of independence, enjoyment and parental satisfaction. Limited participation has previously been reported for children with various developmental disabilities such as cerebral palsy (e.g. Imms et al. 2009; Jarus et al. 2010; King et al. 2006; Shikako-Thomas et al. 2008), developmental coordination disorder (e.g. Cairney et al. 2005; Jarus et al. 2011; Tien-Ni et al. 2009), sensory modulation disorder (Bar-Shalita et al. 2009), high-functioning autism spectrum disorders (Hilton et al. 2008), and emotional disorders (Desha and Ziviani 2007). These studies predominantly reported on the intensity or diversity of participation of school aged children. Hence, the current study contributes to existing knowledge by highlighting the associations between MDD and the independence, enjoyment, and parental satisfaction dimensions of participation of young preschoolers.

The current study is one of the first studies to incorporate quantitative measure of child process skills. The inclusion of this variable is one of the study's main strength, and—based on the Beta coefficients and interaction effects—was found to be a key predictor of independence, enjoyment and parental satisfaction. This was found for all children, however the associations increased significantly for children with MDD, thus indicating that process skills may serve as a supportive factor for the participation of these children. This is promising, as process skills are acquired skills that can be taught and improved through intervention (Bart et al. 2010; Mandich et al. 2001).

Additionally, the current study revealed a positive association between child's perceived competence and participation diversity for children with MDD and not for children without MDD. Children with motor difficulties are engaged in fewer different activities, yet this may be compensated by a sense of perceived competence which motivates them to take part. Nonetheless engagement in diverse activities, despite the motor difficulties, may enhance the child's perceived competence.

Conclusions and Limitations

Our findings support the multidimensionality approach to participation. Each dimension of participation was associated differently with the various predictors. The results indeed outline different pathways for the participation of children with and without MDD. Although child's and environmental factors were associated with the participation of all children, the current study revealed that child factors (i.e. child perceived competence and process skills) were particularly important for the participation of children with MDD. Human environmental factor (i.e. maternal self-efficacy beliefs) was associated with higher participation for children without disabilities in particular. In addition it was found that parenting self-efficacy beliefs made a complementary contribution to participation for both groups of children. These findings might encourage clinicians to integrate environmental factors into their intervention programs and to further study effectiveness of such programs.

Key limitations of this study should be outlined. Although we measured five different dimensions of participation, we did not exhaust all participation dimensions defined in the literature. Dimensions such as "where the activity was performed" or "with whom" were not included and thus some information about participation was missing. Participation dimensions, performance skills and parenting self-efficacy beliefs were all based on parental self-report questionnaires. Consequently, a possible shared variance might affect the results. Further studies may use

other sources of information (e.g. teachers as informants). Evaluators were not blind to the study purpose which might affect the results too. Participants were children of relatively educated parents with an average or above average income, and this may limit generalization of the findings. Further studies with various populations from diverse backgrounds (i.e. income and parents' education) and health status are warranted. Further studies should also explore a broader range of child's and environmental factors. Among the child factors, cognitive process skills were found to be a crucial predictor for participation thus further studies could explore other cognitive and meta-cognitive variables such as executive functions. Among the environmental factors, parenting self-efficacy beliefs were found to be a crucial predictor of child participation; therefore further studies should focus on other parental characteristics such as parenting style.

Implications for Practice

Understanding the processes underlying the participation of young children may assist health professionals in providing improved services to children and their parents. The findings suggest that practitioners who aim to promote child participation in educational, rehabilitation or community settings should consider a variety of pathways to do so. Children may benefit from direct intervention which promotes improved process skills and positive perceived competence. They may also benefit from indirect intervention which focuses on increasing parental awareness, self-efficacy beliefs and involvement in activities with their children, as it pertains to child participation.

Acknowledgments This work was performed in partial fulfillment of the requirements for the Ph.D. degree of Limor Rosenberg. We are grateful to the parents and children who participated in this study. We thank the dedicated students and certified occupational therapists for their valuable assistance in data collection.

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