

# The Learn at Play Program (LAPP): Merging Family, Developmental Research, Early Intervention, and Policy Goals for Children with Down Syndrome

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**Abstract** This article addresses the dynamics of parent–child interactions and their potential influence on the development of social competence among children with Down syndrome (DS). The authors argue that a strong parent–child relationship is fundamental for building the social competence of children with DS and the integration and inclusion of these children into their communities. The Learn at Play Program (LAPP), a model of early intervention that prioritizes the goals of nurturing and shaping the development of interpersonal skills and social competence among children with DS, is proffered. Discussed first is a brief overview of early intervention and the rationale for the need to focus on parent–child interactions and social competence when DS is present. The LAPP early intervention model for children with DS and their families is presented along with data from seven mother–child dyads assessed with the LAPP longitudinal study of parent–child interactions in DS to demonstrate the use of the model. The author's experiences with the LAPP program are also used to illustrate the utility of linking supportive networks (such as nonprofit organizations), academic and provincial government funding partnerships and public policy forums, and publicly funded organizations providing services to children with developmental delays from birth to 3 years old.

**Keywords:** Down syndrome, early intervention, social competence, systems

## INTRODUCTION

Down syndrome (DS) is one of the most common noninherited “organic” causes of intellectual disability and occurs in approximately 1 out of every 650 live births. DS is the result of the presence of all or a portion of an extra copy of chromosome 21. Complete trisomy 21, an extra 21st chromosome in all cells of the body, accounts for over 95% of all full-term cases (Simonoff et al., 1998). In 3–4% of cases translocation occurs, whereby the 21st chromosome breaks off and attaches to other chromosomes. One to two percent of cases are due to postconception nondisjunction that produces three copies of chromosome 21 in some but not all cells (i.e., mosaicism) (Cooley & Graham, 1991). The evidence from behavioral genetic studies of cognitive development suggests that developmental outcomes are not determined in a direct fashion by gene action and that genetic vulnerabilities correlate and interact with the individual's environment (Flint, 1999; Nokelainen & Flint, 2002). The

chromosomal anomaly in DS has powerful and specific influences on development, the consequences of which may be considered so great by adulthood that environmental interventions have relatively little to contribute. Conversely, in the early stages of development, the prognosis of infants and young children with DS is more promising, as recent evidence in the neurobehavioral sciences indicates that brain development is quite malleable and responsive to early pre-, peri-, and postnatal influences (Nelson, 2000; Weiss & Wagner, 1998).

The notion of plasticity in DS is consistent with reports of the considerable variability in the severity of impairment and adaptive functioning within this group (Rutter, Simonoff, & Plomin, 1996; Simonoff, Bolton, & Rutter, 1996; Simonoff et al., 1998). Similarly, despite considerable individual variation in the developmental progress of infants with DS who participate in early intervention programs (Spiker & Hopmann, 1997), children with DS are responsive to early interventions designed to target specific domains of development (Hines & Bennett, 1996).

The effects of DS are not limited to the infant whose development is directly impacted by the chromosomal anomaly. The addition of an infant with DS into a family unit, even one that functions cohesively and flexibly, may perturb and overly tax the family system. Distress in one or more members of the family is

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likely to reverberate throughout the family system and affect the functioning of individual members, their interpersonal relationships, and the family as a whole. This systemic perturbation is due to the family operating as a unit rather than as a group of individuals (Nichols & Schwartz, 1998). For example, the birth of a new child is a time when family subsystems are particularly vulnerable to stressors due to the inclusion of a new member and necessary renegotiations in the couple and parent-sibling relationships (Carter & McGoldrick, 1999). The quality of existing family relationships, in turn, are likely to both influence and be influenced by the new parent-infant relationship (Turnbull, Summers, & Brotherson, 1986). When the newborn has DS, the normal challenges of this family life cycle transition and readjustment may be more arduous due to the added demands placed on the primary caregiver (usually the mother) to provide for the child's special needs and relatively less time, or energy, or both, to attend to other family subsystems. The mother and infant subsystem, however, may also be at risk due to the unique profile of disabilities associated with children with DS that includes medical, motor, social, affective, and cognitive features that elicit specific parental beliefs and expectations regarding the child's current and future capacities (Cicchetti & Sroufe, 1978; Ly & Hodapp, 2002).

The need to seek out specialized professionals and services, financial resources, and training are among the most well-documented parental stressors that conspire to challenge the family system caring for a child with special needs (Guralnick, 2000; Minnes, 1998). Families of children with DS report that negative attitudes from health professionals, particularly with regard to expectations for future success, can be an additional source of stress (Virji-Babul, Eichman, & Duffield, 2004). Concerns about future expectations and success frequently compel parents to adopt specialized and highly structured parenting techniques that may unduly test their sense of mastery, confidence, or satisfaction in caregiving (Guralnick, 2000). Alternatively, parents may thrive in their unique roles as their child's advocate, case manager, and teacher but at a significant cost to their roles as play partner, emotion regulator, and nurturer of self-identity and autonomy. The functioning of the family system and its various subsystems need to be considered as the "special needs" extend beyond the child with DS.

The initial early intervention programs for infants with DS focused on remediating areas of weakness and capitalizing on the strengths of the child with DS. Later approaches were designed to educate and support families with children with DS, and incorporated techniques to optimize both child and family support (for a review, see Guralnick, 2000). We believe that in designing new early intervention programs for children with DS we must achieve yet another milestone by moving to a higher level of analysis that integrates both the child and family processes within a dynamic transactional model (Cicchetti & Beeghly, 1990; Kasari & Hodapp, 1996; Sameroff, 1992; Sameroff & Chandler, 1975). An integrative analysis is necessary to capture the complexity of the developmental phenomena of the infant with DS in context.

Thus, we propose an early intervention model that is designed to consider the specific etiology of DS and the reciprocal effects of children, parents, families, and their broader social systems (Shonkoff, Hauser-Cram, Krauss, & Upshur, 1992). The emphasis of an early intervention program is to foster, facilitate, and optimize interactions between children with DS and their carers and other social partners and, thus, build social, affective, and cognitive development in the child as well as family wellness. The long-term developmental goals are to improve the child's social competence and community integration and adaptation to family life cycle transitions.

In designing an early intervention program for families with children with DS, we recognize that the child's ecology has a significant impact on the quality of the interpersonal relationship because the dyad is embedded within, and largely influenced by, the broader social systems (Bateson, 1971; 1979; Dunst, 2000; Guralnick, 2000). This notion is relevant to all developing children but is particularly pertinent in the case of children with developmental disabilities and their parents who are inherently dependent on their schools, communities, and social service agencies for healthy development. Thus, the qualities of the parent-child relationship and the quality of the relations among the various systems within which the relationship is embedded are intrinsically linked. Similar to the dyadic alliance between a child with DS and his or her parent, the relations among groups that have the potential to greatly impact the development of children with DS (i.e., families, researchers, early interventionists, and policy makers) need to be understood, nurtured, and supported for optimal outcomes. The simple merging of these groups is insufficient because the alliance per se is not a strategy but a means of implementing strategy. This distinction is crucial as early intervention initiatives by families, researchers, interventionists, and policy makers are naturally entwined, and thus, efforts to optimize the inevitable interactions of these diverse systems must be strategically implemented.

In this article, we advocate a developmental systems perspective (see Guralnick, 2005) to better understand both the dynamics of parent-child interactions and their influence on the development of social competence among children with DS and the interplay of the various social systems of support available within the province of British Columbia (BC) in Canada where these dyads are situated. We begin with a brief overview of early intervention and the need to focus on parent-child interactions and social competence in DS. We then outline the Learn at Play Program (LAPP), a social competence model of early intervention for children with DS and their families that we are currently developing at the Down Syndrome Research Foundation (DSRF) in Burnaby, BC. The role of the supportive networks of the DSRF, a nonprofit organization, and the Human Early Learning Partnership (HELP), an academic and provincial government funding partnership and a public policy forum, will be discussed with regard to the broader developmental system and policy goals of LAPP.

## THE EFFECTS OF DOWN SYNDROME ON PARENT–CHILD INTERACTIONS

Between the second and third months of life of a child with DS, there are significant developments in behavioral synchrony, turn-taking, and reciprocity between the parent and infant (Fogel, 1977; Schaffer, 1977; Schore, 1994). According to Barnard's (Barnard, 1997; Barnard & Kelly, 1990) model of parent–child interaction, both partners are active participants in the social-communicative exchange. The carer is responsible for responding to the infant's cues, alleviating the infant's distress, and providing socioemotional and cognitive growth. The child is similarly active and responsible for providing clear cues and responses to the carer's bids. Thus, the parent–child interaction cycle involves a process whereby each partner is both influencing and accommodating the other. Compared with typically developing children, those affected by DS develop at a slower rate, show uneven development across domains, have motor challenges, and experience more frequent hospitalizations for health concerns (Cicchetti & Ganiban, 1990; Cooley & Graham, 1991; Dunst, 1998). Any or all of these risk factors may interfere with the child's ability to engage in dyadic interaction and, in turn, with the parent's response to the child's behavior.

Contrary to the popular perception of infants with DS as easy, happy, and socially engaged, they often show affective, temperamental, and social interactive atypicalities within the context of the parent–child dyad (Cheseldine & McConkey, 1979; Cunningham, Rueler, Blackwell, & Deck, 1981; Gibson, 1978; for a review see Spiker, Boyce, & Boyce, 2002). In particular, infants with DS as compared with their mental age- (MA) and chronological age- (CA) matched typically developing peers display diminished affective reactivity and social signaling, including difficulties using facial expressions, gestures, eye-contact, and emotional reactivity to alert the carer (Berger & Cunningham, 1981; Dunst, 1998; Ganiban, Wagner, & Cicchetti, 1990; Vaughn et al., 1994). Less predictability, clarity, and frequency in social cueing among the infants with DS appear to be associated with more control and direction by their mothers during naturalistic play (Cielinski, Vaughn, Seifer, & Contreras, 1995; Landry & Chapieski, 1990; Mahoney, Fors, & Wood, 1990; Mahoney & Robenalt, 1986).

In addition to the effects of attenuated signaling by the infant and increased directive cuing by the mother, the interaction between infants with DS and their mothers may be a function of the parents' beliefs about the nature or goals of their interactions (Mahoney et al., 1990; Maurer & Sherrod, 1987). For example, mothers of infants with DS, as compared with mothers of typically developing infants, may be more likely to perceive them as immature and dependent (Fidler, 2003; Fidler & Hodapp, 1999) and use interactions as teaching rather than play opportunities (Landry, Garner, Pirie, & Swank, 1994). Intervention programs may further reinforce this directive interactive style by intensively focusing the parent and child with DS on structured teaching opportunities designed to remediate specific (usually cognitive) areas of weakness (Marfo, 1991; Spiker & Hopmann, 1997).

Although a highly directive and intrusive interaction style may promote cognitive development in the short term, this strategy may increase the risk of an insecure attachment in the child and adversely affect their socioemotional development in the long term (Ganiban, Barnett, & Cicchetti, 2000). In addition to proximal risk factors, the quality of the parent–child relationship may be vulnerable to distal risk factors such as frequent separations due to medical or psychological services, couple or family conflict, financial stressors, and the challenges of navigating service delivery systems.

Because of the distinctive effects of DS on the child, parent, and family, a more nuanced position on the parent–child relationship that takes into account the unique context within which the parent–child interaction develops may be necessary to understand the process of adaptation. For example, increased structure, control, and guidance may be necessary for the child with DS to take full advantage of object play. Thus, the problem may lie not in the maternal directiveness per se but, rather, in the disruption of the natural balance between maternal sensitivity and directiveness during play (Marfo, 1991; Landry et al., 1994). Roach, Barratt, Miller, and Leavitt (1998) compared the directive, supportive, and nondirective strategies of mothers and their 16- to 30-month-old infants with DS with those of mothers and their MA-matched and CA-matched typically developing peers. The mothers of the infants with DS were more vocal, active, and directive in their interactions during object play, yet their strategies were balanced with an increased number of supportive behaviors such as verbal praising and steadying, moving and adjusting toys to facilitate the infant's attempts at object play. However, Roach cautioned that dyadic interaction styles must be tracked longitudinally because they may appear adaptive at a particular developmental period but require adjustments as developmental tasks change over time. Moreover, distal risk factors change (e.g., decreased availability of professional services) and interact with life cycle transitions (e.g., the child's entry into the school system); therefore, short-term parental and family coping strategies may also need to be adjusted to achieve long-term child and family well-being.

## SOCIAL COMPETENCE AS A HIGHER-ORDER GOAL OF EARLY INTERVENTION AND CHILDREN WITH DOWN SYNDROME

Dyadic interactions at 4–6 months are thought to be developmental precursors of triadic interactions in which the child and its communicative partner begin to share attention in face-to-face interactions and later coordinate their shared attention toward inanimate objects or other people (Carpendale & Lewis, 2004; Carpenter, Nagell, & Tomasello, 1998; Legerstee & Weintraub, 1997; Tomasello, 1997). The emergence of joint attending between the parent and child about an object is the initial link in the chain of progressively more sophisticated forms of social-emotional responsiveness and understanding necessary for the

development of social competence (Sigman & Ruskin, 1999). Effectively, dyadic and later triadic interactions provide the socio-cultural context within which many key cognitive, emotional, and social milestones are achieved that are foundational to the development of social competence in children with and without DS (Carpendale & Lewis, 2004; Sigman & Ruskin, 1999).

Although the construct of social competence may be operationalized and measured in several ways, four main constructs are particularly pertinent to work with children with DS: the ability to experience emotional states in self and recognize them in others, the ability to communicate about social and emotional experiences, the ability to understand mental states such as desires and beliefs in self and others, and the ability to regulate and act on cognitions and emotions in an adaptive way (e.g., during peer interactions). These components of social competence may be implicated in the challenges that children with DS often face with regard to social adaptation despite their IQ status. Specifically, difficulties in social competence may be linked to several adjustment problems observed among children with DS later in life, including the areas of self-identity development, peer relationships, and mental health (Beeghly & Cicchetti, 1987; Cicchetti & Serafica, 1981; Cicchetti & Sroufe, 1976; 1978; Hill & Tomlin, 1981; Thompson, Cicchetti, Lamb, & Malkin, 1985).

In addition to the developmental significance of socially competent functioning, Guralnick (1989; 1995; 1999) provides compelling reasons to consider social competence as a higher-order goal of early intervention programs for children with developmental disabilities. He argues that social competence is potentially more malleable than IQ, readily identifies tangible target areas for the design and evaluation of early intervention programs, and draws on diverse developmental resources related to interpersonal problem solving that provide a sensitive and dynamic measure of overall functioning (Guralnick, 2000).

The emphasis on the development of social competence as an overarching goal of early intervention is consistent with the view that development is dynamic and integrated and involves multiple domains of function and that the domains are interdependent and converge in complex ways over time (Burack, Iarocci, Bowler, & Mottron, 2002). Thus, contrary to the traditional early intervention models that take a "bottom-up" approach in which specialized professionals (e.g., speech and language pathologists, occupational therapists) focus on isolating and treating specific domains of function such as speech or motor development, an early intervention model focused on social competence would employ a "top-down" approach in which skills would be taught more holistically in a transdisciplinary and integrative manner. For example, an intervention designed to promote the ability to communicate about social and emotional experiences, a key component of social competence, would involve a transdisciplinary approach that merges domain-specific expertise to devise developmentally appropriate learning opportunities that link skills from across the various domains of function. Thus, the intervention may begin by emphasizing parent-child socioemotional reciprocity, joint attending, referential language, and social prag-

matics, and conclude with learning how to communicate about emotions with parents, peers, and other social partners. For each of the component developmental tasks, the intervention would include specific areas of weakness and strength for children with DS (e.g., motor control, expressive and receptive language, attention, emotion processing) to facilitate mastery of the task.

The "top-down" approach is consistent with research findings in the area of motor development among young children with DS (Mahoney, Robinson, & Perales, 2004). According to Mahoney et al. (2004), children must be actively engaged in a problem-solving context to discover new and more adaptive forms of gross motor behavior. Ultimately, the social competence model of early intervention would lead to improvements in both basic foundational skills and more complex interpersonal skills that are linked to a host of other social benefits, such as personal independence and autonomy, community integration, vocational success, and quality of life (Guralnick & Neville, 1997; Guralnick, 2000). Consistent with the systemic approach, relevant distal protective factors present in the child's family, community, school, and social service agency could also be exploited to further increase the odds of attaining positive developmental outcomes.

#### THE DEVELOPMENT OF A SOCIAL COMPETENCE MODEL OF EARLY INTERVENTION FOR CHILDREN WITH DOWN SYNDROME

##### *The LAPP Framework*

The LAPP, framed within a social competence model, was designed to be an early intervention program for infants with DS and their families grounded in developmental (Cicchetti, 1984; Sameroff, 1992; Sameroff & Chandler, 1975) and ecologic systems perspectives (Bronfenbrenner, 1979). It is understood that the development of infants with DS, much like that of typically developing infants, is a dynamic process reflecting mutually and perpetually influential interactions between the children and their proximal (e.g., parent-child relationship) and distal (e.g., current public policy on disability) contexts. Given this, the main goal of the program is to optimize and support the development of social competence among children with DS as well as family well-being. Thus, the initial developmental task involves maximizing the quality of early dyadic interactions between infants with DS and their parents within a play context. We chose the medium of play because it serves intrapersonal, interpersonal, and sociocultural functions (O'Connor, 2000) and it provides an ideal context in which to enhance the quality of the parent-child relationship. As the children develop, the tasks are modified to reflect developmentally appropriate goals that emphasize the social and emotional skills that are essential for children during the preschool years and the transition into formal schooling. Interventions are designed to target the specific domains (e.g., motor, language, short-term memory) that are typically affected by DS within the broader context of social competence goals.

TABLE 1  
Benefits and challenges of each key component of LAPP

Key components of LAPP	Benefits	Challenges
Etiology-specific evidence-based practices	Interventions designed to facilitate the development of social competence in DS will be more effective if the unique cognitive, emotional, and behavioral profiles of children with DS are considered	There is a paucity of research on social competence in DS to draw on
Transdisciplinary approach	Expertise from different professionals and developments and advances in the different disciplines are available	The vast types and amount of information may be overwhelming and difficult to integrate in a way that is meaningful to all stakeholders
Collaborative relationships among key stakeholders (e.g., clinicians, parents, researchers, policy makers)	Communication, accountability, and transparency of the process are encouraged	More effort is required to ensure that all stakeholders are informed and have opportunity to have input in the process
Focus on support networks and systemic issues (e.g., family, peers, schools)	Impact on development is potentially greater due to the targeting of many support systems	There is more conceptual, empiric, and applied complexity
Evidence-based approach incorporates longitudinal data collection to chart periods of development	Information generated from intervention is examined systematically over time to further refine the model	Longitudinal data collection is labor-intensive and requires additional time commitment and resources

The LAPP incorporates five key components (see Table 1): (1) the emphasis on etiology-specific evidence-based practices; (2) the use of a transdisciplinary team that consists of a speech and language pathologist, physical therapist, occupational therapist, psychologist, infant psychiatrist, and researchers, to provide psychoeducation and guidance for parent-child play and teaching opportunities; (3) the fostering of collaborative relationships among parents, clinicians, researchers, and community agencies; (4) the focus on systemic issues and support networks (e.g., family, peers, schools) to ease transitions such as the child's entry into the school system; and (5) the commitment to an empirically supported approach that incorporates longitudinal data collection to chart periods of development when marked changes in social competence are expected to occur. The research findings contribute to the identification of the interventions that work best for whom and at what period in development in order to optimize social competence in the child and family well-being and, in turn, are used to evaluate and refine the model.

#### *The LAPP Program Experience*

We initiated LAPP at the DSRF in 2002 with a pilot cohort of seven children with DS (five girls and two boys; CA 10–41 months) and their parents. The families participated in one intervention session per week for 8 weeks in the early part and then again in the late part of each year, over a period of 2 years.

(The families will continue to be followed until the children are 6 years old or 1 year after they enter the school system – the cohort is also involved in a longitudinal study designed to investigate risk and resilience with regard to the quality of the dyadic relationship (Iarocci, Virji-Babul, Reebye, Sturn, & Yeoll, 2004).) In assessing the potential impact of participation in the LAPP, we hypothesized that risk factors associated with the child, parents, and broader social systems (e.g., family, school) may disrupt the natural flow of interaction between the dyad by shaping expectations, conceptions of the communicative partner, and future responses. Initial efforts to examine the quality of the parent-child interaction cycle involved individually videotaping the interactions of the mothers and their children with DS. The parent and child interactions were coded based on the Nursing Child Assessment Teaching Scale (NCAST – Sumner & Spietz, 1994). The NCAST is a standardized measure of parent-child interaction that involves instructing mothers to teach their child a novel skill that they select from a list of developmentally appropriate tasks (e.g., opening and closing a book) for children 0–3 years. The children were administered the Bayley Scales of Infant Development (BSID – Bayley, 1969), and the parents were asked questions about their infant's adaptive behavior using the Vineland Adaptive Behavior Scale (VABS – Sparrow, Balla, & Cicchetti, 1984) when they began the intervention group (CAs of 10–41 months) and approximately 4–5 months later the dyads were administered the NCAST. The BSID and VABS age equivalents and NCAST scores are presented in Table 2.

TABLE 2  
Chronological age (CA), BSID and VABS mental ages (MAs) for children with DS, and NCAST scores for parent-child dyads

Participant	Subscale	Score (SD) <sup>a</sup>	Sample norm M (SD)	Participant	Subscale	Score (SD) <sup>a</sup>	Sample norm M (SD)	
Participant 1 Ages in months:	Bayley CA	22		Participant 2 Ages in months:	Bayley CA	19		
	Bayley MA	16			Bayley MA	17		
	Vineland age equivalent	10.75			Vineland age equivalent	9.75		
	Child score	19 (<1 above)	15.61 (4.30)		Child score	20 (= 1 above)	15.61 (4.30)	
	Clarity of cues	9 (<1 above)	8.03 (1.52)		Clarity of cues	10 (>1 above)	8.03 (1.52)	
	Responsiveness to carer	10 (<1 above)	7.58 (3.17)		Responsiveness to carer	10 (<1 above)	7.58 (3.17)	
	Parent score	47 (<1 above)	41.46 (8.44)		Parent score	44 (<1 above)	41.46 (8.44)	
	Sensitivity to cues	10 (<1 above)	9.31 (1.67)		Sensitivity to cues	10 (<1 above)	9.31 (1.67)	
	Response to distress	11 (<1 above)	10.18 (1.56)		Response to distress	9 (<1 below)	10.18 (1.56)	
	Socioemotional growth promoting	10 (<1 above)	9.19 (1.71)		Socioemotional growth promoting	11 (>1 above)	9.19 (1.71)	
Participant 3 Ages in months:	Cognitive growth promoting	16 (<1 above)	12.78 (3.50)	Cognitive growth promoting	14 (<1 above)	12.78 (3.50)		
	NCAST parent-child total	66 (<1 above)	59.56 (6.95)	NCAST parent-child total	64 (<1 above)	59.56 (6.95)		
	Participant 4 Ages in months:	Bayley CA	16		Participant 4 Ages in months:	Bayley CA	9	
		Bayley MA	16			Bayley MA	11	
		Vineland age equivalent	9			Vineland age equivalent	8	
		Child score	14 (<1 above)	15.61 (4.30)		Child score	19 (<1 above)	15.61 (4.30)
		Clarity of cues	7 (<1 above)	8.03 (1.52)		Clarity of cues	9 (<1 above)	8.03 (1.52)
		Responsiveness to carer	7 (<1 above)	7.58 (3.17)		Responsiveness to carer	10 (<1 above)	7.58 (3.17)
		Parent score	41 (<1 above)	41.46 (8.44)		Parent score	48 (<1 above)	41.46 (8.44)
		Sensitivity to cues	7 (>2 below)	9.31 (1.67)		Sensitivity to cues	11 (<1 above)	9.31 (1.67)
Response to distress		11 (<1 above)	10.18 (1.56)	Response to distress		10 (<1 above)	10.18 (1.56)	
Socioemotional growth promoting		10 (<1 above)	9.19 (1.71)	Socioemotional growth promoting		10 (<1 above)	9.19 (1.71)	
Participant 5 Ages in months:	Cognitive growth promoting	13 (<1 above)	12.78 (3.50)	Cognitive growth promoting	17 (>1 above)	12.78 (3.50)		
	NCAST parent-child total	55 (<1 above)	59.56 (6.95)	NCAST parent-child total	67 (>1 above)	59.56 (6.95)		
	Participant 6 Ages in months:	Bayley CA	10		Participant 6 Ages in months:	Bayley CA	41	
		Bayley MA	13			Bayley MA	21	
		Vineland age equivalent	9			Vineland age equivalent	15	
		Child score	14 (<1 below)	15.61 (4.30)		Child score	12 (>1 below)	15.61 (4.30)
		Clarity of cues	7 (<1 below)	8.03 (1.52)		Clarity of cues	7 (<1 below)	8.03 (1.52)
		Responsiveness to carer	7 (<1 below)	7.58 (3.17)		Responsiveness to carer	5 (>1 below)	7.58 (3.17)
		Parent score	48 (<1 above)	41.46 (8.44)		Parent score	42 (<1 below)	41.46 (8.44)
		Sensitivity to cues	10 (<1 above)	9.31 (1.67)		Sensitivity to cues	9 (<1 below)	9.31 (1.67)
Response to distress		11 (<1 above)	10.18 (1.56)	Response to distress		11 (<1 above)	10.18 (1.56)	
Socioemotional growth promoting		11 (<1 above)	9.19 (1.71)	Socioemotional growth promoting		9 (<1 below)	9.19 (1.71)	
Participant 7 Ages in months:	Cognitive growth promoting	16 (<1 above)	12.78 (3.50)	Cognitive growth promoting	13 (<1 below)	12.78 (3.50)		
	NCAST parent-child total	62 (<1 above)	59.56 (6.95)	NCAST parent-child total	54 (<1 above)	59.56 (6.95)		
	Participant 7 Ages in months:	Bayley CA	17		Participant 7 Ages in months:	Bayley CA	41	
		Bayley MA	9			Bayley MA	21	
		Vineland age equivalent	9.75			Vineland age equivalent	15	
		Child score	19 (<1 above)	15.61 (4.30)		Child score	12 (>1 below)	15.61 (4.30)
		Clarity of cues	8 (<1 below)	8.03 (1.52)		Clarity of cues	7 (<1 below)	8.03 (1.52)
		Responsiveness to carer	11 (>1 above)	7.58 (3.17)		Responsiveness to carer	5 (>1 below)	7.58 (3.17)
		Parent score	41 (<1 below)	41.46 (8.44)		Parent score	42 (<1 below)	41.46 (8.44)
		Sensitivity to cues	8 (>1 below)	9.31 (1.67)		Sensitivity to cues	9 (<1 below)	9.31 (1.67)
Response to distress		10 (<1 above)	10.18 (1.56)	Response to distress		11 (<1 above)	10.18 (1.56)	
Socioemotional growth promoting		9 (<1 below)	9.19 (1.71)	Socioemotional growth promoting		9 (<1 below)	9.19 (1.71)	
Participant 7 Ages in months:	Cognitive growth promoting	14 (<1 above)	12.78 (3.50)	Cognitive growth promoting	13 (<1 below)	12.78 (3.50)		
	NCAST parent-child total	60 (<1 above)	59.56 (6.95)	NCAST parent-child total	54 (<1 above)	59.56 (6.95)		

<sup>a</sup>Any score at least 1 SD below the mean is considered a low score (>1 below or = 1 below).

### *The LAPP Preliminary Results*

The profiles presented in Table 2 represent Time 1 (i.e., first 8-week intervention) data on the seven dyads that participated in the pilot phase of the LAPP. The results indicate variability in performance among the seven children with DS on cognitive and adaptive measures. Similarly, the dyads showed variability in the quality of their interactions on the NCAST. However, variability in parent-child interaction competency as assessed by the NCAST was not correlated with their performance on the BSID or VABS. Two of the seven children with DS provided social and communicative signals that were not salient and were not readily interpretable by their mothers. Three of the mothers were overly responsive to their child's cues and, for one mother, this occurred despite the lack of clarity in her child's cues. Four dyads achieved low parent or child contingency scores, as their interactions reflected poor reciprocity and synchrony. Two dyads showed a quality of parent-child interaction within the normal range for their CA.

### *Commentary on the LAPP Results*

The variability in the quality of interactions between a parent and a child with DS suggests that explicit interventions and psychoeducation regarding the goals and quality of interaction may only be necessary for certain dyads at this period in development. For these dyads, a dialog between the therapists and parents may help to identify areas that require more or less focus from the parent. In the case of a child who has weak social signaling, the parent may be encouraged to look for opportunities to elicit social cues rather than anticipate the child's wishes or actions. In addition, a focus on social-communicative engagement may direct mothers' attention to emphasize play and enjoyment in their interactions with their children even within the context of a teaching task. Data collection conducted within the context of the LAPP serves both research and clinical goals. For example, clinically the NCAST data are used to better tailor the intervention to meet the needs of the dyads. Thus, a parent who is directing the child's attention to an object repetitively and missing opportunities to attend to the cues of the child who is attending to another object of interest may receive psychoeducation about the importance of the quality of the parent-child interaction in the socioemotional development of the infant. Later the parent would view the videotape segment of their interaction with the clinician, and together, they would discuss possibilities for optimizing the parent-child interaction (e.g., pausing to pay attention to the child's focus of attention). With regard to research goals, LAPP's longitudinal data can be used to explore the child, parent, and broader systemic sources of variability (e.g., family stress and coping, school resources) in the quality of the parent-child relationship. In addition, it can help better define the role of the quality of the parent-child relationship on mal/adaptive child and family outcomes with regard to peer relationships,

social competence, parenting satisfaction, family cohesiveness, and adaptability.

### DISCUSSION

The available empirical evidence suggests that, beginning in infancy, children with DS and their parents may experience difficulties in the dynamics of responding contingently, reciprocally, and affectively and in using scaffolding opportunities that are key dimensions of typical dyadic interaction patterns known to promote optimal social-cognitive development (see reviews in Spiker et al., 2002; also see Guralnick, 1997; Shonkoff et al., 1992). Although the emergence of this dyadic interaction is natural and inevitable in all infants, the quality of the relationship is dependent on many environmental factors and may be compromised with children with DS (Barber, 2000; Bornstein, 1995; Kochanska, 1997; Mahoney & Wheeden, 1997; Shonkoff & Phillips, 2000). An early disadvantage in building the foundational parent-child relationship may compromise the development of future interpersonal relationships with siblings, peers, and, ultimately integration into their community. Thus, the focus on the quality of the dyadic interaction during the infant years is helpful because this is a time in development when interventionists can capitalize on both the malleability of the developing brain (Nelson, 2000) and the parent-child relationship, a powerful environmental context within which social-cognitive development is rooted (Barnard, 1997; McGrath, Rosmus, Canfield, Campbell, & Hennigar, 1998; Schore, 1994).

The LAPP was conceived as an early intervention model that could be used to promote the development of social competence in children with DS and emotional well-being in their families. The long-term goals of the program extend beyond providing services and supports to the participating families or producing developmental research, as they encompass the broader systemic goals of exploring and facilitating the relations among families, researchers, early interventionists, and policy makers (Minnes, 1998). The emphasis on a broader perspective of the factors that influence the development of children with DS and their family's well-being allowed us to strategically place LAPP within nurturing environments that foster the opportunity to merge developmental research, early intervention, and policy goals regarding DS. For example, LAPP is based at the DSRF, a community-centered, nonprofit organization located in the greater Vancouver, BC area. The DSRF offers a physical setting with a family meeting space, child play and development areas, a multimedia library, and classroom space for educational programs, as well as a neuroimaging research facility. It provides a unique community-based and dynamic environment that supports, stimulates, and disseminates research related to DS, where researchers and clinicians can work with families to apply basic research findings to practice, where basic research can be informed by current practice, and where proactive collaboration among practitioners, academics, basic scientific

researchers, industry partners, and community stakeholders is encouraged.

A program such as the LAPP can offer an opportunity to merge family process, developmental research, early intervention, and policy goals regarding DS by linking with a number of organic resources within an area. From our experience, we observed productive outcomes from the linkage with the HELP, a provincial granting agency with a public policy mandate to promote pioneering, interdisciplinary research partnerships for the purpose of contributing to new understandings and approaches to early child development. HELP served as an enabling mechanism as it works in partnership with and receives partial funding from the BC Ministry of Children and Family Development (MCFD), and in particular, the BC Minister of State for Early Childhood Development. HELP maintains a close liaison with other provincial government ministries and regularly provides funding for research development and a forum for researchers, clinicians, and policy makers concerned with early child development in which to collaborate. Thus, when applied to settings where such enabling mechanisms exist, an early intervention initiative such as the LAPP can benefit from facilitation from mechanisms such as BC's HELP, and the input of other researchers, clinicians, and policy makers to affect research, clinical practice, and public policy regarding early intervention for children with DS and their families.

We intend to expand LAPP by incorporating this specialized model into ongoing mainstream provincial services for infants with developmental disabilities (some of whom have DS) and their families. For example, within the continuum of services and supports available to Canadian children and their families, LAPP could improve specialized infant development programs that focus on children from birth to 3 years old who have, or are at risk for, delayed development. These Infant Development Programs (IDPs) provide a range of family-centered prevention and early intervention services and supports for families and children with developmental disabilities that are funded by the provincial MCFD (see Goelman, Brynson, Pighini, & Kysela, 2005). These are administered by a variety of community agencies and have evolved to meet the needs of each community and to complement the mix of services available. Within the context of a comprehensive service delivery model, such IDP services can meet the needs of families coping with the care and education of children affected by a variety of developmental disabilities. Thus, the integration of specialized evidence-based services for children with DS and their families within their current service structure could ensure a widespread and cost-effective use of resources and improve the opportunity for larger-scale longitudinal research. Just as the development of children with DS is intricately tied to their ecology, the successful development and refinement of LAPP will depend largely on the supportive environments that sustain it.

The development of children with DS, much like typically developing children, is a dynamic process reflecting ongoing interactions between the children and their social contexts. How-

ever, as children with DS develop at a slower rate, show uneven development across domains, and have motor challenges, they are often at risk for medical and psychological complications. Thus, raising a child with DS poses unique challenges that most families had not expected and were not prepared to undertake. As a group, although families caring for a child with DS appear to cope better than families with children with other types of developmental disabilities, some of these families may be at greater risk and they may express a greater need for specialized services. Failure to consider the risk and protective factors present in the family system may lead to premature conclusions regarding family well-being. Similarly, the popular view of children with DS as friendly, sociable, and engaging can tend to detract attention from the extensive empiric evidence that these children show atypicalities in their interpersonal and social behavior that may compromise both early parent-child interactions and later learning and task performance. Thus, the adoption of an early intervention-based program, such as the LAPP, may prove beneficial and may serve to provide long-lasting constructive outcomes for children with DS and as well as their families.

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