

## **Child and Adult Social--Emotional Benefits of Response-Contingent Child Learning Opportunities**

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### *Abstract*

Findings from two studies of 42 children with profound developmental delays (26 males and 15 females) using systematic and intense response-contingent learning opportunities interventions are reported. Response-contingent learning games were used to promote the participants' use of behavior that either produced environmental consequences or elicited reinforcing stimuli. The focus of analysis was the social--emotional benefits of the learning opportunities on both the children and adults (parents and teachers). Results showed that child production of behavior producing reinforcing consequences was associated with heightened positive social--emotional benefits in both the children and adults. Keywords: Child learning, response-contingent reinforcement, social--emotional behavior, early intervention.

More than 100 years ago, Baldwin (1895) noted that infants who come to "know" that their behavior is the "cause" of environmental effects often demonstrate increased behavioral responding in other areas, most notably social and emotional behaviors such as smiling, laughter, and excitement. Piaget (1936/1952) made similar observations based on the detailed study of his own three infants. Both Haith (1972) and McCall (1972) noted that an infant's ability to understand that he or she is the agent of an environmental consequence produces social--emotional behavior because cognitive achievement is pleasurable. Watson (1972) in his seminal paper *Smiling, Cooing, and "The Game,"* described the importance of contingency awareness and detection as determinants of both the likelihood and strength of the social--emotional concomitants of response-contingent learning (see also Watson, 2001).

Most infants learn response-contingent behavior and develop contingency awareness (Watson, 1966) and contingency detection (Tarabulsky, Tessier, & Kappas, 1996) by 2 months of age. Infants and young children with disabilities often take longer to learn contingency behavior but appear to develop contingency awareness and detection in a manner much like infants without disabilities (see especially Dunst, Storck, Hutto, & Snyder, 2006; Hutto, 2003).

The extent to and manner in which response-contingent learning is associated with positive child social--emotional behavior was the focus of a research synthesis completed by Dunst (2003) of studies of infants and young children with and without disabilities or delays. The synthesis included 30 studies of infants without disabilities or delays and 12 studies of infants and young children with disabilities or delays. The two sets of studies included 898 and 199 study participants respectively. Findings from the synthesis showed that response-contingent learning opportunities where the relationship between an operant behavior and its environmental consequences were clearly detectable increased the likelihood that the study participants displayed increased positive social--emotional behavior and decreased negative social--emotional responding. The patterns of relationships between contingency awareness and child social--emotional behavior were much the same for children with and without disabilities or delays, although the children with disabilities or delays generally displayed less positive social--emotional behavior compared to their typically developing counterparts. Notwithstanding these differences, the results of the synthesis taken together were consistent with contentions made by Tarabulsky et al. (1996) regarding the role contingency detection and awareness plays in social--emotional development.

The studies described in this paper were both a replication and extension of previous studies of young children with disabilities or delays. Two studies--one with children with profound disabilities and delays and their parents and the other with children with profound disabilities and delays and their teachers--were conducted as part of a line of research and practice investigating the characteristics and consequences of providing young children with profound developmental delays and multiple disabilities systematic and intense response-contingent learning opportunities. The focus of analysis was the relationship between response-contingent child learning and both child and caregiver social--emotional behavior displayed during contingency learning games and during observations of the study participants while not playing the games.

The conduct of the studies was guided by a conceptual framework (Raab & Dunst, 1997) that was the basis for hypothesizing both the immediate effects of response-contingent learning on child and caregiver behavior (termed first-order effects) and the extended benefits of the learning on child and caregiver behavior (termed second-order effects). The framework includes key formulations of an ecological paradigm and the characteristics of microsystems (Bronfenbrenner, 1993) that are the contexts for development-instigating experiences having behavioral effects on both the persons providing and provided learning opportunities. Operationally, the provision of response-contingent learning opportunities having behavior enhancing consequences was expected to have positive effects on a child afforded the learning opportunities and a caregiver who engages the child in the learning opportunities to the extent that the caregiver's efforts produced expected positive child consequences (Goldberg, 1977). The hypothesized influences of child learning on child social--emotional behavior were based on theory and research demonstrating the fact that infant operant learning and the development of contingency awareness and detection is associated with concomitant positive behavior functioning (e.g., Colombo, 2001; Gergely & Watson, 1999; Rochat, 2001). The expected influences of child learning on caregiver behavior was based on theory and research showing that successful caregiver efforts to influence child learning strengthens caregiver confidence which is typically manifested in the form of behavioral enjoyment (e.g., Goldberg, 1977; Mowder, 2005; Skinner, 1985; Teti & Gelfand, 1991).

The influences of contingency learning on child social--emotional behavior during learning episodes constituted a replication of findings from previous studies (see Dunst, 2003). It was hypothesized that child contingency learning and the contingency awareness and detection associated with that learning would produce social--emotional behavior in a manner similar to that found in other studies of young children with disabilities or delays (e.g., Haskett & Hollar, 1978; O'Brien, Glenn, & Cunningham, 1994). The expectation that contingency learning would be related to child social--emotional behavior beyond the learning episodes was based on research demonstrating a relationship between contingency detection and other areas of child social--emotional functioning (Tarabulsky et al., 1996).

The hypothesized relationship between response-contingent child learning and caregiver social--emotional behavior was based on observations made by Dunst and his colleagues (Dunst, Cushing, & Vance, 1985; Dunst & Lesko, 1988) of parents' responses to seeing their children with profound delays and multiple disabilities display contingency behavior when afforded response-contingent learning opportunities. Dunst et al. (1985) noted, for example, that when parents "see their child for the first time manifest behavioral competencies...the parents often manifest a sense of pleasure and enjoyment in their child's newly learned behavior" (p. 44). The pleasure and enjoyment that the caregivers displayed included both affective behavior (smiling and laughter) and positive comments about their children's contingency capabilities. The caregiver social--emotional behavior displayed while a child was playing response-contingent learning games were considered first-order caregiver effects and the caregiver social--emotional behavior associated with child learning when a child was not playing contingency games were considered second-order caregiver effects.

The children in both studies were engaged in contingency learning games designed specifically to increase operant responding (Williams, 2001). The learning games were characterized by behavior-based contingencies (Tarabulsky et al., 1996) when a child's behavior either elicited a reinforcing consequence (e.g., swiping at a mobile producing movement and auditory feedback) or his or her behavior was reinforced by a caregiver (e.g., a parent tickling a child's tummy each time he or she looked at the adult). In these types of learning games, the availability of a reinforcement or the production of an interesting consequence is dependent on the child's actions and behavioral interactions. The behaviors that the children used to produce environmental effects or reinforcing consequences were ones that were in their behavioral repertoire but were not used as operants.

## **STUDY 1**

### **Method**

#### *Participants*

The participants were 19 children (12 males and 7 females) and their mothers. The children were an average of 61 months of age ( $SD = 26$ ) and had a mean developmental age of 4 months ( $SD = 2$ ) as determined by the Griffiths (1970) Mental Development Scales. The children were all profoundly developmentally delayed as evidenced by Griffiths general quotients (GQ) of less than 20 (Mean = 9,  $SD = 5$ ). None of the children demonstrated contingency awareness as determined by formal testing, behavioral observations, or parent report.

Nearly all of the children (95%) had cerebral palsy and more than three quarters of the children (79%) had seizure disorders. Half of the children (53%) had some type of visual impairment. Sixteen of the children (84%) had two or more disabilities.

The children's parents were, on average, 30 years of age ( $SD = 6.31$ ) and had completed an average of 12 years of formal schooling ( $SD = 2.02$ ). The majority of the parents were married (68%) while the other participants were divorced (21%) or single (11%). Sixty (60) percent of the participating parents were not working outside of the home.

#### *Procedure*

The parents and research staff together identified the children's behavioral capabilities, things the children seemed to enjoy, stimuli that maintained the children's attention, any learning activities the parents used with their children, and the everyday routines that were the contexts of behavioral expression. This information, taken together, was used to construct a profile of each child's behavioral strengths and the contexts of and conditions under which these behaviors were most often manifested.

Parents were then asked to describe the behaviors they wanted their children to learn or use, and how their children's behavioral strengths could be used to facilitate child learning. Research staff described the key characteristics of response-contingent learning and explained how children's behavior that elicited interesting consequences or reinforcement increased child production of targeted (desired) behavior. This information was used by both the parents and research staff to develop contingency "learning games" that included the targeted (operant) behaviors and the reinforcers or interesting consequences that would be provided or made available contingent on child production of the behaviors. Procedures described by Dunst (1981), Dunst and Lesko (1988), and Lancioni (1980) were used as guidelines for developing the learning games.

The learning games were implemented by the parents in their homes. Research staff visited the parents and their children every week or every other week to review progress, make changes in the

learning games, and collect the data constituting the focus of analysis. The parents and their children were visited an average of 16 times ( $SD = 4.97$ ).

### *Measures*

*Child learning.* The unit of analysis was the learning games played by the children and the percent of response-contingent game trials that resulted in a reinforcing or interesting consequence. The children played a total of 575 games (Mean = 30.26,  $SD = 12.11$ ). The distribution of the percent of games producing reinforcing consequences was expectedly skewed because the interventions were specifically designed to increase the number of trials that resulted in positive behavior consequences. The learning data were therefore transformed to produce a more equal distribution of the percentages using the probit method for linearizing the data (Cohen, Cohen, West, & Aiken, 2003).

*Child and parent behavior codes.* Child and parent social--emotional behavior was coded both during the learning games (first-order effects) and during observations of the study participants while the child was not producing operant behavior (second-order effects). The first-order child behavior codes included positive affect (smiling or laughter), positive vocalizations (cooing or babbling), and behavioral excitement (anticipatory responses or generalized body movements). These behaviors were coded for each learning game trial. Second-order child behavior codes also included positive child affect, positive vocalizations, and behavioral excitement. These behaviors were coded each time they were manifested following but not during child production of operant behavior.

The first-order and second-order parent behavior codes included positive caregiver affect (smiling or laughter) in response to child contingency behavior and positive verbal descriptions of child contingency capabilities. Both the first-order and second-order caregiver behavior was coded as not occurring (0), occurring one time (1), or occurring more than once (2) during each game and nongame observation period respectively.

### *Inter-rater Reliability*

Inter-rater reliability was determined for the learning game trials and both the child and parent social--emotional behavior. Reliability was calculated as the number of agreements divided by the number of agreements plus nonagreements multiplied by 100. The percent agreement was 95% for the learning game trials producing reinforcing consequences, 87% for the first-order child effects behavior, 98% for the second-order child effects behavior, 96% for the first-order caregiver effects behavior, and 90% for the second-order caregiver effects behavior.

### *Method of Analysis*

The independent variable was the percentage of game trials associated with reinforcing consequences. The percentages were grouped into 5 categories: 0-20, 21-40, 41-60, 61-80, and 81-100 representing a continuum of response-contingent learning. The mean number of learning games in each percent category was 115 ( $SD = 7.82$ , Range = 106 to 127).

The extent to which child and parent social--emotional behavior was associated with differences in child response-contingent behavior was determined by four MANOVAs with the first and second order child and caregiver effects data as the dependent measures. The MANOVAs included univariate ANOVAs to determine if variations in response-contingent learning were associated with differences in the individual effects data. Both the MANOVAs and ANOVAs included tests for linear trends to ascertain if differences in the dependent measures were linearly related to differences in response-contingent learning. Cohen's  $d$  effect sizes for the linear trends (Rosenthal & Rosnow, 1991) were used to assess the

strength of the relationship between the independent and dependent variables.

## Results

Table 1 shows the findings from the four sets of analyses. The MANOVAs for both the child and caregiver first- and second-order effects data showed that variations in positive social--emotional behavior was associated with response-contingent child behavioral capabilities. In all cases, the larger the percent of game trials that produced reinforcing consequences, the more positive behavior the children and their parents manifested.

Table 1  
*First- and Second-Order Child and Parent Social-Emotional Behavior Associated with Child Production of Response-Contingent Behavior*

Dependent Measures	Percent of Game Trials Producing Reinforcing Consequences										Linear Trend		
	0-20		21-40		41-60		61-80		81-100		Between Category F-Test	Cohen's <i>d</i> Effect Size	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
<i>First-Order Child Effects</i>													
MANOVA	0.16	0.77	0.89	1.51	1.31	2.43	2.21	2.90	3.17	5.47	33.13***	129.73***	0.95
Positive Affect	0.28	1.07	1.59	1.93	2.36	3.05	3.95	3.25	5.92	7.29	34.52***	134.42***	0.97
Vocalizations	0.17	0.74	0.75	1.16	1.29	2.35	2.16	2.53	2.89	4.39	20.20***	79.92***	0.75
Excitement	0.04	0.23	0.29	0.95	0.25	0.79	0.53	1.56	0.70	1.99	4.67**	17.29***	0.35
<i>Second-Order Child Effects</i>													
MANOVA	0.06	0.37	0.20	0.69	0.28	1.05	0.45	1.18	0.57	1.50	8.89***	35.31***	0.50
Positive Affect	0.09	0.57	0.31	0.94	0.35	1.15	0.55	1.45	0.62	1.44	3.57*	13.85**	0.31
Vocalizations	0.05	0.25	0.26	0.67	0.46	1.37	0.71	1.30	1.04	2.03	10.13***	39.94***	0.53
Excitement	0.03	0.16	0.04	0.27	0.03	0.22	0.08	0.46	0.04	0.28	0.67	0.79	0.07
<i>First-Order Caregiver Effects</i>													
MANOVA	1.07	0.87	1.54	0.72	1.35	0.83	1.45	0.77	1.50	0.75	7.91***	12.95**	0.31
Positive Affect	0.89	0.87	1.53	0.73	1.38	0.80	1.58	0.67	1.57	0.70	14.76***	35.70***	0.51
Verbal Comments	1.26	0.84	1.56	0.71	1.32	0.85	1.31	0.84	1.43	0.79	2.43	0.15	0.03
<i>Second-Order Caregiver Effects</i>													
MANOVA	0.61	0.81	1.13	0.91	1.16	0.86	1.22	0.88	1.38	0.85	14.08***	45.61***	0.58
Positive Affect	0.62	0.80	1.21	0.90	1.24	0.85	1.40	0.81	1.50	0.78	17.14***	57.46***	0.65
Verbal Comments	0.61	0.83	1.05	0.92	1.09	0.87	1.04	0.91	1.26	0.90	7.65***	22.36***	0.41

\* $p < .01$ . \*\* $p < .001$ . \*\*\* $p < .0001$ .

### *Child Effects*

The ANOVAs for the individual child effects measures showed, except for second-order child excitement, that heightened positive social--emotional behavior was associated with response-contingent child behavior. In each of the five analyses producing significant results, the larger the percent of game trials that produced reinforcing consequences, the more positive the child social--emotional behavior both during the child's production of operant behavior (first-order effects) and during the observation period following production of the behavior (second-order effects). The nature of the relationship between child learning and the dependent measures however was not the same as evidenced by percent category x child behavior interactions for both the first-order,  $F(8, 1140) = 21.93$ ,  $p < .0001$ , and second-order,  $F(8, 1140) = 5.15$ ,  $p < .0001$ , child effects data and the differences in the effect sizes for the linear trends. The strength of the relationship was strongest between response-contingent behavior and child positive affect in the first-order effects analyses and strongest between response-contingent behavior and child

vocalizations in the second-order effects analyses.

### *Parent Effects*

Parent positive affect was associated with response-contingent child behavior both during the learning games (first-order effects) and during observations of the parents while not engaging their children in the learning games (second-order effects) as evidenced by both the linear trends and effect sizes. Second order parent positive comments about their children's capabilities were also related to response-contingent child behavior.

Significant percent category x parent behavior interactions for both the first-order,  $F(4, 541) = 8.96, p < .0001$ , and second-order,  $F(4, 541) = 3.15, p < .01$ , effects analyses indicated that the pattern of the relationship between child learning and the dependent measures were not the same. The strength of the relationship between child learning and caregiver positive affect was stronger than that between child learning and caregiver verbalizations in both analyses.

## **Discussion**

Findings showed that the response-contingent learning demonstrated by children with multiple disabilities and profound delays was associated with social--emotional behavior during learning games in a manner much like that found in other studies (see Dunst, 2003) and that there were both extended child and caregiver social--emotional benefits associated with child contingency learning. The extended child and caregiver benefits are consistent with transactional theories of child development and the bidirectional influences of a caregiver on a child and the influences of a child on his or her caregivers (Anderson & Vietze, 1977; Sameroff, 1975; Sameroff & Chandler, 1975; Sameroff & MacKenzie, 2003). Practically, the results showed that intentional efforts to provide young children with multiple disabilities and profound developmental delays systematic and intense response-contingent learning opportunities was related to child social--emotional behavior and that the children's parents derived enjoyment and gratification from their efforts to influence and promote child learning.

The extended benefits to both the children and their parents deserve comment for two reasons. First, the findings show that the benefits associated with child contingency learning are not limited to response-contingent episodes themselves but are manifested in ways consistent with conceptual models predicting the manner in which child and parent behavior and the different contexts of child learning are inter-related (e.g., Goldberg, 1977; Johnson & Martin, 1985). Second, to the best of our knowledge, the findings are the first of their kind demonstrating the fact that contingency learning opportunities, afforded children with multiple disabilities and profound delays, are associated with child and caregiver behavior in a manner consistent with the hypotheses set forth in the introduction.

In summary, the results from the first study showed that the children's learning was enhanced and that there were social--emotional child and parent benefits associated with child contingency learning. The purpose of the second study was to replicate the findings with caregivers other than the children's parents to ascertain if the practices and benefits could be generalized.

## **STUDY 2**

### **Method**

#### *Participants*

The participants were 22 children (14 males and 8 females) and 16 teachers. The children were an

average of 56 months of age ( $SD = 27$ ) and had a mean developmental age of 3 months ( $SD = 2$ ) (Griffiths, 1970). All of the children were profoundly developmentally delayed as determined by their Griffiths (1970) general quotients (Mean = 8,  $SD = 8$ ). None of the children demonstrated intentional or instrumental behaviors that indicated they had contingency awareness.

Eighteen of the 22 children (82%) had cerebral palsy and 4 children (18%) had other diagnoses (e.g., Down syndrome). Nearly two thirds of the children (64%) had visual impairments and about half (45%) had seizure disorders. Two thirds of the children (68%) had two or more disabilities.

The teachers all worked in center-based programs or preschool special education classrooms. The study participants had high school, bachelor or master degrees, and worked with young children with disabilities from less than one to more than 10 years. Twelve of the teachers implemented the interventions with one child, and four teachers implemented the interventions with either 2 or 3 children.

### *Procedure*

The assessment and intervention procedures were identical to those in Study 1. The teachers and the research staff identified behavior that the children were capable of producing and developed learning games that promoted use of behavior as a means of producing or eliciting reinforcing consequences. The learning games were implemented by the teachers in their preschool classrooms or center-based programs. Research staff visited the teachers once a week or once every other week to review progress, modify or change the learning games, and to collect the data constituting the focus of analysis. The teachers and children were visited an average of 14 times ( $SD = 5.94$ ).

### *Measures*

*Child learning.* The children played a total of 467 learning games (Mean = 21.23,  $SD = 8.97$ ). The percentage of game trials that resulted in a reinforcing or interesting consequence was the unit of analysis. The percentages were transformed to make them normally distributed in the same way that was done in Study 1.

*Child and teacher behavior codes.* Both child and teacher social--emotional behaviors were coded during the learning games (first-order effects) and during observations of the study participants while the child was not producing operant behavior (second-order effects). The child social--emotional behavior codes included positive affect (smiling or laughter), positive vocalizations (cooing or babbling), and behavior excitement (anticipatory responses or generalized body movements). The first-order child social--emotional behavior was coded for each learning game trial and the second-order child social--emotional behavior was coded each time they were manifested following child production of operant behavior.

The teacher behavior codes included positive affect (smiling and laughter) and positive verbal descriptions of child contingency capabilities (recognition of child competence and teacher gratification in facilitating child competence). Each of the four behaviors were coded as not occurring (0), occurring one time (1), or occurring more than once (2) during the learning games and observation period respectively. The ratings for the behaviors in each code were summed to produce scores of teacher positive affect and teacher verbalizations which ranged from zero (0) to 4 for each measure.

### *Inter-rater Reliability*

Inter-rater reliability was calculated in the same manner as Study 1. The percent agreement was 93% for the learning game trials, 98% for the first-order child effects behavior, 99% for the second-order

child effects behavior, 87% for the first-order caregiver effects behavior, and 96% for the second-order caregiver effects behavior.

### *Method of Analysis*

The independent variable was the percentage of game trials associated with reinforcing consequences organized in the same categories as was done in Study 1. The mean number of learning games included in each percent category was 93.40 (SD = 5.04, Range = 88 to 102). Both MANOVAs and ANOVAs were used to determine if response-contingent learning was associated with differences in the dependent measures. Tests for linear trends and Cohen's *d* effect sizes for the linear trends were used as the measures of the strength of the relationship between variables.

## **Results**

Findings from the different sets of analyses produced significant results for both the four MANOVAs and the 10 ANOVAs (Table 2). In every case, positive child and teacher social--emotional behavior was associated with response-contingent child behavior both during the learning games (first-order effects) and during observations of the children and their teachers when the children were not producing operant behavior (second-order effects).

### *Child Effects*

The ANOVAs for both the first- and second-order child effects data indicated that heightened social--emotional behavior was related to response-contingent child behavior as evidenced by both the linear trends and effect sizes for these trends. The patterns of social--emotional responding were however not the same as determined by percent category x child behavior interactions for both the first-order,  $F(8, 924) = 9.58, p < .0001$ , and second-order,  $F(8, 924) = 7.11, p < .0001$ , effects data and the effect sizes for the linear trends. The strength of the relationship was strongest between response-contingent behavior and child positive affect in both the first-order and second-order effects analyses.

### *Teacher Effects*

Both teacher positive affect and teacher positive verbalizations were associated with response-contingent child behavior both during the learning games (first-order effects) and while the teachers were not engaging the children in playing the games (second-order effects). The pattern of the relationship between child learning and teacher affective behavior and verbalizations was not the same in the first order analysis as determined by a percent category x teacher behavior interaction,  $F(4, 462) = 2.36, p < .05$ . The strength of the relationship between child learning and teacher positive affect was stronger than the relationship between child learning and teacher verbalizations.



Table 2

*First- and Second-Order Child and Teacher Social-Emotional Behavior Associated with Child Production of Response-Contingent Behavior*

Dependent Measures	Percent of Game Trials Producing Reinforcing Consequences										Linear Trend		
	0-20		21-40		41-60		61-80		81-100		Between Category F-Test	F-Test	Cohen's <i>d</i> Effect Size
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
<i>First-Order Child Effects</i>													
MANOVA	0.62	1.13	1.18	1.95	1.74	2.72	2.47	3.71	3.23	4.37	22.07***	87.78***	0.87
Positive Affect	1.03	1.44	2.36	2.56	3.17	3.43	4.46	4.45	5.80	5.17	23.25***	92.62***	0.89
Vocalizations	0.71	1.09	0.83	1.37	1.33	2.08	1.89	3.13	2.30	3.60	7.06***	27.12***	0.48
Excitement	0.10	0.42	0.33	0.90	0.72	1.75	1.06	2.37	1.58	2.77	9.09***	35.82***	0.56
<i>Second-Order Child Effects</i>													
MANOVA	0.16	0.58	0.68	1.57	1.25	2.57	1.45	2.79	2.09	3.45	14.28***	56.46***	0.70
Positive Affect	0.26	0.76	1.11	2.00	2.00	3.07	2.44	3.41	3.51	4.42	15.73***	62.53***	0.74
Vocalizations	0.13	0.50	0.59	1.34	0.95	2.36	1.37	2.81	1.76	3.01	7.56***	30.16***	0.51
Excitement	0.10	0.42	0.33	1.17	0.78	2.03	0.53	1.47	1.01	2.01	5.02**	16.04***	0.37
<i>First-Order Caregiver Effects</i>													
MANOVA	2.08	1.23	2.28	1.28	2.46	1.33	2.73	1.19	2.80	1.36	6.33***	24.53***	0.46
Positive Affect	2.19	1.21	2.43	1.26	2.65	1.26	2.86	1.13	3.12	1.19	8.35***	33.42***	0.54
Verbal Comments	1.98	1.25	2.14	1.29	2.27	1.37	2.59	1.23	2.48	1.45	3.36*	11.13**	0.31
<i>Second-Order Caregiver Effects</i>													
MANOVA	1.51	1.36	1.78	1.43	2.22	1.40	2.36	1.26	2.37	1.25	4.82**	16.39***	0.46
Positive Affect	1.50	1.27	1.84	1.38	2.21	1.39	2.35	1.31	2.39	1.27	4.54**	15.85***	0.45
Verbal Comments	1.52	1.46	1.73	1.49	2.23	1.41	2.36	1.22	2.35	1.25	4.60**	15.03***	0.44

\* $p < .01$ . \*\* $p < .001$ . \*\*\* $p < .0001$ .

## Discussion

Findings were very similar to those found in Study 1. The children's response-contingent behavior was associated with child positive social--emotional responding during the learning games and when the children were not producing operant behavior. Response-contingent child learning was also associated with teacher positive social--emotional behavior while engaging the children in the learning games and during observations of the teachers while not engaging the children in the contingency games. The findings replicate those reported for Study 1 and add credence to the contention that the relationships between the study variables generalized across both caregivers (parents and teachers) and settings (children's homes and classrooms).

## GENERAL DISCUSSION

The fact that the caregivers in both studies were able to use response-contingent learning games to promote the children's acquisition of contingency behavior was not unexpected since more than 30 years of research has produced evidence demonstrating the fact that children with multiple disabilities and profound developmental delays are capable of operant learning (see Dunst, 2003; Dunst & Lesko, 1988; Dunst et al., 2006; Hutto, 2003). Likewise, the fact that contingency awareness and detection was associated with positive child social--emotional behavior was not unexpected because previous research indicates that children with and without disabilities and developmental delays manifest pleasure in response to their emerging understanding of the relationship between their behavior and its consequences (Dunst, 2003). Findings demonstrating a relationship between child contingency learning and extended

child and caregiver benefits add to the knowledge base in terms of broader-based influences of child learning on both child and caregiver behavior (e.g., Gewirtz, 1991; Goldberg, 1977; Lamb & Sherrod, 1981). The assertion that intense response-contingent learning opportunities provided to children with multiple disabilities and profound developmental delays has both immediate and extended child and caregiver social--emotional benefits therefore seems warranted.

The benefits, however, were not the same depending on the social--emotional behavior measure and whether the outcome was a first- or second-order effects measure. In both sets of analyses (Tables 1 and 2), for example, child first-order positive affect was more strongly related to response-contingent child learning compared to the relationship between child first-order vocalizations and child learning. Similarly, caregiver first-order positive affect was more strongly related to response-contingent child learning compared to the relationship between caregiver first-order verbalizations and child learning. Findings of this sort help elucidate the particular influences contingency learning and detection are likely to have on both the children and their caregivers.

Further inspection of the patterns of results yields yet additional insights. In both sets of analyses, second-order caregiver verbalizations were more strongly related to response-contingent child learning compared to the relationship between first-order caregiver verbalizations and child learning. These findings are best explained by the fact that when caregivers are engaging the children in the contingency games, they are more intent on ensuring child success and therefore verbalize less, whereas their reflections on the children's and their own successes while not playing the games are occasion for positive comments about child learning.

In conclusion, young children with multiple disabilities and profound developmental delays were found capable of learning response-contingent behavior and the learning was associated with positive social--emotional benefits among both the children and their caregivers. Findings taken together were consistent with the study hypotheses and are very much consistent with theoretical formulations posed by Colombo (2001), Rochat (2001), Tarabulsky et al. (1996), and Watson (2001). Practically, the results demonstrate that systematic and intense contingency interventions provided to young children with multiple disabilities and profound developmental delays have a host of immediate and extended positive benefits on both the children and their caregivers.

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