CELLreviews
Center for Early Literacy Learning
2012 ■ Volume 5 ■ Number 8

Child-Directed Motionese With Infants and Toddlers With and Without Hearing Impairments

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Differences in parents' use of motionese (modifying and simplifying gestures, actions, or signs when interacting with infants or toddlers) were examined in a meta-analysis of 10 studies including 14 samples of study participants (N = 178 children). Signing and gesturing to infants and toddlers differed from that used with adults on 7 of 8 outcome measures constituting the focus of investigation. Results showed that parents were more likely to use child-directed signing, actions, and gesturing (i.e., motionese) with infants or toddlers compared to adults. Implications for practice are described.

Adults typically talk to infants differently than they do with older children and adults (Sickert, 2005). Speech to infants is often high-pitched, slower in tempo, includes exaggerated intonation, and is less complex (Kempe, Schaeffler, & Thoresen, 2010; Pine, 1994). This type of child-directed speech is commonly called parentese (Werker, 1987) or motherese (Cross, 1978). Research indicates that infants show a preference for this type of speech (Dunst, Gorman, & Hamby, 2012b) and that it is nearly universally spoken by adults to infants and very young children in many different countries and cultures (Bryant & Barrett, 2007; Grieser & Kuhl, 1988).

A number of investigators have noted that the gestures and actions adults use with typically developing infants and toddlers differ from gestures used with adults in a manner similar to those for child-directed speech (Koterba & Iverson, 2009; Przednowek, 2009). Differences have been reported in terms of range of motion, repetitions, simplifications, as well as other features (Brand, Baldwin, & Ashburn, 2002). Child-directed gestures and actions were first called *motionese* by Brand, Baldwin, and Ashburn (1999) and is the term now commonly used to describe the manner in which parents modify and simplify their gestures and actions when interacting with infants and toddlers (e.g., Brand & Shallcross, 2008; Shallcross, 2006; Vollmer, Lohan, Fritsch, Rohlfing, & Wrede, 2009).

There is also evidence that sign language used by adults with infants and toddlers with hearing impairments differs from sign language used with adults (Masataka, 1992). Signing with infants and toddlers with hearing impairments tends to be slower, exaggerated, and repetitious (Holzrichter & Meier, 2000; Koester & Lahti-Harper, 2010; Masataka, 2000). The effects include increased child attention to the infant-direct signed motionese (Erting, Prezioso, & Hynes, 1990; Hoiting & Slobin, 2002).

The purpose of the meta-analysis described in this *CELLreview* was to determine whether gestures, actions, and signs used with infants in fact differ from those used with adults. This was accomplished by coding and comparing parent behavior when interacting with infants and toddlers to parent behavior manifested when interacting with other adults. A companion *CELLreview* includes analyses of the relationship between infant-directed motionese and different child behavioral outcomes (Dunst, Gorman, & Hamby, 2012a). Both reviews were conducted to inform the use of sign language with infants and toddlers with hearing loss or impairments where this form of communication is indicated and warranted (Koester & McCray, 2011).

Search Strategy

Studies were located using *motionese* or *infant direct gestures* or *infant-directed gestures* or *infant direct action* or *infant-direct action* or *infant directed sign** or *infant-directed*

CELLreviews are a publication of the Center for Early Literacy Learning (CELL) funded by the U.S. Department of Education, Office of Special Education Programs (Grant #H326B060010). CELL is collaboration among the Orelena Hawks Puckett Institute, the American Institutes for Research, and the PACER Center.

*sign** NOT *sing** or *singing* as search terms. The same search was done replacing *infant* with *child* or *toddler* for all of the above combinations. We also performed a series of additional searches using various combinations of *motionese*, *child-directed*, *infant-directed*, *gestures*, *actions*, *movements*, and *sign lang** as search terms.

PsychInfo, ERIC, and MEDLINE were searched for studies. These were supplemented by Google Scholar, Scrius, and Google searches as well as a search of an EndNote library maintained by our Institute. Hand searches of the reference sections of all retrieved journal articles, book chapters, books, dissertations, and unpublished papers were also examined to locate additional studies. Studies were included if the investigators compared the use of gestures or signs with adults and either infants or toddlers and effect sizes for the between condition (person) comparisons could be computed for the data in the research reports.

Search Results

Ten studies were located that included 14 samples of participants (Bekken, 1989; Brand et al., 2002; Brand, Shallcross, Sabatos, & Massie, 2007; Erting et al., 1990; Masataka, 1992, 1996, 2000; Nagai & Rohlfing, 2007, 2008, 2009; Pizer & Meier, 2008; Pizer, Shaw, & Meier, 2008, March; Rutherford & Przednowek, 2012; Vollmer et al., 2009). The study participants were all parents (predominantly mothers) who interacted either naturally with their own children and another adult (separately) or who were asked to use specific signs or demonstrate the use of specific objects with their own children and another adult (separately).

Appendix A includes selected characteristics of the study participants. The 14 samples included 178 adults and infants or toddlers. The children ranged in age from 1 to 30 months (Average mean age = 12 months). Ten samples included children and adults without any hearing impairments and four samples included children and adults with hearing impairments. One hundred and fifty-four children and adults had no hearing impairments and 24 children and adults both had hearing impairments. In the few studies that reported child gender, half were female and half were male.

All of the studies used between person (condition) comparisons where the characteristics of gestures or signs used with adults were compared to the characteristics of gestures or signs used with infants or toddlers. The comparisons were made between naturalistic differences in the use of gestures, actions, or signs with adults and children or involved comparisons of gestures, actions, or signs that the investigators asked the parents to use with their children and other adults. The types of activities observed or demonstrated are shown in Appendix B.

The outcomes that were the focus of investigation included, but were not limited to, range of motion, simplicity of the gestures or signs, enthusiasm, hand movements, repetitions, sign or gesture complexity, and the amount of time interacting with the adults and children. There were 30+ different outcome measures used in the studies which were grouped into eight categories (Table 1) based on the characteristics of motionese and child-directed signing described in the literature (e.g., Brand et al., 2002; Holzrichter & Meier, 2000; Masataka, 1992; Rohlfing, Fritsch, & Wrede, 2004).

Cohen's *d* effect sizes for the between condition differences on each of the study outcomes were used as the size of effect for signing and gestures to children vs. adults. The weighted average effect sizes for different contrasts and comparisons were used to determine if the signs and gestures used with adults and children were similar or different. The 95% confidence intervals for the average effect sizes were used for substantive interpretation where the size of the difference on the outcomes between the two conditions was evaluated by *Z*-tests (Rosenthal, 1994).

Synthesis Findings

The effect sizes for the different outcome measures were first examined to determine if there were any outliers. There were only two effect sizes larger than two standard deviations above the mean which were recoded using procedures described by Lipsey and Wilson (2001) to make adjustments so as not to include inflated effect sizes in any of the analyses. Appendix C includes the comparative conditions in each of the studies, the parent behavior used as the dependant measures, and the Cohen's *d* effect sizes for the difference between gesturing or signing to infants or toddlers and adults. A positive effect size indicates that the differences in the dependent measures favored the infants.

The interactions between the study participants and adults and children involved signing to infants or toddlers and adults with hearing impairments or gesturing to infants

Table 1
Categorization of the Parent Outcomes Used as Indicators of Motionese

Motionese Behavior	Behavior Indicators
Attention Getting	Pointing, tapping objects, showing objects
Physical Contact	Touching child, adult, or object; close proximity
Positive Affect	Smiling, facial expressions, enthusiasm
Pace of Signs or Gestures	Slower movements, longer duration
Range of Motion	Large or exaggerated movements
Object Actions	Modified responses or action streams
Repetitions	Repeating gestures, actions, or signs
Simplifications	Simplified signing or demonstrations

or toddlers and adults without hearing impairments. Figure 1 shows the average effect sizes and 95% confidence intervals for the differences in signing and gesturing. The average effect size for motionese to infants or toddlers with hearing impairments was $d = 1.69$, 95% CI = 1.34 – 2.04, $Z = 9.51$, $p = .0000$, and the average effect size for motionese to infants and toddlers without hearing impairments was $d = .85$, 95% CI = .75 - .96, $Z = 15.80$, $p = .0000$. In both analyses, the study participants signed or gestured differently to children and adults. In all cases, the parents demonstrated behavior indicative of the operational characteristics of motionese (Table 1). The size of effect for signing to infants or toddlers with hearing impairments, however, was twice as large as the size of effect for gesturing to infants or toddlers without hearing impairments. This indicates that parents of young children with hearing impairments modified and simplified their sign language considerably more than parents of young children without hearing impairments modified or simplified their gestures or actions when demonstrating the use of objects to infants and toddlers.

The study participants were observed interacting with the infants or toddlers and adults in one of two ways: Without any specific instructions (naturalistic) or by asking them to use specific signs or to demonstrate the use of an object (demonstration). The sizes of effects of the two types of motionese are shown in Figure 2. The average effect size for the naturalistic use of motionese was $d = 1.44$, 95% CI = 1.12 – 1.76, $Z = 8.70$, $p = .0000$, and the average effect size for motionese when the parents were asked to demonstrate either signs or the use of objects was $d = .88$, 95% CI = .76 - .98, $Z = 15.96$, $p = .0000$. In both analyses, the study participants signed or gestured differently to children and adults in a manner consistent with the characteristics of motionese.

The outcomes in the studies all included parent behavior used with infants or toddlers and adults. Table 2 shows the sizes of effects for the differences on each of the eight outcome categories. All of the average effect sizes except attention getting differed significantly from zero as evidenced by statistically significant Z-tests and confidence intervals not including zero. In all cases, parents' behavior with their infants or toddlers was more characteristic of motionese than behavior used with adults. Parents were more likely to touch their children, modify their actions with objects, demonstrate positive affect, manifest a wider range of motion when using signs or gestures, repeat the signs or gestures, produce signs or gestures at a slower pace, and simplify the signs or gestures used with their infants compared to adults.

The extent to which the size of the differences in the effect sizes was moderated by study variables is shown in Table 3. The moderators included year of publication, type of publication, experimental setting, and the language or type of sign language used with the infants or toddlers and

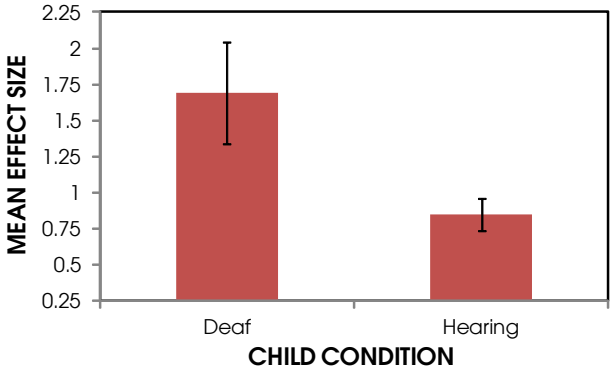

Figure 1. **Average effect sizes and 95% confidence intervals for the differences in signing or gesturing to infants or toddlers with and without hearing impairments.**

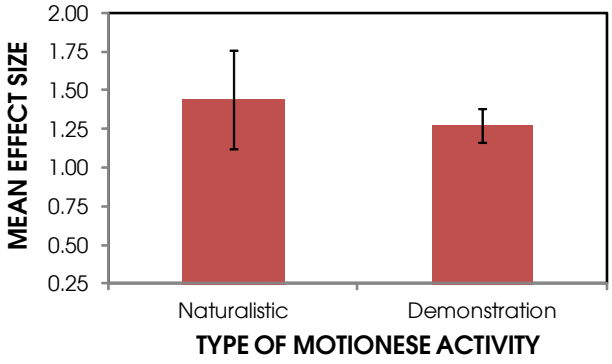

Figure 2. **Average effect sizes and 95% confidence intervals for the differences in signing or gesturing to infants or toddlers under naturalistic or prescribed conditions.**

adults. Parent behavior with infants or toddlers was different than that used with adults regardless of the moderator. All of the average effect sizes differed significantly from zero as evidenced by the Z-tests and confidence intervals not including zero.

Discussion

Findings from the meta-analysis showed that the nature of parent signing and gesturing to infants and toddlers differed from the ways in which parents interacted with adults. Motionese with infants and toddlers was slower paced, more repetitious, more exaggerated, more simplified, and included more positive affect than the behavior used with adults. The findings from the different sets of analyses, taken together, provide yet additional evidence for the contention that parents interact differently with infants and toddlers in terms of how they modify sign language (e.g., Erting, Prezioso, & Hynes, 1994) and how they modify gestures and actions (e.g., Przednowek, 2009). The results also provide support for the contention that motionese (Brand & Shallcross, 2008) like parentese (Dunst et al., 2012b) is a common phenomenon among parents while interacting with infants and toddlers

Table 2
Average Effect Sizes and 95% Confidence Intervals (CI) for the Differences in the Types of Motionese Used with Infants or Toddlers and Adults

	Number					
Parent Behavior	Studies	Effect Sizes	Average Effect Size	95% CI	*Z*	*p*-value
Physical Contact	4	4	2.07	1.69 – 2.45	10.71	.0000
Object Actions	4	7	1.66	1.30 – 2.01	9.11	.0000
Positive Affect	4	8	1.19	.96 – 1.43	9.95	.0000
Range of Motion	9	9	.82	.55 – 1.08	6.14	.0000
Pace of Signs or Gestures	9	12	.78	.53 – 1.03	6.12	.0000
Repetitions	5	5	.72	.41 – 1.02	4.60	.0000
Attention Getting	1	3	.61	-.11 – 1.33	1.66	.0969
Simplifications	6	9	.36	.14 - .58	3.26	.0011

Table 3
Moderators of the Effects of Motionese on the Differences Between the Infants or Toddlers and Adults

	Number					
Moderators	Studies	Effect Sizes	Mean Effect Size	95% CI	*Z*	*p*-value
Year of Publication						
1989 – 2002	6	33	1.05	.89 – 1.20	13.16	.0000
2003 – 2012	8	24	.84	.70 – .97	12.28	.0000
Type of Publication						
Peer Reviewed	8	37	.87	.76 – .98	15.40	.0000
Other	6	20	1.24	.98 – 1.49	9.47	.0000
Experimental Setting						
Laboratory	10	38	1.14	.99 – 1.28	15.77	.0000
Home + Laboratory	3	17	.69	.54 – .84	9.24	.0000
Language/Sign Language						
English	7	31	1.08	.92 – 1.23	13.62	.0000
Japanese	3	16	.73	.58 – .87	9.56	.0000

with or without hearing impairments (Brand et al., 2009; Waxman & Spencer, 1997).

Implications for Practice

Findings from the meta-analysis reported in the *CELLreview* as well as a companion *CELLreview* (Dunst et al., 2012a) have a number of implications for using sign language to facilitate the communication and language development of very young children with disabilities. The results from both syntheses indicate that somewhat simple modifications in natural gestures and sign language not only will increase child visual attention to the motionese but that the modifications will more likely make it easier for children to process and understand the communicative message. Results also indicate that motionese will increase child engagement in interactions with people and objects will likely make it easier to introduce learning opportunities to the children.

The findings also have implications for resolving a controversy with regard to using natural gestures or sign language to facilitate the communication development of infants and toddlers with hearing impairments or other types of disabilities (Hoiting & Slobin, 2002; Volterra & Erting, 1994). Results from this meta-analysis indicate that a balance between the two approaches may perhaps have better consequences inasmuch as modifications of natural gestures and sign language have similar effects (Dunst, Meter, & Hamby, 2011).

There are a number of *CELLpractice* guides that include guidelines for using sign language to increase the social-communicative competence of infants and toddlers with disabilities (www.earlyliteracylearning.org). These practice guides include suggestions for how sign language can be modified and changed to increase the likelihood that the interventions will have positive effects. Results from this as well as our other *CELL* syntheses (Dunst, Gorman, & Hamby, in press; Dunst et al., 2011) provide yet additional information about how gestures and signing can be used to have behavioral-enhancing child consequences.

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Appendix A

Background Characteristics of the Child Study Participants

		Age (Months)		Gender		Diagnostic Condition	
Study	Number	Mean	Range	Male	Female	Child	Adult
Bekken (1989)	6	18	Not reported	0	6	Hearing	Hearing
Brand et al. (2002) (Sample 1)	18	7	6-8	Not reported	Not reported	Hearing	Hearing
Brand et al. (2002) (Sample 2)	16	12	11-13	Not reported	Not reported	Hearing	Hearing
Brand et al. (2007) (Sample 1)	14	7	6-8	Not reported	Not reported	Hearing	Hearing
Brand et al. (2007) (Sample 2)	14	12	11-13	Not reported	Not reported	Hearing	Hearing
Erting et al. (1990)	8	3[a]	1-6	Not reported	Not reported	Deaf	Deaf
Masataka (1992, 2000)	8	9[a]	8-11	Not reported	Not reported	Deaf	Deaf
Masataka (1996) (Sample 1) Masataka (2000)	5	6	Not reported	3	2	Deaf	Deaf
Nagai & Rohlfing (2007, 2008, 2009)	15	11	8-11	Not reported	Not reported	Hearing	Hearing
Pizer & Meier (2008) Pizer et al. (2008)	3	15	9-23	0	3	Deaf	Deaf
Rutherford & Przednowek (2012)	42	12	Not reported	26	16	Hearing	Hearing
Vollmer et al. (2009) (Group 1)	8	9[a]	8-11	3	5	Hearing	Hearing
Vollmer et al. (2009) (Group 2)	11	18[a]	12-23	6	5	Hearing	Hearing
Vollmer et al. (2009) (Group 3)	10	27[a]	24-30	4	6	Hearing	Hearing

[a]Estimated.

Appendix B

Selected Characteristics of the Child-Adult Interactions

Study	Adult Activity	Setting	Method of Motionese Presentation	Child's Position	Type of Motionese Presentation
Bekken (1989)	Free play with toys	Home	In vivo	Not reported	Naturalistic
Brand et al. (2002) (Sample 1 & 2)	Demonstration of five novel objects	Laboratory	In vivo	High chair	Demonstration
Brand et al. (2007) (Sample 1 & 2)	Demonstration of four novel objects	Laboratory	In vivo	Infant seat	Demonstration
Erting et al. (1990)	Mothers signing "mother"	Laboratory and home	In vivo	Not reported	Naturalistic
Masataka (1992, 2000)	Typical Japanese sign language interaction	Laboratory	In vivo	Chair with seat belt	Naturalistic
Masataka (1996) (Sample 1) Masataka (2000)	Signing seven supplied sentences in Japanese sign language	Laboratory	In vivo	Chair with seat belt	Predetermined presentation
Nagai & Rohlfing (2007, 2008, 2009)	Demonstration of colored stacking cups	Laboratory	In vivo	Seated at table across from parent	Predetermined presentation
Pizer & Meier (2008) Pizer et al. (2008)	Joint attention interactions	Not reported	In vivo	Not reported	Naturalistic
Rutherford & Przednowek (2012)	Demonstration of two novel objects	Laboratory or home	In vivo	High chair adjacent to parent	Demonstration
Vollmer et al. (2009)	Demonstration of stacking cups	Laboratory	In vivo	Seated at table across from parent	Predetermined presentation

Appendix C

Cohen's d Effect Sizes for the Differences in Child-Directed vs. Adult Directed Motionese

Study	Study Design	Comparative Condition	Adult Outcome Measures	Cohen's *d* Effect Size
Bekken (1989)	Between conditions	Mothers' presentation of an object to adult vs. to child	Percent of gestures	0.95
Bekken (1989)	Between conditions	Mothers' manipulation of an object with adult vs. with child	Percent of gestures	2.03
Bekken (1989)	Between conditions	Mothers' pointing to objects with adult vs. with child	Percent of gestures	-0.93
Bekken (1989)	Between conditions	Mothers' tapping objects with adult vs. with child	Percent of gestures	1.38
Bekken (1989)	Between conditions	Mothers' touching objects with adult vs. with child	Percent of gestures	1.64
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' proximity of object demonstration to adult vs. to child	Level of proximity	2.50
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' interactiveness when demonstrating objects to adult vs. to child	Level of interaction	1.61
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' enthusiasm when demonstrating objects to adult vs. to child	Level of enthusiasm	1.56
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' range of motion when demonstrating objects to adult vs. to child	Level of range of motion	1.23
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' repetitiveness when demonstrating objects to adult vs. to child	Level of repetition	0.82
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' simplification of actions when demonstrating objects to adult vs. to child	Level of simplification	0.38
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' punctuated actions when demonstrating objects to adult vs. to child	Level of punctuated action	0.32
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' rate of movement when demonstrating objects to adult vs. to child	Level of rate of movement	-0.12
Brand et al. (2002) (Sample 1)	Between conditions	Mothers' proximity of object demonstration to adult vs. to child	Level of proximity	2.61
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' interactiveness when demonstrating objects to adult vs. to child	Level of interaction	1.66
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' enthusiasm when demonstrating objects to adult vs. to child	Level of enthusiasm	1.01
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' range of motion when demonstrating objects to adult vs. to child	Level of range of motion	1.34
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' repetitiveness when demonstrating objects to adult vs. to child	Level of repetition	0.51
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' simplification of actions when demonstrating objects to adult vs. to child	Level of simplification	0.88
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' punctuated actions when demonstrating objects to adult vs. to child	Level of punctuated action	0.48
Brand et al. (2002) (Sample 2)	Between conditions	Mothers' rate of movement when demonstrating objects to adult vs. to child	Level of rate of movement	-0.37
Brand et al. (2007) (Sample 1)	Between conditions	Mother relinquishes object to adult vs. to infant	Number of times relinquished	1.43
Brand et al. (2007) (Sample 1)	Between conditions	Mothers' object actions with adult vs. with infant	Action types per turn	1.69
Brand et al. (2007) (Sample 2)	Between conditions	Mother relinquishes object to adult vs. to infant	Number of times relinquished	2.37
Brand et al. (2007) (Sample 2)	Between conditions	Mothers' object actions with adult vs. with infant	Action types per turn	2.22

Appendix C, continued.

Study	Study Design	Comparative Condition	Adult Outcome Measures	Cohen's *d* Effect Size
Erting et al. (1990)	Between conditions	Mothers' hand orientation when signing "mother" to adult vs. to infant	Proportion of showing full palm or back of hand	0.81
Erting et al. (1990)	Between conditions	Mother touches adult vs. infant when signing "mother"	Proportion of touching partner	4.79
Erting et al. (1990)	Between conditions	Mother moves mouth when signing "mother" to adult vs. to infant	Proportion of moving mouth while signing	1.32
Erting et al. (1990)	Between conditions	Mothers' positive affect on face when signing "mother" to adult vs. to infant	Proportion of positive affect	2.11
Masataka (1992, 2000)	Between conditions	Mothers' repetition of signing to adult vs. to infant	Percent of rate of repetition	1.95
Masataka (1992, 2000)	Between conditions	Mothers' duration of signing to adult vs. to infant	Number of video frames in which sign appears	1.22
Masataka (1992, 2000)	Between conditions	Mothers' exaggeration of hand movements when signing to adult vs. to infant	Angle subtended by the hand	2.60
Masataka (1992, 2000)	Between conditions	Mothers' exaggeration of elbow movements when signing to adult vs. to infant	Angle subtended by the elbow	1.64
Masataka (1996) (Sample 1) Masataka (2000)	Between conditions	Mothers' repetition of signing to adult vs. to infant	Percent of rate of repetition	1.46
Masataka (1996) (Sample 1) Masataka (2000)	Between conditions	Mothers' duration of signing to adult vs. to infant	Number of video frames in which sign appears	2.86
Masataka (1996) (Sample 1) Masataka (2000)	Between conditions	Mothers' exaggeration of hand movements when signing to adult vs. to infant	Degree of angle subtended by the hand	1.93
Masataka (1996) (Sample 1) Masataka (2000)	Between conditions	Mothers' exaggeration of elbow movements when signing to adult vs. to infant	Degree of angle subtended by the elbow	1.02
Nagai & Rohlfing (2007, 2008, 2009)	Between conditions	Parents' action in stacking cups for an adult vs. for an infant	Contribution rate of inherent features (color, intensity, orientation) to saliency for the cup	1.17
Pizer et al. (2008)	Between conditions	Adult directed joint attention vs. infant directed joint attention to signing rate	Number of signs per minute	3.38
Pizer et al. (2008)	Between conditions	Adult directed joint attention vs. infant directed joint attention to modified signs	Percentage of modified signs	0.79
Rutherford & Przednowek (2012)	Between conditions	Mothers' repetitiveness when demonstrating objects to adult vs. to child	Level of repetition	0.52
Rutherford & Przednowek (2012)	Between conditions	Mothers' rate of movement when demonstrating objects to adult vs. to child	Level of rate of movement	0.52
Rutherford & Przednowek (2012)	Between conditions	Mothers' punctuated actions when demonstrating objects to adult vs. to child	Level of punctuated action	-0.11
Rutherford & Przednowek (2012)	Between conditions	Mothers' range of motion when demonstrating objects to adult vs. to child	Level of range of motion	0.39
Rutherford & Przednowek (2012)	Between conditions	Mothers' proximity of object demonstration to adult vs. to child	Level of proximity	1.65
Rutherford & Przednowek (2012)	Between conditions	Parents ' complexity of actions when demonstrating objects to adult vs. to child	Level of complexity	0.34
Rutherford & Przednowek (2012)	Between conditions	Parents' interactiveness when demonstrating objects to adult vs. to child	Level of interaction	1.55
Rutherford & Przednowek (2012)	Between conditions	Parents' enthusiasm when demonstrating objects to adult vs. to child	Level of enthusiasm	0.45

Appendix C, continued.

Study	Study Design	Comparative Condition	Adult Outcome Measures	Cohen's *d* Effect Size
Vollmer et al. (2009) (Group 1)	Between conditions	Adult directed vs. infant directed range of hand movements	Distance of movement	0.88
Vollmer et al. (2009) (Group 1)	Between conditions	Adult directed vs. infant directed pace during interactions	Duration of pace in minutes	3.74
Vollmer et al. (2009) (Group 1)	Between conditions	Adult directed vs. infant directed time without movement	Percentage of time	2.42
Vollmer et al. (2009) (Group 2)	Between conditions	Adult directed vs. infant directed range of hand movements	Distance of movement	0.38
Vollmer et al. (2009) (Group 2)	Between conditions	Adult directed vs. infant directed pace during interactions	Duration of pace in minutes	0.00
Vollmer et al. (2009) (Group 2)	Between conditions	Adult directed vs. infant directed time without movement	Percentage of time	1.77
Vollmer et al. (2009) (Group 3)	Between conditions	Adult directed vs. infant directed range of hand movements	Distance of movement	0.56
Vollmer et al. (2009) (Group 3)	Between conditions	Adult directed vs. infant directed pace during interactions	Duration of pace in minutes	1.88
Vollmer et al. (2009) (Group 3)	Between conditions	Adult directed vs. infant directed time without movement	Percentage of time	3.03