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Effects of Motionese on Infant and Toddler Visual Attention and Behavioral Responsiveness

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Findings from eight studies (12 samples) of infants and toddlers (N = 261) investigating the effects of adults use of motionese (modifying and simplifying gestures, actions, or signs when interacting with infants and toddlers) on child outcomes are reported. Results showed that child positive affect, visual attention, and behavior engagement were enhanced when the children experienced gestures and signing that included simplifications, exaggerations, repetitions, and was slower paced. Implications for practice are described.

Adults both speak and gesture differently to infants and toddlers than they do to adults (Aulich, 2001; Przednowek, 2009). Both speech and gesturing to infants and toddlers tends to be slower, simplified, and includes exaggerated words and actions (Bekken, 1989; Kempe, Schaeffler, & Thoresen, 2010). The terms *parentese* or *motherese* and *motionese* are now commonly used to describe, respectively, the kinds of speech and gestures used with infants and toddlers (Brand, Baldwin, & Ashburn, 2002; Cross, 1978; Werker, 1987). Research has found that infants and toddlers show a preference for both parentese and motionese (Brand & Shallcross, 2008; Dunst, Gorman, & Hamby, 2012b; Koterba, 2002) and both have behavioral- and developmental-enhancing effects (Durkin, Rutter, & Tucker, 1982; Koterba & Iverson, 2009; Pence, Golinkoff, Brand, & Hirsh-Pasek, 2005).

Observations and studies of parents' actions and signing to infants and toddlers with hearing impairments indicates that they modify their hand and body movements in ways similar to what has been found in motionese studies of parents of infants and toddlers without hearing impairments (e.g., Erting, Prezioso, & Hynes, 1990; Kyle & Ackerman, 1990; Masataka, 1996). As noted by Erting et al. (1994), parents "modify the sign language they use with their [deaf] infants, producing signing that appears slower, formationally different, and grammatically less complex than signing produced during adult-directed discourse" (pp. 101-102). These types of modifications are made by parents with and without hearing impairments with their infants or toddlers with hearing impairments (Swisher, 1991, 2000). The effects of infant-directed signing or motionese with infants and toddlers with hearing impairments include increased visual attention, parent-child interaction, and early communication development (e.g., Swisher, 1991, 2000; Vohr et al., 2010; Waxman & Spencer, 1997).

The purpose of the meta-analysis described in this *CELLreview* was to determine if motionese has behavioral-enhancing effects on infants and toddlers with and without hearing impairments. A companion *CELLreview* includes analyses of studies demonstrating that parents in fact gesture and sign differently to infants and toddlers than they do to adults (Dunst, Gorman, & Hamby, 2012a). Both reviews were conducted to inform the use of sign language with infants and toddlers with hearing impairments and other disabilities where this form of communication is indicated and warranted (Dunst, Meter, & Hamby, 2011; 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 sign** NOT *sing** or *singing* as search terms. The same search was done replacing *infant* with *child* for all of the above combinations. We also performed a series of additional searches using various combinations of *motionese*, *child-directed*, *in-*

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fant-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 effects of infants and toddlers experiencing either motionese or nonmotionese on the children's visual attention and behavioral responsiveness.

Search Results

Eight studies were located that included 12 samples of participants (Brand et al., 2002; Brand & Shallcross, 2008; D'Cunha, 2008; Koterba, 2002; Koterba & Iverson, 2009; Masataka, 1996, 1998, 2000; Rutherford & Przednowek, 2012; Shallcross, 2006). Appendix A includes selected characteristics of the study participants. The 12 samples included 261 infants. The children ranged in age from 6 to 14 months (Average mean age = 9 months). All of the infants, except 12 in one study (Masataka, 1996), had no hearing impairments. Fifty-three percent of the infants were male and 47% were female.

The types of motionese and nonmotionese used in the studies, the setting in which the studies were conducted, and the mode and type of presentation of the gestures or signs are shown in Appendix B. Infant and toddler-directed motionese was presented to the study participants either in-vivo (N = 3 studies) or by video tapes (N = 6 studies). The studies were conducted in laboratory settings in all but one study. The investigators used between condition designs where the same infants or toddlers observed child-directed and non child-directed signing or gesturing in all but one study. A between group design was used in one study where one group of infants or toddlers observed child-directed signing or gesturing and another group observed non child-directed signing or gesturing. Five different characteristics of motionese were examined: Adult affect, repetitions, modifications (simplification and exaggerations), object actions, and pace of the gestures or signs. The child outcomes that were the focus of investigation were child visual attention to the two types of signing and gesturing, child affective behavior, and child behavioral engagement with objects or toys.

Cohen's *d* effect sizes for the between condition differences or between group differences on each of the study outcomes were used as the size of effect for the two types of gestures and signing on the child outcomes. The weighted average effect sizes for different contrasts and comparisons were used to determine if the two types of gestures and signs had similar or different effects. 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 child behaviors used as the dependant measures, and the Cohen's *d* effect sizes for the difference between the two types of gesturing or signing. A positive effect size indicates that the differences in the dependent measures favored the infants and toddlers who observed motionese.

Table 1 shows the findings for three different experimental variables (type of design, mode of presentation of

Table 1
Average Effect Sizes and 95% Confidence Intervals (CI) for the Influences of Different Experimental Variables on the Child Outcomes

	Number					
Variables	Studies	Effect Sizes	Average Effect Size	95% CI	*Z*-test	*p*-value
Type of Design						
Between Condition	11	21	1.10	.96 – 1.23	15.96	.0000
Between Group	1	5	.09	-.28 – .45	0.48	.6329
Method of Presentation						
In Vivo	4	11	.86	.66 – 1.07	8.27	.0000
Video Tape	8	15	1.04	.88 – 1.21	12.75	.0000
Type of Motionese						
Naturalistic	8	15	1.01	.84 – 1.17	12.37	.0000
Prescribed	4	11	.92	.72 – 1.13	8.73	.0000

child-directed and non child-directed signing or gesturing, and type of signing or gesturing). The effects of the two types of signing or gesturing did not differ for either mode of presentation or type of motionese. The one between group design study which included five effect sizes did not produce an overall between group effect size difference. The average effect size for the between condition differences indicated that child-directed signing or gesturing was associated with more positive child outcomes compared to non child-directed signing or gesturing.

The influences of the two types of signing and gesturing on the three child outcomes are shown in Figure 1. In all three sets of analyses, child-directed signing and gesturing was associated with more positive child outcomes compared to non child-directed signing and gesturing. These findings demonstrate that motionese had behavioral-enhancing influences on all three child outcomes.

The types of motionese used in the studies included five different types of adult behavior or combinations of behavior. These included positive affect, object actions, range of motion, modifications, repetitions, and the pace of the gestures or signs. The relationships between these characteristics and the sizes of effect for the differences between child-directed gesturing and signing and non child-directed gesturing and signing are shown in Table 2. Use of any one of the characteristics (or combination of characteristics) was associated with positive child outcomes as evidenced by the *Z*-test results and confidence intervals not including zero. Modifications in the form of simplifications and exaggerations, a larger range of motion, and slower pace of gesturing and signing proved to be particularly effective in terms of influencing the child outcomes.

Discussion

Findings from the meta-analysis showed that when adults demonstrated or interacted with infants and toddlers in a manner consistent with the characteristics of motionese (see Table 2), the children demonstrated more positive affect, increased visual attention to the adult gestures and signs, and more behavioral engagement with adults, objects, and toys. The findings from the different sets of analyses provide support for the contention that motionese has behavioral-enhancing effects (e.g., Brand, Shallcross, Sabatos, & Massie, 2007; D'Cunha, 2008; Koterba & Iverson, 2009; Rohlfing, Fritsch, & Wrede, 2004). The results also demonstrate the fact that modifications in the gestures and signs used with infants and toddlers are at least one characteristic that sets the occasion for introducing learning opportunities for the children (Brand et al., 2007; Koterba & Iverson, 2009; Kyle & Ackerman, 1990).

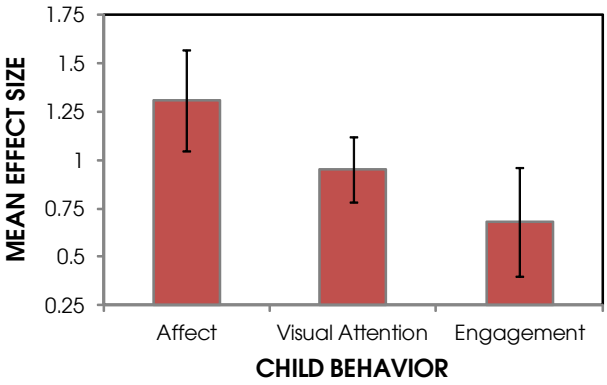

Figure 1. **Average effect sizes and 95% confidence intervals for the influence of motionese on the child outcomes.**

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

Table 2.
Average Effect Sizes and 95% Confidence Intervals (CI) for the Relationships Between Different Motionese Characteristics and the Child Outcomes

Characteristic	Number		Average Effect Size	95% CI	*Z*-test	*p*-value
	Studies	Effect Sizes				
Modifications	5	10	1.31	1.12 – 1.50	13.55	.0000
Range of Motion	6	12	1.27	1.09 – 1.44	14.10	.0000
Pace of Gestures or Signs	3	6	1.22	.97 – 1.47	9.67	.0000
Repetitions	6	15	1.05	.88 – 1.22	12.25	.0000
Object Actions	10	22	.87	.73 – 1.01	12.20	.0000

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 had similar effects (see Dunst et al., 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 other *CELL* syntheses (Dunst, Gorman, & Hamby, 2012; 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

Study	Number	Age (Months)		Gender		Diagnostic Condition	
		Mean	Range	Male	Female	Child	Adult
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 & Shallcross (2008) (Study 2) (Sample 1 A)	14	8	6-9	7	7	Hearing	Hearing
Brand & Shallcross (2008) (Study 2) (Sample 1 B)	14	8	6-9	7	7	Hearing	Hearing
Brand & Shallcross (2008) (Study 2) (Sample 2 A)	12	12	11-14	5	6	Hearing	Hearing
Brand & Shallcross (2008) (Study 2) (Sample 2 B)	12	12	11-14	6	7	Hearing	Hearing
D'Cunha (2008)	20	8	6-9	13	7	Hearing	Hearing
Koterba (2002) Koterba & Iverson (2009)	24	9	8-11	12	12	Hearing	Hearing
Masataka (1996) (Sample 2) Masataka (2000)	12	6	Not reported	7	5	Deaf	Deaf
Masataka (1998, 2000)	45	6	Not reported	21	24	Hearing	Hearing
Rutherford & Przednowek (2012)	42	12	Not reported	26	16	Hearing	Hearing
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	32	7	6-8	17	15	Hearing	Hearing

Appendix B

Selected Characteristics of the Child-Adult Interactions

Study	Activity	Setting	Method of Motionese Presentation	Child's Position	Type of Motionese Presentation
Brand et al. (2002) (Sample 1 & 2)	Watching mother demonstrate five novel objects to an infant vs. adult	Laboratory	In vivo	High chair	Demonstration
Brand & Shallcross (2008) (Study 2) (Sample 1 A & 2 A)	Viewing split screen video clips of a mother demonstrating four novel objects to an infant vs. adult	Laboratory	Video	Parent's lap	Demonstration
Brand & Shallcross (2008) (Study 2) (Sample 1 B & 2 B)	Viewing split screen video clips of a blurred faced mother demonstrating four novel objects to an infant vs. adult	Laboratory	Video	Parent's lap	Demonstration
D'Cunha (2008)	Viewing split screen video clips of a mother demonstrating four novel objects to an infant vs. adult	Laboratory	Video	Parent's lap	Predetermined presentation
Koterba (2002) Koterba & Iverson (2009)	Watching presentation of novel objects presented with either high amplitude/ high repetition (infant directed) or low amplitude/low repetition (adult directed)	Laboratory	In vivo	High chair	Predetermined presentation
Masataka (1996) (Sample 2) Masataka (2000)	Viewing video display of an unfamiliar mother using Japanese sign language with an infant vs. adult	Laboratory	Video	Held at parent's shoulder	Predetermined presentation
Masataka (1998, 2000)	Viewing video display of an unfamiliar mother using Japanese sign language with an infant vs. adult	Laboratory	Video	Held at parent's shoulder	Predetermined presentation
Rutherford & Przednowek (2012)	Watching parent demonstrate two novel objects to an infant vs. adult	Laboratory or home	In vivo	High chair adjacent to parent	Demonstration
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Viewing split screen video clips of a mother demonstrating four novel objects to an infant vs. adult	Laboratory	Video	Parent's lap	Demonstration

Appendix C

Cohen's d Effect Sizes for Infant Directed vs. Adult Directed Motionese on Child Outcomes

Study	Study Design	Comparative Condition	Child Outcome Measures	Cohen's *d* Effect Size
Brand et al. (2002) (Sample 1)	Between conditions	Adult vs. infant possession time of object	Amount of object possession time in seconds	1.70
Brand et al. (2002) (Sample 1)	Between conditions	Adult vs. infant joint action with mother	Amount of joint action ime in seconds	2.41
Brand et al. (2002) (Sample 2)	Between conditions	Adult vs. infant possession time of object	Amount of object possession time in seconds	1.18
Brand et al. (2002) (Sample 2)	Between conditions	Adult vs. infant joint action with mother	Amount of joint action time in seconds	1.08
Brand & Shallcross (2008) (Study 2) (Sample 1 A)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items	Looking time in seconds	0.44
Brand & Shallcross (2008) (Study 2) (Sample 1 B)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items with mother's face blurred	Looking time in seconds	1.04
Brand & Shallcross (2008) (Study 2) (Sample 2 A)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items	Looking time in seconds	1.26
Brand & Shallcross (2008) (Study 2) (Sample 2 B)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items with mother's face blurred	Looking time in seconds	0.57
D'Cunha (2008) (Trials 1-8)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items	Looking time	0.24
D'Cunha (2008) (Trials 9-16)	Between conditions	Adult directed vs. infant directed action clips of four novel items	Looking time	2.26
Koterba (2002) Koterba & Iverson (2009)	Between groups	Low amplitude/low repetition and static display vs. high amplitude/high repetition and static display of eight novel objects	Difference in looking time at movement vs. static displays	0.62
Koterba (2002) Koterba & Iverson (2009)	Between groups	Low repetition vs. high repetition demonstration of eight novel objects	Duration of looking at object	0.00
Koterba (2002) Koterba & Iverson (2009)	Between groups	Low repetition vs. high repetition demonstration of eight novel objects	Duration of mouthing object	-0.10
Koterba (2002) Koterba & Iverson (2009)	Between groups	Low repetition vs. high repetition demonstration of eight novel objects	Duration of turning/ rotating object	-0.82
Koterba (2002) Koterba & Iverson (2009)	Between groups	Low repetition vs. high repetition demonstration of eight novel objects	Duration of banging/ shaking object	0.74
Masataka (1996) (Sample 2) Masataka (2000)	Between conditions	Adult directed vs. infant directed Japanese sign language	Amount of fixation time	3.97
Masataka (1996) (Sample 2) Masataka (2000)	Between conditions	Adult directed vs. infant directed Japanese sign language	Affective responsiveness	1.71
Masataka (1998, 2000)	Between conditions	Adult directed vs. infant directed Japanese sign language	Amount of fixation time	1.51
Masataka (1998, 2000)	Between conditions	Adult directed vs. infant directed Japanese sign language	Affective responsiveness	1.11
Rutherford & Przednowek (2012)	Between conditions	Adult vs. infant possession time of object	Amount of object possession time in seconds	0.81
Rutherford & Przednowek (2012)	Between conditions	Adult vs. infant joint contact on object with mother	Amount of joint contact time in seconds	1.21

Appendix C, continued.

Study	Study Design	Comparative Condition	Child Outcome Measures	Cohen's *d* Effect Size
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Between conditions	Adult directed vs. infant directed action clips with demonstration of four novel items	Looking time in seconds	0.72
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Between conditions	Adult directed vs. infant directed action clips with demonstration of gripper	Looking time in seconds	0.78
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Between conditions	Adult directed vs. infant directed action clips with demonstration of pulley	Looking time in seconds	4.68
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Between conditions	Adult directed vs. infant directed action clips with demonstration of dispenser	Looking time in seconds	-0.69
Shallcross (2006) Brand & Shallcross (2008) (Study 1)	Between conditions	Adult directed vs. infant directed action clips with demonstration of gigglestick	Looking time in seconds	2.19