INFANT-DIRECTED ACTION

UNCOVERING THE SCOPE

OF

INFANT-DIRECTED ACTION:

ARE MOTHER-INFANT INTERACTIONS UNIQUE?

By

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ABSTRACT

Infant-directed action, or 'motionese', is the tendency for mothers to spontaneously incorporate modifications to their actions when interacting with their infant versus another adult in a manner that may facilitate the child's understanding of human action (Brand, Baldwin, & Ashburn, 2002). The present study explored whether fathers similarly alter their behaviour and whether this alteration differs from mothers' infant-directed action. Forty-two mothers and fathers demonstrated the properties of two novel objects to their 11- to 13-month-old infants and to another adult. While mothers modified their actions on repetitiveness, range of motion, proximity, interactiveness, and enthusiasm, fathers modified their actions only on rate, proximity, and interactiveness. When directly comparing mothers' and fathers' motionese, few differences were observed. These findings indicate that to some extent, infants may learn about action from interactions beyond those experienced with their mothers.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

Introduction

Our social environment contains a vast array of complicated information, part of which takes the form of action sequences carried out by other people. Human behaviour is often perpetual and lacks pauses or sufficient boundaries between distinct actions. This behaviour must be interpreted instantaneously for effective communication and interaction to take place between people, since understanding human action is crucial for the interpretation and prediction of others' behaviour. Despite the complexity of the social information encountered, adults are capable of effortlessly decoding the actions and intent of those around them, allowing them to act and react accordingly based on this automatic interpretation.

1.1 Detecting Intentionality in Others' Behaviour

Understanding the nature of others' mental states, such as their beliefs, desires, and intentions, provides one gateway for interpreting and predicting human behaviour. Being able to distinguish intentional acts from unintentional ones, for example, shapes how observers construe others' actions and respond accordingly. Malle and Knobe (1997) contend that human behaviour is oftentimes classified spontaneously in terms of intentional action. They demonstrated that when adults are presented with various verbally described behaviors such as 'Anne had a craving for cherries after dinner' and 'Anne ignored Greg's arguments,' they readily agree in their judgments of intentional and unintentional behaviors. The authors suggest that an action is deemed intentional if there is a desire for an outcome, a belief about the action leading to that outcome, an intention to perform that act, the skill to perform the action, and an awareness of performing that act.

A primitive understanding of intentionality has been similarly demonstrated with young children. For example, Joseph and Tager-Flusberg (1999) tested preschool children's understanding of intention on the basis of an agent's desire by presenting them with a scenario where one character wanted to throw her ball over a fence and another character did not, but in the end both threw their ball over the fence. When asked 'Who was trying to throw their ball over the fence,' the majority of 3- and 4-year-olds answered correctly, suggesting their appreciation for the distinction between intended and unintended acts based on the agent's desire. Furthermore, it has been demonstrated that 4-year-olds recognize that the same action can be motivated by different intentions (Baird and Moses, 2001), differentiate the outcomes of characters' intentions from their desires and preferences (Feinfield et al., 1999), and distinguish an involuntary act (such as sneezing) from the same act performed intentionally but by pretend (pretending to sneeze) (Joseph, 1998).

1.2 Action Parsing

Baird and Baldwin (2001) assert that intentional action may be characterized by physical and temporal features which coincide with the initiation and completion of purposeful acts. Detecting this structure within dynamic action streams may facilitate observers in understanding the behaviour with respect to its underlying intention.

Important information may be extracted from an action sequence by decomposing the stream into its smaller components or units. Newtson (1973) had undergraduate students view a 5 minute video-taped behaviour sequence of an actor filling out a questionnaire. In one condition, the participants were instructed to record the smallest units of behaviour which seemed most natural to them by pressing a button on an event recorder when they suspected that a meaningful action had ended and a different one had begun. In another condition, participants were instructed to record the largest units of behaviour which seemed most natural to them. Participants in the fine-unit condition were more confident in their impression of the actor and were more likely to describe his behaviour as causal compared to participants in the gross-unit condition. The author theorized that individuals who use a fine level of analysis when interpreting intentional action have more information at their disposal (Newtson, 1973). If ongoing action is segmented into meaningful units, then boundaries between actions should be reliably detected and possess properties which are distinctly different from other parts of the action stream (Newtson, Engquist, and Bois, 1977). Newtson and Engquist (1976) had participants detect deletions within a continuous film which had segments removed at breakpoints and nonbreakpoints. Breakpoints were defined as instances of the action stream which were consistently identified as unit boundaries and nonbreakpoints were all instances of action between breakpoints. It was found that participants were more accurate at detecting deletions at breakpoints than nonbreakpoints. The authors extracted clips from the film which were characterized by breakpoints and nonbreakpoints and mounted them on slides. Triads of successive breakpoint and nonbreakpoint slides were then presented to participants. Results revealed that participants who had viewed breakpoint slides were more accurate at describing the action depicted and were more accurate at judging the ordering of the action. Additionally, they described the action in the breakpoint sides as more intelligible (Newtson and Engquist, 1976). These results provide support for the notion that action can be segmented into coherent units with recognizable beginnings and endings, and observers' judgments of where these beginnings and endings occur are reliable (Newtson, Engquist, and Bois, 1977).

More recently, Baird, Baldwin, and Malle (2000) video-taped action sequences of a person doing an everyday task (e.g. cleaning their kitchen). They inserted tones at two different locations of the action sequence: endpoint tones coincided with the completion of an intentional act, and midpoint tones occurred in the midst of an intentional act just before it was completed. The videos were presented to adults who were instructed to pay close attention to the placement of the tones. The videos were presented again with the tones removed and participants were instructed to click a mouse during the action sequence where they thought the tone had occurred. Adults made more errors while locating midpoints versus endpoints, providing evidence for the notion that dynamic action may be characterized by salient boundaries coinciding with the initiation and completion of intentional acts. Segmentation along meaningful boundaries has been similarly demonstrated with speech. Fodor and Bever (1965) had participants listen to various sentences containing clicks. Some of the clicks were located at a major syntactic boundary which separated the primary elements of the sentence. For example, for the sentence 'That he was happy was evident from the way he smiled,' the major syntactic boundary was located between the words 'happy' and 'was.' Remaining clicks were located at other parts of the speech segment other than the syntactic boundary such as proceeding words or coinciding with a particular syllable. Participants were more accurate at locating clicks placed within the major syntactic boundary than clicks placed anywhere else within the sentence. It was concluded participants made use of the pauses characterizing the speech to determine the location of an interruption within a sentence. However, because not all of the sentences participants were presented with contained distinguishable pauses, they may have additionally segmented the speech into perceptual units based on their knowledge of the rules of sentence structure (Fodor & Bever, 1965).

Parsing of dynamic motion into discrete action has also been demonstrated with infants. The proceeding studies make use of several paradigms which utilize a specific logic in the interpretation of their results. In the habituation paradigm, infants are presented with an image until their ability to pay attention declines. When their looking time decreases, they are presented with a new image. If infants recognize the image as new and different, their looking time should decrease. If they are unable to differentiate the new image from the old one looking time will remain low. In the novelty preference paradigm, infants are presented with either one image or two images side by side during a 'familiarization' condition. During the 'test' condition, infants are presented with the familiar image and a novel image side by side. If infants are able to discriminate the new image from the old one, looking time should be longer towards the novel image versus the familiar image. Additionally, some studies employ a paradigm which assumes that if infants are presented repeatedly with an action display, they will form a set of expectations about the event. Infants should look longer towards a new sequence of events which violates their expectations versus a sequence of events which is consistent with their expectations.

Wynn (1996) explored infants' ability to individuate the sequential jumps of a puppet separated by motionless pauses. One group of 6-month-old infants was habituated to a puppet jumping two times and another group was habituated to a puppet jumping three times. During the test trials, each infant observed a puppet jumping alternately two and three times. Infants looked longer at the display during novel-number trials, indicating they were sensitive to the number of jumps in the action sequence. Similar results were found when the study was repeated with a puppet whose jumps were continuous and thus unseparated by a motionless pause, demonstrating that pauses within the action sequence were not necessary for individuating the actions (Wynn, 1996). Although these findings suggest that infants are capable of breaking up an action sequence into its components, the generalizability of these results is limited because infants were presented with stimuli which were artificial and simplified.

Baldwin, Baird, Saylor, and Clark (2001) provided a test of infants' ability to parse continuous behaviour using sequences of behaviour which were more realistic. A group of 10- to 11-month-old infants were familiarized with a digitized everyday action sequence of a woman grasping a towel and hanging in on a rack. During the test trials, infants observed two different versions of the action sequence which had still-frame pauses inserted into the action stream at different points in time. In the completing test video the pause was inserted just after the completion of an intentional act (e.g. grasping the towel), while in the interrupting test video the pause was inserted in the midst of an intentional act (e.g. reaching for the towel). Infants looked longer to the interrupting test video compared to the completing test video. A control group of infants who viewed both testing videos without prior familiarization to them did not show significant looking-time differences towards the interrupting versus completing test video. This indicates that infants who were first familiarized with an everyday continuous action sequence did not regain interest in the interrupting video due to a simple mechanism such as perceptual salience. The authors reasoned that although it is possible that infants' ability to parse human action maybe be driven by their understanding of intentional behaviour, they are likely exploiting a low-level mechanism of structure detection which allows them to discern units within the motion sequence whose boundaries are correlated with the initiation and completion of purposeful acts. Such an appreciation of the structure inherent to dynamic action might be a prerequisite for understanding intentional behaviour (Baldwin et al., 2001).

Saylor, Baldwin, Baird, and LaBounty (2007) further explored infants' ability to parse continuous action sequences using an intermodal-matching technique. Rather than using digitized videos of action, the investigators made use of live and relatively novel sequences of motion on novel sets of objects. A group of 9- to 11-month-old infants were presented with two simultaneous action displays. The action sequences incorporated an actor completing a small number of goals towards a focal object, such as placing a lid in front of a jar, placing cotton in the jar, and unfolding a scarf and placing it in the jar. In one display, tones played with a keyboard corresponded to the initiation and completion of target actions. In the other display, the tones were asynchronous to the initiation and completion of the actor's actions. Infants looked longer at action sequences where the tones coincided with intention-relevant boundaries. The results of this study provide additional support for infants' ability to segment human motion along boundaries deemed by adults to coincide with intentional acts. The implementation of a live display, along with the incorporation of actions and objects likely to be novel to infants, indicates that infants' parsing skills are much broader in scope than previously thought (Saylor et al., 2007).

As briefly mentioned above, Baldwin et al. (2001) proposed two possible mechanisms underlying infants' ability to parse continuous motion. A low-level mechanism involves the detection of physical and temporal regularities coinciding with the initiation and completion of intentional acts. A high-level mechanism, on the other hand, requires that infants possess a conceptual appreciation of intention to guide their parsing abilities. A body of literature demonstrating that infants may be sensitive to intentional behaviour within their first year of life gives support for infants' use of a high-level mechanism while detecting structure within a continuous stream of motion.

1.3 Infants' Understanding of Intention

Infants' understanding of intention has been investigated with respect to their sensitivity to aspects of an actor's behavior which are directed at a goal. For example, Gergely, Nadasdy, Csibra, and Biro (1995) set out to test whether infants attribute intentional states to others, or take the 'intentional stance,' while interpreting the goal-directed action of a rational agent. Two groups of 12-month-old infants were habituated to two different events which incorporated circles exhibiting cues of agency. The 'rational approach' group witnessed a small circle approach a larger circle by jumping over a rectangular obstacle between them. The authors believed that infants would encode the agent's behavior as a rational approach to fulfilling the goal. Infants in the 'nonrational approach' group observed a sequence of actions which were identical to that witnessed by the rational approach group, but the rectangular obstacle was now placed behind the small circle rather than between the small and large circles. The small circle still jumped while approaching the large circle despite the absence of an obstacle. In this case, the authors suspected that the infants would not interpret the small circle as a rational agent with the goal of approaching the larger circle since the path of motion it took was not the most rational means of reaching the goal. The authors reasoned that infants would form a set of expectations about the behavior of the circle and apply them when faced with a new situation. During the dishabituation phase, infants observed two test events with the rectangular obstacle removed. For the new action event, the small circle approached the larger circle through the shortest pathway (that is, a straight line). In the old test event, the small circle approached the large circle in the same manner it had during habituation; it jumped despite the absence of the rectangular obstacle. Despite the events of the new action event being more perceptually dissimilar to the habituation event, the majority of infants in the rational approach group showed higher dishabituation for the old action than for the new action. There were no differences in dishabituation between the old action and the new action for infants in the nonrational approach group. However, infants in the 'nonrational approach' group showed significantly more dishabituation than infants in the 'rational approach' group for the new action. The authors concluded that infants encoded the small circle to be a rational agent with a particular intention and formed a set of expectations about the most rational way the agent would fulfill its goal given a new situation (Gergely et al., 1995). To determine whether infants apply the principle of rational action to human agents, Sodian, Schoeppner, and Metz (2004) replicated Gergely et al.'s (1995) study using a male and female adult separated by a wall displayed on a television screen. During habituation, infants in the experimental group observed the female jump over the wall to reach the male. In the control group, the wall was moved to the edge of the screen and the female jumped through the air despite the absence of the wall. Two test events followed after habituation where the wall was removed for both. In the old action test event, the female carried out the exact series as in habituation even though the obstacle was no longer present. In the new action test event the female walked directly towards the male, taking the more rational but perceptually novel path of motion. Infants looked longer at the old action test event, indicating that they had formed a set of expectations about the goal-directed behaviour of human agents engaged in a meaningful social interaction (Sodian, Schoeppner, and Metz, 2004).

Expanding on the findings demonstrated by Gergely et al. (1995), Woodward (1998) set out to test whether infants attribute goal-directed behaviour to an actor's reach.

A group of 9-month-old infants were habituated to an event where an actor reached for and grasped one of two toys situated side by side on a stage. During testing the position of the toys was switched and in one event infants observed the actor's hand take a new path and reach for and grasp the same toy that had been touched during habituation. In another event, the hand took the same path but reached for and grasped the new toy. Infants showed a preference for the event in which the actor grasped a different toy even though the path of motion taken by the hand was the same path taken during habituation, suggesting infants were sensitive to the change in the actor's goal (Woodward, 1998). It has also been show that typical surface features of an agent are necessary before an infant can interpret an actor's action as goal-directed. Using Woodward's (1998) habituation paradigm, Guajardo and Woodward (2004) discovered that infants no longer recognized the actor's behaviour as goal-directed if their hand was obscured by a glove, indicating that visibility of the actor's skin was required in order for infants to interpret the arm as an agent.

The above studies have shown that infants generate a set of expectations about an actor's goal-directed behaviour after witnessing the actor fulfill a goal and anticipate that the same purposeful behaviour will occur in a new situation with a spatially altered arrangement. Kuhlmeier, Wynn, and Bloom (2003) suggested that infants' ability to appreciate goal-directed behaviour is more sophisticated than previously thought by demonstrating their ability to attribute intentionality to an agent in an unfamiliar context based on the agent's behaviour in a previous setting. A group of 12-month-old infants were presented with movies depicting animated geometric figures. During habituation infants observed a circle rolling up a hill, but halfway up it began having difficulty. In the 'Help' version a square pushed the ball to the top of the hill while in the 'Hinder' version a triangle pushed the ball down the hill. During testing, infants witnessed all three figures in a new context without the hill present. The circle was situated at the bottom of the screen between the triangle and square which were located at the top of the screen. The cicle ascended to the top of the screen and approached either the triangle (Approach Triangle movie) or the square (Approach Square movie). Infants looked longer toward the test video in which the ball approached the object which had previously helped it reach the top of the hill, indicating that infants were able to interpret the circle's goal-directed action in a new context without prior exposure to that behaviour (Kuhlmeier, Wynn, & Bloom, 2003).

Research has demonstrated that 12-month-old infants are also able to relate longer sequences of action (such as opening the lid of a box and grasping the toy inside) to an overarching goal (Woodward & Sommerville, 2000). Additionally, it has been observed that infants interpret the point gesture of a human agent as goal-directed (Woodward & Guajardo, 2002) and can utilize gaze-direction, emotional expression (Phillips, Wellman, & Spelke, 2002), and reaching and grasping (Sodian & Thoermer, 2004) to predict an actor's subsequent intentional action. Furthermore, 12-month-old infants are able to classify an action as intentional despite not witnessing the end goal being achieved and can infer the presence of an unseen object to justify the interpretation of an action as goal-directed (Csibra, Biro, Koos, & Gergely, 2003).

The above infant experiments are interpreted under the assumption that longer looking time towards one stimulus over another is an indicator of infants' preference for one of the stimuli based on an understanding of the difference between the two. Alternatively, infants could be detecting low-level perceptual features within the stimuli to guide their looking. Research examining infants' appreciation of intention and goal-directed action is based on the presumption that infants have some understanding of these concepts. This area of research is limited by the fact that infants' understanding of behaviour is very different from adults' interpretations of human action. Infants lack knowledge about the world which would normally regulate adults' interpretations. They don't possess an adult-like theory of mind which allows adults to supplement their interpretations of others' intentions and motivations with an understanding of their knowledge and beliefs. Additionally, infants' understanding of intention may be more similar to the less sophisticated notion of desire. Lastly, infants may be simply attending to physical properties of the action sequences, making use of movement-based cues such as direction of motion to understand the action. Without the presence of these cues, infants' ability to interpret behaviour in intentional terms could be degraded (Baldwin & Baird, 1999).

1.4 How Infants Make Sense of Social Information

According to the nativist view of human development, infants are biologically programmed to detect intentionality in other people's actions. Premack (1990) contends that the perception of intentionality is a hard-wired ability manifested with appropriate stimulation. He argues that infants have an inborn ability to attribute intentionality to changes in movements of self-propelled objects, or objects which change their state without the help of another object. Additionally, with the presence of two self-propelled objects, he proposes that infants perceive the action of one object upon another as goal-directed and that the affected object has the intention to reciprocate the action. Lastly, he states that infants may have the ability to interpret the movements of objects as either positive or negative (Premack, 1990).

Infants can also acquire knowledge by interacting with their environment and early social experiences have been found vital for normal development. Parental sensitivity and responsivity, for example, play an important role in infants' social development (Wachs & Gruen, 1982). Certain aspects of parent-child interactions may aid infants in processing social information. More specifically, certain modifications parents incorporate into their infant-directed interactions may accentuate important features of the information they are trying to convey.

1.4.1 Modifications in Infant-Directed Behaviours.

Like action, language is expressed in a continuous stream. Sentences often lack adequate pauses or breaks between words, making the task of interpreting the communicated message appear arduous and daunting. Strikingly, most people effortlessly decipher the spoken language around them and are able to use this intricate form of communication while interacting with others. Psychologists have spent years studying language acquisition. Although nativist theories postulate that humans possess an innate device which permits language development with minimal environmental exposure (Chomsky, 1967), early linguistic experience, such as that provided by adults when they speak to children, may facilitate the early development of certain aspects of language acquisition (Harris, 1992).

For decades researchers have explored the distinctive way in which adults and older siblings speak to infants and toddlers. This modification in language, often termed infant-directed speech or motherese, is a pattern of speech characterized by utterances which are higher in pitch than adult-directed speech and contain exaggerated pitch contours. Moreover, motherese is slower, simpler, and more repetitious compared to adult-directed speech (Ferguson, 1964; Papousek, Papousek, & Haekel, 1987; Warren-Leubecker & Bohannon, 1984). Researchers have noted that motherese may contain universal prosodic features. Similar modifications in speech have been documented in mothers who speak Mandarin Chinese (Greiser & Kuhl, 1988), English, Russian, and Swedish (Kuhl et al., 1997).

It has been shown that the speech modifications adults exhibit may serve several important communicative functions. Fernald (1992) proposed a model outlining how the function of infant-directed speech changes over the first year of life. She argues that early in development infants have an innate tendency to respond differentially to various types of infant-directed sounds. During this time, prosodic cues in infant-directed speech function as "unconditioned stimuli" which elicit an unconditioned response from the infant. Examples of these unconditioned responses include a defensive response to infant-directed prohibition vocalization and being soothed to comfort sounds.

Within the next several months, the exaggerated intonation patterns of infant-directed speech function to capture the infant's attention. This can be supported by the consistent finding that infants prefer listening to infant-directed over adult-directed speech. When presented with recordings of unfamiliar infant-directed and adult-directed speech, even 1-month-old infants prefer listening to infant-directed speech (Cooper, Abraham, Berman, & Staska, 1997). There is even evidence to suggest that new-born infants are sensitive to the exaggerated prosodic features of infant-directed speech, indicating that this preference may have an innate component (Cooper & Aslin, 1990). It also has been demonstrated that infants prefer listening to infant-directed singing (Trainor, 1996; Trainor & Zacharias, 1998), a style of singing which is slower in tempo, higher and more variable in pitch, and more emotional and loving compared to singing in the absence of an infant (Trainor, 1996; Trainor, Clark, Huntely, & Adams, 1997). During this stage, the prosody of mothers' speech also serves to modulate the infant's emotional state. For example, Rock, Trainor, and Addison (1999) suggested that parents communicate different messages to their infants through various styles of infant-directed singing and infants show different behavioural responses to play-song and lullaby styles of singing.

In the second half-year of life infant-directed speech may help infants interpret the emotional state of the speaker (Fernald, 1992). Fernald (1989) demonstrated that when provided with only prosodic cues, adults are more accurate at identifying the communicative intent in infant-directed versus adult-directed speech. She suggested that the intonation patterns characteristic of infant-directed speech are more meaningful and distinctive than those of adult-directed speech and could be informative for preverbal infants in terms of helping them identify the affective state and intention of the speaker. Infants also prefer listening to infant-directed speech expressing positive affect over infant-directed speech expressing negative affect (Fernald, 1993). Trainor, Austin, and Desjardins (2000) proposed that the most important function of infant-directed speech is the maintenance of an emotional bond between the caregiver and preverbal infant and the type of information that is conveyed in the intonation patterns characteristic of infant-directed speech is emotional. They claimed that infant-directed speech differs from adult-directed speech because typical adult-directed speech is less emotionally expressive. To test this idea, the authors compared emotional infant-directed speech to emotional adult-directed speech on pitch, pitch contour, pitch range, tempo, and rhythmic contour. Few acoustic differences were found between infant-directed and adult-directed emotional speech, providing evidence for the idea that infant-directed speech arises from the vocal expression of emotion. Since infants are unable to understand the words of infant-directed speech, the prosody becomes important for communication (Trainor, Austin, & Desjardins, 2000).

Ultimately, infant-directed speech may facilitate infants with various aspects of language acquisition, guiding their attention to the individual units making up the speech stream (Fernald, 1992). Maye, Werker, and Gerken (2002) exposed 6- to 8-month-old infants to an artificially designed 8-step continuum of [da] to [ta] speech syllables. One group of infants received more instances of steps 4 and 5, corresponding to a unimodal frequency distribution. The other group received more instances of steps 2 and 7, corresponding to a bimodal frequency distribution. After a familiarization phase, the group of infants exposed to a bimodal frequency distribution but not the infants exposed to a unimodal frequency distribution were able to differentiate steps 1 and 8, indicating that a distributional mechanism may facilitate infants' learning of phonetic categories in the first year of life. Werker et al. (2007) examined the likelihood of infants utilizing a distributional learning mechanism by determining whether distribution-based cues exist in infant-directed speech. English and Japanese-speaking mothers were asked to teach their 12-month-old infants a set of 16 nonsense words which contained two vowel pairs, /I-ii/ and /E-ee/. Acoustic analysis of the input revealed language-specific cues: the vowel pairs differed in duration in the speech of Japanese mothers, whereas the pairs differed in colour (i.e. spectral differences) in the speech of English mothers. Most importantly, vowel length better predicted two categories for each vowel pair in the speech of Japanese mothers, while vowel colour better predicted two categories for each vowel pair in the speech of English mothers. This finding supports the notion that information about the frequency distribution of acoustic cues is available in infant-directed speech, which may highlight the necessary cues for discriminating among the basic units of one's native language (Werker et al., 2007). Thiessen, Hill, and Saffran (2005) reasoned that infants may also take advantage of statistical information to assist them with aspects of language acquisition, as certain syllables are more likely to occur together within a word rather than between word boundaries. More specifically, they were interested in whether infants make use of the intonation contours characteristic of infant-directed speech alongside of statistical cues to facilitate them with word segmentation. Two groups of infants between the ages of 6.5 and 7.5 months were familiarized with two artificial languages comprised of nonsense words. One group heard sentences spoken in a monotonic manner characteristic of adult-directed speech while the other group heard the same sentences spoken with the exaggerated prosody typical of infant-directed speech. The sentences were continuous and the only cues present to word boundaries were the probabilities of two syllables occurring together. During the test trials, all infants heard a set of words they were exposed to during familiarization and a set of part-words that were sequences of syllables crossing the word boundaries. Infants who initially heard the sentences spoken in infant-directed speech were able to discriminate between the words and part-words, while infants who heard adult-directed speech were unable to do so. This demonstrated that infants utilized the prosodic features of infant-directed speech alongside of statistical cues to word boundaries to parse the speech stream (Thiessen, Hill, & Saffran, 2005). Trainor and Desjardins (2002) examined how the high pitch and exaggerated pitch contours characteristic of infant-directed speech affect infants' ability to discriminate vowels. The authors reasoned that high pitch would not facilitate infants with vowel discrimination, as this feature of infant-directed speech likely serves the function of expressing emotional information. Exaggerated pitch contours, on the other hand, would enhance infants' ability to discriminate vowels because this feature of infant-directed speech plays a role in language learning. Using acoustic software they synthesized two variations of the vowels /i/ and /I/. One was a low- and a high-pitched steady-state version while the other was a low- and a high-pitched downward contour version. Using a conditioned head turn procedure, four groups of 6- to 7-month-old infants were tested for their ability to discriminate between the two vowels in four different conditions: high-steady, low-steady, high-contour, and low-contour. Infants were able to discriminate between the vowels more easily in the contour condition than in the steady state condition. Additionally, they were better at discriminating low-pitch vowels than high-pitch vowels. Thus, the exaggerated pitch contours found in infant-directed speech assists infants with vowel discrimination while high pitch likely impedes it (Trainor & Desjardins, 2002).

Phenomena similar to motherese have been observed within mother-infant interactions in a number of different modalities. Masataka (1996) explored deaf mothers' modifications in sign language when interacting with their congenitally deaf infants. Five deaf mothers were video-taped reciting seven sentences to their 6-month-old infants and to their deaf adult friends. When the mothers were interacting with their infants, their signs were slower, more repetitious, bigger, and took up more space compared to the signs directed at their adult friends. When a group of 6-month-old congenitally deaf infants were later presented with the videotapes, they fixated significantly longer and were more responsive to infant-directed signing than to adult-directed signing (Masataka, 1996). Hearing infants without prior exposure to sign language also looked longer at and responded more affectively to a video-tape depicting infant-directed sign language than at a tape depicting adult-directed sign language, indicating that parents modify their behaviour to get their infants' attention and infants might be biologically prepared to attend to this modification (Masataka, 1999).

Modifications in infant-directed behaviours have also been observed in the modality of gestures. Bekken (1989) examined mothers, their 18-month-old daughters, and another adult in a play situation. Mothers made alterations to their gestures when interacting with their child versus another adult. Mothers' gestures occurred less frequently and were simpler compared to adult-directed gestures. They were also less continuous and fluid. Iverson, Capirci, Longobardi, and Caselli (1999) also noted that gestures within mother-child interactions tended to be deictic or conventional, referring to the immediate context or reinforcing the verbal message. Emphatic gestures typically characteristic of adult conversations were infrequent.

Chong, Werker, Russell, and Carroll (2003) investigated modifications in infant-directed behaviours in yet another modality. Upon examining the facial expressions of English- and Chinese-speaking mothers while they interacted with their 4- to 7-month-old infants, they discovered that mothers made use of three distinct expression types characterized by a set of muscle movements which were different from those involved in adult-directed expressions. First, mothers puckered their lips with their mouth slightly open. The second type corresponded to a 'surprise' expression where mothers opened their mouth wide while pulling up the corners of their lips and raising their eyebrows. The third type corresponded to a 'happy' expression where the mouth was slightly open, the lips corners were pulled up, and the cheeks were raised. When adult participants were asked to describe what message they conveyed, the infant-directed facial expressions were also found to communicate clear and distinctive emotional messages. The first expression was described to convey comfort and care. Participants detected surprise, interest, and excitement in the second expression, and joy, love, praise, and admiration in the third (Chong et al., 2003).

Recently, a behavioral variation of motherese termed infant-directed action or 'motionese' was documented. Brand, Baldwin, and Ashburn (2002) proposed that mothers may incorporate modifications into their infant-directed action when interacting with their child. More specifically, they suggested that when mothers are demonstrating to their infant how a new object works, they alter their actions in a way that might assist the child in learning about action and human intention. They video-taped mothers demonstrating to their 6- to 8-month or 11- to 13-month-old infants how five novel objects work. These two age groups were chosen because they fall on either side of an important developmental milestone termed 'secondary intersubjectivity,' which develops by approximately 9-months of age. During this time, infants are capable of simultaneously manipulating objects and communicating with other people (Trevarthen & Hubley, 1978), and this ability can be evidenced by the emergence of joint attention, social referencing, and gaze following at this age (Tomasello, 1994). Another group of mothers demonstrated the five novel objects to another adult. To maintain a similar level of intimacy between demonstrator and partner, mothers demonstrated the objects to an adult they knew well such as their spouse, relative, or a close friend. Mothers were provided with a description of two properties of each toy to ensure some consistency among the types of actions which were enacted across the two groups of mothers. Mothers' actions were coded along eight broad dimensions. *Interactiveness* measured whether the mother offered the object to her partner, whether the mother and her partner engaged in joint contact on the object, and whether the mother and her partner made eye contact. *Proximity* was indicated by how close to the partner the mother demonstrated the object. *Repetitiveness* referred to how repetitive the mother made her actions. *Simplification* measured whether mothers' actions were characterized by individual units separated by pauses or complex series of different units. *Range of motion* measured whether mothers' motions were small and restricted or broad and expansive. *Punctuation* measured whether mothers' actions were sharp, abrupt, and contained many pauses, or whether they were gentle and continuous. *Rate* measured how fast the mother manipulated the object. Lastly, *enthusiasm* indicated how much positive affect the mother showed towards the object and by how fun and exciting she thought the object was. It was hypothesized that mothers would score higher on all measures, except rate, when their partner was an infant than when their partner was another adult. The authors reasoned that modifications in action along these measures may highlight important information within the action sequence. For example, an exaggerated range of motion and higher levels of punctuation may emphasize the boundaries between units of action. Demonstrating the objects in close proximity to the partner allows the demonstrator to present the information within a range for which infants' sensory systems are best tuned. Performing the actions slowly and repetitively might allow infants to gain familiarity with units of action. Additionally, increasing enthusiasm and incorporating a high level of interactivity such as offering the object to the partner, making eye contact, and engaging in joint contact on the object might help infants process the information more fully. It was found that when demonstrating the objects to their infants versus another adult, mothers scored significantly higher on proximity, interactiveness, enthusiasm, simplification, repetitiveness, and range of motion. Mothers receive similar ratings when interacting with their child and another adult on rate and punctuation. Additionally, mothers demonstrated the objects for a slightly shorter period of time to their infants than to another adult, infant partners had the objects in possession for a longer period of time than adult partners, and mothers engaged in more joint action on the objects with infant than adult partners. No differences were found between the 6- to 8-month-old and 11- to 13-month-old infants. A fine-grained analysis of interactiveness and simplification in infant-directed action revealed that older infants received shorter, more frequent gazes and more object exchanges than younger infants (Brand, Shallcross, Sabatos, & Massie, 2007). The authors concluded that the phenomenon of motherese extends to action and might play an important role in capturing infants' attention, teaching them about human motion and how to act on objects, and ultimately helping them appreciate intentional action and goal-directed behaviour (Brand, Baldwin, & Ashburn, 2002). More recently, Brand and Shallcross (2008) demonstrated that infants prefer motionese over adult-directed action. They presented 6- to 8-month-old and 11- to 13- month-old infants with a split-screen video sequence depicting two mothers engaging in infant-directed and adult-directed action. A preferential looking paradigm revealed infants looked longer to the side of the screen which portrayed infant-directed action, indicating that infant-directed action successfully engaged infants' attention. The authors repeated the study with the same video-sequences with the mothers' faces now blurred. Both groups of infants looked longer at infant-directed action despite being void of facial expression and eye gaze cues, indicating that the presence of these features is not vital for capturing infants' attention. Mothers' behaviour which included their arms and hands acting on the object was sufficient in eliciting the effect. These findings strengthen the claim that infants abstract important information from infant-directed action which may facilitate learning about human action.

1.5 Parent-Infant Interactions: Gender-Based Differences

Past research has documented that characteristics of infant-directed speech are observed in adults other than mothers. Papousek, Papousek, and Haekel (1987) compared mothers and fathers on several features of speech addressed to their 3-month-old infants in a dyadic face-to-face interaction. Mothers' and father' speech did not differ on linguistic complexity: both made use of simple and redundant utterances. Both parents talked in equal amounts and used short segments of speech which were slow in terms of tempo of articulation and tempo of speech. Additionally, the voices of both parents were characterized by higher than average frequency ranges and both frequently made use of simple melodic speech contours. These modifications in fathers' infant-directed speech suggest that fathers may make similar modifications to their infant-directed action. Kruper and Uzgiris (1987) compared mothers and fathers of similar ages on several aspects of speech and also found many similarities in structure and content. However, fathers tended to use fewer repetitions than mothers and made less use of game-related statements, leading the authors to conclude that fathers may be less likely than mothers to adjust aspects of their speech when communicating with their infants.

This may seem like an intuitive finding when research on the amount of time fathers spend interacting with their infants relative to mothers is taken into consideration. For example, Rebelsky and Hanks (1971) followed fathers' verbal interactions with their infants from the time the infant was 2 weeks to 3 months of age. They reported that fathers spent on average 37.7 seconds per day interacting with their infants. More recently, Yeung, Sandberg, Davis-Kean, and Hofferth (2001) found that on weekdays fathers spend less time engaging with their children compared to mothers, especially in care-giving, teaching/achievement related tasks, and household activities. The short amount of time fathers spend interacting with their children suggests that compared to mothers, they may be less sensitive to their children's needs. Thus, they may be less likely to modify their behaviour as mothers do when interacting with their child. However, fathers who spend a low proportion of time interacting with their children have been found to make modifications to their infant-directed speech similar to those seen in fathers who spend a high proportion of time interacting with their children (Hummel, 1982). Additionally, fathers who spend fewer hours at home than mothers have been shown to incorporate modifications to their speech similar to those observed in mothers (Golinkoff & Ames, 1979; Papousek, Papousek, & Haekel, 1987). These findings suggest that despite the discrepancies in the quantity of time mothers and fathers spend with their children, the quality of the interactions may be similar. Clarke-Stewart (1978) reported that in a naturalistic observation, mothers interacted with their infants more frequently than fathers, but no differences were noted between the parents in terms of responsiveness, affection, effectiveness, or behaviours directed at stimulating the infant.

Lamb (1977) argued that although infants display similar attachment behaviours towards both mothers and fathers, mother-infant and father-infant interactions may entail very different experiences for the child. A large portion of these differences have been found to arise during play. For example, Lamb (1977) observed that fathers were far more likely to hold their infants at 7, 8, 12, and 13 months to simply play with them while mothers were more likely to hold their infants for caretaking purposes. He noted that fathers were more likely to engage their infants in rigorous and physically stimulating play. Mothers were more likely to use more conventional forms of play, as well as toy-mediated play. Fathers' frequent use of physically involving play has been readily observed in literature comparing father-infant and mother-infant interactions (Clarke-Stewart, 1978; Dickson, Walker, & Fogel, 1997; MacDonald & Parke, 1986). Stevenson, Leavitt, Thompson, and Roach (1988) noted that fathers made more use of functional play with their 12-month-old infants by manipulating objects to elicit their properties. Mothers engaged in more instructive play, which consisted of naming or requesting the naming of objects, colours, and numbers. Furthermore, infants tend to prefer play enacted by their fathers rather than their mothers. For example, Lamb (1977) observed that fathers were significantly more likely than mothers to elicit a positive response from their infant at 7, 8, 12, and 13 months during play. Clarke-Stewart (1978) similarly noted that at 15, 20, and 30 months of age, children were more responsive to play initiated by fathers. They were rated as more cooperative, interested, and involved when they were partaking in play with their fathers. She contended that children are likely responding to fathers' style of play which tends to be more engaging than mothers' play. This suggests that there are features of fathers' social behaviour towards infants which they find particularly appealing. Since the only aspects of fathers' play which these past studies characterized was style and mode, it is not clear exactly which specific components of this play infants find desirable. However, these findings clearly suggest that fathers may incorporate modifications to their infant-directed action similar to those found in mothers. Whether fathers' more engaging play style transfers over to instructional play is uncertain.

1.6 Present Study

The purpose of the present study is to expand our knowledge of motionese by extending the findings reported by Brand, Baldwin, and Ashburn (2002) and Brand et al. (2007). Both studies examined modifications in infant-directed action only in mothers. Adapting the methodology implemented by Brand, Baldwin, and Ashburn (2002), this study aims to determine whether this modification in action is unique to mothers by exploring whether this alteration in behaviour is found in fathers as well. Finding the answers to these questions will help us understand the scope of motionese and allow us to determine whether infants might learn about action within interactions beyond those experienced with their mothers. The finding that fathers incorporate modifications to their infant-directed speech as observed in mothers despite spending less time interacting with their children suggests that fathers may also modify their actions in a similar fashion to mothers. However, findings from play research reveal a preference for fathers' play over mothers' play, suggesting fathers may modify their actions to a greater extent that mothers do. Whether differences exist between mothers and fathers in their modifications of infant-directed action will be explored in the present study.

The methodology employed in this study is very similar to the procedures Brand, Baldwin, and Ashburn (2002) cleverly devised. While being video-taped, participants will demonstrate to their baby and to another adult they have a close relationship with how two different objects work. Their actions will be coded on a 5-point scale comprised of the eight features Brand, Baldwin, and Ashburn (2002) attributed to infant-directed action. To gain more information about the participants they will be asked to fill out several questionnaires addressing their parenting style and their family's general functioning. They will be used to explain any differences which may arise between mothers and fathers on the dependent measures. A questionnaire on parental mood with a special focus on depression will also be administered. Bettes (1988) demonstrated that mothers suffering from depression are less likely to modify their speech in a manner consistent with motherese. Additionally, depressed mothers are characterized by lower levels of warmth, acceptance, and responsiveness, and higher levels of negativity compared to unaffected mothers (Murray, Fiori-Cowley, Hooper, & Cooper, 1996). These attributes suggest that mothers with depression may be less likely to engage in infant-directed action. Parents will be screened for symptoms of depression using this questionnaire in an attempt to rule out this factor as an underlying cause for any observed discrepancies. Parents will also be asked to indicate whether they had a previous history of anxiety or substance abuse, both associated with lower levels of parental sensitivity and positive affect during parent-child interactions (Beckwith, Howard, Espinosa, &

Tyler, 1999; Das Eiden, Chavez, & Leonard, 1999; Kaitz & Maytal, 2005). Lastly, a measure of infant temperament will be administered to the parents. Infants elicit differential responding from their caregivers as a result of their individual behavioural styles (Lerner, et al. 1986). Infants with a negative temperament may promote infant-direction action which differs from the type elicited by infants with a positive temperament. This factor will also be utilized to account for any differences between mothers and fathers that may arise.

CHAPTER TWO

Methods

2.1 Participants

Twenty-one mothers (mean age= 32.40 years, range= 19.00, SD= 4.30) participated in this study with their 11- to 13-month-old infants (male= 13, female= 8; mean age= 13.04 months, SD= 25.84 days) and another adult (mean age= 40.71, range= 43.00, SD= 13.57 years) with who they were close to – either their spouse (16) or their own mother (5). Eleven- to 13-month-old infants were chosen for this study because at this age they are well past the developmental milestone of secondary intersubjectivity, allowing for a more fruitful interaction between parent and child. Twenty of the mothers classified themselves as Caucasian and 1 as multiracial. The majority of mothers were middle-class. One mother reported she had a current health concern regarding her child but did not wish to specify what it was. Two of the infants were 6 weeks premature but the mothers did not report any current health concerns regarding these infants. Only first-born infants were included in this study in an attempt to eliminate any differences between parents due to varying years of experience raising children. Two mothers had a spouse with children from another marriage but all mothers reported to have experience raising only their own first child.

Twenty-one fathers (mean age= 30.38 years, range= 14.00, SD= 3.83) also participated with their 11- to 13-month-old infants (male= 13, female= 8; mean age= 11.86 months, SD= 21.47 days) and another adult (mean age= 28.30 years, range= 14.00, SD= 3.93 years) with who they were close with, who happened to be their spouse in all 21 cases. Eighteen of the fathers classified themselves as Caucasian, 1 as Hispanic, 1 as Multiracial and 1 as 'other'. The majority of fathers were middle-class. All infants were full-term and none of the fathers reported any current health concerns regarding their children. Nineteen of these infant were first-borns. Two of the fathers each had one child from a previous relationship but neither father reported to have contact with these children while they were infants. Therefore, all fathers had experience raising only one infant. Lastly, 1 of the men was the father of twins.

One father did not follow instructions during the interaction and demonstrated to his infant more than one toy at a time. His data was not used and an additional father was recruited to fill his place.

2.2 Materials

2.2.1 Stimuli.

Participants demonstrated four novel objects, two to each partner: a small sphere of pink, green, and yellow suction cups about 2.5 inches in diameter; a set of red rods about 6.5 inches long with yellow, orange, red, and purple balls on the end attached to a small blue circle about 2 inches in diameter; a 17-inch-long string of green, orange, red, pink, yellow, blue, purple, beige, and white wooden beads of various shapes; and a clear hamster ball about 7.5 inches in diameter with a blue, orange, pink, green, and purple bumpy ball about 2.5 inches in diameter to be placed inside of it. As in Brand, Baldwin, and Ashburn (2002), participants were provided with cards with a description of each object and two of its properties to maintain some consistency across participants in terms of the actions enacted. For example, 'You can bounce the bumpy ball on the table or place it inside the clear ball and roll both across the table' (see Figure 1 below for all four pictures and descriptions of the objects).

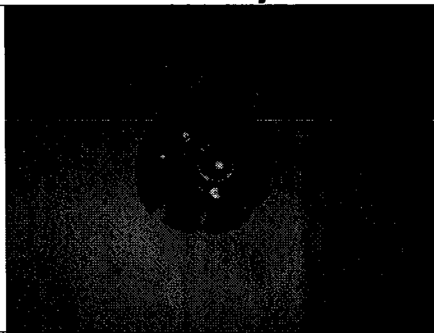
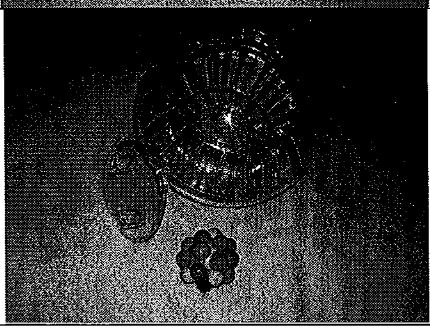
Novel Object	Description given to mother
	**Suction Cups** **You can attach the ball to the table and it will make a popping sound when it's pulled off, or you can roll the ball across the table.**
	**Wooden Snake** **You can rattle the snake across the table or spin the individual parts of the tail.**
	**Planets** **You can spin the discs on the balls or move the legs back and forth.**
	**Bumpy Ball** **You can bounce the bumpy ball on the table or place it inside the clear ball and roll both across the table.**

Figure 1. Images of novel objects and their descriptions.

2.2.2 Questionnaires.

Each parent filled out four questionnaires. The *Center for Epidemiologic Studies Depression Scale* (CES-D Scale), titled *The Parental Distress Scale* in the study, is a 20-item self-report scale designed to measure symptoms of depression in the general population (Radloff, 1977). The scale was found to have high internal consistency in the general population (about .85), and moderate test-retest reliability for those without negative life events at time of test and retest (r= .54) and for patients before and after treatment (r= .53). When compared with other self-report scales designed to measure depressive symptomology, the CES-D was also found to have reasonable criterion-oriented validity (eg. r= .61 for Bradburn Balance; r= .60 for Bradburn Negative Affect). The CES-D also discriminated well between patient and general population groups, where 70 percent of the clinical sample but only 21 percent of the general population scored above an arbitrary cut-off score. The correlation between CES-D ratings and the assessment of symptoms by a nurse-clinician in a patient sample was .56 (Radloff, 1977). Sample items included 'I was bothered by things that usually don't bother me' and 'I talked less than usual.' Ratings were made on a 4-point scale ranging from rarely or none of the time (0) to most or all of the time (3).

The Arnold et al. (1993) *Parenting Scale*, made up of 30 items, assessed dysfunctional parenting practices in discipline situations towards the child in the study within the past 2 months. The three styles of dysfunctional parenting comprising the scale, laxness (permissive discipline), overreactivity (anger, meanness, and irritability), and verbosity (reliance on talking), were found to possess internal consistencies of .83,

.82, and .63 and test-retest correlations of .83, .82, and .79 respectively. Clinic and nonclinic mothers scored significantly different on the laxness and overreactivity factors, scores on all three factors were significantly related to maternal reports of child misbehavior on the Child Behavior Checklist, and observational ratings of mother-child interactions were found to significantly correlate with the three factors, verifying the validity of this questionnaire (Arnold, O'Leary, Wolff, and Acker, 1993). Each item on the questionnaire asks the parent to rate their response to a number of their child's behaviours on a 7-point scale. For example, for the item 'When my child misbehaves' a score of (1) indicated 'I do something right away' and a score of (7) indicates 'I do something about it later.'

The McMaster Family Assessment Device (FAD), based on the McMaster Model of Family Functioning (MMFF), assessed family functioning. The questionnaire contains seven subscales: Problem Solving, Communication, Roles, Affective Responsiveness, Affective Involvement, Behaviour Control, and General Functioning. Epstein, Baldwin, and Bishop (1983) observed reliabilities ranging from .72 to .92 on the seven subscales. The scale was also found to have discriminant validity, correctly predicting 67 percent of families from a nonclinical group and 64 percent of families from a clinical group. The present study employed only the last subscale, General Functioning. Sample items included 'Planning family activities is difficult because we misunderstand each other' and 'We confide in each other.' Parents were asked to rate their agreement or disagreement on how well each item described their family on a 4-point scale ranging from strongly agree (1) to strongly disagree (4).

The *Infant Behavior Questionnaire* (IBQ), designed to asses infant temperament, was added halfway through the study. A copy was mailed to the participants who had already been tested. For the remaining participants, it was left with the parents for them to fill out and mail back to the researcher at their convenience. The scale identified six dimensions of infant temperament which were found to be significantly reliable when mothers' responses were compared with those of another adult in the household. The six dimensions and their product-moment correlations were: smiling and laughter, $r = .45$; duration of orienting (measures attention span and distractibility), $r = .46$; soothability (measures ability of infant to be consoled) $r = .54$; fear (measures distress and reluctance of infant to approach novel stimuli), $r = .66$; distress to limitations (measures infants' responses to frustrating situations), $r = .60$; and activity level (measures gross motor activity), $r = .69$. Stability across age (3, 6, 9 and 12 months) was found for all scales except for fear and distress to limitations, which did not reach stability until 6 months (Rothbart, 1981). Lamb, Frodi, Hwang, and Frodi (1983) found moderate agreement between parents on the IBQ at 3 (ranging from -.18 to .36) and 8 (ranging from .05 to .64) months in a Swedish Sample, but agreement was higher at 8 months. Overall, the agreement coefficients were lower than those reported by (Rothbart, 1981). Moderate convergence validity (from .09 to .50) has also been reported on dimensions of activity level, smiling and laughter, distress to limitations, fear, vocal activity, and reactivity based on intercorrelations between the IBQ and home observation measurements of temperament at 9 months of age (Rothbart, 1986). This questionnaire required parents to indicate how often the baby demonstrated certain behaviours in different contexts within the last week. The categories of situations included feeding, sleeping, bathing and dressing, play, daily activities, and soothing techniques. Parents were asked to rate their child's behavior on a 7-point scale. For example, for the item 'When having to wait for food or liquids during the last week, how often did the baby seem not bothered?' a score of (1) indicated never and a score of (7) indicated always. Parents had the option of circling (X) if the situation did not apply.

A demographic questionnaire was compiled by the researcher. Participants were asked to answer questions about their gender, age, primary language, race, education, income, marital status, number of children, and whether they had a history of anxiety, mood disorders, or substance abuse.

2.3 Design

The independent variables in this mixed-measures design were age of partner (11-13 months or adult) which constituted the within-subjects component and sex of parent which constituted the between-subjects component. Parents interacted both with their child and with another adult they had a close relationship with. Half of the parents participated first with their infant and the other half participated first with the adult. The four objects could be placed into 24 possible different orders and the sequence they would appear in the experiment was randomly determined. Participants were assigned to an object order in the sequence they were recruited. One of the orders was accidentally omitted. The first 23 participants (21 females and 2 males) were tested with the first 23 object orders and for the remaining 19 participants (males) that same sequence of orders was repeated. Each participant demonstrated the first two toys to one partner and the second two toys to the other partner. Each toy was demonstrated approximately half the time to an infant and half the time to an adult.

2.4 Procedure

This study has been reviewed and approved by the McMaster University Ethics Board. The majority of the procedures carried out in the present study were adapted from Brand, Baldwin and Ashburn (2002). Based on their preference, parents were tested either in a laboratory room at the university or visited by the investigator at their home. For convenience, the majority of parents decided to hold the session at their home. To make the participants comfortable, the session began with a brief warm up period where the investigator chatted with the parents, their child, and the other adult. The participants were told that the purpose of the present study was to assess certain types of social information while parents demonstrated a novel object to another partner. Participants filled out a consent form for themselves and provided consent for their child. The adult partner who they would also be interacting with filled out a consent form as well. Participants then filled out the demographic questionnaire as well as the other four questionnaires described above. Next, the parents were given a few minutes to familiarize themselves with the four objects and their description cards, which were all placed in separate black baskets numbered one through four. When they indicated they were done, they were then seated at a table with their partner adjacent to them so that they were separated by only the corner of the table. Infants sat in a highchair placed against the table with the tray always removed. Parents were instructed to demonstrate two toys in a predetermined order to each partner in sequence while the interaction was videotaped. The demonstrator and only the space in front of the partner were included in the shot. They were given a guideline of 1 to 2 minutes per object but were advised to demonstrate the toys for a period of time that felt natural. The objects were placed two at a time next to the parent on either a small table or a chair and outside of the view of the partner. When the parent indicated they were finished demonstrating the objects to the first partner, the camera was turned off and the investigator placed the next two objects beside them and the second partner took the previous partner's seat at the table. During each interaction, the adult who was not being video-taped either sat with the experimenter in another room or observed the interaction from a distance.

Participants were video-taped with a Panasonic PV-GS250 digital video camcorder. Data from the camcorder cassettes were transferred to DVDs and were coded from a computer using a digital media player with fast-forward, reverse, and seek functions.

2.5 Coding and Reliability

The coding script employed in the present study was adapted from Brand, Baldwin, and Ashburn (2002). Participants' behaviour was coded on eight global features using a 5-point scale: *repetitiveness* (0 = 'no repetitions', 4 = 'extremely repetitive'), *rate* (0 = 'very slowly', 4 = 'very fast'), *punctuation* (0 = 'very fluid', 4 = 'very punctuated'), *range of motion* (0 = 'very small, restricted movements', 4 = 'only broad, expansive movements'), *distance from partner* (0 = 'object never or almost never leaves demonstrator's space', 4 = 'almost always or always in partner's space'), *complexity of action unit* (0 = 'only single units', 4 = 'only complex series of different actions'), *interactiveness* (0 = 'very low interaction', 4 = 'very high interaction'), and *enthusiasm* (0 = 'very low enthusiasm', 4 = 'very high enthusiasm'). To obtain an objective measure of *distance from partner,* placemats were used to define the space around each person. They were taped to the table in front of the demonstrator and partner 65 centimeters apart. As in the Brand, Baldwin, and Ashburn (2002) study, coders were told to look for specific behaviours during the interaction. For the variable *interactiveness,* for example, they were instructed to attend to joint contact on the object, eye contact, gaze checking, and offering of the object to the partner. Even though the face of the partner was not included in the short, the coders were still able to infer from the direction of the partner's gaze whether they were looking at their partner's face. As in Baldwin, and Ashburn (2002), coders were also provided with verbal descriptions at intermediate scale points. For example, for the variable *complexity of action unit,* 1 = 'some short series of one repeated action', 2 = 'long series of single actions, or short series of different actions', and 3 = 'longer series of different actions.' Coding began when the mother brought the object into view and ended when she placed it back into the basket. Since the partner often maintained complete possession of the object, coders were instructed to keep coding for *interactivess* and *enthusiasm,* but not for the other six variables. Higher levels on all the features except rate and complexity were predicted for infant-directed versus adult-directed action. The length of each demonstration was noted and it was predicted that parents would demonstrate the objects longer to their infant than to the adult partner. The length of time each partner remained in possession of the object and the amount of time both engaged in joint contact on the object was also measured, with the prediction that infants would remain in longer possession of the objects than adults and parent-infant interactions would be characterized by longer bouts of joint contact.

The coders were two trained undergraduate female research assistants. Since the partner's hands, arms, and sometimes head could be seen in the video when they leaned forward, both coders were blind to the purpose and hypotheses of the study. The mothers' data was coded first. The coders were trained first on pilot tapes and eventually on tapes of actual participants until reliability between their ratings was reached. After all tapes were coded, 15 percent of them were re-coded by the other rater to ensure inter-rater reliability was maintained. A minimum correlation coefficient of .60 was required for adequate inter-rater reliability. Inter-rater reliability was not maintained for *rate* (Cronbach's alpha = .50) and *complexity* (Cronbach's alpha = .38). Under the assumption that the coders were unable to reach inter-rated reliability on these two features because the ratings required a fine distinction between points, the scales for *rate* and *complexity* were compressed to include 3 points each. For example, the scale for *rate* was consequently: 1= 'slowly or very slowly', 2= 'medium', 3= 'fast or very fast'. The tapes were re-coded for these two features using the modified scales and inter-rater reliability between the two coders climbed to a Cronbach's alpha value of 1.00 for *rate* and .83 for *complexity* on 15 percent of the tapes. The male data was coded next with the two modified scales and the remaining six original scales. Inter-rater reliability between the two coders for the eight features ranged from .70 to .97 based on 15 percent of the male sample (see Table 1 below).

Table 1

Inter-Rater Reliability Ratings for the Eight Action Features

	Cronbach's Alpha	
Action Feature	Mothers	Fathers
Repetitiveness	.77	.98
Rate	1.00	.86
Punctuation	.94	.97
Range of Motion	.72	.95
Proximity	.89	.99
Complexity	.83	.89
Interactiveness	.93	.77
Enthusiasm	.88	.92

CHAPTER THREE

Results

3.1 Demographic Data

3.1.1 Parents.

Mothers and fathers were compared on several demographic variables. The groups were similar in terms of age, language, race, education, and income. Only 2 mothers and 1 father reported a history of anxiety. Three mothers and none of the fathers reported a history of mood disorders and neither group had any participants with a history of substance abuse (see Table 2 below).

Table 2

Parental Demographic Variables

		Female (n=21)	Male (n=21)	*df*	X^2	*p*
Language						
	English	21	19	1	2.10	.15
	Other	0	2			
Race						
	Caucasian	20	18	3	2.11	.55
	Hispanic	0	1			
	Multiracial	1	1			
	Other	0	1			
Education						
	Grammar school	0	1	5	4.43	.49
	High school	0	2			
	Some college or university	3	4			
	College diploma	7	7			
	Bachelor's degree	8	6			
	Master's Degree	3	1			
Income						
	40,000-49,000	0	4	4	8.78	.07
	50,000-74,999	6	5			
	75,000-99,000	1	4			
	More than 100,000	11	7			
	Would rather not say	2	0			
History of Anxiety						
	Yes	2	1	1	.36	.50
	No	18	19			
History of Mood Disorders						
	Yes	3	0	1	3.24	.16
	No	17	20			
History of Substance Abuse						
	Yes	0	0	-	-	-
	No	20	20			

3.1.2 Infants.

The infants in the mother-child interactions (mean age= 13.04 months, SD= 25.84 days) were 35 days older than the infants in the father-child interactions (mean age= 11.86 months, SD= 21.47 days), a significant difference, $F(1, 40) = 23.23, p < .01, \eta^2 = .37$.

3.2 Action Feature Analyses

3.2.1 Mothers' Infant-Directed Action.

The female group was analyzed first in an attempt to replicate the finding that mothers incorporate modifications to their infant-direction actions not observed in adult-directed action. A repeated measures ANOVA with sex of the infant partner as the between-subjects factor revealed no significant differences in ratings across all eight action features. All subsequent analyses combine male and female infants. A paired samples t-test was carried out for each of the eight variables averaging across the two toys used in each interaction. The means and standard deviations for each of the eight variables are displayed in Table 3 below.

Table 3

Means and Standard Deviations for the Eight Action Feature Ratings by Age of Partner

Action Feature		Mothers		Fathers	
		M	*SD*	*M*	*SD*
Repetitiveness					
	Infant	2.64	.62	2.60	.85
	Adult	2.14	.76	2.36	.62
Rate					
	Infant	1.74	.37	1.76	.12
	Adult	1.88	.38	2.10	.11
Punctuation					
	Infant	1.86	.55	1.62	.52
	Adult	1.81	.77	1.81	.72
Range of Motion					
	Infant	2.02	.66	1.55	.16
	Adult	1.52	.73	1.50	.15
Proximity					
	Infant	2.48	.60	3.24	.11
	Adult	1.74	.54	1.90	.14
Complexity					
	Infant	1.88	.50	1.79	.09
	Adult	1.95	.44	1.98	.06
Interactiveness					
	Infant	3.14	.71	3.29	.13
	Adult	1.98	.68	2.17	.21
Enthusiasm					
	Infant	2.36	.95	1.95	.19
	Adult	1.57	.73	1.98	.16

The summary statistics for the paired samples t-tests are found in Table 4 below.

Table 4

Summary Statistics of the Paired Samples t-test for Each of the Eight Action Features

	Mothers			Fathers		
Action Feature	*t*	*p*	Cohen's *d*	*t*	*p*	Cohen's *d*
Repetitiveness	-2.35*	.03	.51	-1.00	.33	.22
Rate	1.30	.21	.28	2.14*	.045	.47
Punctuation	-.22	.83	.05	1.28	.21	.28
Range of Motion	-2.24*	.04	.49	-.24	.81	.05
Proximity	-3.75**	.00	.82	-7.68**	.00	1.68
Complexity	.48	.63	.11	1.71	.10	.37
Interactiveness	-6.72**	.00	1.47	-4.06**	.00	.89
Enthusiasm	-3.37**	.00	.74	.11	.91	.02

$^*p<.05$. $^{**}p<.01$.
Degrees of freedom = 20 in all cases.

The analyses revealed that mothers significantly modified their actions in the predicted direction on measures of *repetitiveness*, $t(20) = -2.35, p < .05, d = .51$, *range of motion* $t(20) = -2.24, p < .05, d = .49$, *proximity*, $t(20) = -3.75, p < .01, d = .82$, *interactiveness*, $t(20) = -6.72, p < .01, d = 1.47$, and *enthusiasm*, $t(20) = -3.37, p < .01, d = .74$. Although ratings of *punctuation, rate,* and *complexity* fell in the predicted direction, mothers' modification of their actions did not reach significance on these features (See Figures 2a and 2b below).

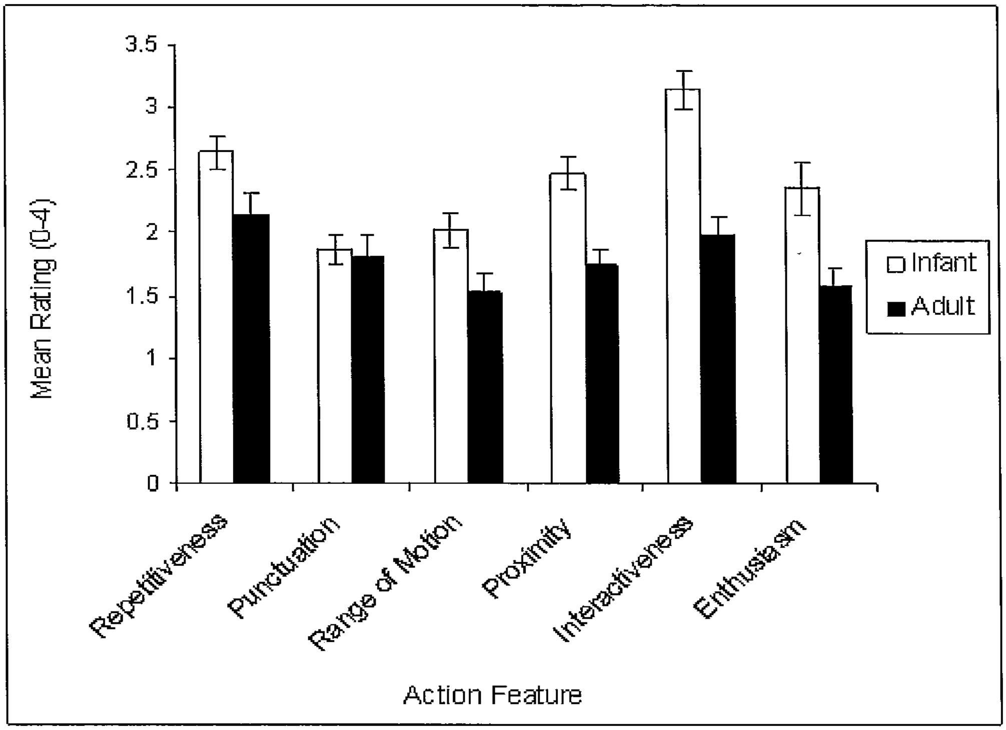


Figure 2a. Mean ratings of mothers' actions by age of partner on the six action features measured on a 0-4 scale.

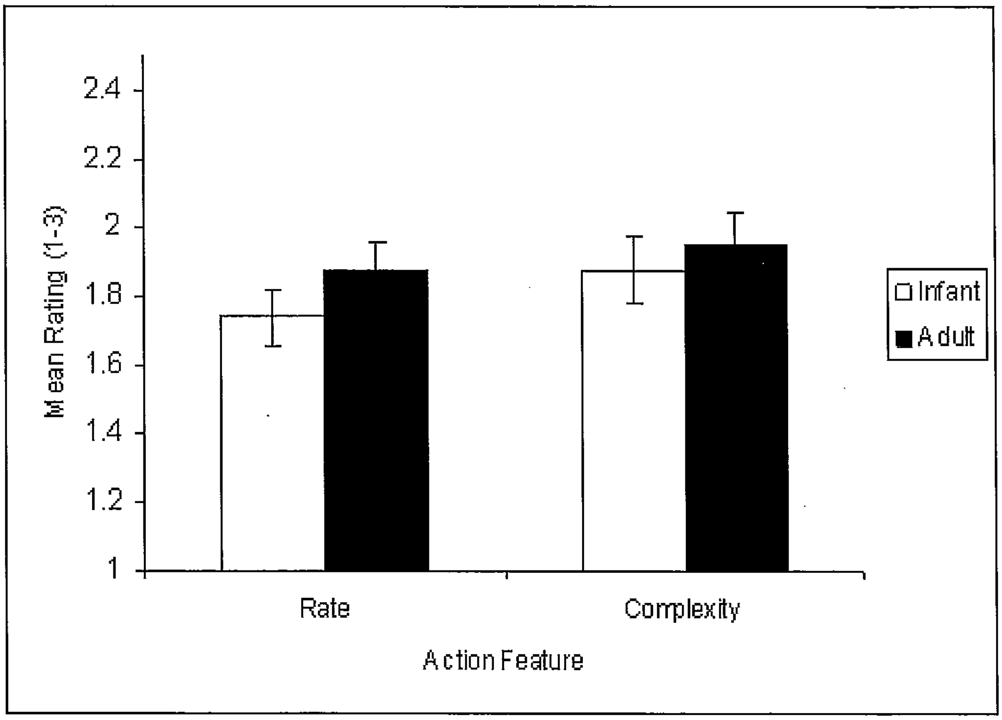


Figure 2b. Mean ratings of mothers' actions by age of partner on the two action features measured on a 1-3 scale.

3.2.2 Fathers' Infant-Directed Action.

The same analyses were repeated with the males' data to determine whether fathers engage in infant-directed action in a similar fashion as observed in mothers. A repeated measures ANOVA across the eight action features with sex of the infant partner as the between-subjects factor revealed a significant interaction between *enthusiasm* and sex, $F(1) = 8.08$, $p < .05$, partial $\eta^2 = .30$, with higher levels of enthusiasm towards females (see Figure 3 below).

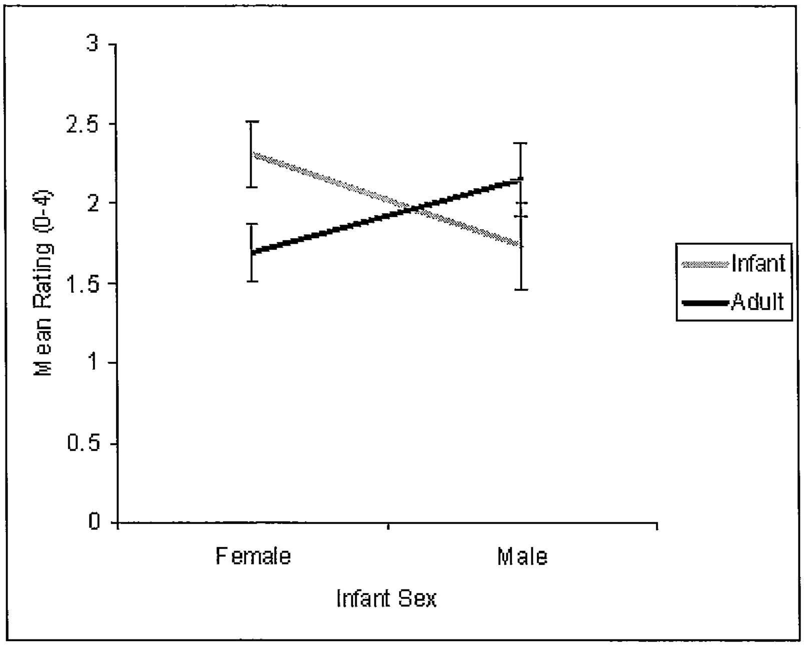


Figure 3. Ratings of fathers' enthusiasm by sex of infant and age of partner.

A paired samples t-test was carried out for all eight action features, averaging across the two toys used in each interaction. All subsequent analyses combine male and female infants. The means and standard deviations for each of the eight variables are displayed in Table 3 above. The summary statistics for the paired-samples t-tests are found in Table 4 above. The analyses revealed that fathers significantly modified their actions in the predicted direction when demonstrating the objects to their infant versus another adult on measures of *proximity*, $t(20) = -7.68, p < .01, d = 1.68$, *interactiveness,* $t(20) = -4.06, p < .01, d = .89$, and *rate*, $t(20) = 2.14, p < .05, d = .47$. Although ratings of *repetitiveness*, *range of motion*, and *complexity* fell in the predicted direction, fathers' modification of their actions did not reach significance on these features. Fathers did not significantly modify their actions on ratings of *punctuation* and *enthusiasm*, neither which fell in the predicted direction (see Figures 4a and 4b below).

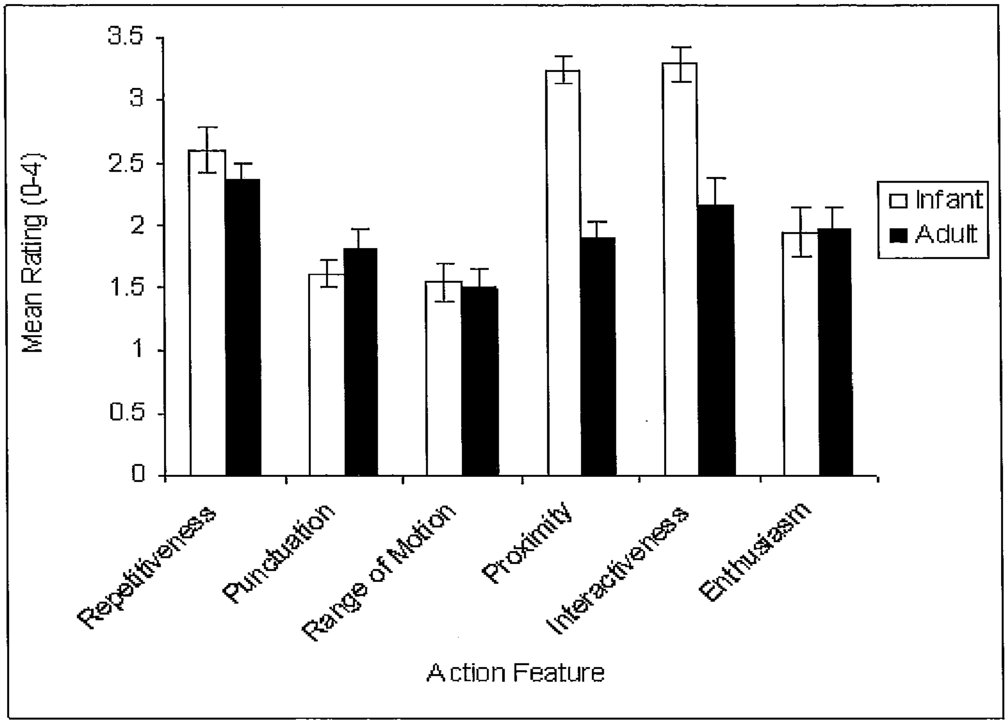


Figure 4a. Mean ratings of fathers' actions by age of partner on the six action features measured on a 0-4 scale.

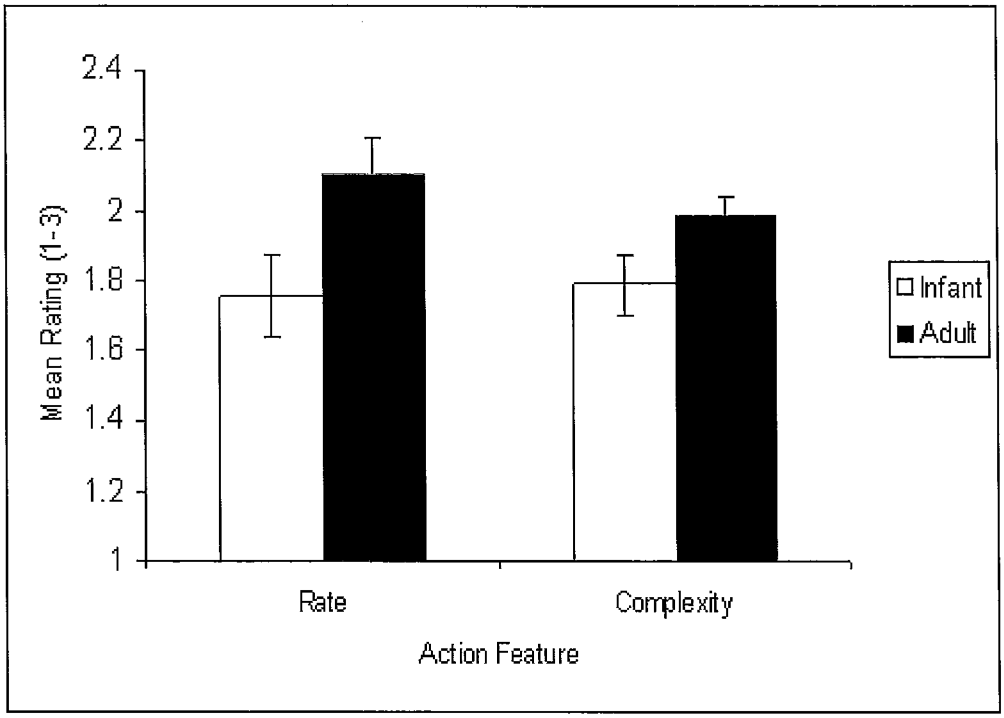


Figure 4b. Mean ratings of fathers' actions by age of partner on the two action features measured on a 1-3 scale.

3.2.3 Differences Between Mothers' and Fathers' Infant-Directed Action

To determine whether there was a difference between mothers' and fathers' infant-directed action, a mixed ANOVA with sex of parent as the between subjects factor and partner type as the within subjects factor was conducted across each of the eight action features. The summary statistics for each action feature by sex of parent interaction are found in Table 5 below. These analyses were repeated with age of infant as a covariate, as infants in the mother-child interactions were significantly older than infants in the father-child interactions. The results remained approximately the same.

Table 5

Summary Statistics of the Mixed Analysis of Variance for Differences Between Mothers and Fathers on the Eight Action Features

Action Feature	F	p	Partial η^2
Repetitiveness	.67	.42	.02
Rate	1	.32	.02
Punctuation	.82	.37	.02
Range of Motion	2.33	.14	.06
Proximity	5.14*	.03	.11
Complexity	.41	.52	.01
Interactiveness	.02*	.89	.00
Enthusiasm	6.71**	.01	.14

*p<.05. **p<.01.
Degrees of freedom= (1, 40) in all cases.

For *repetitiveness*, there was a significant main effect of partner type $F(1,40)= 5.35, p< .05, \eta^2 = .12$; collapsed across sex of parent, ratings of repetitiveness were higher when the partner was an infant versus an adult. The main effect of sex was not significant, $F(1,40)= .30, p> .05, \eta^2 = .01$. There was no significant interaction effect between partner type and sex, $F(1,40)= .67, p> .05, \eta^2 = .02$, indicating that mothers and fathers received similar difference scores on this action feature when interacting with their baby versus another adult (see Figure 5a below).

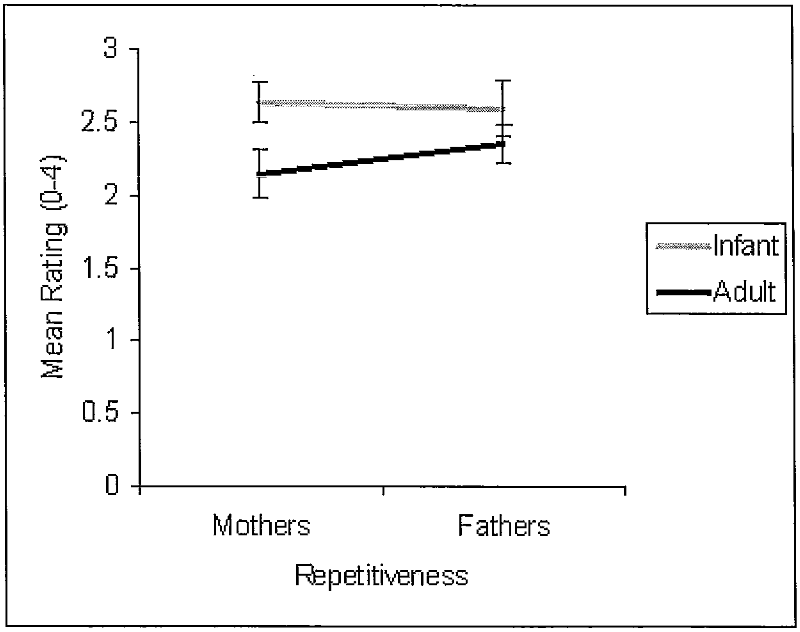


Figure 5a. Difference between mothers and fathers on repetitiveness.

For *rate,* there was a significant main effect of partner type, $F(1,40) = 6.25$, $p < .05$, $\eta^2 = .14$; collapsed across sex of parent, ratings of rate were higher when the partner was an adult versus an infant. The main effect of sex was not significant, $F(1,40) = 1.29$, $p > .05$, $\eta^2 = .03$. There was no significant interaction effect between partner type and sex, $F(1,40) = 1.00$, $p > .05$, $\eta^2 = .02$ (see Figure 5b below).

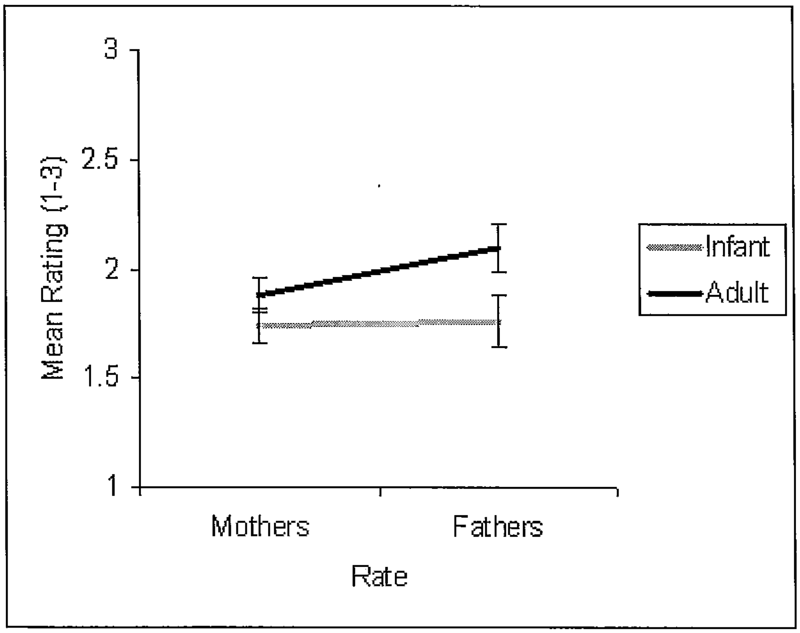


Figure 5b. Difference between mothers and fathers on rate.

For *punctuation,* there was no significant main effect of partner type, $F(1,40)= .29$, $p> .05$, $\eta^2 = .01$, or sex, $F(1,40)= .63$, $p> .05$, $\eta^2 = .02$. There was no significant interaction between partner type and sex, $F(1,40)= .82$, $p> .05$, $\eta^2 = .02$ (see Figure 5c below).

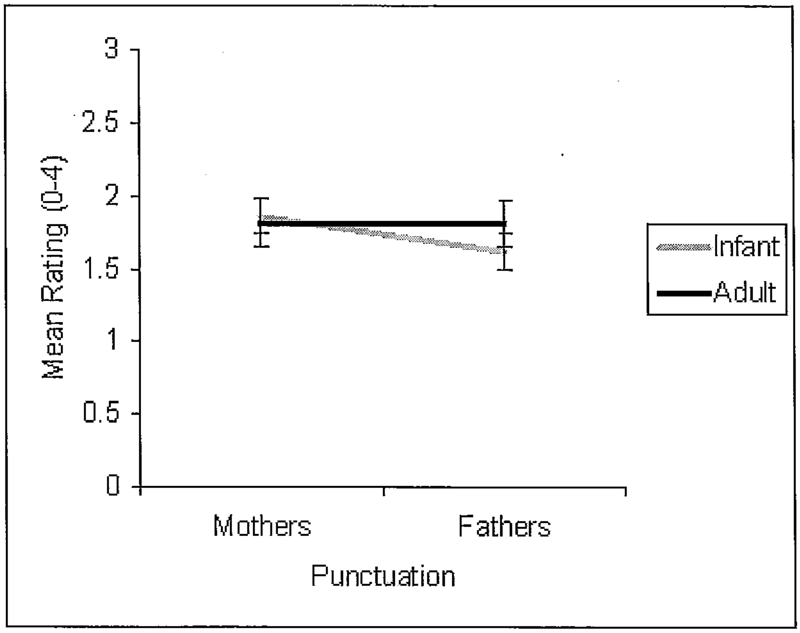


Figure 5c. Difference between mothers and fathers on punctuation.

For *range of motion,* there was no significant main effect of partner type, $F(1,40) = 3.41, p > .05, \eta^2 = .08$, or sex, $F(1,40) = 2.51, p > .05, \eta^2 = .06$. There was no significant interaction between partner type and sex, $F(1,40) = 2.33, p > .05, \eta^2 = .06$ (see Figure 5d below).

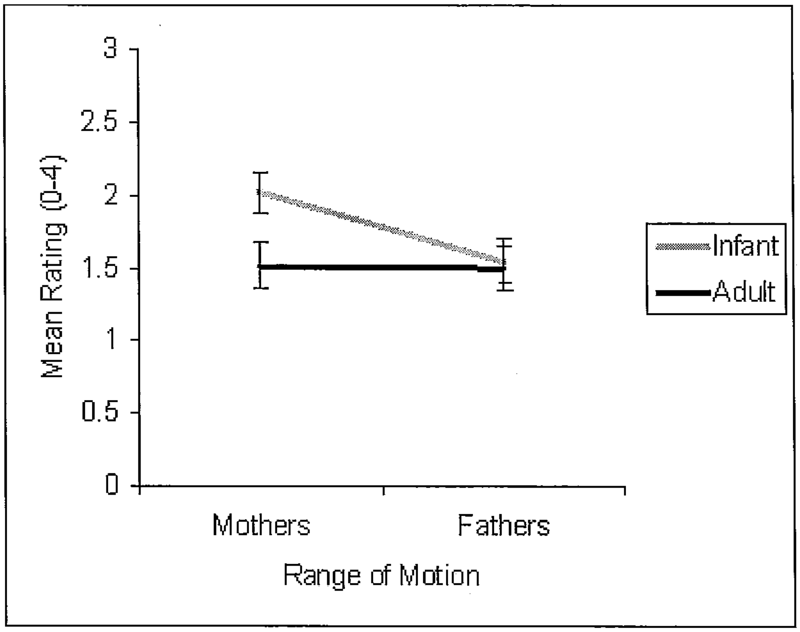


Figure 5d. Difference between mothers and fathers on range of motion.

For *proximity,* there was a significant main effect of partner type, $F(1,40)= 62.19$, $p< .01$, $\eta^2 = .61$; collapsed across sex of parent, ratings of proximity were higher when the partner was an infant versus an adult. The main effect of sex was significant, $F(1,40)= 14.87$, $p< .01$, $\eta^2 = .27$; collapsed across partner type, fathers received higher ratings on proximity than mothers. There was also a significant interaction effect between partner type and sex, $F(1,40)= 5.14$, $p< .05$, $\eta^2 = .11$; the difference in proximity ratings fathers received when interacting with their baby versus another adult was significantly higher than the difference in ratings mothers received when interacting their baby versus another adult (see Figure 5e below).

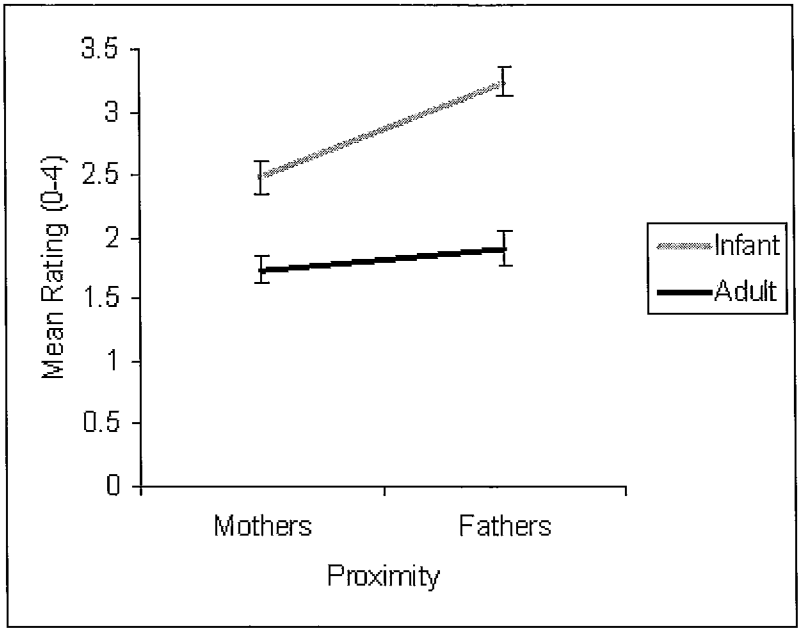


Figure 5e. Difference between mothers and fathers on proximity.

For *complexity,* there was no significant main effect of partner type, $F(1,40)= 2.00$, $p> .05$, $\eta^2 = .05$, or sex, $F(1,40)= .16$, $p> .05$, $\eta^2 = .00$. There was no significant interaction between partner type and sex, $F(1,40)= .41$, $p> .05$, $\eta^2 = .01$ (see Figure 5f below).

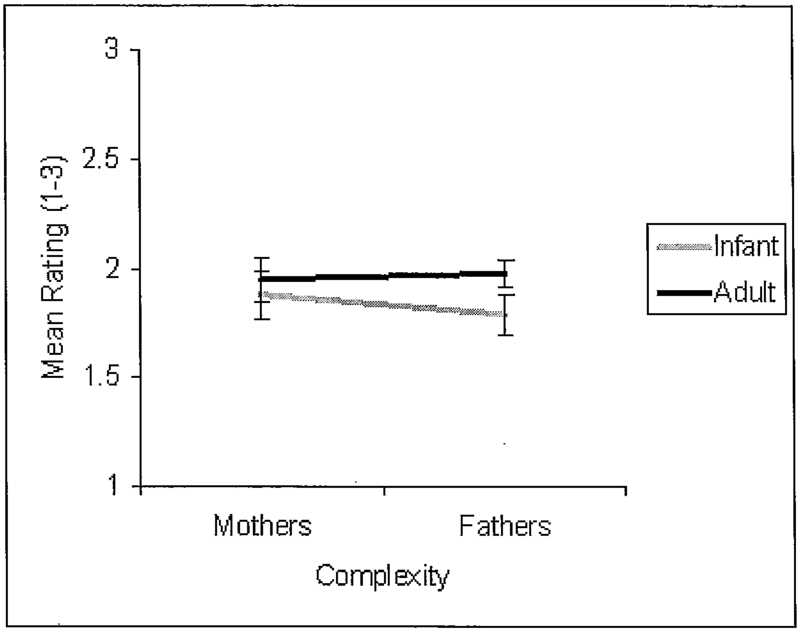


Figure 5f. Difference between mothers and fathers on complexity.

For *interactiveness,* there was a significant main effect of partner type, $F(1,40)= 49.18, p< .01, \eta^2 = .55$; collapsed across sex of parent, ratings of interactiveness were higher when the partner was an infant versus an adult. The main effect of sex was not significant, $F(1,40)= 1.06, p> .05, \eta^2 = .03$. There was no significant interaction between partner type and sex, $F(1,40)= .02, p> .05, \eta^2 = .00$ (see Figure 5g below).

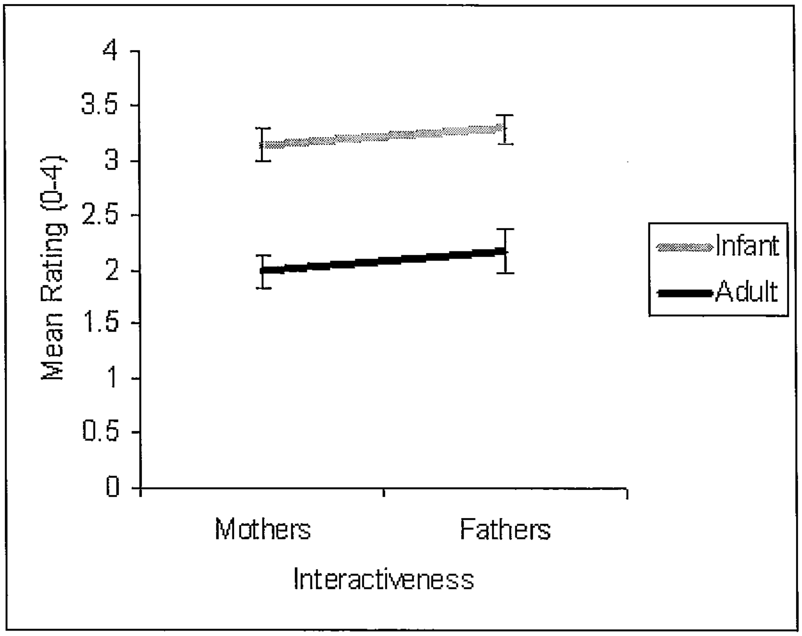


Figure 5g. Difference between mothers and fathers on interactiveness.

For *enthusiasm,* there was a significant main effect of partner type, $F(1,40)= 5.94$, $p< .05$, $\eta^2 = .13$; collapsed across sex of parent, ratings of enthusiasm were higher when the partner was an infant versus an adult. The main effect of sex was not significant, $F(1,40)= .00$, $p> .05$, $\eta^2 = .00$. There was a significant interaction effect between partner type and sex, $F(1,40)= .6.71$, $p< .05$, $\eta^2 = .14$; the difference in enthusiasm ratings mothers received when interacting with their baby versus another adult was significantly higher than the difference in ratings fathers received when interacting with their baby versus another adult (see Figure 5h below).

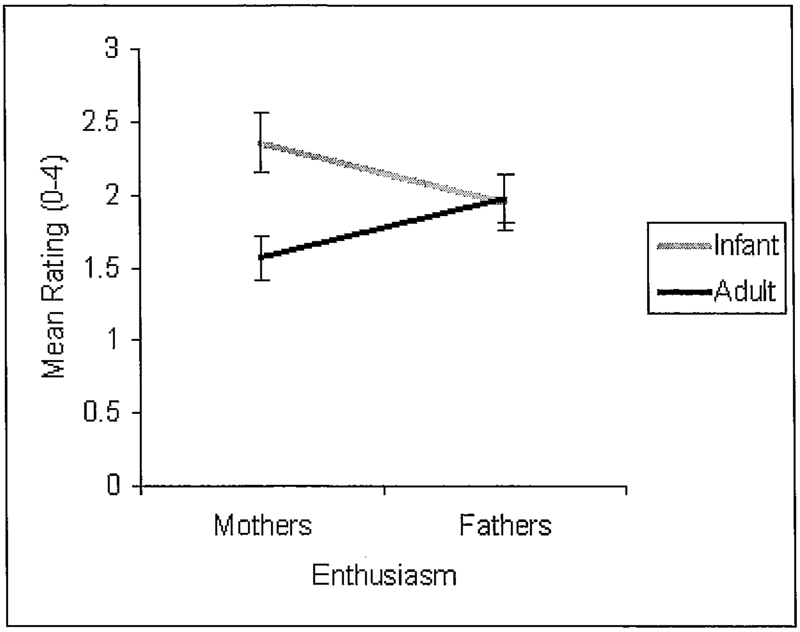


Figure 5h. Difference between mothers and fathers on enthusiasm.

3.3 Time Measures

The length of time the entire interaction took place, the length of time the demonstrator and partner were in possession of the objects, and the length of time both individuals spent engaging in joint contact was recorded and averaged across the two objects (see Table 6 below).

Table 6

Mean Length of Entire Demonstration, Length of Object Possession (Demonstrator and Partner), and Length of Joint Contact by Age of Partner in Seconds

		Mothers		Fathers	
		M	*SD*	*M*	*SD*
Demonstration Length					
	Infant	102.81	43.51	101.24	45.07
	Adult	63.10	34.04	59.43	25.71
Demonstrator in Possession					
	Infant	45.14	21.67	42.88	25.03
	Adult	36.88	23.88	42.33	18.28
Partner in Possession					
	Infant	42.60	37.54	31.14	20.80
	Adult	20.83	22.27	12.21	12.46
Joint Contact					
	Infant	10.43	9.35	25.43	19.51
	Adult	2.98	6.26	2.57	3.12

The summary statistics for the paired samples t-tests are found in Table 7 below.

Table 7

Summary Statistics of the Paired Samples t-tests for Length of Entire Demonstration and Object Possession Types

	Mothers			Fathers		
	t	*p*	Cohen's *d*	*t*	*p*	Cohen's *d*
Demonstration Length	-4.32**	.00	.94	-5.74**	.00	1.25
Demonstrator in Possession	-1.23	.23	.27	-.10	.92	.02
Partner in Possession	-2.99**	.007	.65	-5.05**	.00	1.10
Joint Contact	-2.65*	.015	.58	-5.27**	.00	1.15

*p<.05. **p<.01.
Degrees of freedom= 20 in all cases.

Mothers demonstrated the objects significantly longer to their infants than to the adult partners, $t(20) = -4.32$, $p < .01$, $d = .94$. The partner maintained possession of the object significantly longer when they were an infant versus another adult, $t(20) = -2.99$, $p < .01$, $d = .65$, and there was no significant difference in length of object possession by the demonstrator when the partner was an infant versus another adult. Lastly, there were significantly longer periods of joint contact on the object when the partner was an infant versus an adult, $t(20) = -2.65$, $p < .05$, $d = .58$ (see Figures 6a and 6b below).

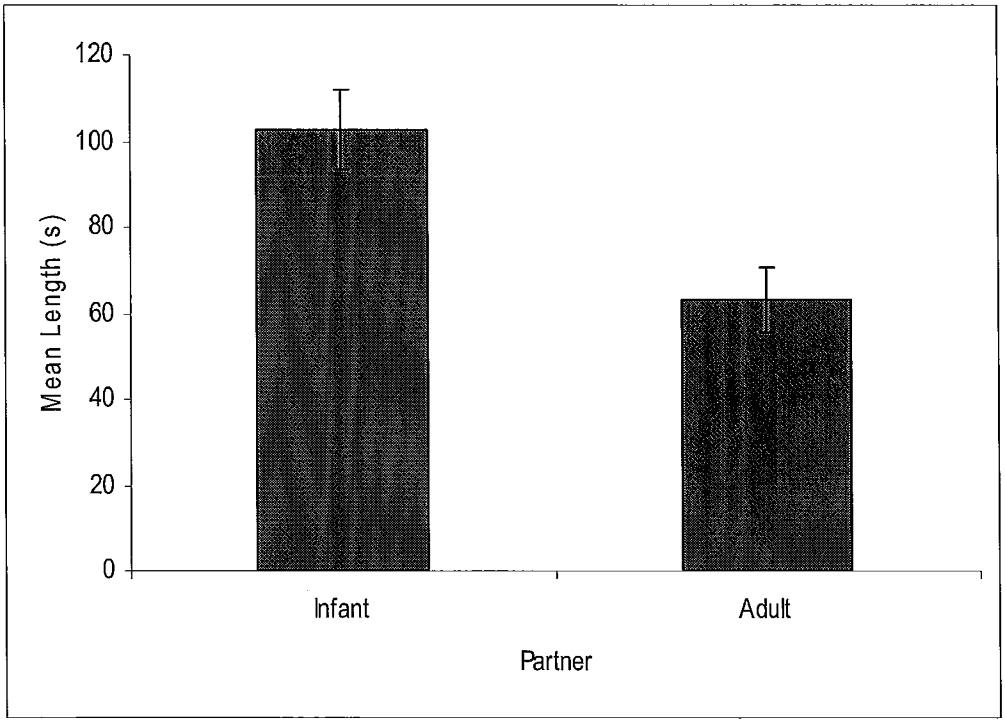


Figure 6a. Mean length of mother-partner interactions by partner type in seconds.

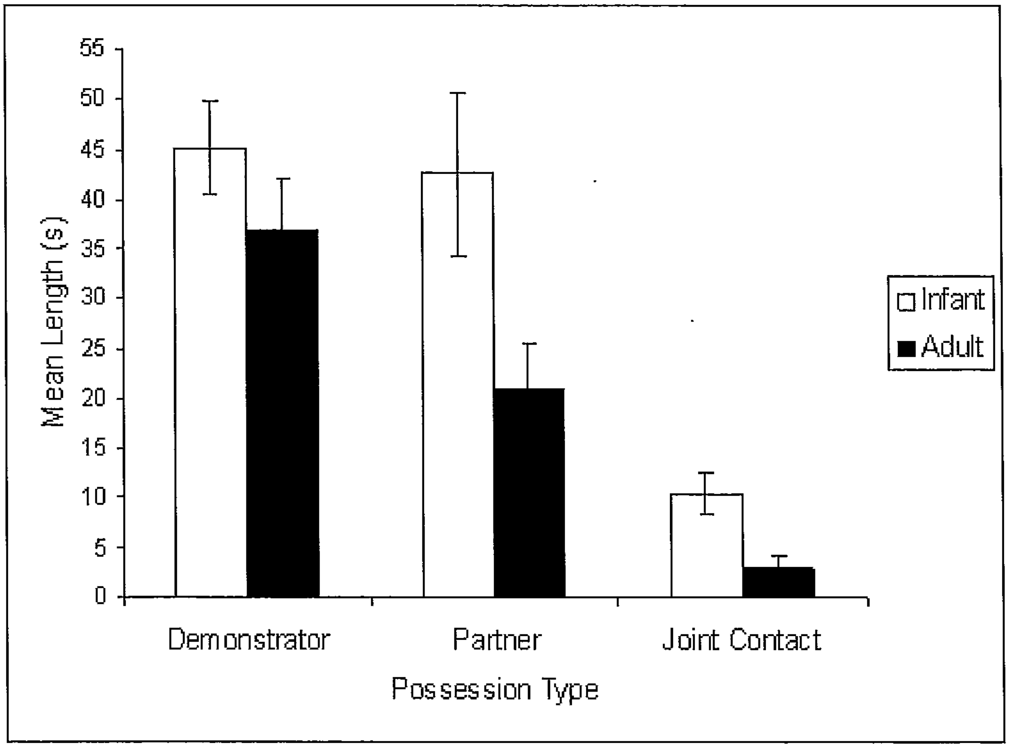


Figure 6b. Mean length of object possession types in mother-partner interactions by age of partner in seconds.

Fathers demonstrated the objects significantly longer to their infants than to the adult partner, $t(20) = -5.74$, $p < .01$, $d = 1.25$. The partner maintained possession of the object significantly longer when they were an infant versus another adult, $t(20) = -5.05$, $p < .01$, $d = 1.10$, and there was no significant difference in length of object possession by the demonstrator when the partner was an infant versus another adult. Lastly, there were significantly longer periods of joint contact on the object when the partner was an infant versus an adult, $t(20) = -5.27$, $p < .01$, $d = 1.15$ (see Figures 7a and 7b below).

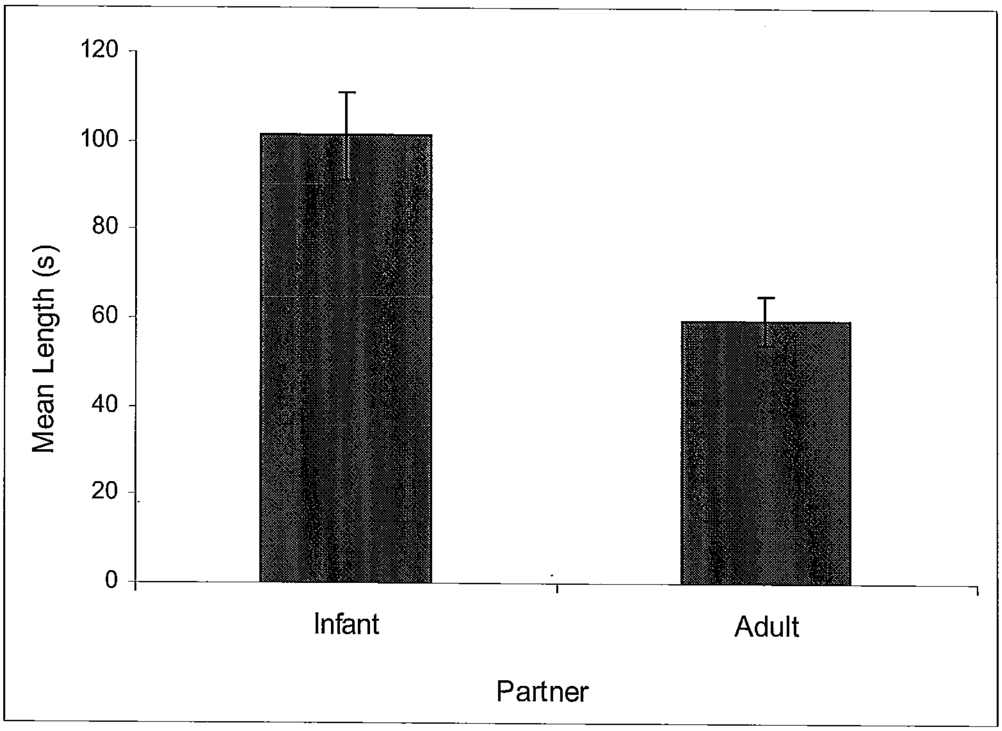


Figure 7a. Mean length of father-partner interactions by partner type in seconds.

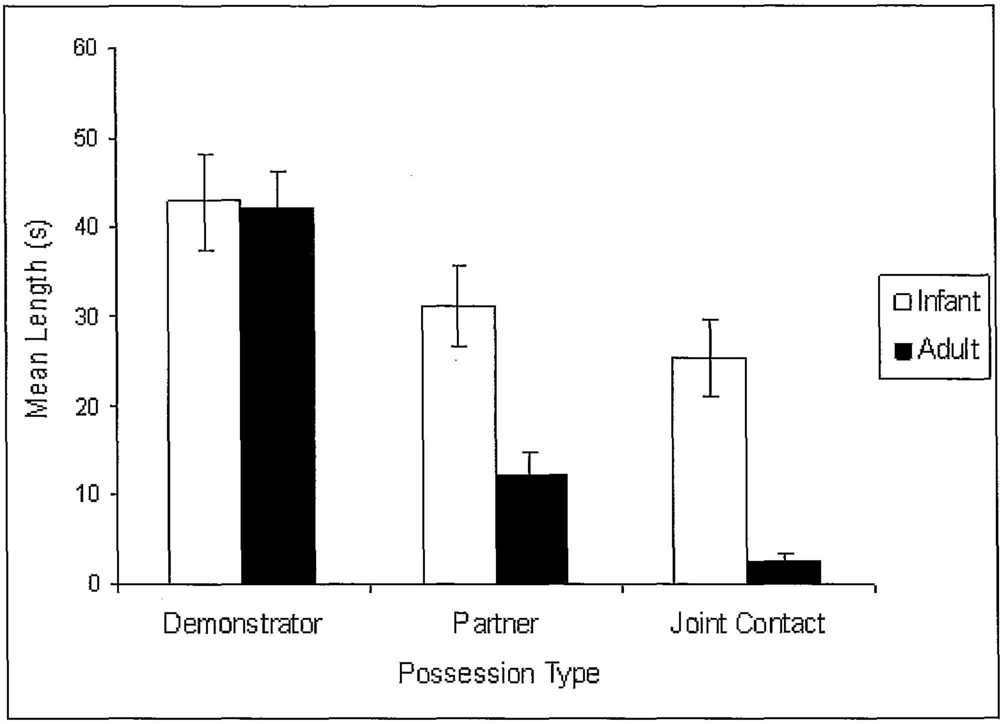


Figure 7b. Mean length of object possession types in father-partner interactions by age of partner in seconds.

A mixed ANOVA with sex of the parent as the between-subjects factor was carried out for each of the time variables to determine whether mothers and fathers differed on these measures (see Table 8 for summary statistics of the interactions).

Table 8

Summary Statistics of the Repeated Measures Analysis of Variance for Differences Between Mothers and Fathers on Length of Entire Demonstration and Object Possession Types

	F	p	Partial η^2
Demonstration Length	.03	.86	.00
Demonstrator in Possession	.80	.38	.02
Partner in Possession	.12	.73	.00
Joint Contact	8.87**	.00	.18

**p<.01.
Degrees of freedom= (1, 40) in all cases.

For the entire demonstration length, the main effect of partner type was significant, $F(1,40)= 48.32, p< .01, \eta^2 = .55$; collapsed across sex of parent, interactions in which the partner was an infant versus another adult were longer. The main effect of sex was not significant, $F(1,40)= .07, p> .05, \eta^2 = .00$. The interaction between partner type and sex was not significant, $F(1,40)= .03, p> .05, \eta^2 = .00$; mothers and fathers spent comparable amounts of time interacting with their partners (see Figure 8a below).

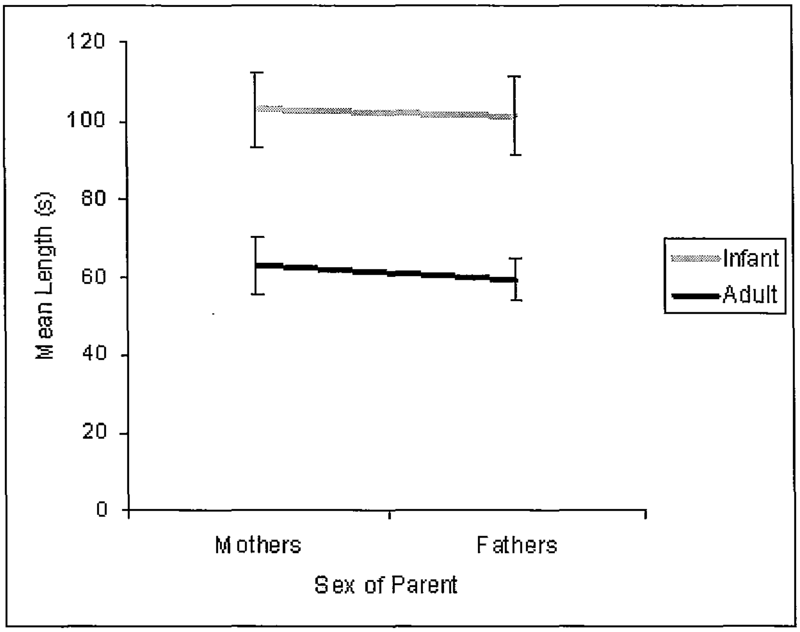


Figure 8a. Difference between mothers and fathers on demonstration length.

For the demonstrator possession type, the main effect of partner type, $F(1,40)= 1.05, p> .05, \eta^2 = .03$, and sex, $F(1,40)= .09, p> .05, \eta^2 = .00$, were not significant. Additionally, the interaction between partner type and sex was not significant, $F(1,40)= .80, p> .05, \eta^2 = .02$ (see Figure 8b below).

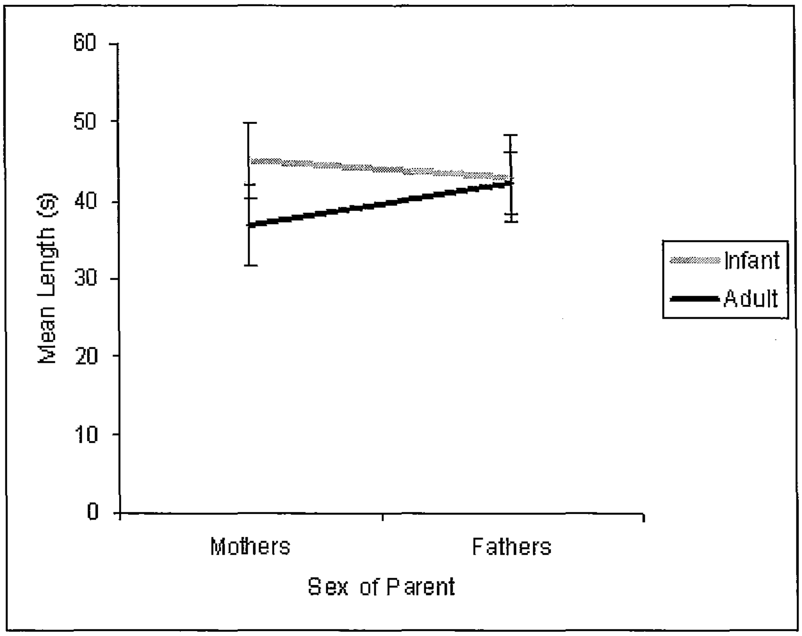


Figure 8b. Difference between mothers and fathers on demonstrator possession type.

For the partner possession type, the main effect of partner type was significant, $F(1,40)= 24.76, p< .01, \eta^2= .38$; collapsed across sex of parent, infant partners maintained possession of the objects longer than adult partners. The main effect of sex was not significant, $F(1,40)= 2.36, p> .05, \eta^2 = .00$. Additionally, the interaction between the partner type and sex was not significant, $F(1,40)= .12$, $p> .05, \eta^2 = .00$; partners maintained possession of the objects for similar lengths of time regardless of whether the demonstrator was male or female (see Figure 8c below).

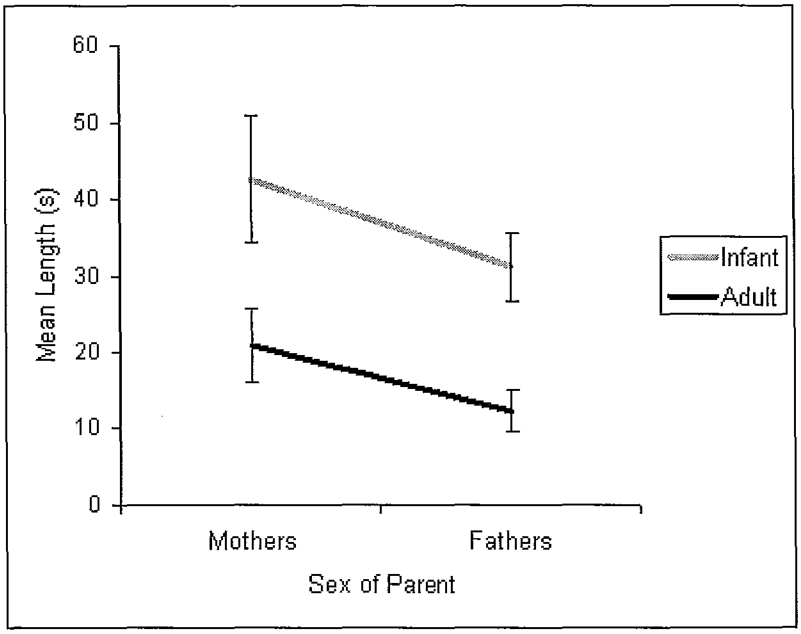


Figure 8c. Difference between mothers and fathers on partner possession type.

For the joint contact possession type, the main effect of partner type was significant, $F(1,40) = 34.34$, $p < .01$, $\eta^2 = .46$; collapsed across sex of parent, there were longer bouts of joint contact on the objects when the partner was an infant versus another adult. The main effect of sex was significant, $F(1,40) = 9.48$, $p < .01$, $\eta^2 = .19$; regardless of whether the partner was an infant or another adult, fathers engaged in longer bouts of joint contact than mothers. Lastly, the interaction between partner type and sex was significant, $F(1,40) = 8.87$, $p < .01$, $\eta^2 = .18$; the difference score for fathers when engaging in joint contact with their infant versus another adult was larger than the difference score for mothers when engaging in joint contact with their infant versus another adult (See Figure 8d).

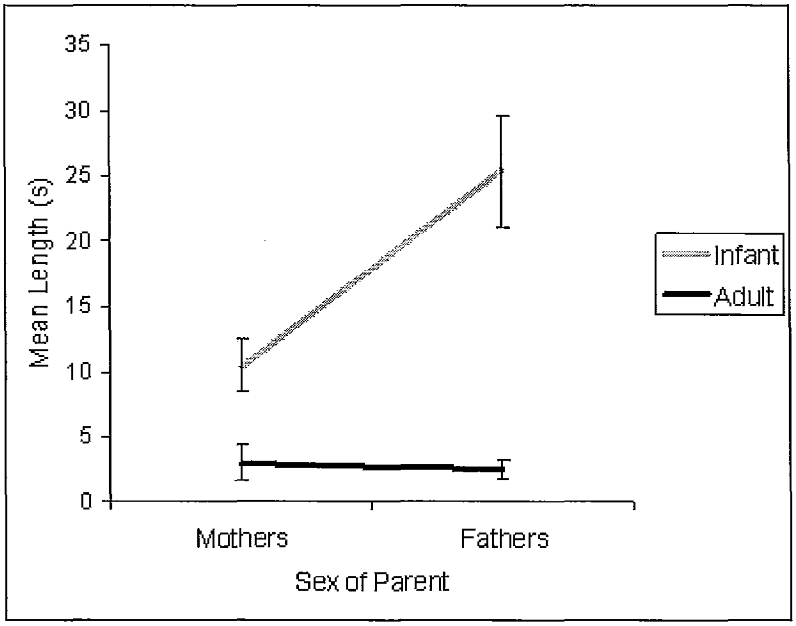


Figure 8d. Difference between mothers and fathers on joint contact possession type.

3.4 Parental Scales

Differences between mothers and fathers on the parental measures were assessed using a one-way ANOVA with sex of parent as the between-subjects factor. The means and standard deviations of mothers' and fathers' scores are found in Table 9 and the summary statistics of the one-way ANOVA for differences between mothers and fathers are found in Table 10.

Table 9

Means and Standard Deviations of Parental Measures

	Mothers		Fathers	
	M	*SD*	*M*	*SD*
CES-D	5.86	5.38	7.00	3.61
Parenting Scale				
Laxness	3.58	.41	3.69	.37
Overreactivity	4.11	.43	4.14	.34
Verbosity	3.66	.54	3.56	.49
Total score	3.80	.25	3.82	.19
FAD	3.65	.32	3.42	.35
IBQ				
Smiling and laughter	5.68	.57	5.10	.72
Duration of orienting	3.37	1.18	3.30	.65
Soothability	5.36	.94	5.22	.83
Fear	3.04	.67	2.98	.54
Distress to limitations	3.59	1.05	3.49	.57
Activity level	4.26	.75	4.29	.71

Table 10

Summary Statistics of the One-Way Analysis of Variance for Differences Between Mothers and Fathers on the Parental Measures

	df	*F*	*p*	Partial η^2
CES-D	1, 40	.65	.42	.02
Parenting Scale				
Laxness	1, 40	.88	.35	.02
Overreactivity	1, 40	.06	.81	.00
Verbosity	1, 39	.44	.51	.01
Total score	1, 39	.03	.86	.00
FAD	1, 40	5.42*	.03	.12
IBQ				
Smiling and laughter	1, 27	5.60*	.03	.17
Duration of orienting	1, 27	.04	.84	.00
Soothability	1, 27	.18	.67	.01
Fear	1, 27	.06	.80	.00
Distress to limitations	1, 27	.10	.75	.00
Activity level	1, 27	.01	.91	.00

*p<.05.

Mothers' and fathers' scores on the CES-D (see Figure 9 below), and on all subscales of the *Parenting Scale* (see Figure 10 below) were not significantly different from each other.

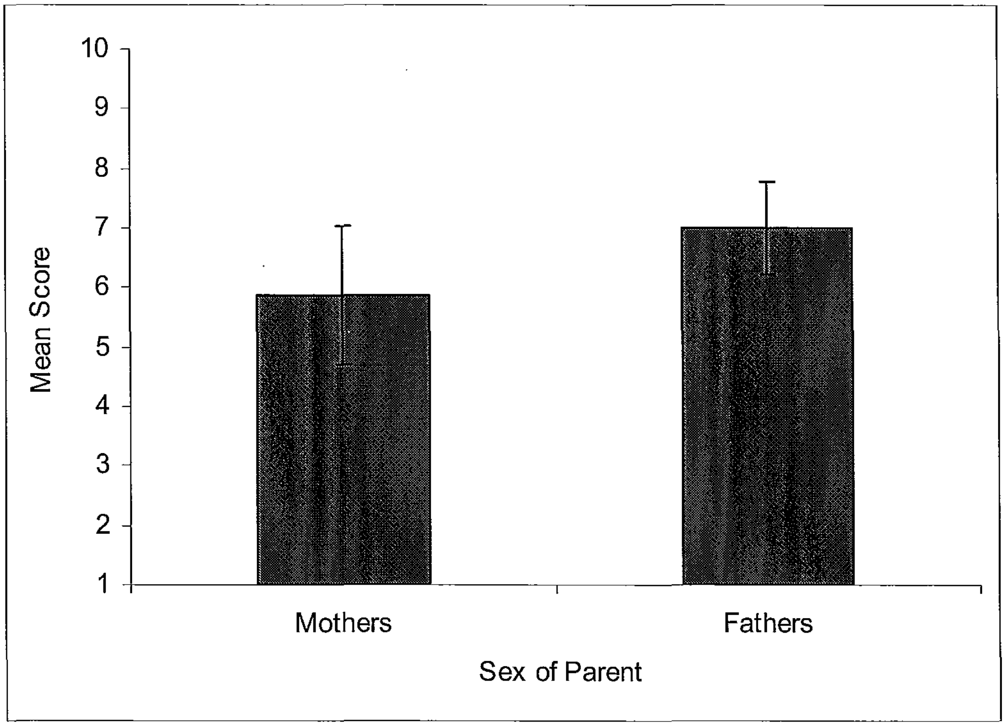


Figure 9. Difference between mothers and fathers on the CES-D scale.

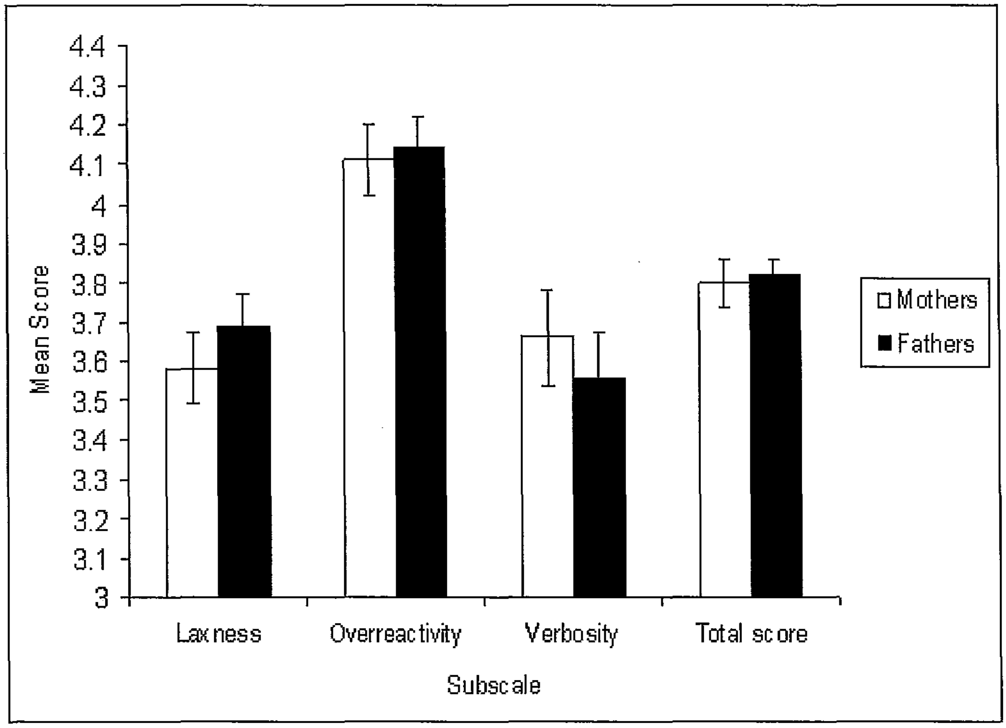


Figure 10. Differences between mothers and fathers on The Parenting Scale subscales.

One mother received a score of 25 on the CES-D, indicating she may have met the criteria for depression. The paired samples t-test was repeated across the eight action features with this participant's data removed to determine whether this affected the extent to which mothers modified their actions. The results were not substantially altered with the omission of this data point. Mothers received significantly higher scores than fathers on the FAD, $F(1,40)= 5.42$, $p< .05$, $\eta^2= .12$ (see Figure 11 below).

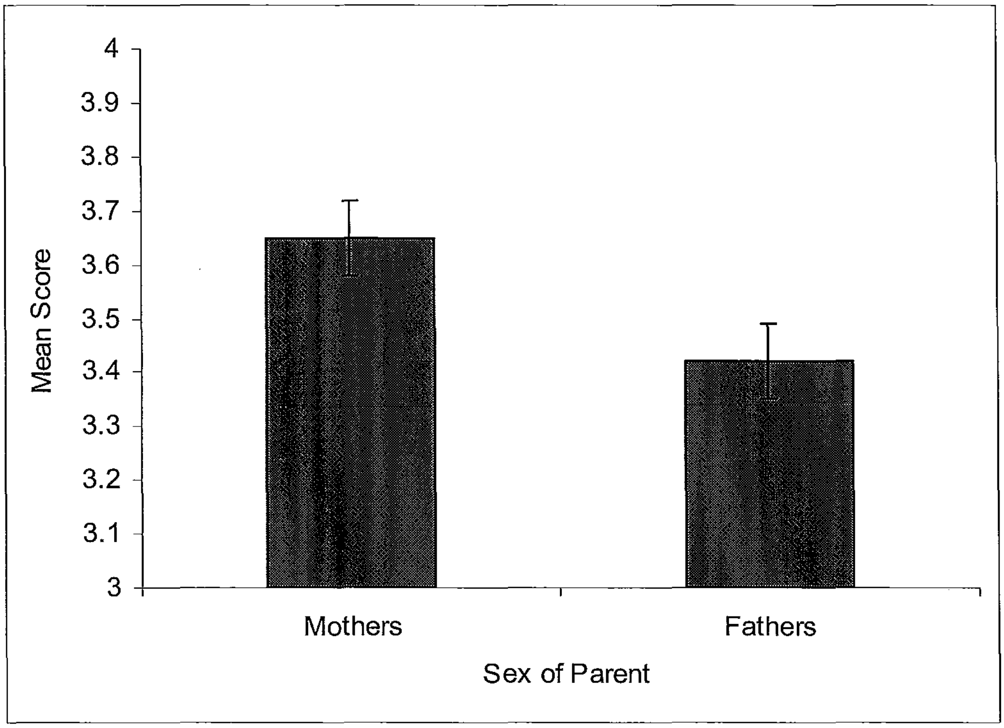


Figure 11. Differences between mothers and fathers on the FAD scale.

Lastly, mothers gave their children significantly higher ratings on the 'smiling and laughter' subscale of the IBQ compared to fathers, $F(1,27)= 5.60$, $p< .05$, $\eta^2= .17$. Differences between mothers and fathers on the remaining subscales of this measure were insignificant (see Figure 12 below).

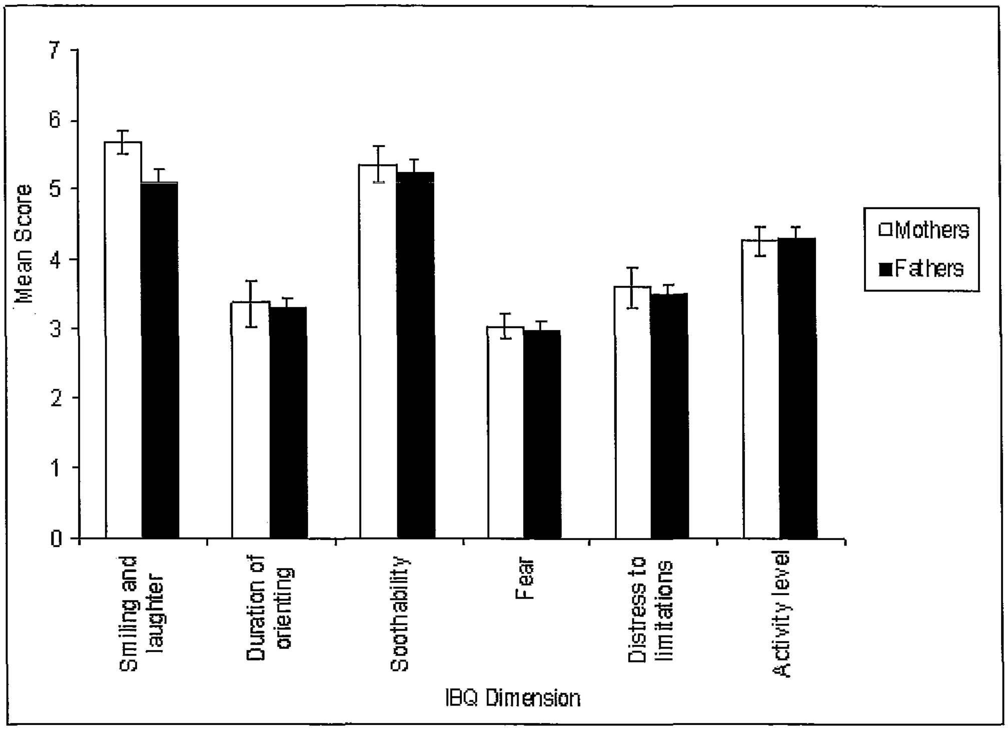


Figure 12. Differences between mothers and fathers on the IBQ subscales.

A mixed ANOVA with sex of parent as the between subjects factor and mean FAD score as a covariate was conducted across the eight action features. The covariate, mean FAD score, was not significantly related to participants' scores on any of the eight action features. After controlling for reported level of general family functioning, the difference between mothers and fathers on *proximity*, $F(1,39)= 5.03, p< .05$ .03, $\eta^2= .11$, and *enthusiasm*, $F(1,39)= 5.14, p< .05, \eta^2=.12$, remained significant. Differences between mothers and fathers on the remaining action features remained insignificant. Because only the 'smiling and laughter' subscale of the IBQ revealed a significant difference between mothers and fathers, infant temperament did not likely have a significant impact on the difference between mothers' and fathers' infant-directed action.

A Pearson-product moment correlation coefficient was calculated between mean ratings on each of the action features (Tables 11 and 12), as well as between each action feature and the scores on the various parental scales. Only a weak association was found between the variables.

Table 11

Correlation Matrix for Mothers' Ratings on the Eight Action Features

	Action Features							
	A	B	C	D	E	F	G	H
A								
Pearson Correlation	1	-	-	-	-	-	-	-
Sig. (2-tailed)								
B								
Pearson Correlation	-.05	1	-	-	-	-	-	-
Sig. (2-tailed)	.84							
C								
Pearson Correlation	.28	.23	1	-	-	-	-	-
Sig. (2-tailed)	.21	.31						
D								
Pearson Correlation	-.32	.48	-.13	1	-	-	-	-
Sig. (2-tailed)	.16	.03	.58					
E								
Pearson Correlation	.38	-.14	.29	-.50	1	-	-	-
Sig. (2-tailed)	.09	.55	.20	.02*				
F								
Pearson Correlation	.18	.09	.35	-.14	.24	1	-	-
Sig. (2-tailed)	.43	.69	.13	.54	.29			
G								
Pearson Correlation	.08	.45	.29	.48*	-.18	-.04	1	-
Sig. (2-tailed)	.73	.04	.20	.03	.43	.87		
H								
Pearson Correlation	-.14	.01	.31	-.11	.36	.05	.14	1
Sig. (2-tailed)	.56	.98	.17	.62	.11	.83	.54	

Note: A= Repetitiveness, B= Rate, C= Punctuation, D= Range of Motion, E= Proximity, F= Complexity, G= Enthusiasm, H= Interactiveness.
*p<.05.

Table 12

Correlation Matrix for Fathers' Ratings on the Eight Action Features

	Action Features							
	A	B	C	D	E	F	G	H
A								
Pearson Correlation	1	-	-	-	-	-	-	-
Sig. (2-tailed)								
B								
Pearson Correlation	.08	1	-	-	-	-	-	-
Sig. (2-tailed)	.75							
C								
Pearson Correlation	.06	.36	1	-	-	-	-	-
Sig. (2-tailed)	.80	.11						
D								
Pearson Correlation	.09	.12	.41	1	-	-	-	-
Sig. (2-tailed)	.69	.61	.07					
E								
Pearson Correlation	-.03	.12	-.02	-.39	1	-	-	-
Sig. (2-tailed)	.91	.61	.94	.08				
F								
Pearson Correlation	.68**	.26	.36	.04	.08	1	-	-
Sig. (2-tailed)	.00	.26	.11	.88	.74			
G								
Pearson Correlation	-.26	.10	.07	.33	.05	-.38	1	-
Sig. (2-tailed)	.25	.66	.77	.14	.82	.09		
H								
Pearson Correlation	.07	.03	.01	-.03	.01	-.10	.37	1
Sig. (2-tailed)	.77	.91	.98	.89	.96	.67	.10	

Note: A= Repetitiveness, B= Rate, C= Punctuation, D= Range of Motion, E= Proximity, F= Complexity, G= Enthusiasm, H= Interactiveness.
**$p<.05$.

CHAPTER FOUR

Discussion

4.1 Summary of Findings and Explanations

The purpose of the present study was to explore whether fathers modify their behaviour when interacting with their infants in a fashion which may teach their child how to act on objects in their environment and facilitate their understanding of intentional action. Because such a modification in action has been previously witnessed in mothers, it was also of interest to examine whether fathers' infant-directed action differs from mothers' infant-directed action. Consistent with the hypothesis and previous research (Brand, Baldwin, and Ashburn, 2002), when demonstrating to their child versus another adult how a novel object works, mothers incorporated a variety of modifications into their actions. When interacting with their infants, mothers demonstrated the objects in closer proximity to their infant compared to an adult partner. Mothers' actions were also more repetitive and consisted of a wider range of motion. Lastly, mothers' demonstrations were more enthusiastic and interactive when the partner was their child. There was no difference between mothers' infant-directed and adult-directed action in terms of how fast the objects were demonstrated, or how complex and punctuated their actions were. Similarly, Brand, Baldwin, and Ashburn (2002) failed to find a difference between infant- and adult-directed action on measures of rate and punctuation. These comparable findings could be attributed to the implementation of a similar experimental methodology and an identical rating scale which may have not been sensitive enough to detect differences on these features. Additionally, the rating scales for rate and complexity were altered to include only three points to accommodate the coders' inability to reach inter-rater reliability on these measures. Despite facilitating the coders' accurateness in discerning between points on these scales, this alteration resulted in a rating scale which was even less capable of detecting differences on these action features. Alternatively, a difference between infant and adult partners on the rate and complexity action features may have not existed in this instance. Mothers were frequently observed incorporating an assortment of different object manipulations into the demonstration while quickly switching from one action to the next to capture and maintain their child's interest in the activity.

Despite the finding that fathers modify their speech by making their utterances more simple, repetitive, slower in tempo, and higher in pitch when interacting with their infants (Papousek, Papousek, and Haekel, 1987) and only partially supporting the predicted outcome, in the present study fathers modified their behaviour on only a few of the action features. When demonstrating the objects to their infant versus another adult, fathers did so in closer proximity to their child. Their demonstrations were also more interactive and slower. There was no difference between infant and adult partners on measures of repetitiveness, range of motion, complexity, or punctuation. Interestingly, fathers were rated as more enthusiastic when interacting with their child if it was a female rather than a male. In the context of gender role socialization, this finding is not surprising. Society has a prescribed set of rules dictating appropriate male and female behaviour and a child's earliest experience with gender stereotyping comes from their parents (Lauer & Lauer, 1991). Through various interactions, activities, encouragements, and opportunities, children are taught from an early age what it means to be male or female. Typically, women are socialized to believe that emotional expressiveness is one of the many gender appropriate characteristics expected from them, while masculinity is associated with impassivity and sternness. Corresponding to this bias, the fathers in this study were more likely to smile, laugh, and express delight towards the objects when interacting with their daughters compared to their sons. Fathers are more likely to reinforce gender stereotypes in their children (Fagot, 1978; Langlois & Downs, 1980) suggesting why this pattern was not observed in mothers. Furthermore, Mussen and Rutherford (1963) observed that first-grade girls who were classified as feminine-oriented were more likely to have fathers who actively encouraged them to participate in sex-typed activities.

Father's object manipulations directed at their infants were slower than those directed at another adult. As stated previously, mothers did not incorporate this modification into their demonstrations, who likely adopted a faster pace in order to maintain their child's attention. This difference is consistent with the finding that fathers are more successful that mothers in engaging their child during play (Clarke-Stewart, 1978). Fathers also expressed similar frequencies of repetitions in their infant- and adult-directed actions, while mothers made use of more repetitions with their infants than with another adult. Mothers are also more likely than fathers to use repetitious speech when interacting with their infants (Kruper and Uzgiris, 1987), suggesting that this difference in redundancy of behaviours may span different modalities.

Fathers may have modified their actions on a fewer number of the features compared to mothers when interacting with their infant versus another adult for a variety of reasons. The methodology employed in this study was likely not a contributing factor to this difference. The procedures adapted were almost identical to those developed by Brand, Baldwin, and Ashburn (2002), and the near replication of these authors' findings with the mothers' data in the current study augments this assertion. The disproportional lengths of time mothers and fathers spend interacting with their children may account for this finding. Concordant with previous research which states mothers spend more time with their children than fathers do (Rebelsky and Hanks, 1971; Yeung et al., 2001), all mothers and only two of the fathers in the present study were primary care-givers to their children. This may have produced disparate levels of comfort and familiarity each parent had with their child, as well as varying expectations about their child's behaviour. Mothers' frequent interactions with their infants may allow them the advantage of being more attuned to their child's developing understanding of the world around them, resulting in a set of action modifications which may facilitate this understanding. Interestingly, fathers who spend few hours at home and a low proportion of time interacting with their children still incorporate modifications into their infant-directed speech (Golinkoff & Ames, 1979; Hummel, 1982; Papousek, Papousek, & Haekel, 1987). Perhaps the tendency to modify one's speech around young children is biologically programmed, as suggested by Jacobson, Boersma, Fields, and Olson (1983) who discovered that even non-parents who have little experience with children speak in motherese. Motionese, on the other hand, might be more dependent on experience, an assertion which requires a replication of this study with fathers who are primary-caregivers to their children or who have more than one child. Evidence also indicates that the verbal input toddlers receive from their fathers is more diverse and cognitively demanding than that which they receive from their mothers, who are more likely to adjust their speech to the child's linguistic ability (Masur & Gleason, 1980; McLaughlin, White, McDevitt, & Raskin, 1983). Perhaps this pattern of differential input has roots in infancy and permeates modalities other than language, suggesting that fathers' failure to modify their actions places more demands on the child and creates a challenging learning environment. It is also possible that the list of action features investigated in the current study is not exhaustive and an unexamined repertoire of features exists along which fathers do in fact modify their actions. It is important to note that several fathers expressed their concern regarding the form in which the interaction took place. They claimed that they rarely interact with their infant in the structured manner required by the experiment and would have felt more comfortable in a less confined setting such as sitting with their child on the floor. In turn, the actions exhibited by fathers may have been different if they were given the opportunity to carry out the demonstration in a context reflective of how they typically interact with their children. Furthermore, the impact of the infants' age must be considered, as infants who interacted with their fathers were about four weeks younger than the infants who interacted with their mothers. It could be argued that the infants in the latter group have an additional month of experience acting on objects and interacting with others, contributing to a more fruitful mother-infant interaction. However, Brand, Baldwin, and Ashburn (2002) found that mothers modified their actions while demonstrating to infants as young as 6 months, indicating that motionese is possible with infants who are months from reaching the milestone of secondary intersubjectivity. On the other hand, because additional experience corresponds with a more sophisticated understanding of intentional action, mothers should have been less likely to modify their behaviour to accommodate their infants' expanding knowledge. Since this was not observed, this difference in age likely did not have a significant impact on the outcome of this study.

Despite the finding that mothers modified their infant-directed action on more features than fathers did, directly comparing mothers' and fathers' infant- and adult-directed action revealed only a few differences. This is consistent with the finding that in general, more similarities than differences exist between maternal and paternal infant-directed speech (Kruper & Uzgiris, 1987; Papousek, Papousek, & Haekel, 1987). The difficulty in making connections between motionese and motherese comes from the fact that many of the aforementioned studies comparing mothers and fathers on their infant-directed speech do not actually test whether the speech analyzed differs significantly from adult-directed speech. The extent of the similarities and differences between mothers and fathers on their baby talk and the degree to which their speech has been modified cannot be accurately depicted unless it is compared to a baseline measure of speech. Mothers and fathers were similar on repetitiveness, rate, punctuation, range of motion, complexity, and interactiveness. However, fathers demonstrated the toys in much closer proximity to their children than mothers did. This may be a reflection of fathers' physically involving style of play (Clarke-Stewart, 1978; Dickson, Walker, &

Fogel, 1997; MacDonald & Parke, 1986). Since the set-up of the study prevented them from picking up their child, the close demonstration could have been their adaptation to the restraints of the interaction. Mothers, on the other hand, displayed higher levels of enthusiasm than fathers did. This is supported by the finding that mothers smile at (Parke, O'Leary, & West, 1972) and express positive affection toward (Belsky, Gilstrap, & Rovine, 1984) their infants more frequently than fathers do. Additionally, mothers may be adhering to cultural expectations of the feminine role.

Although no significant difference was found between mothers and fathers on demonstration length, both maternal and paternal toy demonstrations lasted somewhat longer when their partner was their child versus another adult. This is in contrast to Brand, Baldwin, and Ashburn's (2002) finding of the slight tendency for mothers to demonstrate the objects longer to their adult partner, who reasoned mother-infant interactions may have been cut short due to the infants' persistence in gaining possession of the object. This difference may be attributed to the design of the previous study, in which half the mothers interacted with an infant partner while the remainder interacted with an adult partner, likely resulting in mothers making an absolute judgment in terms of how long the interaction should last. In the present study, mothers and fathers interacted with both types of partners during the same session, perhaps allowing them to make a relative judgment regarding the length of the demonstration. Additionally, rather than ending the demonstration prematurely when their child seized control of the object, parents would simply look on as the infant independently explored the toys' properties. This is evidenced by the finding that in comparison to parent-adult demonstrations, parent-infant demonstrations were characterized by longer periods of time in which the partner was in possession of the object. Mothers and fathers allowed for similar intervals of independent object exploration when infants gained possession. Lastly, despite mother-infant interactions having longer bouts of joint contact on the objects relative to mother-adult interactions, the periods of joint contact found in father-infant versus father-adult interactions were substantially prolonged. Again, this may be a consequence of fathers' propensity to be physically involving in their play.

4.2 Contributions and Future Research

Fathers play an important role in infants' cognitive, social, and emotional development, offering them a unique source of stimulation (Ricks, 1985). Despite this assertion, most studies on infant development continue to examine mother-infant interactions. The current study extends previous research on infant-directed action, which has focused solely on mothers, by observing fathers and their contribution to the phenomenon of motionese. Unlike past research on parental modifications across the different modalities discussed, this study attempts to incorporate measures of infant temperament, family functioning, parenting style, and depression, all factors which may have a significant impact on parent-child interactions.

In sum, when directly comparing mothers' and fathers' infant-directed action to their adult-directed action, more similarities than differences exist. This suggests that infants have the opportunity to learn about human action and goal-directed behaviour from interactions beyond those experienced with their mothers. Future research should aim at exploring whether this finding persists across action features not addressed in the present study. Although few differences between mothers' and fathers' motionese may exist when adopting a global rating scale, a fine-grained analysis such as that utilized by Brand et al. (2007) may prove to be more sensitive in capturing subtle differences. Lastly, a replication in a less structured setting is necessary to deem these results generalizable.

REFERNCES

Arnold, D.S., O'Leary, S.G., Wolff, L.S., & Acker, M.M. (1993). The parenting scale: A measure of dysfunctional parenting in discipline situations. *Psychological Assessment, 5,* 137-144.

Baird, J.A., Baldwin, D.A., & Malle, B.F. (2000). Parsing the behavior stream: Evidence for the psychological primacy of intention boundaries. Manuscript, University of Oregon.

Baird, J.A., & Baldwin, D.A. (2001). Making sense of human behavior: Action parsing and intentional inference. In B.F. Malle, L.J. Moses, & D.A. Baldwin (Eds.), *Intentions and Intentionality: Foundations of Social Cognition* (pp. 193-206). Cambridge, MA: MIT Press.

Baird, J.A., & Moses, L.J. (2001). Do preschoolers appreciate that identical actions may be motivated by different intentions? *Journal of Cognition and Development, 2,* 413-448.

Baldwin, D.A., & Baird, J.A. (1999). Action Analysis: A gateway to intentional inference. In P. Rochat (Ed.), *Early Social Cognition: Understanding Others in the First Months of Life* (pp. 215-240). Hillsdale, NJ: Erlbaum.

Baldwin, D.A., Baird, J.A., Saylor, M.M., Clark, M.A. (2001). Infants parse dynamic action. *Child Development, 72,* 708-717.

Bekken, K. (1989). *Is there motherese in gesture?* Unpublished doctoral dissertation, The University of Chicago, Chicago, IL.

Beckwith, L., Howard, J., Espinosa, M., & Tyler, R. (1999). Psychopathology, mother-child interaction, and infant development: Substance abusing mothers and their offspring. *Development and Psychopathology, 11,* 715-725.

Belsky, J., Gilstrap, B., & Rovine, M. (1984). The Pennsylvania Infant and Family Development Project, I: Stability and change in mother-infant and father-infant interaction in a family setting at one, three, and nine months. *Child Development, 55,* 692-705.

Brand, R.J., Baldwin, D.A., & Ashburn, L.A. (2002). Evidence for 'motionese': modifications in mothers' infant-directed action. *Developmental Science, 5,* 72-83.

Brand, R.J., Shallcross, W.L., Sabatos, M.G., & Massie, K.P. (2007). Fine-grained analysis of motionese: eye gaze, object exchanges, and action units in infant-versus adult-directed action. *Infancy, 11,* 204-214.

Brand, R.J., & Shallcross, W.L. (2008). Infants prefer motionese to adult-directed action. *Developmental Science, 11,* 853-861.

Chomsky, N. (1967). Recent contributions to the theory of innate ideas. *Synthese, 17,* 2-11.

Chong, S.C.F., Werker, J.F., Russell, J.A., & Carroll, J.M. (2003). Three facial expressions mothers direct to their infants. *Infant and Child Development, 12,* 211-232.

Clarke-Stewart, K.L. (1978). And daddy makes three: The father's impact on mother and young child. *Child Development, 49,* 466-478.

Cooper, R.P., & Aslin, R.N. (1990). Preference for infant-directed speech in the first month after birth. *Child Development, 61,* 1584-1595.

Cooper, R.P., Abraham, J., Berman, S., & Staska, M. (1997). The development of infants' preference for motherese. *Infant Behavior and Development, 20,* 477-488.

Csibra, G., Biro, S., Koos, O., & Gergely, G. (2003). One-year-old infants use teleological representations of actions productively. *Cognitive Science, 27,* 111-133.

Das Eiden, R., Chavez, F., & Leonard, K.E. (1999). Parent-infant interactions among families with alcoholic fathers. *Development and Psychopathology, 11,* 745-762.

Dickson, K.L., Walker, H., & Fogel, A. (1997). The relationship between smile type and play type during parent-infant play. *Developmental Psychology, 33,* 925-933.

Epstein, N.B., Baldwin, L.M., & Bishop, D.S. (1983). The McMaster Family Assessment Device. *Journal of Marital and Family Therapy, 9,* 171-180.

Fagot, B.I. (1978). The influence of sex of child on parental reactions to toddler children. *Child Development, 49,* 459-465.

Feinfield, K., Lee, P.P., Flavell, E.R., Green, F.L., & Flavell, J.H. (1999). Young children's understanding of intention. *Cognitive Development, 14,* 463–486.

Ferguson, C.A. (1964). Baby talk in 6 languages. *American Anthropologist, 66,* 103-114.

Fernald, A. (1989). Intonation and communicative intent in mothers' speech to infants: Is the melody the message? *Child Development, 60,* 1497-1510.

Fernald, A. (1992). Human maternal vocalizations to infants as biologically relevant signals: An evolutionary perspective. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 391-428). New York: Oxford University Press.

Fernald, A. (1993). Approval and disapproval: infant responsiveness to vocal affect in familiar and unfamiliar languages. *Child Development, 64,* 657-674.

Fodor, J.A., & Bever, T.G. (1965). The psychological reality of linguistic segments. *Journal of Verbal Learning and verbal Behavior, 4,* 414-420.

Gergley, G., Nadasdy, Z., Csibra, G., & Biro, S. (1995). Taking the intentional stance at 12 months of age. *Cognition, 56,* 165-193.

Golinkoff, R.M., & Ames, G.J. (1979). A comparison of fathers' and mothers' speech with their young children. *Child Development, 50,* 28-32.

Greiser, D.L., & Kuhl, P.K. (1988). Maternal speech to infants in a tonal language: Support for universal prosodic features in motherese. *Developmental Psychology, 24,* 14-20.

Guajardo, J.J., & Woodward, A.L. (2004). Is agency skin deep? Surface attributes influence infants' sensitivity to goal-directed action. *Infancy, 6,* 361-384.

Harris, M. (1992). *Language experience and early language development.* Hove: Lawrence Earlbaum Associates Ltd.

Hummel, D.D. (1982). Syntactic and conversational characteristics of fathers' speech. *Journal of Psycholinguistic Research, 11,* 465-483.

Iverson, J.M., Capirci, O., Longobardi, E., & Caselli, M.C. (1999). Gesturing in mother-child interactions. *Cognitive Development, 14,* 57-75.

Jacobson, J.L., Boersma, D.C., Fields, R.B., & Olson, K.L. (1983). Paralinguistic features of adult speech to infants and small children. *Child Development, 54*, 436-442.

Joseph, R. M. (1998). Intention and knowledge in preschoolers' conception of pretend. *Child Development, 69,* 966–980.

Joseph, R. M., & Tager-Flusberg, H. (1999). Preschool children's understanding of the desire and knowledge constraints on intended action. *British Journal of Developmental Psychology, 17,* 221–243.

Kaitz, M., & Maytal, H. (2005). Interactions between anxious mothers and their infants: An integration of theory and research findings. *Infant Mental Health Journal, 26,* 570-597.

Kruper, J.C., & Uzgiris, I.C. (1987). Fathers' and mothers' speech to young infants. *Journal of Psycholinguistic Research, 16,* 597-614.

Kuhl, P.L., Andruski, J.E., Chistovich, I.A., Chistovich, L.A., Kozhevnikova, E.V., Ryskina, V.L., Stolyarova, E.I., Sundberg, U., & Lacerda, F. (1997). Cross-language analysis of phonetic units in language addressed to infants. *Science, 277,* 684-686.

Kuhlmeier, V., Wynn, K., & Bloom, P. (2003). Attribution of dispositional states by 12-month-olds. *Psychological Science, 14,* 402-408.

Lamb, M.E. (1977). Father-infant and mother-infant interaction in the first year of life. *Child Development, 48,* 167-181.

Lamb, M.E., Frodi, A.M., Hwang, C., & Frodi, M.E. (1983). Interobserver and test-retest reliability of Rothbart's Infant Behavior Questionnaire. *Scandinavian Journal of Psychology, 24,* 153-156.

Langlois, J.H., & Downs, A.C. (1980). Mothers, fathers, and peers as socialization agents of sex-typed play behaviors in young children. *Child Development, 51,* 1237-1247.

Lauer, R.H., & Lauer, J.C. (1991). *Marriage and Family. The Quest for Intimacy.* Dubuque: Wm. C. Brown Publishers.

Lerner, R.M., Lerner, J.V., Windle, M., Hooker, K., Lenerz, K., & East, P.L. (1986). Children and adolescents in their contexts: Tests of a goodness of fit model. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities, and challenges* (pp. 99-114). New Jersey: Lawrence Erlbaum Associates, Publishers.

MacDonald, K., & Parke, R.D. (1986). Parent-child physical play: The effects of sex and age of children and parents. *Sex Roles, 15,* 367-378.

Malle, B.F., & Knobe, J. (1997). The folk concept of intentionality. *Journal of Experimental Social Psychology, 33, 101-121.*

Masataka, N. (1996). Perception of motherese in a signed language by 6-month-old deaf infants. *Developmental Psychology, 32,* 874-879.

Masataka, N. (1998). Perception of motherese in Japanese sign language by 6-month-old hearing infants. *Developmental Psychology, 34,* 241-246.

Masur, E.F., & Gleason, J.B. (1980). Parent-child interaction and the acquisition of lexical information during play. *Developmental Psychology, 16,* 404-409.

Maye, J., Werker, J.F., & Gerken, A. (2002). Infant sensitivity to distributional information can affect phonetic discrimination. *Cognition, 82,* 101-111.

McLaughlin, B., White, D., McDevitt, T., & Raskin, R. (1983). Mothers' and fathers' speech to their young children: similar or different? *Journal of Child Language, 10,* 245-252.

Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of post-natal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development, 67,* 2512-2526.

Mussen, P., & Rutherford, E. (1963). Parent-child relations and parental personality in relation to young children's sex-role preferences. *Child Development, 34,* 589-607.

Newtson, D. (1973). Attribution and the unit of perception of ongoing behavior. *Journal of Personality and Social Psychology, 28,* 28-38.

Newtson, D., & Engquist, G. (1976). The perceptual organization of ongoing behavior. *Journal of Experimental Social Psychology, 12,* 436-450.

Newtson, D., Engquist, G., & Bois, J. (1977). The objective basis of behavior units. *Journal of Personality and Social Psychology, 35,* 847-862.

Papousek, M., Papousek, H., & Haekel, M. (1987). Didactic adjustments in fathers' and mothers' speech to their 3-month-old infants. *Journal of Psycholinguistic Research, 16,* 491-516.

Parke, R.D., O'Leary, S.E. & West, S. (1972). Mother- father-newborn interaction: Effects of maternal medication, labor and sex of infant. *Proceedings of the American Psychological Association,* 85-86.

Phillips, A.T., Wellman, H.M., & Spelke, E.S. (2002). Infants' ability to connect gaze and emotional expression to intentional action. *Cognition, 85,* 53-78.

Premack, D. (1990). The infant's theory of self-propelled objects. *Cognition, 36,* 1-16.

Radloff, S.L. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385-401.

Rebelsky, F., & Hanks, C. (1971). Fathers' verbal interaction with infants in the first three months of life. *Child Development, 42,* 63-68.

Ricks, S.S. (1985). Father-infant interactions: A review of empirical research. *Family Relations, 34,* 505-511.

Rock, A.M.L., Trainor, L.J., & Addison, T.L. (1999). Distinctive messages in infant-directed lullabies and play songs. *Developmental Psychology, 35,* 527-534.

Rothbart, M.K. (1981). Measurement of temperament in infancy. *Child Development, 52,* 569-578.

Saylor, M.M., Baldwin, D.A., Baird, J.A., & LaBounty, J. (2007). Infants' on-line segmentation of dynamic human action. *Journal of Cognition and Development, 8,* 113-128.

Sodian, B., & Theormer, C. (2004). Infants' understanding of looking, pointing, and reaching as cues to goal-directed action. *Journal of Cognition and Development, 5,* 289-316.

Sodian, B., Schoeppner, B., & Metz, U. (2004). Do infants apply the principle of rational action to human agents? *Infant Behavior and Development, 27,* 31-41.

Stevenson, M.B., Leavitt, L.A., Thompson, R.H., & Roach, M.A. (1988). A social relations model analysis of parent and child play. *Developmental Psychology, 24,* 101-108.

Thiessen, E.D., Hill, E.A., & Saffran, J.R. (2005). Infant directed speech facilitates word segmentation. *Infancy, 7,* 53-71.

Tomasello, M., (1994). On the interpersonal origins of self-concept. In Neissier, U. (Ed), *The perceived self: Ecological and interpersonal sources of self knowledge,* (pp. 174-184). New York: Cambridge University Press.

Tomasello, M. (1995). Language is not an instinct. *Cognitive Development, 10,* 131-156.

Trainor, L.J. (1996). Infant preferences for infant-directed versus non infant-directed playsongs and lullabies. *Infant Behavior and Development, 19,* 83-92.

Trainor, L.J., Clark, E.D., Huntley, A., & Adams, B. (1997). The acoustic basis of preferences for infant-directed singing. *Infant Behavior and Development, 20,* 383-396.

Trainor, L. J., & Zacharias, C. A. (1998). Infants prefer higher-pitched singing. *Infant Behavior and Development, 21,* 799-805.

Trainor, L.J., Austin, C.M., & Desjardins, R.N. (2000). Is infant-directed speech prosody a result of the vocal expression of emotion? *Psychological Science, 11,* 188-195.

Trainor, L.J., & Desjardins, R.N. (2002). Pitch characteristics of infant-directed speech affect infants' ability to discriminate vowels. *Psychonomic Bulletin and Review, 2,* 335-340.

Trevarthen, C. & Hubley, P. (1978). Secondary intersubjectivity: Confidence, confiding, and acts of meaning in the first year. In A. Lock (Ed.), *Action, gesture, symbol: The emergence of language* (pp. 183-229). London: Academic Press.

Wachs, T.D., & Gruen, G.E. (1982). *Early Experience and Human Development.* New York: Plenum Press.

Warren-Leubecker, A., & Bohannon, J.N., III. (1984). Intonation patterns in child-directed speech: Mother-father differences. *Child Development, 55,* 1379-I385.

Werker, J.F., Pons, F., Dietrich, C., Kajikawa, S., Fais, L., & Amano, S. (2007). Infant-directed speech supports phonetic category learning in English and Japanese. *Cognition, 103,* 147-162.

Woodward, A.L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition, 69,* 1-34.

Woodward, A.L., & Sommerville, J.A. (2000). 12-month-old infants interpret action in context. *Psychological Science, 11,* 73-77.

Woodward, A.L., & Guajardo, J.J (2002). Infants' understanding of the point gesture as an object-directed action. *Cognitive Development, 17,* 1061-1084.

Wynn, K. (1996). Infants' individuation and enumeration of actions. *Psychological Science, 7,* 164-169.

Yeung, W.J., Sandberg, J.F., Davis-Kean, P.E., & Hofferth, S.L. (2001). Children's time with fathers in intact families. *Journal of Marriage and Family, 63,* 136-154.