Chapter

# Pretend Play in Signing Chimpanzees (*Pan troglogytes*)[[1]](#footnote-1)\*

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## Abstract

Pretend play is well studied in human children and is thought to be associated with symbolic thought and theory of mind. There are many descriptions of pretend play in chimpanzees and other apes but few systematic studies. This study was a systematic sampling of videotapes for instances of pretend play in chimpanzees who have acquired American Sign Language. There were two sampling methods. The first sample of 17 hours 36 minutes and 26 seconds of videotape contained five instances of pretend play. The second sample of 50 hours 16 minutes and 41 seconds contained 16 instances. The instances fell into four different categories; substitution, attribution of function, animation, and insubstantial situation attribution.

## Defining Pretend Play

Over the years a great deal of interest in the behavior of play has culminated in numerous studies exploring the topic (Fagen, 1981; Fein, 1975, 1981; Gomendio, 1988; Iwaniuk, Pellis, & Nelson, 2001; Jensvold & Fouts, 1993; Lowe, 1975; Matthews, 1977; Mitchell, 1990, 2002; Nielson & Dissanayake, 2000; Pellegrini & Bjorklund, 2004; Pellegrini & Smith, 1998; Piaget, 1962). One form of play behavior is pretend play. A variety of terms are used interchangeably to describe this type of play behavior: make-believe play, fantasy play, dramatic play, imaginative play, representational play, simulative play, and symbolic play (Fein, 1981; Lowe, 1975; Mitchell, 1990; Piaget, 1962). Pretend play is an intriguing and fairly common behavior observed in human children.

Many researchers have described and defined pretend play (Lillard, 1993; McCune-Nicolich, 1981; Mitchell, 2002; Pellegrini & Bjorklund, 2004; Pellegrini & Smith, 1998). Lillard (1993) described pretend play as the intersection between play and pretense. She offered a useful definition of pretend play: “the projecting of a supposed situation onto an actual one, in the spirit of fun rather than for survival” (p. 349). Pellegrini and Smith (1998) recommended a more detailed definition of pretend play: “Fantasy involves an ‘as if . . .’ orientation to the world and involves actions, use of objects, and verbalizations with nonliteral meanings; often, it involves playing a distinct pretend role such as mummy, fireman, doctor” (p. 52). McCune-Nicolich (1981) offered a checklist of specific criteria commonly used to infer when a child is engaged in pretend play:

(1) inanimate objects are treated as animate (e.g., caretaking of a doll), (2) everyday activities are performed in the absence of the necessary materials (e.g., drink from an empty cup), (3) the child performs actions usually done by someone else (e.g., cooking, telephoning), (4) activities are not carried to their usual outcome (e.g., purse over arm, wave, but not go out), (5) one object is substituted for another (e.g., shell = cat), and (6) affective and instrumental behaviors by the child signal the nonliteral quality of the activity. (pp. 785-786)

McCune-Nicolich further described pretend play as a transformation of “activities from their real objectives and objects from their real counterparts” (p. 786). Matthews (1977) developed six categories of pretend play. These provided objective definitions that can be linked to observed behaviors and were used in this study.

## Pretend Play in Cognition

Lunzer (1959), McCune-Nicolich (1981) and Piaget (1962) described both pretend play and language as manifestations of symbolic thought since both involve active representations. Smith (1982) argued that the relationship between pretend play and language may actually be a causal relationship. Although there is a positive correlation between development of pretend play and development of language; children without language and children with language-impairments engage in pretend play (Casby & Ruder, 1983; Gregory, 1976; Terrell, Schwartz, Prelock, & Messick, 1984; Udwin & Yule, 1983). Recent theorists suggest pretend play is evidence of theory of mind since the child must take the perspective of another (Pellegrini & Bjorklund, 2004; Smith 2002, 2005; Veneziano, 2002).

There are many theories on the possible function(s) of pretend play (McGhee, 1979; Parker & Gibson, 1979; Pellegrini & Bjorklund, 2004; Piaget, 1962; Smith, 1982). Pellegrini and Bjorklund (2004) suggested that pretend play has an “immediate function of helping juveniles take the perspective of other players” (p. 29). Smith (1982) theorized that pretend activity “optimized the degree of complexity and goal-directedness of play behavior as functional practice for adult skills” (p. 152). Along the same lines, Parker and Gibson (1979) argued that pretend play is vital for the rehearsal of subsistence roles. Piaget’s (1962) observations that during pretend play young children often enact daily activities such as eating, preparing and serving food, and sleeping, support this argument. McGhee (1979) asserted a somewhat different function when he noted that in pretend play children could create a new and interesting set of circumstances by manipulating or rearranging some aspect of reality. Similarly, Piaget (1962) speculated that pretend play allows children to reproduce a modified version of reality for pleasure. It is doubtful that pretend play has just one specific function; more likely several exist (Bekoff, 1998; Fagen, 1981).

## Pretend Play in Non-human Primates

The existence of pretend play in non-human primates contributes to our understanding of this behavior in humans ontogenetically and phylogenetically. There are many descriptions of pretend play in chimpanzees (R. Gardner & Gardner, 1969, 1989; Goodall, 1986; Hayaki, 1985; Hayes, 1951; Sandel, 2010; Wrangham, 1995), bonobos (Lyn, Greenfield, & Savage-Rumbaugh, 2006), gorillas (Matevia, Patterson, & Hillix, 2002), and orangutans (Russon, 2002). Please see Gomez and Martin-Andrade (2005) for review.

While descriptions of pretend play are numerous, there are few systematic studies. Jensvold and Fouts (1993) studied pretend play in 5 signing chimpanzees. The researchers recorded the chimpanzees’ behavior with a remote videotaping technique. They put a variety of objects in the enclosure each day to simulate a playroom environment. Fifteen hours of behavior were recorded over a 3-week period. There were six instances of pretend play as defined by Matthews’ (1977) and were classified into two categories: animation and substitution. The definitions used in Matthews’ study are described in section 5.1.3 and   
Table 3.

Mignault (1985) compared the behavior of nursery-reared chimpanzees to that of human children when interacting with objects typical of their environment. The researcher watched videotapes of the chimpanzees’ behavior and classified the behaviors into one of three categories: activities without objects, interpretable activities with objects (the functional use of an object and “make-believe” play) and non-interpretable activities with objects (activities in which the subject used an object on him or herself, did not use an object on him or herself, and used more than one object). Interestingly, Mignault did not record the behaviors of brushing a doll’s hair and body and acting as if eating from a plate with a spoon handle as pretend play. She concluded that the chimpanzees did not exhibit pretend activity.

Lyn, Greenfield, & Savage-Rumbaugh (2006) examined the development of pretend play in chimpanzees and bonobos using archival videotape. They found 27 examples in both species representing all the developmental stages in the scheme.

The purpose of this study was to build upon Jensvold and Fouts’ (1993) pretend play research. While Jensvold and Fouts analyzed 15 hr of videotape recorded over a 3-week period, this study was a longitudinal analysis of more than 67 hr of videotape recorded over an 18-year period.

## General Method

### Overview

The were two studies to sample videotapes of chimpanzee behaviors for instances of pretend play. The participants were the same individuals in each study. An observer viewed videotapes for instances of pretend play and then classified those instances in both studies. The procedure to select and sample videotapes differed between the two studies. Study 2 ensured an equal sampling of videotapes between the years of the study. Both studies resulted in a descriptive analysis of the instances.

### Participants

The participants in this study were five chimpanzees (*Pan troglodytes*) who lived at the Chimpanzee and Human Communication Institute (CHCI) located at Central Washington University (CWU) in Ellensburg, WA. This community of chimpanzees comprised three females and two males. Table 1 contains biographical information for each chimpanzee. The chimpanzees had lived together at CWU since 1981.

Table 1. Biographical Information for Chimpanzee Participants

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Washoe | Moja | Tatu | Dar | Loulis |
| Birth date | 10/65 (est.) | 11/18/72 | 12/30/75 | 8/2/76 | 5/5/78 |
| U. of Nevada-Renoa | 1966-70 | 1972-79 | 1975-81 | 1976-81 | n/a |
| U. of Oklahomab | 1970-1980 | 1979-1980 | n/a | n/a | 1979-1980 |
| Central Wash. Uc | 1980-2007 | 1980-2002 | 1981-2013d | 1981-2012 | 1980-2013d |

a Cross-fostered, exposed to ASL only.

b Exposed to ASL and spoken English.

c Exposed to ASL and spoken English until 6/86; thereafter exposed primarily to ASL.

d Relocated to Fauna Foundation, Montreal, Quebec June, 2013.

Four of the five chimpanzees observed in this research, Washoe, Moja, Tatu and Dar, were raised like human children using an ethological technique called cross-fostering (R. Gardner & Gardner, 1989). The Gardners described this approach as follows:

Cross-fostering a chimpanzee is very different from keeping one in a home as a pet. Many people keep pets in their homes. They may treat their pets very well, and they may love them dearly, but they do not treat them like children. True cross-fostering – treating the chimpanzee infant like a human child in all respects, in all living arrangements, 24 hours a day every day of the year – requires a rigorous experimental regime that has rarely been attempted. (R. Gardner & Gardner, 1998, p. 292)

The cross-fosterlings drank from cups, ate at the table with silverware, dressed themselves, used a toilet and had the usual children’s toys (R. Gardner & Gardner, 1989).

In addition to being treated like children, the cross-fosterlings were immersed in American Sign Language (ASL). The cross-fostered chimpanzees learned the signs of ASL through modeling, much the same way human parents model speech and sign for human children. Human caregivers signed to each other and to the cross-fosterlings throughout the day and commented frequently on common objects and events in the environment (R. Gardner & Gardner, 1989).

As a young adult Washoe adopted 10-month-old Loulis, the fifth chimpanzee in this research. To determine whether Loulis would acquire signs without human intervention, all human signing, except for seven signs, WHO, WHAT, WHERE, WHICH, WANT, SIGN, and NAME, was prohibited in his presence. Loulis spent all of his time with Washoe and other signing chimpanzees. He began to sign in seven days and combined signs into phrases in five months. In the 5-year-period of signing restriction, Loulis learned 51 signs (Fouts, Hirsch, & Fouts, 1982; Fouts, Fouts, & Van Cantfort, 1989). Like the cross-fostered chimpanzees and human children, Loulis acquired his signs in a conversational setting and later he used his signs in conversations with human caregivers and with the other chimpanzees (Fouts & Fouts, 1989; Leitten, Jensvold, Fouts, & Wallin, 2010; Leeds & Jensvold, 2013; Jensvold, Wilding, & Schulze, 2014).

As adults the cross-fostered chimpanzees lived on the campus of CWU in Ellensburg. They continued to sign with caregivers in all interactions (Bodamer & Gardner, 2002; Jensvold & Gardner, 2000; Leitten et al. 2010), to each other (Fouts & Fouts, 1989; Jensvold et al., 2014; Leeds & Jensvold, 2013), and to themselves (Bodamer, Fouts, Fouts, & Jensvold, 1994). Activities in their daily lives included meals, games, and parties. At the time of this writing, the surviving chimpanzees, Tatu and Loulis, live at the Fauna Foundation in Carignan, Quebec, Canada.

### Facilities

From January 1, 1985 to May 6, 1993, the chimpanzees lived on the third floor of the Psychology Building on the campus of CWU. The chimpanzee area in this facility was 27.87 m2 and contained tunnels and enclosures. The chimpanzees had access to all of the enclosures at all times. From May 7, 1993 through the end of the study period the chimpanzees lived in CHCI building on the campus of CWU. The chimpanzee area at CHCI measured 587 m2, with 4,417 m2 of climbable surface area. It comprised four inter-connecting night enclosures, two large indoor areas, one large outdoor area, and human interaction areas. The indoor and outdoor areas contain climbing structures, cargo nets, tires, and platforms thus creating a complex environment. The chimpanzees had free access to these areas throughout the day. However, they were invited into their night enclosures for meals and nesting at night and did not normally have access to the other areas during this time.

The chimpanzees in this study, like children in pretend play research (Fein, 1975; Lowe, 1975; Matthews, 1977; Nielson & Dissanayake, 2000), had access to a variety of play materials each day. These included toys, stuffed animals, magazines, clothes, mirrors, containers, hoses, bags, purses, brushes, and coloring materials. Given that the videotapes were recorded over an 18-year period, there was a wide variety of play materials that the chimpanzees utilized. Most of the play materials were familiar to the chimpanzees; however, they also had novel items.

### Video Database

The chimpanzees’ caregivers recorded the database of videotapes used in this study. This video recording was part of the regular continuous record keeping. Camera operators recorded interesting chimpanzee behaviors and interactions, such as signing, tool use, play, fights, and grooming and all special events, such as holidays and birthday parties. The amount of recording on each videotape varied; some videotapes contained a full 2 hr and others had 2 min. Also, the amount of time that each chimpanzee appeared on each videotape varied. The database included 245 videotapes recorded between 1985-2002 (4 from 1985, 18 from 1986, 16 from 1987, 6 from 1988, 5 from 1989, 13 from 1990, 5 from 1991, 12 from 1992, 40 from 1993, 13 from 1994, 21 from 1995, 13 from 1996, 31 from 1997, 12 from 1998, 11 from 1999, 17 from 2000, 4 from 2001, and 4 from 2002).

## Study 1

### Method

#### Videotape Selection

An observer (T.E.), with 2 years of training and experience in chimpanzee behaviors and ASL, viewed videotapes for the presence of pretend play. In the first phase of study 1, T.E. viewed eight videotapes for pretend play. To randomly select videotapes, she assigned to each videotape a number between 1 and 245. She then selected eight videotapes with numbers that matched the first eight numbers on a random number list. T.E. then viewed the entire eight videotapes. This procedure meant that years of the study were randomly, but not equally, represented.

Table 2. Videotape Group Description and Number of Instances in Studies 1 and 2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | 1 | | 2 | | 3 | | 4 | |
| Years | 1985-1988 | | 1989-5/6/1993 | | 5/7/1993-1997 | | 1998-6/2/2002 | |
| Tape no. | 1-44 | | 45-87 | | 88-197 | | 198-245 | |
| Individual | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 |
| Washoe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Moja | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 2 |
| Tatu | 0 | 1 | 0 | 2 | 1 | 2 | 0 | 1 |
| Dar | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Loulis | 1 | 4 | 0 | 1 | 0 | 0 | 0 | 0 |
| Total | 1 | 6 | 0 | 3 | 2 | 3 | 2 | 4 |

Note. S1 is study 1 and S2 is study 2.

In the second phase of study 1 a different procedure of selection was used that ensured a more equal sampling of years. The database of videotapes was divided into four groups according to the year the videotapes were recorded each group representing roughly four years. The years each group included were: group 1 1985-1988; group 2 1989-May 6, 1993; group 3 May 7, 1993-1997; and group 4 1998-June 2, 2002. Table 2 contains information on each group of videotapes. Each videotape was assigned a unique number between 1-245. T.E. selected a videotape when its corresponding number appeared on a list of random numbers. Once a videotape from a group was selected, only videotapes from the remaining unselected groups were eligible for selection. She repeated this process until a videotape from each group was selected. Then she repeated the selection process. This selection process ensured an equal and random sampling from each group of videotapes. T.E. viewed only the first 15 min of each selected videotape. Seven of the videotapes were less than 15 min in length; therefore, they were viewed in their entirety. T.E. viewed 23 videotapes from each of the four groups using this method. She then calculated the total amount of viewing time for each group.

#### Locating Instances of Pretend Play

T.E. used six categories of pretend play as an operational definition of pretend play (Matthews, 1977) and they are described in Table 3. When T.E. observed an instance of pretend play she recorded the time on the videotape that it appeared and the name of the acting chimpanzee. She then made a detailed description of the behavior. The CHCI Behavioral Taxonomy (McCarthy, Jensvold, & Fouts, 2012) contains descriptions of chimpanzee behaviors and T. E. used this to describe the behaviors that she observed. She then recorded any sign glosses that occurred during the instance and notes on sign modulation. The gloss is the English word equivalent for a sign. She used the place, configuration, and movement (PCM) system (B. Gardner, Gardner, & Nichols, 1989) to identify sign glosses. B. Gardner and Gardner (1994) and Rimpau, Gardner, and Gardner (1986) described how cross-fosterlings inflected signs and phrases which included reiteration and changes in sign placement and T.E. noted sign modulation on reiterations or place changes. Transcriptions of signs in this article are written in capital letters followed by notes on modulation in parenthesis. A gloss followed by “x” indicates immediate reiteration of that sign.

#### Categorizing Instances of Pretend Play

Finally T.E. categorized the instance of pretend play. Table 4 contains descriptions and examples of Matthews’ six categories of pretend play. Matthews’ first category was substitution defined as “the attribution of an entirely new identity to a referent” (p. 214). Matthews’ second category was attribution of function defined as “the ascription of a functional property to a referent that does not actually possess that property” (p. 214). Matthews’ third category was animation defined as “the attribution of human or living characteristics or functions to an inanimate object” (p. 214). These three categories all incorporate materials that actually exist in the playroom situation.

The remaining three categories all share the characteristic of ideation and do not necessarily incorporate present materials. As Matthews’ described “the actual referent of the fantasy event is intangible…and exists only in the virtue of the child’s imaginative act” (p. 214). Matthews’ fourth category was insubstantial material attribution defined as “reference to materials that do not actually exist, at least not in the present playroom situation” (p. 214). Matthews’ example was a child sitting on the floor, tapping the carpet with a toy horn and exclaiming that the magic was clogged in the horn. In this case, the material that the child referred to, magic, did not exist. Matthews’ fifth category was insubstantial situation attribution defined as “reference to situational factors not actually existing in the context of

Table 3. Matthews’ Six Predominant Categories of Pretend Play

|  |  |  |  |
| --- | --- | --- | --- |
| Categories | Definition | Type | Example |
| Substitution | The attribution of an entirely new identity to a referent. | Material | A child placing a bag on his hand and calling it a glove. |
| Attribution of function | The ascription of a functional property to a referent that does not actually possess that property. | Material | A child using a toy stove and asking his or her parent, “Do you want your soup heated?” |
| Animation | The attribution of human or living characteristics or functions to an inanimate object. | Material | A child feeding her toy dog. |
| Insubstantial material attribution | Reference to materials that do not actually exist, at least not in the present playroom situation. | Ideational | A child exclaiming that magic was clogged in a toy horn. |
| Insubstantial situation attribution | Reference to situational factors not actually existing in the context of the playroom and play session. Also includes singing and rhyming for the present study. | Ideational | A child pounding on a cable spool with a hammer and announcing fireworks were going to occur. Or a child saying “A cat cat cat ate a rat rat rat.” |
| Character attribution | Portrayal of the qualities of a character by active representation. | Ideational | A child acting as if he or she were a police officer. |

Table 4. Number of Pretend Play Instances In Each Category for Studies 1 and 2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Substitution | | Attribution of Function | | Animation | | Insubstantial Material | | Insubstantial Situation | | Character Attribution | | Total | |
| Individual | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 |
| Washoe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Moja | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 |
| Tatu | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 5 | 0 | 0 | 1 | 6 |
| Dar | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Loulis | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| Total | 2 | 0 | 1 | 1 | 1 | 8 | 0 | 0 | 1 | 7 | 0 | 0 | 5 | 16 |

Note. S1 is study 1 and S2 is study 2.

the playroom and play session” (p. 214). For this study, this category also included the reiteration of signs and sign rhyming, as was included in Jensvold and Fouts’ (1993) research on pretend play in this same group. As they described:

Bodamer, et al.’s (1994) study of private signing in these chimpanzees provides examples of Insubstantial Situation Attribution. For example, Moja signed RED RED RED CRY CRY CRY FUNNYto herself as she lay down. Signs of ASL can bebroken down into components of the place where the sign occurs,the configuration of the hand, and the movement that occurs (B. Gardner, Gardner & Nichols, 1989; Stokoe, Casterline & Croneberg, 1965). When some aspects of these components are similar between signs it is analogous to spoken rhyming (Klima & Bellugi, 1979). The three signs in Moja's above instance of imagination rhyme in that the handshape (index finger extended from fist) and the movement (the tip of the index finger rubs down the place) are the same. The only difference between these signs is the place where they occur. Thus this instance is analogous to the alliterations often found in poems. The repetition of the signs also contributes to the instance's songlike quality as children are often observed repeating words to themselves in their songs. p. 223

Matthews’ sixth category was character attribution defined as “portrayal of the qualities of a character by active representation” (p. 214).

### Results

In 17 hr 36 min and 26 sec of videotape, Moja, Tatu, and Loulis together exhibited five instances of pretend play. The instances fit into four of Matthews’ categories: substitution, attribution of function, animation, and insubstantial situation attribution. Table 4 shows the frequency of each category for each chimpanzee. The instances appeared in videotape groups 1, 3, and 4. Table 2shows the number of instances in each group. Because the first phase of study 1 did not equally sample each group, there were no further analyses in this study. A brief description of each instance appears in Table 5.

## Study 2

### Method

#### Videotape Selection

As in study 1, T.E. viewed videotapes for the presence of pretend play. The procedure to select videotape was identical to the second phase of study 1. Once a videotape was selected from each group, T.E. viewed the entire tape for pretend play.T.E. viewed 11 videotapes from each of the four groups using this method. She then calculated the total observed minutes for each group. Then T.E. viewed additional videotapes from each group using the same random selection process, until an approximately equal number of minutes were viewed for each group of videotapes.

#### Reliability

An independent observer (J.K.), with 1 year of training and experience in chimpanzee behaviors and ASLindependently coded data to determine interobserver reliability for the presence or absence of pretend play instances. T.E. randomly selected five 2-min segments of videotape with pretend play instances and five 2-min segments without pretend play. For each segment, J.K. indicated the presence or absence of pretend play; reliability was 90%.

The second measure of reliability was for the categorization of pretend play instances. J.K. viewed five segments of videotape containing pretend play and categorized each instance into one of Matthews’ six categories. Reliability for the classification of each instance of pretend play was 100%.

Table 5. Brief description of instances in each category

|  |
| --- |
| **Animation** |
| S1 (8804M02) 1:02:42-1:06:22 |
| Loulis was pilo erect and displayed towards a box with pilo erect hair, panthooting. He repeated hits the box with brief pauses to eat lilacs. He also bits and hits the box while donning a playface. |
| S2 (8604M02) 56:27-57:04 |
| Loulis played with a blanket scooting on it, spreading it, hitting it while wearing a playface. |
| S2 (8601M04) 10:47-11:55 |
| Moja held a mirror and signed PEEKABOO five times during the session. The sign PEEKABOO covers the eyes. At times she parted her fingers or took her hand away from her face at the end of the sign. The sign PEEKABOO effectually is the game when looking in the mirror. |
| S2 (8701M05) 1:39:17-1:42:17 |
| Loulis played with a purse. Initially he bit and flailed it. This escalated to displays and hits toward it with a playface. |
| S2 (9304M08) 1:43:49-1:44:07 |
| Dar picks up a doll and kissed it. |
| S2 (9301M01) 22:52-24:35 |
| Loulis displayed toward a box and flailed and hit it. |
| S2 (8504M03) 52:47-53:06 |
| Tatu placed a mask on the floor in front of her. She signed THAT on the mask. She picked up the mask and kissed the mouth of the mask. She then signed THAT four times on the mask. |
| S2 (8701M06) no time code on Beta tape |
| Loulis had a shoe. She beat, bit, pressed, bent, and flailed the shoe while wearing a playface. |
| S2 (8701M06) no time code on Beta tape |
| Loulis had a purse. He beat and flailed it while wearing a playface. |
| **Attribution of Function** |
| S1 (9804M08) 4:36-5:01 |
| Moja picks up a toy camera holds it to her eye. She pressed the top button with her index finger. She looks at the camera operator. Then she held the camera to her eye. |
| S2 (9901M01) 0:00-6:23 |
| Moja lay down and held a telephone receiver to her ear while she moved her lips. She pressed her knuckles on the buttons on the phone base. This continued for the duration. She rearranged the receiver position to her ear and manipulated the phone cord. |
| **Substitution** |
| S1 (9403M01) 0:00-0:38 |
| Moja opened a purse and put it on her head. She looked around, then brushed her arm with a hairbrush while wearing the purse. The hat fell off her head. |
| S1 (9804M06) 1:52:01-1:55:25 |
| Moja has two linked plastic toy rings (the type used to hang infant toys). She placed one by separating the ends and clipping it on her right earlobe. She shook her head and touched the rings. She removed it and replaced it. Then she looked at herself in a small handheld mirror. She manipulated the ring with one hand while holding the mirror in the other and looked at herself. She then placed the link on her left earlobe and looked in the mirror. She removed the link and unlinked the two rings. She put a single ring on her right earlobe and looked at herself in the mirror. She removed the ring and put it on her left earlobe and looked in the mirror. She removed the ring and walked away. |
| **Insubstantial Situation Attribution** |
| S1 (9304M03) 13:59-15:58 |
| Tatu holds a red hat. She signs THAT with13 reiterations towards the hat. She put the hat on her hand and signed THAT with reiterations. She put the hat on her foot and signed THAT with reiterations and then THAT RED. |
| S2 (9901M01) 36:01-37:39 |
| Moja wore a dress with a flower pattern. She picked up a mirror and looked at her self throughout this session. She signed THAT (on the dress) FLOWER. She then manipulated the dress. She repeated the utterance THAT FLOWER 10 more times during the session. |
| S2 (9003M04) 8:14-8:53 |
| Tatu leaned over a mirror that was on the floor and looked at her image throughout this session. She signed THAT on the mirror, then touched her lips. She repeated this and made a playface. She blew her breath on the mirror then signed THAT five times and RED. Then she pulled on one ear then both ears while looking in the mirror. |
| S2 (9402M02) 0:00-1:36 |
| Tatu had a calendar. She signed THAT on the calendar and THAT BLACK 12 times during the session. The signs within the phrases were reiterated. |
| S2 (9300M01) 23:00-24:07 |
| Tatu looked at a magazine. She signed THAT (on the magazine). Then THAT BLACK. She repeated these signs throughout the session, at one point reiterating the sign THAT 12 times. |
| S2 (9204M04) 54:15-55:28 |
| Tatu had a large black plastic hair clip. She clipped it on her right foot and signed THAT BLACK on the clip and reiterated the signs. She looked in a mirror on the floor and reiterated the signs BLACK THAT on the clip. She reiterated these signs. Then she put the clip in her hair. |
| S2 (0001M01) 14:35-15:50 |
| Washoe interacted though glass with a caregiver who was in an observation area. Washoe signed to the caregiver HURRY GIMME. She then “tickled” the caregiver’s shoe through the glass. Washoe signed SHOE HURRY two times then HURRY GIMME SHOE and then “tickled” the shoe some more. |
| S2 (0001M01) 17:03-17:41 |
| Tatu interacted though glass with a caregiver who was in an observation area. The caregiver held a mask up to the glass. Tatu “hit” the mask and then toward the caregiver’s face repeatedly. Tatu signed THAT toward the mask. She “hit” the mask again. |

### Results

In 50 hr 16 min and 41 sec of videotape, all of the chimpanzees together exhibited 16 instances of pretend play. The instances fit into three of Matthews’ categories: animation, attribution of function, and insubstantial situation attribution. Table 4 shows the frequency of each category for each chimpanzee. The instances appeared in each videotape group.

Table 2shows the number of instances in each group. The amount of time analyzed for group 1 was 11 hr 10 min and 25 s, for group 2 was 11 hr and 59 s, for group 3 was 14 hr 16 min and 54 s and for group 4 was 13 hr 48 min and 23 s. The average frequency of pretend play instance per hr was 0.32. The frequency of pretend play instances per hr in group 1 was 0.54, in group 2 was 0.27, in group 3 was 0.21, and in group 4 was 0.29. A brief description of each instance appears in Table 5.

## Overall Discussion

In studies 1 and 2 the chimpanzees demonstrated pretend play, as defined by Matthews (1977), representing four of the six categories. The categories of pretend play observed in this study were substitution, attribution of function, animation, and insubstantial situation attribution. Neither character attribution nor insubstantial material attribution appeared in this sampling.

### Substitution

The two instances of substitution shared the criterion of reidentifying an object. An example of this was on videotape #9804M06.

1:52:01 Moja picked up two interlocked plastic rings with her right hand.

1:52:02 Moja separated the ring ends and placed one ring on her right earlobe.

1:52:11 Moja shook her head with the ring on her ear.

1:52:13 Moja manipulated the ring with her hand while it was on her ear.

1:52:27 Moja shook her head with the ring on her ear.

1:52:29 Moja manipulated the ring while it was on her ear.

1:52:52 Moja removed the ring from her ear.

1:52:55 Moja touched her right ear with her right hand.

1:53:02 Moja picked up the rings with her right hand.

1:53:05 Moja separated the ring ends and placed one ring on her right earlobe.

1:53:12 Moja removed the ring from her ear.

1:53:14 Moja separated the ring ends and placed one ring on her left earlobe.

1:53:20 Moja removed the ring from her ear.

1:53:23 Moja bit the ring.

1:54:21 Moja placed one ring on her right earlobe and looked in a mirror.

1:54:25 Moja manipulated the ring with her left hand while she wore it on her ear and looked in the mirror.

1:54:38 Moja removed the ring from her ear while she looked in the mirror.

1:54:41 Moja separated the ring ends and place one on her left earlobe while she looked in the mirror.

1:54:51 Moja removed the second ring from the first.

1:54:52 Moja placed the first ring on her right earlobe while she looked in the mirror.

1:54:58 Moja removed the ring from her right earlobe and placed it on her left earlobe while she looked in the mirror.

1:55:25 Moja set the ring and the mirror on the floor and quadrupedal walked away from them.

In the other instance of substitution Moja treated a purse as if it were a hat by opening it and wearing it on her head.

Some researchers have argued for an additional criterion in order to demonstrate “true” substitution (Lillard, 1993, p. 350; Mitchell, 2002, p. 9): that the individual knows and understands the conventional use of the object being reidentified. The chimpanzees in this community are aware of the conventional uses for many typical household objects due to the cross-fostering environment they grew up in and subsequent enrichment. They used household tools such as hammers and screwdrivers, and brooms. They observed humans using more “valuable” objects such as cameras and telephones. While the cross-fosterlings wore clothes they did not regularly wear jewelry, makeup, and hats, they did observe their human caregivers accessorize.

#### Attribution of Function

The two instances of attribution of function shared the criterion of ascribing a functional property to an object that did not actually possess that property. An example of this was on videotape #9901M01 and Figure 1 shows an image from the videotape.

0:00 Moja lay down with a toy telephone held to her ear.

0:03 Moja repeatedly moved her lips.

0:06 Moja pressed her knuckles on the telephone buttons.

0:09 Moja turned the telephone upside down and held it to her ear.

0:16 Moja bit the telephone.

0:52 Moja set the telephone down and pressed and bit the buttons.

1:20 Moja picked the telephone up and held it to her ear.

1:28 Moja pushed the telephone buttons with her thumb.

1:57 Moja held the telephone to her ear while she moved her lips repeatedly.

2:32 Moja repositioned the telephone on her ear.

3:37 Moja moved her lips repeatedly with the telephone to her ear.

3:48 Moja dropped the telephone.

3:50 Moja picked up the telephone and held it upside down to her ear.

4:00 Moja held the telephone right side up to her ear.

4:03 Moja pushed the telephone buttons with her left index finger.

4:19 Moja dropped the telephone.

4:21 Moja held the telephone to her ear.

4:54 Moja manipulated the telephone cord with her left hand.

4:58 Moja moved her lips while she held the telephone to her ear.

5:09 Moja manipulated the base of the telephone with her right hand.

5:14 Moja picked up the base of the telephone with the telephone still to her ear.

5:17 Moja moved her lips repeatedly with the telephone to her ear.

5:33 Moja set the telephone down.

5:37 Moja picked up the base of telephone and bit it.

5:55 Moja set the telephone down and pant hooted.

6:04 Moja picked up the telephone and held it to her ear.

6:23 Moja moved her lips repeatedly with the telephone to her ear.

In the second instance, Moja held a toy camera to her eye while she looked through the viewfinder and pressed the button with her right index finger as if to take a picture. Moja ascribed to the toy camera the functional property of a true camera.



Figure 1. Moja holds a telephone to her ear.

#### Animation

The nine instances of animation shared the criterion of attributing human or living characteristics to inanimate objects. An example of this was on videotape #9304M08.

1:43:56 Dar picked up a doll from the floor with his left hand.

1:43:58 Dar grabbed the doll with both of his hands.

1:43:59 Dar placed the doll’s mouth on his own mouth.

1:44:01 Dar moved his lips in a kissing motion on the doll’s mouth with his lips protruded from his mouth.

In the instances of animation Moja, Tatu, Dar and Loulis treated an inanimate object as if it were a living being through such actions as playing and signing peek-a-boo with a mirror, kissing a doll, biting, hitting or flailing shoes and purses while wearing a play face, or displaying mildly towards boxes. A playface is a behavior that clearly and consistently occurs in the social context of play (Goodall, 1986). When it accompanies these actions towards objects it indicates a playful use and suggest and interaction with the objects, indicating the animation of the object.

Animation was the most prevalent category in this study and is well reported in free-living chimpanzees. Wrangham (1995) described a male chimpanzee who played with a log for hours at a time. Wrangham wrote:

He carried it on his back, on his belly, in his groin, on his shoulders. He took it with him every time he moved. He carried it up four trees, and down again. He lay in his nest and held it above him like a mother with her baby. And he made a special nest that he didn’t use himself, except to put the log in. (p. 5)

Hayaki (1985) described a comparable situation in which an adolescent male chimpanzee played with a branch as if he were playing with a conspecific. It included slapping, wrestling, and biting branches while laughing. Sandel (2010) described free-living chimpanzees grooming, cradling, carrying, and copulation behaviors directed to a rock and dead civet.

Gorillas (Matevia, Patterson, & Hillix, 2002) and monkeys also have been reported to demonstrate animation. Breuggeman (1973) observing parental care in a group of free-ranging rhesus monkeys found that many monkeys in this group would press inanimate objects to their chests and “cuddle them.” Some of the inanimate objects the monkeys attributed living characteristics to included a styrofoam coffee cup, a small fruit juice can, a crumpled sheet of polyethylene plastic, and a piece of note paper. Koko, a gorilla reared in a highly enriched signing environment, displayed numerous instances of animation (Matevia, et al, 2002).

#### Insubstantial Situation Attribution

Finally, the eight instances of insubstantial situation attribution shared the criterion of referring to situational factors that were not present in the environment. Two instances of insubstantial situation attribution involved Washoe and Tatu acting like they were tickling a shoe and hitting a mask, respectively. However, neither situation actually occurred because there was glass separating the chimpanzee and the object in which with they interacted. Six of the eight instances incorporated songs, where there was a methodical repetition of one or more signs that gave the signing a songlike quality. An example of this was on videotape #9901M01.

36:01 Moja picked up a mirror and wore a flowered dress.

36:09 Moja manipulated the neck of the dress.

36:12 Moja looked in the mirror and signed THAT (toward the dress) FLOWER.

36:17 Moja held and the mirror with her right hand and manipulated the dress with her left hand.

36:23 Moja looked in the mirror and sign THAT (5x toward the dress) FLOWER.

36:33 Moja looked in the mirror and signed THAT (toward the dress).

36:35 Moja manipulated the dress.

36:39 Moja looked in the mirror signed THAT (toward the dress) FLOWER (2x).

36:46 Moja looked in the mirror and signed THAT (toward the dress) FLOWER.

36:50 Moja looked in the mirror and reiterated THAT (4x toward the dress) FLOWER.

36:55 Moja looked in the mirror.

36:56 Moja looked in the mirror signed THAT (2x toward the dress) FLOWER.

37:01 Moja signed THAT (toward the dress).

37:02 Moja manipulated the dress.

37:08 Moja looked in the mirror and signed THAT (toward the dress).

37:11 Moja smelled the dress.

37:17 Moja manipulated the dress.

37:25 Moja looked in the mirror and signed THAT (2x toward the dress) FLOWER.

37:31 Moja looked in the mirror and signed THAT (toward the dress) FLOWER.

37:39 Tatu climbed on Moja and invited her to play.

The repetition of the utterance and the reiteration of the signs contribute to the singsong quality of Moja’s interaction in the mirror. In the other five instances, Tatu reiterated the sign THAT and the utterance THAT BLACK numerous times while she pointed to hair clips and mirrors.

#### Character Attribution

One category of pretend play that did not appear in this sampling was character attribution. Fein (1981) defined social role enactment as “behavior in which the child simulates the identity or characteristics of another person” (p. 1101). This is equivalent to Matthews (1977) character attribution. Examples of character attribution appear across taxa. For example, a 2-year-old female rhesus followed her mother. The mother carried the infant brother in the ventral position. The daughter clasped a piece of coconut shell with one hand to her ventrum. When her mother stopped and lay on her side while resting one hand on her infant’s back, the daughter, just a couple of feet away, adopted the exact posture of her mother, and held the coconut shell to her ventrum (Breuggeman, 1973). The signing gorilla Koko described herself as an elephant adding that a hose was her nose (Matevia, et al, 2002, p. 297). A zoo living gorilla took the role of the human trainer by pretending to feed the trainer the reward with a spoon (Gomez & Martin-Andrade, 2002, p. 265). In addition, there are several cases of social role enactment in Indian Ocean bottlenose dolphins. For example a female bottlenose dolphin frequently imitated the behavior of a fur seal and the postures and swimming behavior of fish, turtles, and penguins (Tayler & Saayman, 1973).

Several authors have described imitating household routines as pretend play which could be classified as character attribution. Part of role playing includes activities that occur in the house (McCune-Nicolich, 1981; Mitchell, 2002; Gomez & Martin-Andrade, 2005). For example Gomez and Martin-Andrade (2005) described: “the partial, nonfunctional imitation of fragments of serious routines, such as cleaning or brushing with the appropriate implements corresponds to some early and simple manifestations of imaginative play in humans . . .” (p. 165). Young Washoe kissed, bathed, and fed her dolls, things that her caregivers did to her (R. Gardner & Gardner, 1969). Viki imitated her adoptive mother by “crudely copying my household routine--dusting, washing dishes, pushing the vacuum cleaner about” (Hayes, 1951, p. 181). In this study, numerous instances were found where the chimpanzees acted “as if” they were cleaning, similar to the daily cleaning routines of their human caregivers but they were not coded as pretend play. In addition, two instances were observed where Washoe blew her breath on a pair of sunglasses and then proceeded to use a piece of fabric to clean the sunglasses, again it was not coded as pretend play. The reason we did not include these was because these cases did not clearly fit into Matthews’ (1977) category of character attribution.

#### Insubstantial Material Attribution

Insubstantial material attribution was the second of Matthews’ (1977) pretend play categories that did not appear in this sampling. Yet cases of insubstantial material attribution are reported in other research (Goodall, 1986; Hayes, 1951). Perhaps the most famous example involves a home-reared chimpanzee named Viki. Hayes (1951) wrote:

Very slowly and deliberately she was marching around the toilet, trailing the fingertips of one hand on the floor. Now and then she paused, glanced back at the hand, and then resumed her progress. . . . I thought at first that she might merely be enjoying the vibrations from her fingertips . . . But gradually I remembered where I had seen her act this way. Viki was at the pulltoy stage when a child is forever trailing some toy on a string. . . . She trudged along just this busily on two feet and one hand, while the other arm extended backward this way to pull a toy. Viki had an imaginary pulltoy!

No sooner had I arrived at this amazing deduction than she interrupted the sport one day to turn and make a series of tugging motions. That is, they would have been called tugging had there been a rope to tug. . . . Eventually there was a little jerk and off she went again, trailing what to my mind could only be an imaginary pulltoy. (pp. 81-82)

Goodall (1986) described a young free-living chimpanzee:

Once a four-year-old Wunda watched intently from a safe distance as her mother, using a long stick, fished for fierce driver ants from a branch overhanging the nest.Presently Wunda picked a tiny twig, perched herself on alow branch of a sapling in the same attitude as her mother, and poked her little tool down--into an imaginary nest? (p. 591)

Also Lyn, et al. (2006) described bonobos eating pretend berries (p. 208).

While character attribution and insubstantial material attribution were not found in this study, they have been observed in other groups of apes. The evidence in the systematic reports and the anecdotal cases of pretend play show that chimpanzees engage in the same six categories of pretend play that occurred in Matthews’ research with children.

#### Rates of Occurrence

The frequency of pretend play throughout human development varies. Piaget (1962) argued that pretend activities first emerge during the second year of life, increase during the next several years, and then begin to decline; thus, forming an inverted U-shape pattern. Later research showed the frequency of pretend play relative to other forms of play ranged from 10% to 17% during the preschool years (Nicolich, 1977). During kindergarten years, this frequency increased to approximately 33% (Nicolich) and began to decrease in second grade as compared to the first grade (Eifermann, 1971). In study 2 the rate of pretend play instances decreased from group 1 to group 2 and from group 2 to group 3; however, it increased from group 3 to group 4. All of the chimpanzees in the videotape were well past the age that pretend play peaks in children which may explain the different patterns in this study. Instead this study may have detected the downward slope of the inverted U-shape pattern rather than the entire inverted U-shape pattern.

The overall frequency of pretend play was lower in this community of chimpanzees than in studies of human children. In Matthews’ (1977) study, the frequency of pretend play instances per hour per subject was 0.23. In this study, the frequency of pretend play instances per hour per subject was 0.064. In Jensvold and Fouts (1993) the rate for this same group was 0.08. In Lyn, et al. (2006) the rate per hour per subject was 0.05. There is a general consistency among chimpanzees and bonobos and they show a lower rate than children. In Matthews’ (1977) study the children were 4-year-olds and the chimpanzees in this study ranged from 6 to 24 years of age, a large difference particularly since pretend play begins to decline at about age 6. A comparison with younger chimpanzees might reveal more similar rates. Also many of the videotapes selected in this study consisted of parties and forages, where the likelihood of pretend play was low due to the overriding theme of celebration. In support of this finding, McCune (1995) found that in children the frequency of pretend play is highly sensitive to contextual elements, and this is likely the case for nonhumans as well.Additionally cultural variations exist in the frequency of pretend play in human children (Pellegrini, Dupuis, & Smith, 2007).

#### Is Language Necessary?

Numerous examples of pretend play appear in free-living chimpanzees who have no exposure to human language (Goodall, 1986; Hayaki, 1985; Sandel, 2010; Wrangham, 1995) and captive chimpanzees, bonobos, and gorillas who do not use a human induced two way communication (Lyn, et al., 2006; Gomez & Martin-Andrade, 2002). Similarly, children without language and language-impaired children engage in pretend play (Casby & Ruder, 1983; Terrell, et al., 1984; Udwin & Yule, 1983). Yet some have argued that human intervention may be essential for nonhumans to be capable of pretend play (Gomez & Martin-Andrade, 2005; Roberts & Krause, 2002; Smith, 1982, Tomasello & Call, 1997). Perhaps these critics are responding to the large number of records of pretend play in signing and language trained apes as compared to free-living or other captive apes. Veneziano (2002) indicated that in children verbalization during play may make it easier for experimenters to understand or label a behavior as pretend.

For example in the case of a baby doll placed in a plastic container, if the child chooses to say ‘bath’ instead of, for example ‘baby’ or ‘here’, the child’s verbalization makes explicit and brings into focus a particular aspect of her intended pretense activity, an aspect which, to be understood, requires that the other makes the same meaning transformation as the child has imagined. (p. 61).

The same may be true for signing and language trained apes since researchers can use the symbols as a way to understand the situation. In eight of the 21 instances in this study the chimpanzees signed, this is 38% which is considerable. Instances with signs we in all but two of the instances of Insubstantial Situational Attribution. So sign language may increase the frequency of imaginary play, and certainly is essential for aspects of the ISA category. Yet language is not necessary. Additionally, there is more cultural overlap in terms of objects and routines between captive apes and their researchers than between free-living apes and their researchers. With a greater cultural overlap, more behaviors are recognizable to the researchers.

## Conclusion

This study systematically expanded Jensvold and Fouts’ (1993) early observations that the individuals in this community of chimpanzees demonstrate pretend play. Although there are instances of pretend play reported in nonhumans, many instances almost certainly go unnoticed due to either communication barriers (Takhvar & Smith, 1990) or double standards when labeling behavior as pretend play (Mitchell, 1990). The important conclusion in this study is that pretend play, which in children occurs at a low frequency relative to other forms of play (Fein, 1981), is demonstrated by non-human species. This study adds to the growing body of evidence of the occurrence of pretend play in chimpanzees, contrasting claims that pretend play exists only in the repertoire of human primates (Bering, 2001; Fagen, 1981; Rosenberg, 1990; Smith, 1982; Tomasello & Call, 1997).

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