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Imaginary Play In Chimpanzees (Pan troglodytes)

Imaginary Play was studied in a group of five signing chimpanzees and it was found that chimpanzees engage in imaginary play similar to that found in human children. Fifteen hours of remote videotapes were analyzed for instances of imaginary play. Behaviors were defined as imaginary play by meeting a predetermined criteria which allowed them to be classified into one of six different categories of imaginary play. Six instances of imaginary play were found and these were classified into the two categories of Animation and Substitution. Observations of imaginary play in other research with chimpanzees were discussed.

Imaginary play has been thoroughly examined in the human species (Griffiths, 1935; Groos, 1899; Lunzer, 1959; Matthews, 1977; Piaget, 1962; Sinclair, 1970; Singer, 1973) but it rarely has been studied in ther species. The logical comparative study of imaginary play should begin with chimpanzees because they are so similar to humans in regard to their behavioral, emotional (Goodall, 1986) and biological (King & Wilson, 1975) characteristics. The purpose of the present research was to systematically observe imaginary play in five chimpanzees who use the signs of American Sign Language (ASL) (Gardner & Gardner, 1971; 1978; 1984; 1989; Fouts, Hirsch, & Fouts, 1982; Fouts & Fouts, 1989; Fouts, Fouts, & Van Cantfort, 1989).

Matthews (1977) developed six behavioral categories that defined imaginary play. If a behavior fits the criterion of the categories in general, Matthews stated that: "All of these [categories] share the act of attributing to the situation, event, or materials certain properties other than those they actually possess" (*ibid*). This definition was used in the present study.

Researchers have speculated whether or not apes engage in imaginary play. Wolfe (1984) and Bickerton (1990) hold that imaginary play is a uniquely human behavior. Yet researchers who have studied primates have quite a different view. For example Yerkes and Yerkes (1929) have stated that "Evidences of creative imagination... may be observed in the playful activities of monkeys and apes" (p. 577). Groos (1898) saw make-believe as occurring in many species. He gave an example of a dog play biting and engaging in "mock combats". He also stated that: "If we could be certain that apes treat lifeless objects as dolls, this act would be in the foremost rank of illusion plays....But we cannot be sure of these things, for speech is wanting in these creatures" (p. 302).

There have been numerous observations of chimpanzees engaging in what has been described as imaginary play. Hayes (1952) made the following observation of their home reared chimpanzee, Viki:

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 her hand, and then resumed her progress... During the next couple of days Viki often played this new game, but now she paused frequently to make sure that I was not watching her...Viki was at the pulltoy stage when a child is forever trailing some toy on a string, when everything with a string attached becomes a pulltoy. Dragging wagons, shoes, dolls, or purses, her body assumed just this angle. She trudged along

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just this busily on two feet and one hand, while the other arm extended backward this way to pull the toy. Viki had an imaginary pulltoy! (p. 81).

Hayes (*ibid.*) described times when Viki acted as though the toy had gotten stuck on something and she tugged on the invisible string until it came undone as evinced by a little jerk and Viki continuing on her way. On one occasion Hayes (*ibid*) reported that Viki acted as if the toy had become stuck. Hayes (*ibid*) wrote "she sat down abruptly with her hands extended as if holding a taut cord. She looked up at my face in the mirror and then she called loudly, 'Mama! Mama!''' (pp. 82-3). Hayes pretended to unwrap the cord. Viki then tore off again in this same imaginary pulltoy position.

Savage-Rumbaugh and McDonald (1988) described imaginative play behavior in a bonobo chimpanzee, Kanzi, who uses symbols to communicate. They stated:

"Kanzi frequently pretends to hide invisible objects in piles of blankets or vegetation. Later he will take them out and pretend to eat them... Kanzi also engages the participation of others in the "invisible objects" games by giving them the pretend object and then watching to see what they do with it." (p. 232)

In our laboratory we have recorded behaviors that fit the description of imaginary play. For example Loulis was videotaped playing with a hose. He attacked the hose then sat back as if the hose were to take its turn. This sequence was repeated several times. In this videotape turn-taking behavior was evident. Turn-taking is an integral part of any interactive behavior. Turn-taking interactions normally occur with animate beings or machines that are operating according to a program. Loulis' behaviors toward the hose would then fall under the criterion for imaginary play as he was demonstrating turn-taking interactive behaviors toward a non-machine object. "[Young Washoe] was bathed regularly and according to a standard routine... during the 10th month of the project, she bathed dolls in the same way we usually bathed her" (Gardner & Gardner, 1969, p. 666).

McGhee (1979) and Smith (1982) stated that language is a necessary prerequisite for imaginary play. Thus far we have only presented examples of imaginary play in chimpanzees exposed to human language. However, the evidence from wild chimpanzees, who have had no human language exposure, indicates that imaginary play can exist without language as we know it. Indeed, as Gregory (1976) noted with evidence from deaf children, language need not be a prerequisite for imaginary play.

In regard to wild chimpanzees Goodall (1986) reported that a 4-year-old chimpanzee, Wanda, who had been watching her mother, who was perched on a branch above a termite hill, dip a stick into the insects' hole and pull it out loaded with termites. Wanda then picked up a small twig, perched herself on a sapling branch, and poked her stick in a downward direction. A similar instance of imaginary play is very common in human children using cups, saucers, pots, and toy stoves to pretend to prepare and serve a meal. In these instances a child uses adult tools to go through the motions of a common adult activity, be it pots for cooking or twigs for dipping, these are analogous behaviors.

Hayaki (1985) observed a young chimpanzee in the wild who played with branches as if playing with a friend; the chimpanzee wrestled and pelvic thrusted them while play-panting. These are play behaviors that are normally directed toward animates. In this case these behaviors were directed toward objects and this fits the description of imaginary play.

In this laboratory videotapes were analyzed for instances of chimpanzee private signing in two studies (Bodamer, Fouts, Fouts, & Abshire, 1991: Fouts, Fouts, Abshire, & Bodamer, 1991; Bodamer, 1987). These instances were classified into one of 11 categories developed by Furrow (1984). One of these categories was Imaginary. In the first study 4.4% (4) and in the second study 5% (17) of the total private utterances (458) were classified as Imaginary.

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Mignault (1985) examined the development of object manipulation in young chimpanzees with symbolic play being one type of object manipulation. In regard to symbolic play the author concluded that it was never observed during the experiments yet some behaviors were described that we would define as imaginary play. For example, two of the chimpanzees, Spock and Sophie, brushed the hair on a doll.

A very similar behavior to imaginary play is deception; both require behaviors directed toward something that is not there. There are many instances of deception reported in both monkeys and apes (Goodall, 1986; Davis, 1978; De Waal, 1989; Temerlin, 1975; Whiten & Byrne, 1988). Since this is a common behavior and so closely related to imaginary play, it should not be surprising that apes have been observed in imaginary play.

While there are many anecdotal instances of imaginary play, no study has systematically looked exclusively at this behavior in non-human species. The purpose of this research was to systematically observe and classify the imaginary play behavior of five signing chimpanzees using the criteria from a study of imaginary play in human children.

Method

Subjects

The subjects were five signing chimpanzees. At the time of the present study Washoe, a female, was 24 years old; Moja, a female, was 16 years old; Tatu, a female, was 13 years old; Dar, a male, was 12 years old; and Loulis, Washoe's adopted son, was 11 years old. Washoe, Moja, Dar, and Tatu were all cross-fostered (Gardner & Gardner, 1971; 1978; 1984; 1989; Gardner, Gardner, & Nichols. 1989) and acquired ASL in that environment. Loulis acquired his signs from the other chimpanzees (Fouts, Hirsch & Fouts, 1982; Fouts & Fouts, 1989; Fouts, Fouts & Van Cantfort. 1989; Fouts, Fouts & Schoenfeld, 1984). This group was housed in a compound at Central Washington University. Please See Table I for biographical information on each chimpanzee.

Procedure

The chimpanzees' behavior was recorded on black and white Beta videotapes using a remote videotaping technique (Fouts, 1984). Four mounted cameras were positioned in one of the chimpanzees' enclosures. The wire woven enclosure measured 2.13 meters wide by 3.35 meters long

	Washoe	Moja	Tatu	Dar	Loulis
Sex	female	female	female	male	male
D .O.B.	9/65	11/18/72	12/30/75	8/2/76	5/10/78
Cross-fostering/ASL immersion U of Nevada Reno	6/21/66	11/19/72	1/2/76	8/6/76	_
ASL exposure U of Oklahoma	8/70	12/79	—		3/24/79
Central Wash. U	9/80	9/80	5/81	5/81	9/80

TABLE I - Biographical Information for Each Chimpanzee

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by 2.18 meters high. Each camera was positioned to cover a different portion of the enclosure. Each covered more than one fourth of the enclosure with some overlap so that almost the entire enclosure was monitored. The cameras were connected to four monitors located in a separate recording room. While four cameras were used, only one scene was recorded onto the videotape. An observer watching the television monitors used a switching device to record the best scene from the four monitors. If more than one chimpanzee was in the enclosure, the observer was instructed to give first preference to the individual with an object and the next to the most active.

Fifteen hours of behavior were recorded over a three week period. Data was collected for one hour per day between 9 a.m. and 3 p.m. for 15 days, Monday through Friday. To insure equal distribution of morning and afternoon videotaping sessions, a schedule was developed using random selection without replacement of the morning or afternoon times. Eight sessions were in the morning and seven in the afternoon. Because the chimpanzees were free to leave the enclosure whenever they chose during the taping session, the possibility existed that it might take more than three hours to obtain the one hour of videotaped behaviors. The cameras were turned on only when at least one chimpanzee was present in the enclosure. If all the chimpanzees left the enclosure, the cameras were left on for 30 seconds and then if a chimpanzee did not enter the room, they were turned off.

The cameras were in place from 15 minutes to one hour before and after a taping session. By having the cameras outside the enclosure this extra time and by having no lights on the cameras, the chimpanzees had no indication that the cameras were on or that the recording session had begun. Objects were put in the enclosure each day to simulate a playroom environment. Ten objects or categories of objects were used: magazines, stuffed animals, plastic toys, purses or bags, clothes, brushes, crayons with paper, butcher paper, plastic mirrors, and pool hose. The chimpanzees had prior experience with these objects. Within the object categories the actual item introduced could be varied. For example, a different stuffed animal could be put in on different days. Some objects were not varied. For example, the same segment of pool hose was always used. Varying the objects within categories was one way of increasing novelty and variety. Each day only seven items from the ten possible categories were introduced. A schedule was written using random selection without replacement to insure that each category had equal exposure. This was also done to maintain variety and novelty. When the cameras were set up in the room no humans were allowed to interact with the chimpanzees, enter their enclosure areas, or the surrounding hallways. When the cameras were removed from the enclosure each day the normal daily routine was reestablished.

Analysis

The videotapes were analyzed for instances of imaginary play. The categories from Matthews (1977) were used to define and classify the instances of imaginary play. Please see Table II for a complete list of the categories and examples of them. For the present study any word play, rhymes, jokes, songs, or poetry were included in the category of Insubstantial Situational Attribution. These things make reference to situations not existing in the immediate environment. Furrow (1984) included these speech acts in the category of Imaginative in a study of private speech.

The amount of time each chimpanzee spent in the enclosure was calculated. Every ten minutes a one second sample was taken and scored for the presence or absence of each chimpanzee for all 15 hours of videotape.

Reliability

Inter-observer reliability for data analysis was obtained by having two independent observers, who had at least one year experience with the chimpanzees, analyze 10% of the data. Three measures were analyzed: identification of the individual chimpanzees, the behavior that occurred and the occurrence of any signs. Each measure was scored one time every minute. The percent agreement of the scores for each minute were calculated.

Inter-observer reliability for the occurrence of imaginary play was obtained by having three independent observers, who had at least one year experience with the chimpanzees, analyze thitteen one minute segments of chimpanzee behavior. Six of the segments contained instances of imaginary play. Each observer scored whether or not an instance of imaginary play occurred during each segment. Percent agreement was calculated.

Inter-observer reliability for the classification of instances of imaginary play was obtained by having an independent second observer, with at least one year experience with the chimpanzees, analyze all the video segments containing instances of imaginary play by the chimpanzees. The observer categorized each instance into one of Matthews' (1977) categories.

Results

Six instances of imaginary play were found in 15 hours of videotape. Each instance is described and classified in Appendix A. Washoe produced two of the instances, Dar produced three of the instances, and Moja produced one. Four instances were categorized as Animation and two as Substitution.

At least one instance of imaginary play occurred each week. Three of the instances occurred in the first week, one in the second, and two in the third. Instances of imaginary play occurred every day of the week except Friday. All of the instances occurred during the morning videotaping time. Within each data session, the instances were evenly distributed across the sessions. Three instances occurred in the first half and three occurred in the second half.

Name	Definition	Example Wooden block is put on head and called a hat	
Substitution	Object is given new identity		
Attribution of function	Object is given a functional property that it does not possess	A toy camera is used to take a picture	
Animation	An inanimate object is treated as though animate	Talking to a stuffed bear	
Insubstantial material attribution	Reference to materials that do not exist in the present situation	Picking up non-existent food from a plate and putting it to mouth	
Insubstantial situation attribution	Reference to a situation that is not actually occurring; word play, rhymes, jokes	A child announces he will have a birthday party	
Character attribution	Portrayal of qualities of a character	A child announces "I will be the nurse"	

TABLE II - Categories of Imaginary Play

Frequency of Imaginary Play

The number of instances per subject per hour was 0.32. This figure was obtained by dividing the total number of instances for each chimpanzee by the number of hours spent in Room 1. The average for all five chimpanzees was then found.

Time Analysis

The analysis of the amount of time each chimpanzee spent in Room 1 during the videotaping time showed that the two chimpanzees Washoe and Dar had the highest number of instances and spent the most time there. Washoe spent 58.1% and Dar spent 33.3% of the total time in Room 1. Moja and Tatu spent the least amount of time in Room 1 with Moja spending 8.6% and Tatu spending 7.6% of the total time. Loulis spent 26.7% of the total time in Room 1.

Reliability

Inter-observer reliability for the data analysis was 98% for the identification of the individual chimpanzee, 97% for identification of the behaviors, and 100% for the occurrence of signs. The total reliability for data analysis was 98%.

Inter-observer reliability for the occurrence of imaginary play was 90%. Inter-observer reliability for the categorization of instances of imaginary play was 100%.

Discussion

It was found in this study that imaginary play occurs in this group of chimpanzees. The instances that were observed fell into two categories, Animation and Substitution, of the six categories defined by Matthews (1977). Compared to studies with children, fewer categories were found in this study. This is probably because so few instances were observed during the course of the study. However, when other studies and observations by other researchers are taken into consideration, the number of categories in which chimpanzees have been observed to display instances of imaginary play increases from two to six.

The instances of imaginary play found in this study were classified into the categories of Animation and Substitution. The instances of Animation all share the criterion of ascribing living characteristics to an inanimate object. For example, the results show that Dar signed TICKLE to a stuffed bear and then positioned it between his body and the fence. Dar typically presses his own body against the fence in this same fashion when being tickled by a human companion. Using Matthews' (1977) criterion, Dar acted as if the bear had the ability to understand his request to tickle. In a similar instance, Dar held the stuffed bear in his pelvic pocket and signed PEEKABOO. This is a sign he uses when playing hide and seek with human companions. Again, using Matthews' (*ibid*) criterion, Dar acted as if the stuffed animal understood his requests. Washoe demonstrated a slightly different instance of Animation by using a natural chimpanzee killing gesture, the "hit away", on a stuffed animal. This gesture is usually used with live animals. When Washoe made the gesture she had a play face which also indicated the playfullness and nonliteral nature of her actions.

Two examples of Substitution were also found in the results. Both instances shared the criterion of an object being reidentified. In one instance Moja substituted a purse for a shoe. She did this by her actions; she treated the purse as if it was a shoe. In the other instance Washoe reidentified a brush as a book. Washoe often had been observed placing a book under her arm and holding it there which was the same action she used with the brush. Thus her actions and her signing of BOOK afterwards were indicative of her Substitution.

Cole and LaVoie (1985) and Field. Destafano, and Koewler (1982) studied imaginary play in children and their results were used in this study as a comparison for the chimpanzees' instances of imaginary play. Cole and LaVoie (*op cit*) looked at the distribution of categories demonstrated by children 2- to 6-years-old. They found Substitution was highest in 5-year-olds although there were no significant differences between any of the ages. Attribution of Function was highest in the 2- to 3-year-olds. Finally, there was no significant difference between age groups in the number of instances of Animation although 2- to 4-year-olds used it more often than 5- to 6-year-olds. Overall, the occurrence of this category was lower in frequency than Attribution of Function and Substitution. These three categories use an object as a referent and can be placed in a broad category of object fantasy play. The other three categories which are Insubstantial Material Attribution, Insubstantial Situation Attribution, and Character Attribution all have a "mental image which is not present to the senses" (Matthews, 1977, p. 214) as a referent and can be placed under a broad category of ideation fantasy play. Cole and LaVoie (1985) found that 2year-olds showed no ideation fantasy play. There was then a linear increase in frequency of ideation fantasy play across the older ages.

Field, Destafano, and Koewler (1982) found similar results to Cole and LaVoie's (1985) results in that object fantasy play was highest among 3 1/2-year-old children as compared to 2 1/ 2- and 4 1/2-year-olds. They also found that the frequency of ideation fantasy play increased linearly across the age groups. Both studies demonstrated that as the child grew older he or she developed an increased ability to remove the symbol from what it symbolizes.

In the present study, the instances of Animation and Substitution can be put into the broad category of object fantasy play. Two suppositions can be drawn from this: the first is that chimpanzees only engage in more concrete types of imaginary play (object fantasy play), and the second is that the low number (six) of instances found in this study was not a large enough sample to provide a full scope of chimpanzee imaginary play. An examination of other reports of imaginary play in chimpanzees reveals that chimpanzees do engage in other categories of imaginary play than just Animation and Substitution (Goodall, 1986; Savage-Rumbaugh & McDonald, 1988; Gardner & Gardner, 1985; Bodamer, Fouts, Fouts & Abshire, 1991; Fouts, Fouts, Abshire & Bodamer; 1991; Bodamer, 1987).

In our laboratory Washoe was observed to pick up a toothbrush, sign Hairbrush, and then brush her hair with it. This is an example of Attribution of Function in which the object is assigned a new functional property. Washoe ascribed the functional properties of a hairbrush to a toothbrush.

Bodamer, Fouts, Fouts & Abshire's (1991) study of private signing in these chimpanzees provides examples of Insubstantial Situation Attribution. For example, Moja signed RED RED RED CRY CRY CRY FUNNY to herself as she laid down. Signs of ASL can be broken down into components of the place where the sign occurs, the configuration of the hand, and the movement that occurs (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.

Bodamer, Fouts. Fouts. and Abshire (1991) also noted another instance of Insubstantial Situation Attribution from the private signing of Moja. She was observed to repeat the sign RED to herself. In this sign she altered the configuration; instead of the index finger extending from the

fist, the thumb was extended and rubbed down the lips. Klima and Bellugi (1979) stated that:

One method of playing on signs is to substitute one regular A.S.L. prime value for another, thus using elements of the linguistic code to create new sign forms. This occurs when a signer intentionally distorts a sign by substituting a value that adds a new dimension of meaning. (p. 324)

Moja played with the sign by altering its handshape. Again the repetition adds to the nonliteral quality of the instance. In another instance of Insubstantial Situation Attribution Dar was observed to sign Bird ten time to himself while looking around the room. The methodical repetition of the sign gives it a songlike quality. Word play, songs, or rhyming fall under the category of Insubstantial Situation Attribution which is an ideation type of fantasy play.

Numerous instances of Insubstantial Material Attribution exist in the observational research. This mode of transformation contains references to materials that do not exist in the present situation. When the chimpanzee, Viki, pulled an imaginary pulltoy (Hayes, 1952) she demonstrated this category. Viki acted as if she was playing with an object that did not exist. The observations of the bonobo chimpanzee, Kanzi (Savage-Rumbaugh & McDonald, 1988) eating objects that did not exist, and Goodall's (1986) observation of Wanda going through the motions of dipping a stick into a nonexistent termite mound also fits this category.

Finally, when Gardner and Gardner (1985) recorded young Washoe feeding and bathing her dolls she demonstrated Character Attribution. Washoe was portraying the qualities of her caretakers that usually fed and bathed her.

Examples for all six categories have been observed in chimpanzees. In comparison with studies of imaginary play in children the frequency of imaginary play is similar. In Matthews' (1977) study the number of instances per subject per hour was 0.23. For deaf children there were 0.74 instances per subject per hour (Abshire & Raymond, 1991). In the present study the average number of instances per subject per hour was 0.32.

Analysis of the amount of time each chimpanzee spent in the enclosure showed that Washoe and Dar spent a great deal of time in the room and Moja and Tatu spent very little time there. It is interesting to note that Washoe and Dar also had the most instances of imaginary play while Moja had a low number and Tatu had none. It is possible that Moja and Tatu were engaging in imaginary play in another area away from the cameras. A future study on imaginary play should have cameras in all of the chimpanzee enclosures so all instances would be recorded.

The results from this study as well as observations from other scientists demonstrated that chimpanzees engage in all categories of imaginary play as operationally defined by Matthews (1977) in studies of human children. This provides further evidence for a continuity between human and non-human primate species. It also suggests further cognitive similarities between these two species and provides clues as to the cognitive abilities of early humans.

Appendix A

Description and Classification of Instances of Imaginary Play ANIMATION 1-11-89

9:36:15 Dar played with a stuffed bear. He threw it from hand to hand, shook it, pulled on it, covered it with paper and then punched it through the paper.

9:37:20 Dar touched and repositioned the bear and the paper.

9:37:26 Dar signed TICKLE TICKLE on the bear while looking at it.

9:37:29 Dar repositioned pushing the bear between his shoulder and the fence.

9:37:33 Dar spun on his back keeping the bear pressed between his body and the fence.

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ANIMATION 1-11-89

9:43:58 Dar grasped a stuffed bear and manipulated it.

9:44:10 Dar looped the stocking hat on the bear through the fence.

9:45:32 Dar shook the bear. Dar pelvic pocketed the bear.

9:45:40 Dar oriented his face away from the bear and signed PEEKABOO.

SUBSTITUTION 1-12-89

9:27:53 Moja had a shoe on her left foot and put a purse on her right foot.

9:27:55 Moja groomed the purse with her mouth.

9:27:59 Moja took the purse off her foot and dropped it.

9:28:00 Moja signed SHOE as her face oriented toward the shoe.

9:28:01 Moja touched the shoe.

9:28:02 Moja signed SHOE.

9:28:03 Moja took the shoe off her right foot.

9:28:08 Moja put the purse on her right foot.

9:28:14 Moja took the purse off her foot.

9:28:15 Moja looked inside the purse.

9:28:34 Moja put the purse on her left foot.

9:28:37 Moja zipped the purse closed. Her mouth opened.

9:28:46 Moja zipped the purse closed further. Her mouth opened.

9:28:53 Moja took the purse off her foot.

ANIMATION 1-16-89

10:16:30 Dar grasped a puppet.

10:16:32 Dar pushed the puppet away. Dar signed TICKLE on the puppet.

10:16:33 Dar signed TICKLE on the puppet.

10:16:35 Dar looked away from the puppet.

SUBSTITUTION 1-23-89

9:33:04 Washoe had been playing and signing with papers and a brush. Washoe grasped the brush.

9:33:07 Washoe put the brush below her arm and held it against her body with her arm.

9:33:08 Washoe signed BOOK IN while looking at her hands.

ANIMATION 1-24-91

9:13:14 Washoe had been playing with papers and a stuffed bear. Washoe grabbed the papers and rubbed them on her head.

9:13:16 Washoe displayed a playface and hit away at the bear with her hand that was holding the papers.

9:13:19 Washoe repositioned the bear.

9:13:20 Washoe displayed a playface and hit away at the bear with the papers and her hand. 9:13:31 Washoe pushed the bear with the papers and her hand.

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