

Comparing the categorization and abstraction abilities of baboons and three-year-old children.

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Three-year-old children and adult baboons were tested on three categorization tasks of increasing levels of abstraction, based on Herrnstein's (1990) classification and ranging from functional categorization of objects to the use of identity relations between concepts.

The children were able to categorize objects into two different functional classes, foods vs. toys. They were also able to judge two physical objects as "same" or "different" (perceptual identity task). However, they were not able to solve a conceptual identity task, in which they had to sort on one hand pairs of different objects belonging to the same category (for example, an apple and a banana, or a doll and a ball), and on the other hand, pairs of objects belonging to different categories (for example, an apple and a doll). The conceptual identity task may require analogy abilities that seem to be not fully developed at 3 years of age.

Adult baboons were able to master the functional categorization and the perceptual identity task, and also, unlike the children, to use analogical abilities to perform the conceptual identity task. This is the first demonstration of conceptual identity in a monkey species, which suggests that these nonhuman primates possess the prerequisites for analogical reasoning, as has previously been reported in great apes.

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**Infants' understanding of televised images:
Can infants utilize information from TV in a real-world task?**

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In their everyday life, most infants are exposed to many hours of televised images. However, how infants understand images presented via television is still unknown. In the present research, we focused on infants' ability to utilize information seen on television and explored whether infants would use information presented via television to solve a non-search AB task (a hiding task) in the real world.

In Experiment 1, participants were eleven 10-month-olds. Six were assigned to the consistent condition, and 5 to the inconsistent. Participants were presented the cue and test events. In the cue event, presented to all infants via television, a blue hat and red one were placed side by side on the table, and a stuffed bear was placed in front of one of the hats. Then hands appeared, and lifted up both hats, and put them in front of their previous location, with the result that one of the hats hid the bear. Following this television presentation, infants were presented one of two test events in the real world. Infants in the consistent condition were presented the consistent event: its procedure was exactly the reverse of the cue event where the bear appeared from the hat which had hidden it in the cue event. Infants in the inconsistent condition were presented the inconsistent event same as the consistent event except that the bear appeared from the hat which hadn't hidden it. Infants' looking times were measured, and each infant's looking time for the test event was analyzed. Infants looked longer at the inconsistent event than at the consistent ($p < .05$). This suggests that these 10-month-olds expected the real world event to be consistent with the information that had been presented via TV.

In Experiment 2, a replication of Experiment 1, eight 6-month-olds, also looked longer at the inconsistent event ($p = .051$). The results suggest that 6- and 10-month-old infants can use information obtained via television to solve a non-search AB task.

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Speech: Nut-cracking in human and non human primates : comparative analysis of the nut-cracking movement in relation to the skill level – problematic, hypothesis and protocol

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Poster: Nut-cracking movement analysis in chimpanzees: a preliminary study

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Among primates, chimpanzee is the one who demonstrates the richest variety of tool use patterns. Among those, nut cracking appears as one of the most well known. Apart from the proximity with human tool use, nut-cracking is remarkable as it implies generally two tools (as compared with most of the other situations where only one tool is used). This activity is considered as the most complex animal technique because of the asymmetrical use of 2 detached objects (hammer and anvil) as tools. The chimpanzee's genetic proximity to human, on the one hand and the complexity of the nut-cracking action, on the other hand, make it an intermediate stage of the evolutive process to the human technical skills. To our knowledge, no quantitative analysis of the nut-cracking movement, that could inform on the level of the motor control involved, has been carried out . In addition, there are very few comparative studies on nut-cracking between human and non human primates and few studies on the tool use learning in human that could give insight into the complexity of the skill.

This research project proposes a comparative and developmental study of nut-cracking in human and non human primates, based on an analysis of the striking movement and of the strategy used to crack nuts. We hypothesise that the choice of the "ideal" tool depends on skill level of expertise. In other words, we hypothesis that only the subjects having a sufficient control of the movement are able to perceive and thus, to choose the best strategy, the ideal tools to make the task in an optimal way (affordance concept).

The preliminary results of a 3D analysis of nut-cracking movement in one captive chimpanzee, are presented in the poster and should allow evaluating if and how the chimpanzee adapts his movement to the type of nut and tools properties.

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**Study of a kind of self-control in lemurs (*Eulemur macaco* and
Eulemur fulvus).**

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Six brown lemurs and four black lemurs were presented with two stimulus arrays, namely 1 (array 1) and 4 (array 4) raisins. Under a reverse-reward contingency they received the array they did not choose. All subjects initially showed a strong preference for the larger array (array 4) but progressively developed an exclusive side preference bias that supplanted their preference for the larger array. When a "large-or-none" reward contingency was applied (i.e., no reward followed the choice of the larger array, but this array was given for the choice of the smaller array), six of the 10 subjects overcame their side preference bias and learned to select the smaller array. Thus, those subjects expressed a form of self-control already observed in simian primate species. These performances were maintained when the original reverse-reward contingency was rerun, and when novel array pairs were presented. Several months after the study, six subjects retained a significant preference for choosing the smaller of the two arrays. The present study demonstrates a form of self-control and also some numerical skills, as they were able to make quantity judgment, in two prosimian species.

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EFFECTS OF UNDERSTANDING OTHER'S MENTAL STATES ON MORAL JUDGMENT OF COMMISSION AND OMISSION

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Introduction: This study examines the relationship between understanding other's mental states and moral judgment of commission and omission. If we can understand other's mental states, we can judge whether he/she foresees outcomes and, thus, whether his/her action is bad.

Design: Four tasks were composed of two levels of mental states (1st-order and 2nd-order) × two behavior types (with and without behavior).

Methods: Participants were 182 elementary school children who were 7-, 9-, and 11-year-olds. All four tasks had two stories that were similar but differed in the protagonist's mental states. In Story 1 the protagonist could foresee the outcome, but in Story 2 the protagonist could not. Therefore, when participants judged the protagonist's action in Story 1 was worse than that in Story 2, they could recognize commission in the case of action with the core behavior and omission in the case of action without the core behavior. Two questions were asked: on the protagonist's mental state and on moral judgment.

Results: Seven-year-olds passed only 1st-order tasks in both questions, but 9- and 11-year-olds could also pass 2nd-order tasks. Behavior types did not differ under almost all conditions. Moreover, the two questions were correlated in all four tasks.

Conclusions: First, if we can understand other's mental states, we can judge whether his/her action is bad. Second, if we need to understand 2nd-order mental states, 7-year-olds cannot judge correctly. Third, 7-year-olds can already recognize commission and omission as being at the same level.

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Self-other Differentiation, Embarrassment, and Empathy in Toddlers

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Embarrassment and empathy are much social because embarrassment signals appeasement to others and empathy impels oneself to approach and help others. It is said that embarrassment and empathy develop when self-consciousness emerges. The preceding researches found that toddlers who could pass the mirror self-recognition task showed more embarrassment and empathy. But I think both of them are also necessary for some knowledge of others. Embarrassment is a feeling based on an appraisal that others feel something about one's self. Empathy is caused by an appraisal that others want one's self to do something. So I hypothesize that embarrassment and empathetic reactions are more elicited by toddlers who can represent others as an agent that has desires or feelings differentiated with one's own (self-other differentiation).

Children at 18-24 months were individually administered an elicited imitation task used to index self-other differentiation. Their embarrassment and empathetic reactions were obtained from parental report. Children who represented an animate replica as an agent that has desires differentiated with their own showed more empathetic reactions than those who failed to. In contrast to empathy, children who failed to do so showed more embarrassment. It was suggested that empathetic reactions were more elicited by children who could represent the agency of others at a more advanced level. But the result in embarrassment didn't support my hypothesis and presented some of suggestions.

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Intermodal arithmetical ability in human infants: 1 object plus 1 tone

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Recent studies using a violation-of-expectation task have demonstrated that preverbal infants are capable of discriminating between correct and incorrect outcomes of basic arithmetical operations analogous to addition and subtraction (e.g., Wynn, 1992). There is still debate, however, over whether their performance is based on any expectation of the arithmetical operations, or on a general perceptual tendency to prefer visually familiar and complex displays (e.g., Cohen & Marks, 2002). Here we provide new evidence that 5-month-old infants recognize basic arithmetical operations across sensory modalities. Using the violation-of-expectation task that eliminated the possibility of the familiarity and complexity preferences, infants were presented alternatively with two types of arithmetical events: the expected, correct outcomes of operations (1 object + 1 tone = 2 objects and 1 object + 2 tones = 3 objects) and the unexpected, incorrect ones (1 object + 2 tones = 2 objects and 1 object + 1 tone = 3 objects). Results showed that they looked significantly longer at the unexpected events than at the expected events, suggesting that infants are more likely to recognize basic arithmetic operations that bridges sensory modalities.

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Eighteen- through 22-month-old infants differentially imitate their mothers' actions

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This study explored infants' ability to discriminate between, and their tendency to re-enact, the accidental and intentional actions of their mothers. Twenty 18- through 22-months-olds watched their mothers performed a series of action on objects that made interesting results occur, but their actions seemed irrational and strange. There were five objects. For example, subjects watched their mothers illuminated a light by leaning forwards and touching its top with their forehead. There were two conditions; in one condition (the occupied condition), the subjects could see that their mothers' hands were occupied while the irrational action (e.g., holding a cloth-cover of the light), and in another condition (the free condition), their mothers' hands were free. Following each demonstration, infants were given a chance to make the result occur themselves in the same situation. Overall, after watching the irrational action, infants in the free condition re-enacted that action more frequently than infants in the occupied condition. Moreover, infants in the occupied condition showed stronger tendency to use primarily their hands to achieve the goals (e.g., switching on the light by touching its top by their hands) than infants in the free condition. These results suggest that infants before age of 2 years understand something about the intentions of other persons and their imitation of goal-directed actions involves evaluation of the rationality of the means. Furthermore, it was confirmed that, especially when infants witnessed their mothers intentionally, but not accidentally, act in funny ways, infants would prefer to imitate those actions.

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**Learning from other people's mistakes:
Could monkeys learn wisdom by the follies of others?**

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We investigated whether tufted capuchin monkeys (*Cebus paella*) would learn from people's mistakes. We prepared three transparent containers having the same appearance: one that could be opened from the lid, one that could be opened from the bottom, and one that could be opened in either way. Using each of the first two one-way containers, the subjects were first trained to open it by imitating the experimenter's action to obtain a piece of potato in it. After this training, using the third two-way container, the human trainer showed an unsuccessful action to the subjects. However, none of the subjects opened it by spontaneously correcting the demonstrator's unsuccessful action at a statistical significance. This result suggests that the capuchin monkeys may not learn from others' mistakes.

Key Words: tufted capuchin monkeys, social intelligence, social learning.

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Cross-Dimensional Object Recognition

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What is the impact of dimensionality on object recognition? My research focuses on the ability of nonhuman primates to equate three-dimensional objects with their two-dimensional depictions. Additionally, I am investigating whether nonhuman primates can utilize two-dimensional object depictions to gain information about their three-dimensional environment. My talk will review literature conducted in these areas with human children, adults, and nonhuman subjects. I plan to discuss an experiment conducted with capuchin monkeys that examined the influence of familiarity on the ability to recognize objects from novel viewpoints in two-dimensions. Two adult females served as subjects. After training with a MTS procedure on a touchscreen monitor, subjects were exposed to six objects in several familiarization sessions. Subjects were then tested for recognition from multiple perspectives on the touchscreen with both familiar and unfamiliar objects. Results suggest that nonhuman primates form viewpoint-independent representations of objects from single two-dimensional depictions. I will also discuss research that I am currently conducting with chimpanzees and capuchin monkeys. In this study, subjects haptically search a two-dimensional depiction of an object on a touchscreen for a hidden food item. Once the item is located in two-dimensions, subjects are presented with the depicted object in three-dimensions. I am seeking to determine whether nonhumans can equate these two experiences and therefore use information from two-dimensional displays to guide their actions in three-dimensional space.

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Cultural and Behavioral Origins of Teaching

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Receptivity and the drive to learn from others are the building blocks for long-term, academic success. We are interested in determining how and when children initiate the process of learning from others. Specifically, we are investigating when children begin to preferentially select adults with particular abilities when requesting for help in solving a problem. With this *request for help* paradigm, we hope to address how children develop the initiative to learn from others early in life and identify the impact this initiative has on learning in the preschool years across cultures. We hope to capture what might motivate children's requests for instructional help from other individuals.

A series of developmental studies on the initiative to learn from others early in life and across culture is presented and discussed.

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Development of face processing in infant chimpanzees
(*Pan troglodytes*)

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We present three experiments on developmental changes in the ability to process faces in three infant chimpanzees (*Pan troglodytes*). Firstly, we investigated the imitation of facial expressions from just after birth, following a testing procedure identical to that used for human neonates (Meltzoff & Moore, 1977). Results showed that chimpanzee neonates younger than one week of age were able to imitate human facial gestures.

Secondly, the ability of recognizing others' faces was investigated. We prepared photographs of the mother of each infant and an "average" chimpanzee face using computer-graphic technology. From four weeks of age, they showed a strong preference for the mother's face.

Thirdly, we studied gaze perception. We found that the infants aged 10 weeks preferred looking at the photographs of direct/open-gaze faces rather than the photographs of averted/closed faces. However, in the context of scrambled faces, they showed no difference in gaze discrimination between direct and averted gazes. Thus, gaze perception may be strongly influenced by the surrounding facial context.

Our findings suggest that there may be similarities in the ability of facial information processing in humans and chimpanzees in their early stages of life. We discuss an adaptive significance for this ability from an evolutionary perspective.

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Young children's memory for Agency

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The study aims to examine young children's ability to recognize their own and the other's Agent information. Children aged 3, 4, and 5 were introduced to the hide-and-find-toys game with an adult experimenter, and were later asked who contributed to the outcomes of the game event. Materials: For the game event, four stuffed toys were served as targets and each of them was hidden in the 4 out of the 6 identical containers. With each of the toys, small cards were also put into the containers. The 2 out of the 4 cards were marked by \circ , which means a winning card. The remaining were marked by \times , which means a losing card. Procedure: (1) In the game event, the adult and the child opened the containers in turn, for the purpose of finding the toys. If s/he found a toy with a winning card, s/he won the toy. If s/he found a toy with a losing card, s/he had to hand over the toy to the adult. (2) Following the game event, the children were shown the toys in order of those who won and were asked who had found the particular toys. Results and Conclusion: The 3-years-olds significantly claimed that they found all of the toys. The 4-year-olds significantly claimed that they won by themselves for the toys actually found by the adult. The result has shown that the outcome of the action distorted the 4-year-olds' Agent identification. The 6-year-olds could identify who contribute to the outcome. These results indicate that 3- and 4-year-olds have difficulty in recognizing their own and the other's Agent information. These findings have some implications for understanding young children's ability to recognize Agency.

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Advantage of dichromats over trichromats in discrimination of color-camouflaged stimuli

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Most mammals have dichromatic color vision. Among primates, humans, apes, Old World monkeys and one New World monkey (howler monkeys) have routine trichromatic color vision. Although the incidence of human inherited red/green color vision deficiencies reaches up to 7-8% of males in some populations, Old World monkeys and apes rarely have individuals of dichromatic or anomalous trichromatic color vision. In contrast to this, most New World monkeys exhibit a polymorphism of color vision: some animals are dichromatic, some trichromatic. It has been suggested that trichromatic color vision has evolved as a specialization for finding reddish fruits or young leaves among foliage. This hypothesis has been supported by some empirical studies and theoretical arguments. On the other hand, dichromats might be at an advantage in differentiating certain kinds of color-camouflage. The present experiment tested whether the advantage of dichromat exists by the discrimination task with the color-camouflaged stimuli. The subjects were capuchin monkeys (*Cebus apella*) (trichromat $n=1$; dichromat $n=2$) and crab-eating monkeys (*Macaca fascicularis*) (dichromat $n=1$; trichromat $n=2$). The dichromats could discriminate the stimuli but the trichromats could not. From this result, an advantage of dichromats was shown in the discrimination task with the color-camouflaged stimuli.

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Eye contact detection in children with autism

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- a) Background: Individuals with autism, who suffer from severe social, interpersonal and communicative difficulties, are known to have atypical pattern of mutual gaze behavior. However, cognitive or neural basis of such a deviant gaze behavior remains unknown.
- b) Aim: Current study investigated whether perceived eye contact affect gaze processing in children with and without autism.
- c) Method: Eleven children with high-functioning autism and 14 typically developed children participated in 3-item visual oddball task that involves a series of frequent stimuli (downward-looking face) in which two kinds of rare stimuli (face in direct or averted gaze) were inserted. Children were instructed to detect either of rare stimuli and press a corresponding button as soon as possible, ignoring the other rare stimuli. In addition, event-related potential (ERP) were recorded from Cz, T5 and T6.
- d) Results: Behaviorally, perceived eye contact of directed gaze facilitated detection in typically developed children, but gaze direction made no effect in children with autism. Electrophysiologically, in typically developed children, the peak amplitude of N2 component of ERP was larger at right hemisphere (T6) than at left hemisphere (T5). Moreover, it was larger when detecting direct gaze than when detecting averted gaze. In children with autism, however, neither such hemispheric difference nor sensitivity to perceived eye contact was found for peak amplitude of N2 component.
- e) Conclusion: Results suggest that perceived eye contact does not affect gaze processing in children with autism, which contrasts with typically developed children.

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The Development of Children's Lying Behaviour

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The scientific study of the development of lying began at the turn of the 20th century, when developmental psychology as a field of scientific research was just being established. Recently, after having neglected the topic for nearly half a century, researchers with diverse theoretical orientations and research purposes are showing a renewed interest in the development of lying in children. Many developmental psychologists have converged on the issue of the development of lying for both theoretical and practical reasons. Research on children and lying is a cross-cutting field of empirical inquiry that is related to diverse areas of research and practice including cognitive evolution and development, emotion and its development, social psychology, cross-cultural study, clinical and legal practice, and moral education. The aim of this talk will be to review and examine the current findings about children's lie-telling behaviour. Specifically, I will present studies that examine the development of lie-telling in children in different social situations and how successful they are at lying. Lying starts at 2- 3 years of age and develops rapidly. Children tell lies not only to benefit themselves but also to benefit others. First, evidence regarding children's lying in various contexts for different purposes will be examined. Children's lying to conceal their own transgressions and the transgression of others will be discussed as well as children's white lie-telling for prosocial reasons. Second, children's use of display rules to regulate their verbal and non-verbal behaviours while lying will be examined. Children's ability to maintain their lie in their facial expressions is important to avoid detection and lie successfully. Third, the relation between children's conceptual understanding of lies and their actual behaviour will be examined. These findings will be discussed in terms of their implications for future research and implications for diverse areas of psychological research.

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The “expertise eye” of archaeologists : Experts’ scanning patterns in observing pottery and their memory representation.

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Highly experienced archaeologists have an excellent cognitive skill of recognizing artifacts excavated from sites; they can categorize the artifacts exactly as well as quickly, memorize the characteristic features from a single glance, and retain them for a long term. I refer to what makes their good performances possible as the “expertise eye” of archaeologists. The purpose of this study is to understand the expertise eye by examining their scanning pattern in observing archaeological objects and their memory representation with a drawing method.

In Experiment 1, 25 people whose archaeological experience of beginner to advanced level, participated as subjects. They were asked to draw a full-scale picture of the prototype of Itazuke-I pottery, which is a very popular pottery style among Japanese archaeologists. Each drawing was analyzed with attribute analysis, principal component analysis, and quantification method of the 3rd type. As a result, (a) 2 kinds of attributes group were extracted from the drawings of higher experienced subjects; the one is low visibility group and the other is non-verbal group, (b) the drawings of higher experienced subjects were very similar each other, and they were similar to real pottery. These results show experienced archaeologists really have special knowledge representation and share it in the group.

In Experiment 2, 9 people whose archaeological experience of beginner to advanced level, and three novices participated as subjects. Their eye movements were monitored by eye camera (EMR model 8) while observing an archaeological pottery and an ordinary flower pot used as a control stimulus. Fixated location and eye movement patterns were analyzed quantitatively with ANOVA and principal component analysis. The results showed: a) experts fixated their eyes on general outline of the objects more than beginners and novices did and b) they had longer inter-fixation distance and shorter fixation duration than beginners and novices have. It was suggested that experts of archaeology pay stronger attention for morphological feature and proportional aspect, and have specific scanning pattern while observing objects than beginners and novices do.

Key words: experts, cognitive skill, scanning pattern

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**Behavioral development of agile gibbons:
The first five years after the birth**

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Gibbons stand between macaques and great apes in phylogeny. Research in the wild has demonstrated that gibbons have the social structure of a 'nuclear family'. Gibbons also sing long, elaborate songs for the defense of their own territory, and move in suspensory locomotion. These features suggest that gibbons have undergone a series of unique behavioral and morphological adaptations. In contrast to great apes, developmental studies of gibbons are very scarce. This study aims to understand gibbon's behaviors from developmental view. For this purpose, two agile gibbons (*Hylobates agilis*) have been observed from their birth: one is for five years and another one is for four years. We carried out the "participant observation" study for collecting data. The two gibbons whom the biological mother rejected to nurse were reared by the human care-taker (MU). We observed them for five hours per day on average and kept daily records about their tooth eruption, body weight, positional behavior, locomotion, object-manipulation, and vocalization in particular. The social contexts of these behaviors were also identified. We tried to clarify the cognitive and behavioral development of gibbons, and to put it in the comparative framework with the other primates. The results can be summarized as follows. Firstly, the body growth of gibbons is more similar to that of Japanese macaques than that of chimpanzees. Secondly, behavioral development in gibbons is in general slower than that in macaques but faster than that in chimpanzees. However there were some behaviors that had occurred in the later in gibbons than in chimpanzees and humans, such as the touch by the extended index finger and the orienting or combinatory manipulation. We did not find any evidence of tool use. We did not find the self-directed behavior in the mirror-self-recognition task. Finally, there were some unique behaviors developed in gibbons: brachiation, throw-and-catch behavior, song development. These behaviors seem to be all connected to the species-specific adaptation to their arboreal environment.

Key words: gibbon, growth, development, inter-species comparison

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