

## LETTER TO THE EDITOR

# Farsightedness (presbyopia) in a wild elderly chimpanzee: The first report

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Dear Editor,

The chimpanzee (*Pan troglodytes*) is one of four genera in the family Hominidae, which also includes humans, gorillas and orangutans. Approximately 340 chimpanzees live in captivity in Japan and of these, only two chimpanzees are estimated to be older than 50 years old while the chimpanzees in the wild live for approximately 50 years.<sup>1</sup> The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was ratified in 1980 in Japan, so the captive study of chimpanzee elders is limited. Important differences exist between chimpanzees raised in the wild and those raised in captivity. For example, chimpanzees born in the wild acquire social skills and knowledge from their mothers and the elder members of the community, while chimpanzees born in captivity and raised by humans do not have the ability to communicate well with other chimpanzees. As a result, chimpanzees raised by humans frequently abandon their babies when they become mothers. In that sense, it is very important for the chimpanzees to be grown up in a community with elder members. From the standpoint of research on the biology of human aging, it is important to observe aging in chimpanzees, who are the closest evolutionary relatives of humans, especially in a wild setting. Observing research on behavior of elderly chimpanzees in wild settings may be useful not only in the preservation of this endangered species but also in detecting geriatric syndrome in the chimpanzee related to that in human beings.

In the Bossou district in Guinea, West Africa, a group of 13 wild chimpanzees has been studied since 1976. Each individual in the group has been identified and

named, and its age has been confirmed or estimated. These chimpanzees coexist with humans in the primary and the secondary forests near the small hills surrounding the village of Bossou.<sup>2</sup> Bossou chimpanzees sometimes raid the farms and orchards to eat cultivated fruits. However, the chimpanzees have no predators in this area and they are not hunted by the villagers. Thanks to the long-term research, Bossou chimpanzees are fully habituated to humans and we have the record of each individual in the past four decades.<sup>2</sup> Six of these chimpanzees are estimated to be more than 40 years old, and three are believed to be at least 50 years old.

From 23–30 December 2008, we carried out the intensive observation focusing on the old female chimpanzee named Jire. She was estimated to be 50 years old. We did the focal animal sampling following the particular individuals at close range, from early morning till the time of sleeping in the beds in the tree, approximately 12 h a day. During the observation, we focused on the grooming behavior, a form of communication in chimpanzees.<sup>3</sup> In terms of the grooming skill, the eye–hand coordination is very important. We carried out a quantitative observational study of behaviors of the chimpanzee every 5 min. Nineteen grooming scenes of Jire were recorded among a total 862 records of her behavior, of which 104 were missed records.

Following the focal observation, we noticed that the female chimpanzee named Jire groomed her daughter Joya with her eyes focusing at a distance of 40–50 cm. This makes a clear contrast to the younger chimpanzee Foaf (aged 27 years) that groomed with his eyes focusing directly on and close to (10–20 cm) the grooming spot (Fig. 1). Distance estimation of grooming eye spot was measured by video-photo analysis. Other old chimpanzees aged approximately 50 years or over also groomed with their eyes focusing at a longer distance than younger ones. Because chimpanzees remove very small

*Author contributions:* all authors participated in the research in Bossou, Guinea in 2008–2009, and discussed the findings.



**Figure 1** Jire (~50 years old) kept her eyes focused at a longer distance (40–50 cm) with her arm extended while grooming her daughter Joya, on the other hand Foaf (28 years old) kept his eyes focused closely (10–20 cm) while grooming Jire.

insects like lice from fur during grooming, they typically focus their eyes closely.<sup>4</sup> The previous study reported that the visual acuity of the chimpanzee is approximately 1.5, comparable to humans.<sup>5</sup> Thus, we strongly suspected that the grooming behavior of the old chimpanzee must be a symptom of farsightedness (i.e. experienced presbyopia) like an elderly human.

Hearing disturbance<sup>6</sup> and chewing ability<sup>7</sup> are closely associated with lower activities of daily living and with lower quality of life in community-dwelling human elderly. Presbyopia is caused by a decline in the accommodation of the lens. Visual impairment in humans is associated with social isolation and increased risk of depression,<sup>8</sup> and presbyopia correction with an assistive device has been reported to improve human disability and depression.<sup>9</sup> The similarity of accommodative mechanisms between human and monkeys have been reported by some researchers in ophthalmokinetic examinations, but not in clinical or field-setting study.<sup>10</sup> Bito *et al.* has reported the use of the rhesus monkey as an animal model for presbyopia.<sup>11</sup> However, the underlying mechanisms of presbyopia development in monkeys are thought to differ from those of humans.<sup>12</sup> In monkeys, presbyopia is recognized only by examining lens thickness, intraocular pressure, accommodative amplitude and other ocular dimensions, but clinical or

field-setting symptoms remain unknown. Based on our observations, we believe that old chimpanzees must have developed presbyopia. This may be the first report of the observation of clinical presbyopia in chimpanzees in the wild. Although presbyopia in chimpanzees has only been observed to disrupt grooming behavior until now, the future study on the age-related physiological decline and dealing with a disabled state in chimpanzees may provide a clue for understanding human geriatrics and gerontology.

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