

Self-Identity on Dolphins

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Abstract— Only people are not concerned with the meaning of life. Dolphins also know who they are, where they come from and where they should go. They have a mind to look back on themselves now. They are also aware of the value of their family and play a role given to them to maintain the community. Humans have no right to deny even the fact that dolphins are self-recognition because they are the masters of civilization. Based on self-identity, dolphins look equally as human beings.

Keywords— Dolphins, Self-Recognition, Self-Identity.

I. INTRODUCTION

The creatures called dolphins have some images of everyone. There is an image that there are no legs, a dorsal fin, and a tail finding in a sleek body. There is a difference between dolphins and whales. But, most people could not distinguish dolphins and whales at a glance. The difference between dolphins and whales is simply a difference in size, conventionally calling dolphins, which are roughly less than 4 m in length, and whales as large ones. So it is not a scientific way of dividing. Scientifically, dolphins and whales are collectively referred to as "whales", an informal infraorder of Cetacea (John C. Lilly, 1975). Organisms are separated by the taxon; Kingdom, Phylum, Class, Order, Family, Genus and species. The two parvorders of whales, baleen whales (Mysticeti) and toothed whales (Odontoceti), are thought to have split apart around 34 million years ago. The whales comprise of eight extant families: Balaenopteridae (the rorquals), Balaenidae (right whales), Cetotheriidae (the pygmy right whale), Eschrichtiidae (the grey whale), Monodontidae (belugas and narwhals), Physeteridae (the sperm whale), Kogiidae (the dwarf and pygmy sperm whale), and Ziphiidae (the beaked whales) (John C. Lilly, 1975).

Dolphins living in the world underwater, completely different from Human. It has extraordinary swimming ability and diving ability and lives freely underwater while demonstrating the ability of echo location to explore surroundings by sound even in the dark. But dolphin is the same mammal as us, breathing lungs, giving birth in the water, breastfeeding children. As we are, it is becoming known that individuals have various relationships and build complex and diverse societies. By researching such a thing, it seems that humans will come to see in reverse. I want to continue my research thinking like this. In order to know the dolphin's self, we must first look at the dolphin's behavior. Dolphins also have a unique sound. They are communicating with each other by sound. So, many researchers are observing the sound of dolphins. Perhaps the sound and the animal's self are presumed to be deeply related. The sound of the whale when it feels good and the sound it gives when the mood is depressed are different in size and wavelength. By analyzing this in detail, we can find clues of the self-identity of dolphins.

II. SPECIES DISCRIMINATION

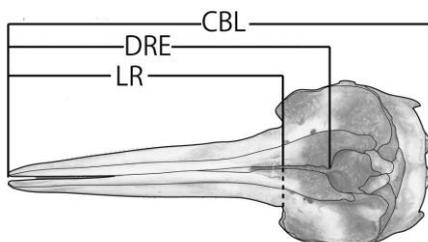
In 1975, an Australian philosopher Peter Singer published a breakthrough book. The book, named "Animal Liberation", is a collection of animals in factory farms and laboratories. Intensive treatment is introduced with shocking pictures and it is strong against exploiting animals for human convenience. Singer's plain and convincing claim drives many people to animal protection movements. Liberation of animals today has acquired the status as a bible of animal rights movement. The core of Singer's assertion says that mind is an accusation of speciesism. Species discrimination is defending the interests of the species to which you belong, Prejudice and attitude denying the interests of other species (Singer, 1975: 26). However, this definition is human. It is based on the dualism of animal species as human beings. There is ambiguity in whether or not there is a hierarchy in question. Along with a huge body, it is the high intelligence that is frequently cited as the reason why dolphins are special animals. It is well known that dolphins have large brains and complex cerebral cortex (Dicke U, Roth G. 2016). In the aquarium, dolphins are on the water, it could be seen acting such as going through the circle and taking the ball thrown into the pool. In movies and television, swim with children, communicate with humans, help people who are drowning, dolphins often appear. Environmentalists regard whales as human beings of the sea, friends of man, special view. Among the researchers who advocated that whales are owners of high intelligence, the most famous are American brain scientists, John C. Lilly who examined the behavior of the captured dolphin and the structure of the brain in detail (John C. Lilly, 1975).

He says that the dolphin has enough ability to communicate knowledge and experience to fellows and the next generation, in addition to the ability to infer and ethics, estimates that there will be, and predicts that dolphin communication with humans will be possible in the near future (John C. Lilly, 1975). Although that dream has not yet been realized, Lilly has been played a major role in spreading the consciousness that dolphins are clever animals to people. By Lilly, many people learned the wonders of dolphins, and many environmentalists started anti-dolphins campaign. Many scientists took inspiration from Lilly's research and started to study cetaceans. One of them is Louis Herman, a cognitive psychologist famous for the study of dolphin language ability. In experiments using sign language, which is a common language of human and dolphin, Herman showed that dolphins can understand the difference between the instructions "pass the stick through the loop" and "pass the ring through the stick" (Payne, 1995: 205). From this experimental result, it was assumed that the dolphin had the ability to understand English grammar.

III. THE VOLUME IN DOLPHIN'S BRAIN

“Telescoping” is a unique morphological feature of cetacean skulls which previous studies have suggested is the result of aquatic adaptation of abilities such as breathing, sound production, and feeding. These abilities are necessary for both newborns and adults, but telescoping is not yet complete at birth. A study has examined changes to shape during the growth process, and why those changes occurred, through observation of external features and actual measurements of the skull of 93 common dolphins *Delphinus delphis* in different stages of growth, from newborns to adults (C. Poth et al, 2005). According to observation of external features on the dorsal aspect of the skull, in young common dolphins the braincase was relatively large compared to the rostrum, and large areas of the inter-parietal, parietal and frontal bones were visible. These results are the same as for previous other studies (Camilla Butti et al, 2014). According to the measurements, condylobasal length (CBL) and length of rostrum (LR), and CBL and distance from tip of rostrum to external nares (DRE) had an almost linear positive correlation (Satoshi T. Yamamoto and Akiko Yatabe, 2013). However, the ratios of LR and DRE to CBL did not increase constantly, having a tendency to increase in three phases (Satoshi T. Yamamoto and Akiko Yatabe, 2013). This was especially the case for the ratio of DRE to CBL. In the first phase, the braincase extended little due to the inter-parietal bone being overlapped by the frontal bone. Extension of the rostrum was faster than the braincase after the first phase, and in the last phase, rostrum and braincase extended with proportions maintained. These results suggest that the inter-parietal bone has an effect on the braincase appearing relatively large and on changing proportions throughout growth (Satoshi T. Yamamoto and Akiko Yatabe, 2013).

One merit of incomplete telescoping of the skull, given that frontal bone and inter-parietal bone are components of the braincase, would be to ensure brain volume (CAMILLA BUTTI et al, 2009). On the other hand, a possible demerit is insufficient ability to perform echolocation given that the concave part of the skull, which functions as an acoustic mirror for echolocation sounds, is incomplete. However, this demerit may have little effect on newborns, which are nursed by their parents (CRISTIANO BOMBARDI et al, 2013). The incomplete telescoping of a newborn's skull is due to ensuring brain volume having priority over feeding-related organs and all abilities.



Source: Satoshi T. Yamamoto and Akiko Yatabe, 2013

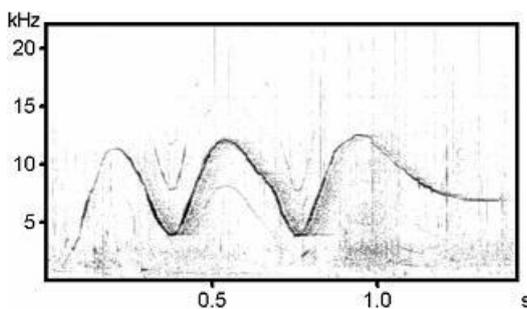
Fig. 1. Condylobasal length: CBL, Length of rostrum: LR, and Distance from rostrum to external nares: DRE.

If intelligence can be measured only by the size of the brain, then the most intelligent animal is a sperm whale. According to British researcher Margaret Klinowska, The brain weight of the male whale reaches 7,820 grams, far surpassing 1,500 grams of human beings (Klinowska, 1992: 24-25). However, the weight of sperm whale is about 500 times that of humans, and it is natural that brains are heavy. Compared with the ratio of brain weight to body weight (brain weight ratio), the index of sperm whale is 0.02, human of 2.10. Besides being low, it is inferior to cattle of 0.08 (same). The highest brain weight ratio among whales is boasted by a bottle dolphin (LORI MARINO et al, 2001). The index is 0.94 which is about half of that of humans. However, It is too hard to decide superiority or inferiority of intelligence by brain weight ratio alone. In discussing intelligence, the quality of the brain, especially the development of the cerebral cortex, is important. In this respect, A bottle dolphin has cerebral cortex that is as complicated as human. Indeed, Lily's study shows that there is no difference between dolphin and humans in terms of density of neurons in the cerebral cortex. (TADAMICHI MORISAKA, 2009) However, examining the structure of the brains of whales in detail gives rise to some doubt concerning the complexity of the brain. The According to Rinowska (Klinowska, 1992: 29), there is the new cortex outside the cerebral cortex, and which governs advanced thought and intelligence. Terrestrial mammals have six layers with different functions, but whales have only five layers, There is no difference in the function of each part. Many land mammals experienced end-stage brain evolution 50 million years ago. However, whales did not go through. So, the whale's brain is actually primitive in many respects, and is one of the terrestrial mammals, the hedgehog and bat level. (Klinowska 1991: 20). Brain weight ratio of Bottle dolphins is higher than whale, and it shows complicated behavior even in the search of food.

IV. SOUNDS AND COMMUNICATION

According to progress of ethology and zoology and biology research, It has been gradually clarified that it existed a unique commerce system among living things (seed) individuals. Dolphins have a unique living environment called the sea, and it is natural that they have their own communication system. When it is installed a system (acoustic buoy) that can record underwater sounds around the island at night, the dolphin sounds could be recorded throughout the night (Glotin H et al, 2013). The place installed was the same as the place where dolphins were in the daytime, because it was a shallower sea than 20 m around island, It is found that the dolphins are at night as well. Also, since unique sounds that are thought to be emitted at the time of foraging could be also recorded, it is probably that they are looking for bait and eating at such places (Herman, L. et al. 1980). Dolphins have the ability of echo location, that is, ability to instantly know what is around where, by emitting sound, listening to the sound that hits the object in sea. Thanks to this ability, dolphins can feed at night. Also, as these forages are often done by herds, a lot of other noises are heard. For example, a whistle, it sounds like "Pui". This sound seems to be used for

communication between individuals. Dolphins are dark and dark in the dark, they are feeding and communicating dependently only on sounds, so the sounds are probably filled with a lot of information. It is necessary to read and understand the information contained in this song for knowing them further. The sound of a big dolphin is a sound that has a wide frequency range from the ultrasound range of 120kHz to the usable frequency. Their sound frequency range is estimated from 100 Hz to 150 kHz. The difference is obvious because human hearing characteristics are generally 20Hz to 20kHz. Stone whales are using a relatively higher frequency than humans. Some whales have also reported that they are communicating using a low-frequency sound that is too low to be heard in humans. Low frequencies arrive far away, so their sounds are estimated to range from hundreds of kilometers to sometimes thousands of kilometers. The scientist recorded the whine of a baby dolphin in the aquarium and conducted a study. The baby dolphin was making a crying sound since birth. The whistle is very simple and short. However, the more you grow, the more complex it is. A baby dolphin makes a lot of crying when he is hungry, moves under his mother's belly and starts feeding. The sound of the baby dolphin heard at this time suggests that the dolphin is feeding the baby.



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Fig. 2. Signature whistle sonagram of dolphin.

Sonagram: Voice is visualized by taking frequency (sound height) on the vertical axis and time (here seconds) on the horizontal axis.

The types of dolphins cry vary. Among them, the most frequent and unique type of whistle is presumed to be a whistle called a name. a whistle called a name is different for each individual, and they are often used when calling each other or answering an opponent's call. Some dolphins can even imitate the whirring of the name of another dolphin. Such a whirling of the name can be said to be the sound of calling a name by human being. They learn a whirling of the name about adult dolphin around three years after birth. Once acquired, it is known that there is little change in life.

TABLE I. Communication skills of dolphins.

Sensory organ	Distance	Remark
Touch	0 cm	Body to Body
Eye : Day	30 m	In transparent sea
Eye : Night	0 m	In dark sea
Ear : Whistle	2 Km	a unique frequency

Consider communication of the dolphin as a distance (Table I). Communication at the nearest distance is "contact",

rubbing action corresponds to this. Speaking in distance is 0 cm. Next is the behavior related to vision, such as synchronized breathing (action to adjust the timing of respiration on the water surface). In terms of distance, it is up to 30 m in water, depending on transparency and the amount of light in the environment, and approaches 0 cm at night or deep place. Next is the distance seen at the echo location, if it is about 150 m ahead in water. Within this range, dolphins can "see" using sounds, so human can use features close to the sight. It is the distance that whistle is heard at the end, about 2 km if it is in water. Because dolphins can know the individual singing by the signature whistle, they can call each other within this range. In today's modern society, there are various tools of information transmission, such as "contact," "talk," "Skype," "phone," "letter," "Ka-talk and band," "Facebook and Twwitter." It could be considered the "unconscious" information (ie, information other than the information conveyed by the word itself) that is exchanged. The "contact" is a one-to-one action, but because of its high reliability, It is an action that can increase affinity and also provide a sense of security (Likewise, unilateral and improper contact will have the exact opposite effect.) Handshaking, grasping, hacking, kissing, etc. It is an action that could be trusted. It is also important that contact is important for parent-child communication. Meeting and speaking is likewise highly reliable communication. The amount of information is decreased by one step at the moment on a videophone like Skype. It is difficult to match eyes each other, and inconvenience that could be not changed the posture of body freely is one of the causes. Since visual information disappears on the phone, information decreases at a stretch and reliability becomes poor. In other words, it will be possible to falsify the voice, making it easy to be cheated. Facebook is one-to-many communication that callers understand. It is a tool with low reliability but high diffusibility, it is very similar to a whistle of dolphins. There is nothing more than text information any longer on Facebook. The dolphin has the ability to recognize the whistle the mother or brother emits. The whistle that the mother or brother emits has its own frequency. they remember the frequency from my childhood.

V. EXPERIMENTAL EVIDENCES OF SELF- RECOGNITION

The most frequently used experimental method to confirm the self - recognition of animals in cognitive science is the mirror self - recognition test. When a newborn baby first looks in the mirror, he does not know that the baby in the mirror is himself. As time goes on, the child in the mirror becomes aware of himself. This is the process of human self-awareness. Humans sometimes compete and sometimes collaborate. Human beings fall into superiority when they meet success, and inferiority when they fail. All human emotions and actions start from self-awareness. Humans try to recognize themselves more than any other mammal on earth. This sometimes presents the tragedy of suicide. Self- recognition test of dolphins through mirrors are relatively simple (*Lori Marino et al, 2007*). Install a large mirror on one side of the aquarium. Draw different shapes on the chest of dolphins participating in the experiment. Observe whether the triangular - shaped

dolphin and the round-shaped dolphin each behave in a mirror-aware manner. Animal-cognitive scientists have reported that dolphins had passed the mirror self-recognition test (Marco Iacoboni, 2009). Cognitive scientists say that self-recognition is the source of their minds in both animals and humans (M. Arbib, 2002). Feeling thirsty or hungry, feelings of self-recognition are different. When a dog in house is thirsty, he pats his bucket with his feet lightly and asks his master to give him water. This does not mean that the dog is self-recognition. In the nighttime, the dog do not know himself in the glass window of veranda, they perceive themselves as enemies, and repeat the act of barking. When an animal recognizes self, it finally begins to associate with the world (Marco Iacoboni, 2009). If you understand yourself as an individual, then you move to another person's perspective. I look at things from the perspective of the another person. It recognizes that another person is a separate being with the same thoughts as himself. Self-recognition is linked to the point of sympathy and compassion (PAUL R. MANGER et al, 2003). Finally, I become aware of myself in the world. We give help to the sympathy residents with major disasters, floods, typhoons, earthquakes. Empathy and sympathy are both sides of a coin called self-recognition It develops into an entity that competes and cooperates in self-recognition.

VI. EMPIRICAL EVIDENCES OF SELF-RECOGNITION

Cognitive scientists say that mirror neurons in dolphins are the cause of neural coupling (Giacomo Rizzolatti and Laila Craighero, 2004). In other words, the phenomenon in which the brain active part of the speaker and the listener match is called neural binding. It is because of the activity of mirror neurons that it is common for a person to sympathize with the heroine who experiences all kinds of hardships while watching a movie. Mirror neurons are activated when they view or mimic the behavior of other. Everyone has ever seen a dolphin show in their aquarium. A dolphin is holding the ball in his mouth, rushing over the water and throwing it exactly at the target spot. Another dolphin jumps through a ring of 2 meters in diameter that is set up for performance in an aquarium. Dolphins in aquariums have long been trained by human trainer. It is true that intelligence is higher than other animals because dolphins have the ability to perform shows in aquariums. However, it is hard to say that dolphins have the ability to recognize, sympathize, and sympathize (Michael J. Twiner et al, 2012). The average lifespan of dolphins living in the sea is 40 years. However, the average lifespan of dolphins in an aquarium is 20 years. The dolphins in the aquarium are very stressful. The sound of the dolphins is ultrasound. Ultrasound is used to detect objects and communicate with colleagues. The sound of dolphins in the aquarium hits the wall of the aquarium and returns again to ear of dolphins. It is like living in very strong noises for 24 hours a day. Dolphins are self-aware and recognize that they are trapped in aquariums. This is likely to have a very strong mental stress on dolphins. It is a tragedy in 2016 at the Nagoya Aquarium in Japan. Japan is a long tradition of whaling. Recently, international animal protection NGOs have asked the Japanese government to stop whaling. Japanese fishermen hunt whales,

catch their dolphins and send them to the aquarium. In Nagoya Aquarium, a mother dolphin bites his little dolphin and kills him. It was not caused by the mental disorder of the mother dolphin. The mother dolphin was worried about the future of little dolphin and decided to die now rather than suffering painfully. The mother dolphin euthanized little dolphin (Paul R. Manger et al, 2004). It was an episode from the coast of Hawaii in 2013. One dolphin approached the person who scuba dives underwater. The dolphin had a fishing needle on its fins. The dolphin approached the skin scuba, turned body to show a fishing needle, and asked for help. The skin scuba was aware of it and removed the fishing needle. All of this was recorded on the U-tube. Dolphins do not hunt for food alone. A number of dolphins collectively hunt for food. They work together to hunt for food. Each dolphin participating in food hunting fully understands their role and maintains teamwork.

VII. CONCLUSION

It is not the only subject of self-recognition because only human beings use language. Dolphins lacking literacy are also the subjects of self-recognition. They know who they are. They know their habitat is the sea and they know who is the parent and who is the brother. They have basic intelligence that they work together to procure the necessary food. The fact that dolphins know themselves means that they can read the minds of other dolphins. They have empathy ability. Even now dolphin hunting is taking place all over the world. We humans must stop barbarian hunting immediately. They live in the sea without any fault, and they are dying of human attack. Even captured by humans and forced to work on the dolphin show, depriving their happiness. Now we must acknowledge the freedom of dolphins and seek peaceful symbiosis with them.

REFERENCE

- [1] C. Poth, C. Fung, O. Güntürkün, S. H. Ridgway, and H. H. A. Oelschläger, "Neuron numbers in sensory cortices of five delphinids compared to a physeterid, the pygmy sperm whale," *Brain Research Bulletin*, vol. 66, issue 4-6, pp. 357-360, 2005.
- [2] C. Butti, C. M. Janeway, C. Townshend, B. A. Wicinski, J. S. Reidenberg, S. H. Ridgway, C. C. Sherwood, P. R. Hof, and B. Jacobs, "The neocortex of cetartiodactyls: I. A comparative Golgi analysis of neuronal morphology in the bottlenose dolphin (*Tursiops truncatus*), the minke whale (*Balaenoptera acutorostrata*), and the humpback whale (*Megaptera novaeangliae*)," *Brain Structure and Function*, vol. 220, issue 6, pp. 3339-68, 2014.
- [3] C. Butti, C. C. Sherwood, A. Y. Hakeem, J. M. Allman, and P. R. Hof, "Total number and volume of von Economo neurons in the cerebral cortex of cetaceans," *The Journal of Comparative Neurology*, vol. 515, issue 2, pp. 243-259, 2009.
- [4] C. Bombardi, A. Grandis, A. Gardini, and B. Cozzi, "Nitroergic neurons in the spinal cord of the bottlenose dolphin (*Tursiops truncatus*)," *The Anatomical Record*, vol. 296, issue 10, pp. 1603-1614, 2013.
- [5] U. Dicke and G. Roth, "Neuronal factors determining high intelligence," *Philosophical Transactions of the Royal Society B*, vol. 371, issue 1685, 2016.
- [6] G. Rizzolatti and L. Craighero, "The mirror-neuron system," *Annual Review of Neuroscience*, vol. 27, pp. 169-92, 2004.
- [7] Glotin H., LeCun Y., Artières T., Mallat S., Tchernichovski O., and Halkias X., "Neural information processing scaled for bioacoustics: from neurons to big data," *Proceedings of NIPS4B, International Workshop Joint to NIPS, USA*, 2013.
- [8] L. M. Herman, et al., *Cetacean Behavior: Mechanisms and Functions*,

- NY: John Wiley & Sons, 1980.
- [9] J. C. Lilly, *Lilly on Dolphins*, Anchor Press, 1975.
- [10] Klinowska, *Dolphins, Porpoises and Whales of the World*, The IUCN Red Data Book, 1991.
- [11] Klinowska, Marine Mammal Database Review, World Conservation Monitoring Centre, 1992.
- [12] L. Marino, T. L. Murphy, A. L. Deweerd, J. A. Morris, A. J. Fobbs, N. Humblot, S. H. Ridgway, and J. I. Johnson, "Anatomy and three-dimensional reconstructions of the brain of a bottlenose Dolphin (*Tursiops truncatus*) from magnetic resonance images," *The Anatomical Record*, vol. 264, issue 4, pp. 397–414, 2001.
- [13] L. Marino, R. C. Connor, R. E. Fordyce, L. M. Herman, P. R. Hof, L. Lefebvre, D. Lusseau, B. McCowan, E. A. Nimchinsky, A. A. Pack, L. Rendell, J. S. Reidenberg, D. Reiss, M. D Uhen, E. Van der Gucht, and H. Whitehead, "Cetaceans have complex brains for complex cognition," *PLoS Biol*, vol. 5, issue 6, e139, 2007.
- [14] M. A. Arbib, *The Mirror System, Imitation, and the Evolution of Language*, In Kerstin Dautenhahn and Chrystopher Nehaniv, editors, *Imitation in Animals and Artifacts*, The MIT Press, 2002.
- [15] Marco Iacoboni, "Imitation, empathy, and mirror neurons," *Annual Review of Psychology*, vol. 60, pp. 653–70, 2009.
- [16] M. J. Twiner, L. J. Flewelling, S. E. Fire, S. R. Bowen-Stevens, J. K. Gaydos, C. K. Johnson, J. H. Landsberg, T. A. Leighfield, B. Mase-Guthrie, L. Schwacke, F. M. Van Dolah, Z. Wang, and T. K. Rowles et al., "Comparative analysis of three Brevetoxin-associated bottlenose Dolphin (*Tursiops truncatus*) mortality events in the Florida Panhandle Region (USA)," *PLoS ONE*, vol. 7, issue 8, e42974, 2012.
- [17] P. R. Manger, S. H. Ridgway, and J. M. Siegel, "The locus coeruleus complex of the bottlenose dolphin (*Tursiops truncatus*) as revealed by tyrosine hydroxylase immunohistochemistry," *Journal of Sleep Research*, vol. 12, issue 2, pp. 149–155, 2003.
- [18] P. R. Manger, K. Fuxe, S. H. Ridgway, and J. M. Siegel, "The distribution and morphological characteristics of Catecholaminergic Cells in the Diencephalon and Midbrain of the Bottlenose Dolphin (*Tursiops truncatus*)," *Brain Behavior and Evolution*, vol. 64, issue 1, pp. 42–60, 2004.
- [19] R. Payne, *Among the Whales*, New York, NY: Scribner, 1995.
- [20] P. Singer, *Animal Liberation*, Pimlico, 1995.
- [21] S. T. Yamamoto and A. Yatabe, "The changing shape of a common dolphin's skull throughout its growth process," *Japan Cetology*, vol. 23, pp. 7-12, 2013.
- [22] T. Morisaka, "Overview of comparative cognitive studies of dolphins in Japan," *Japanese Psychological Research*, vol. 51, no. 3, pp. 168–176, 2009.