Function of Acquity in Comparative Cognition

Mrs. A. Satya Phani Kumari, Mrs. T. Krishna Sree, Mrs. T. Preeti Rangamani, Dr. V. Sitamaha Lakshmi

Asst. Professors, Dept of Freshman Engg., PVP Siddhartha Institute of Technology, VijayWada, India.

Abstract: - Human beings are gifted with many skills like thinking, inventing and improving. Their intriguing nature makes them different from other living beings. Their interest inspires them learning new things, different languages and novel experiments. Learning is a complex and diligent process that depends on innate abilities and internal patience. The flow of our learning maturity progresses through the stages of sensory and motor skills, cognitive abilities and comprehensive power. Charles Darwin opined that humans were essentially 'big-brained apes'. Coming to comparative cognition, many people believe that humans have more cognitive abilities than other living beings. But Darwin says, "Man with all his noble qualities .... still bears in his bodily frame the indelible stamp of his lowly origin". He disagrees with the opinion of humans are more intelligent than animals. He says, "Intelligence is based on how efficient a species became at doing the things they need to survive". The perception and mental cognition of animals resemble humans' acuity and feelings. The difference may not be very high. This paper deals with cognitive skills between human beings and other living beings, cognitive skill development, cognitive software, cognitive tests etc. Cognition reveals how living beings understand and react to certain things and situations.

The difference between human beings and living beings is rationality and logical thinking. Humans are homo-sapiens. They have knowledge, common sense and reasoning power. This thinking and awareness is called 'cognition' in the past. According to Aristotle cognitive areas deal with memory, perception and mental imagery. The word 'cognitive' comes from the Latin verb 'cognosco' meaning "I know, perceive" and noun 'gnosis' meaning "to conceptualize or to recognize". In recent years casual illusions and optical illusions were introduced to test the goal-directed action of animals and humans. Brain-based skills come under cognitive skills. Through brain-based skills, people can improve their memory power, perceptual talents, rational thinking and creative concepts. This paper tells about various exercises in cognitive functioning start from simple to complex, complex to most complexes, graphic organizers that can improve memory power, concentration and analytical skills.

Key words: Casual reasoning, optical illusions, casual illusion, cognitive software, meta-cognitive strategies, graphic organizers, eye-tracking technology.

I. INTRODUCTION

Comparative cognition is the study of cognitive progression in all kinds of animals, birds and humans. The word comparative signifies clear comparisons of two or more species, but much importance is given to humans and animals. The main aim of comparative cognitive research is to know the similarities and differences between humans and non-humans in understanding some aspects like searching for food, choosing food and mates, recognizing things etc. It is an interesting research to know about the cognitive aptitude of nonhuman species. In yester years also people observed the cognitive abilities of different animals and birds. For example in ancient times, kings used pigeons as spies and messengers. They used horses for different purposes and made them listen to their orders. Elephants were also used in wars and followed the orders of kings. Evaluation of the animal cognition has a great history, but it is the most interesting topic for modern researchers, a general broadening of the phylogenetic map of animal cognition.

From time immemorial, relation with animals as prey, predators, and pets have given sensible motive for people to be curious about animal cognition. Many movie directors got interest to know about the abilities of animals and showed the grasping power and cognitive skills of different animals in their movies. They earned a lot of money by using these animals in the main story. Practical considerations still motivate to do some research on animal cognition, such as that addressing issue in conservation and animal welfare. And much contemporary animal cognition research has the practical goal of developing animal models of human cognitive processes for use in investigating their neurobiological or genetic basis. This approach has evidence to show "there is no fundamental difference

between man and the higher mammals in their mental faculties"

1. *Humans and nonhumans*

Nonhuman animals do not have minds. They can't take decisions on others' issues and they are not aware of others' problems. They don't have negotiation skills. This is the precise difference between humans and nonhumans. Just like humans they can't communicate in language. But to some extent they use their minds to understand the commands and recognize the feelings of nonhumans. They have special skills which humans don't have. For example dogs are used in investigation. Thousands of policemen are there but the department still uses dogs to identify the suspects or culprits.

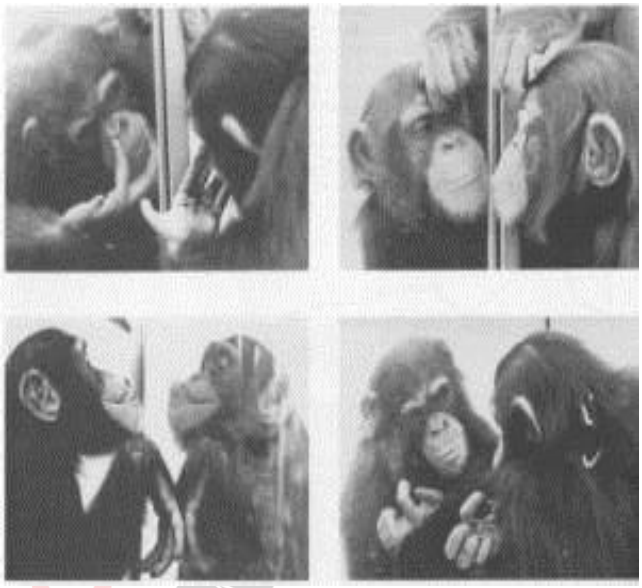
Darwin's outlook or persuasion on comparative cognition leads to many arguments and experiments. His opinion of 'other species are mentally as well as physically similar to humans' causes many research experiments on various animals. Clever Hans is one of the examples of calculating the intelligence of nonhumans. A person named Wilhelm Van Osten has a horse called Hans. Wilhelm is a teacher. He has given training to his horse and other pet animals. But Hans overcomes other animals and starts giving response to his questions. It is a remarkable horse capable of doing complex intellectual tasks such as arithmetic, reading, and spelling, telling time and even understanding the German language.

The people who have observed the performance of Clever Hans agreed that Hans had a special and subtle bond with his owner. Some people felt that the horse was not actually calculating mathematical questions and it was picking up on interpersonal communication takes place below the verge of conscious attentiveness. When the audience was astonished, the horse was able to pick up on the audience's expression and would stop tapping his foot. That's how he was able to answer all these questions with interpersonal communication below the threshold of assiduous awareness. People who rear horses in their houses say, "If a horse knows you well, he will react immediately according to your mood, kissing you when you are sad, rubbing his muzzle against you, getting jittery when you are happy, silent when you are angry. Horses are terribly envious of girlfriends or wives, but not of kids. The biggest mistake people make is to think of a horse as means of transportation, not as an individual being.

While testing the mental self-awareness of nonhuman animals, researchers have conducted mirror test on some animals. The mirror test was developed by psychologist Gordon Gallup Jr. in 1970 as a method for determining whether a non-human animal has the ability of self-recognition. It's also known as the "mark test" or "mirror self-recognition test" (MSR). However some researchers have felt that this method might not be a suitable test for all species. In the psyche level, self-awareness takes the form of meta-cognition. Meta-cognition is about the capacity of thinking, understanding the feelings and recognizing the self-image.

2. *Mirror Test*

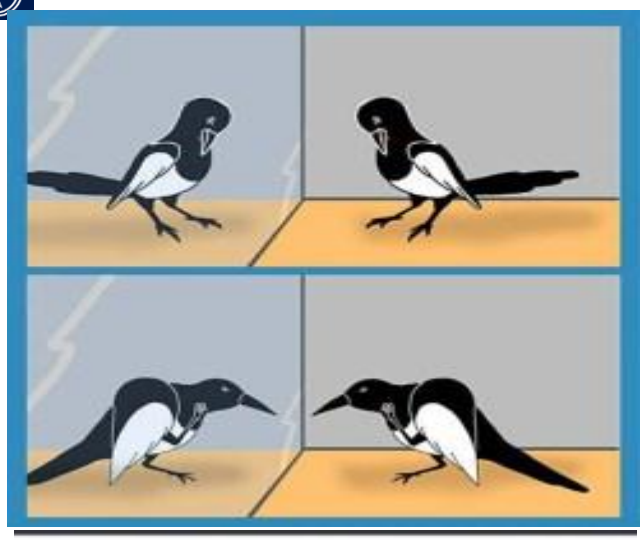
When conducting the mirror test, scientists place a visual marking on an animal's body, usually with scentless paints, dyes, or stickers. They then observe what happens when the marked animal is placed in front of a mirror. The researchers compare the animal's reaction to other times when the animal saw itself in the mirror without any markings on its body. Animals that pass the mirror test will typically adjust their positions so that they can get a better look at the new mark on their body, and may even touch it or try to remove it. They usually pay much more attention to the part of their body that bears a new marking.



Some animals which didn't pass the mirror test also showed different expressions and body language. Some animals got enrage, some animals got curiosity, some animals got confusion etc. Many human infants below 18 months couldn't recognize the mark on their forehead. Some infants recognized the mark but couldn't wipe it.

Bonobos, chimpanzees, orang-utans, gorillas, bottlenose dolphins, orca whales etc. identified the mark on their face. The Eurasian magpie is the first non-mammalian species to pass the mirror test. When some coloured stickers were attached to their wings or feathers, they moved round and tried to remove the stickers. So far scientists believed that the nonhumans who have neocortex in brains can pass the mirror test. But magpies are birds and they don't have neocortex in their brains. Getting success in mirror test, magpies proved that other parts in brain help in self-recognition.

In a research paper it was mentioned that ants also recognized their reflection in the mirror. Their movements and behaviour changed when they noticed their reflection on the mirror. They tried to move their bodies, heads, and antennas and touched the mirror many times.



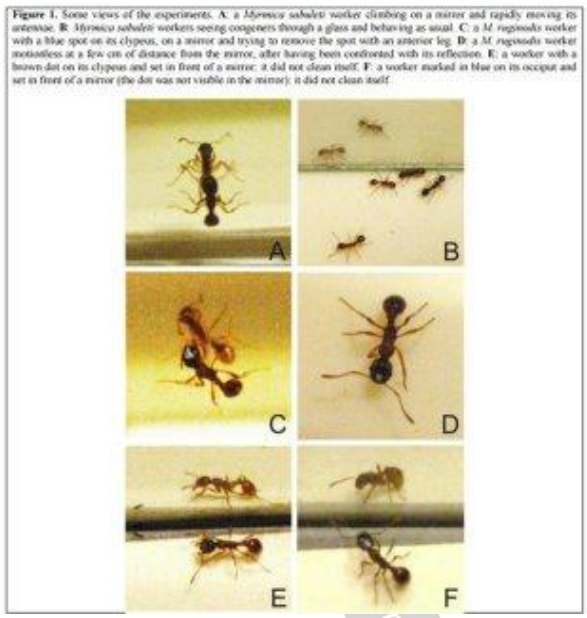


Figure 1. Some views of the experiments. **A**: a *Myrmica sabuleti* worker climbing on a mirror and rapidly moving its antennae. **B**: *Myrmica sabuleti* workers seeing congeners through a glass and behaving as usual. **C**: a *M. ruginodis* worker with a blue spot on its clypeus, on a mirror and trying to remove the spot with an anterior leg. **D**: a *M. ruginodis* worker motionless at a few cm of distance from the mirror, after having been confronted with its reflection. **E**: a worker with a brown dot on its clypeus and set in front of a mirror: it did not clean itself. **F**: a worker marked in blue on its occiput and set in front of a mirror (the dot was not visible in the mirror): it did not clean itself.

The same research paper revealed that some researchers marked blue dots on clypeus of some of the ants. When the mirrors were not there, there was no change in ants' behaviour. But the behaviour was changed when these ants saw their reflection in the mirror. These ants also tried to erase the blue dots on their face. The ants that had brown dots on their clypeus couldn't recognize the change as the colour was mixed in their original colour. The other ants which had no mark became aggressive when they had seen blue dots ants. They felt that these ants were another type of creatures. Through these tests it is proven that self-recognition is not an 'unrealistic' ability.

While discussing the mirror test, I want to mention an old story of 'the clever rabbit', which is a very famous tale in our books. In a forest, a ferocious lion started eating all the animals. To reduce the loss, the senior animals negotiated with the lion and agreed to send an animal each day to his den. When rabbit's turn came, it wanted to escape from the death. Intentionally it delayed its journey and lied to the lion that it was obstructed by another lion. It showed the image of lion in the well, made the lion jump into well. From this story, it is observed that rabbit has the talent of self-recognition but the lion doesn't have.

As our forefathers felt that nonhuman animals had cognitive skills, they created many stories about animals. They gave certain qualities to each animal and created idioms. For example, cunning fox, courageous lion, lion in the stomach, butterflies in the stomach, naughty monkeys, timid hare, hardworking ants, and faithful dogs etc. entered the colloquial language. Panchatantra stories describe different cognitive skills of animals. The great guru Vishnu Sarma keenly examined the characteristics of various animals and taught his disciples moral lessons through animal characters. Another story was also popular about animal recognition. The Satavahana king Hala was illiterate. When he was humiliated by his queens for his illiteracy, he wanted to be a great scholar in Sanskrit. But he wanted to learn entire language in six months. When a scholar called Sarva Varma agreed to educate him within six months, another scholar Gunaadya told that it was impossible to teach Sanskrit in six months. Gunaadya challenged Sarva Varma if he made Hala expert in Sanskrit, he would abandon all languages of the living beings. In that challenge Sarva Varma won and Gunaadya left the place and started living in the nearby forest. There he learnt Paisachi (Devil's) language as he should not speak any human and nonhuman language. He wrote a book in that language and wanted to show it to King Hala. But king Hala couldn't recognize him and threw him away from the court. Felt as a great insult, Gunaadya lit a homagundam and burnt every story after reading it. The birds and animals in the forest and nearby villages came to forest and engrossed in his stories. Later the noticed his mistake and asked apologies from Gunaadya. This story reveals the cognitive and emotional behaviour of nonhumans.

When we observe the performance of the people, some people outperform others with their innate abilities. For example, if hundred students are there in a class, only five to ten students show extraordinary brilliance in their performance. Some students show their mediocre talent both in academics and in extracurricular activities. Some students are slow learners with low performance. But some slow learners show extraordinary skill in other activities like fine arts, literary and sports. Concerns have therefore been voiced about the patterns of strategy use that influence students cognitive functioning and ultimately academic success. When we learn a new language cognitive and meta-cognitive strategies help us to plan, prepare and perform. With regular practice we can improve cognitive skills.

Mental skills or cognitive abilities include attributes like perception, attention, memory, verbosity, visual and spatial processing and executive functions. There is difference between male and female performances. Females show more talent in verbosity, perspicacity, accuracy and fine motor skills. But males dominate women in pragmatic methods, and mathematical abilities. For example, if a grocery list is given to both men and women, women purchased all the items faster than men but they failed in

recognising the routes and giving correct instructions to a driver.

Influential theorists differ on their classifications of metacognitive strategies. Cohen (2010) stated metacognitive strategies as the methods learners used consciously to organize their language learning and divided them into three subsets: planning what learners will do, checking how it is going and evaluating how it went.

4. Methods taken for the improvement of cognitive functioning

Physical Activity: It is proven from the time immemorial that physical activities not only make people fit but sharpen the mental abilities also. Physical exercises ameliorate cognitive skills. Various exercises like swimming, running, jogging etc., help people develop their mental abilities and creative dexterity. While doing exercises, a specific molecule is released and it helps to get better in cognitive skills and makes brain active. Sports and games sharpen the brain functioning and reduce mental tension and pessimistic thoughts.

Fine arts and mind games: Learning fine arts like classical music, instrumental music, drawing, classical and western dances, sculpturing, collage art lessen memory loss and brighten cognitive functioning. Word puzzles, Sudoku puzzles, rubik's cube solutions which are mentally challenging play a major role in cognitive functioning. When we observe the maestros in various fields, we can easily understand that their cognitive functioning is perfect and their memory power is excellent. Some neuroscientists discovered multiple ways that musical training improves the function and connectivity of different brain regions and improves cognitive function. Practicing a musical instrument increases brain volume and strengthens communication between brain areas. Playing an instrument changes how the brain interprets and integrates a wide range of sensory information, especially for those who start before age seven. The findings were presented at the *Neuroscience 2013* conference in San Diego.

Intriguing and Imagination: If the parents encourage their children to attend arts and crafts classes and motivate them to do new designs and works, children's cognitive skills will be improved and their imaginative potential gets great recognition. Some surveys have found that the people who got patents participated actively in their arts and crafts classes. From their childhood onwards their imaginary power increases and through their mind mapping they imagine every task as a working model and they try to find out fresh models. Writers, scientists, business people, artists who partake in creative works can show their original ingenious thoughts in their respective fields.

Book reading is another activity which progresses cognitive functioning. Book reading gives pleasure and treasure of knowledge which help to reach the apogee of successful career. Reading fiction stimulates brain functioning and memory. Vicarious nature, empathy and problem-solving skills will be improved through reading and readers can put themselves in the shoes of other persons and flex the imagination in a way that is equal to the visualization of a sportsman who mentally frames a plan for his match.

Gregarious Attitude: People who are sociable, amicable and extroverts have better cognitive skills compared to the introverts and reserved people. The cognitive functioning in reserved category people is very low and they never allow other people to enter into their intimate zone. Their isolation makes them unfriendly and unhealthy. They face some psychological problems because they are unable to share their thoughts with other people and sometimes they get suicidal thoughts. When their cognitive functioning declines, it makes them either commit suicide or commit illegal activities.

Yoga and Meditation: contemplation and concentration play a pivotal role in cognitive functioning. Our ancient treasure yoga gets popularity now-a-days because it improves cognitive and meta-cognitive abilities in human beings. Meditation leads to concentration and yoga gives fitness. A healthy mind gives wealthy thoughts. In this competitive world everyone faces stress in their life at least once. The people who have physical fitness along with mental fitness can achieve triumphs and great laurels in their life. Stress slows down the cognitive functioning which leads to diseases like Alzheimer's and severe depression. Yoga and meditation perfects cognitive abilities and improves health.

Psyche sport: Mind games or Brain teasers help to get better cognitive aptitude. Many doctors recommend the parents and Alzheimer's patients to play brain-training games and mind games in order to get cognizable capacity. Many games are invented for all ages and parents should encourage their children to play such intellectual games along with outdoor games. Many video games are prescribed to get discernible and diligent thoughts. But parents should choose intelligible games and avoid games which produce violence and criminal thoughts. These brain games not only benefit mental skills but also increase multitasking expertise. They act as stress busters and boost the reasoning ability, rational thinking, accuracy and swiftness.

Proper Rest: Cognitive functioning depends on mental health and brain execution. If mind doesn't work properly, a human being cannot maintain his/her career effectively and efficiently. Rest or sleep makes brain energetic and active. Inadequate sleep damages brain function and leads to memory loss and fatigue. Six to eight hours rest brightens the cognitive flair. "It's an intensive activity for the brain to consolidate learning and so the brain may benefit from sleep perhaps because more energy is available, or because distractions and new inputs are fewer," said study corresponding author Yuka Sasaki, a research associate professor in Brown University's

Department of Cognitive, Linguistic, and Psychological Sciences. If brain doesn't get sufficient rest, new ideas and novel thoughts never come. A machine doesn't work effectively, if lubricants are not used. As lubricants assist the machines for good functioning, rest assists brain to get productive ideas.

5. Important tools that assist for the improvement of cognitive functioning

Graphic Organizers: Graphic organizers are the visual illustrations which help the students to get better knowledge and understand the difference between listening and seeing. It is an ancient belief that we can remember what we see better than what we hear. Graphic organizers prove that old conception true by showing many examples through pictures, diagrams, equations etc. Graphic organizers provide an optional way of depicting knowledge and understanding (Sorenson, 1991), so it is particularly beneficial for students who have difficulty with expressing relationship among parts of various subjects' concepts in written word.Kang (2004) defines a graphic organizer as a creative technique used to present complex information andconvert it into a simple and meaningful graphic display of the relationships between concepts.Students who apply graphic organizers for their studies have better cognitive skills than others and they know how to use them independently in classroom and outside class room.

REFERENCES

[1] Arwa N. Al-Hinnawi. (2012).The Effect of the Graphic Organizer Strategy on University Students' English Vocabulary Building.Canadia Center of Science and Education.Vol.5, No.12; 2012. ISSN: 1916-4742, E-ISSN 1916-4750.

[2] Chris M. Anson and Robert A. Schwegler. (2012). Tracking the Mind's Eye: A New Technology forResearching Twenty-First-Century Writing andReading Processes. National Council of Teachers of English.CCC 64:1. September, 2012, 163-164

[3] Jonathon D. Crystal Comparative Cognition: Comparing Human and Monkey Memory. Current Biology Volume 21, Issue 11, 7 June 2011, Pages R432-R434

[4] Kang, S. (2004).Using visual organizers to enhance EFL instruction, ELT Journal, 58(1), 58-67.

[5] Parnrod, Urarat. (2011). Metacognitive Strategies: What Do Graduate Students Encounter in Academic Writing? The Third International Conference on Language and Communication 2011.254-260.