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# CHARACTERISTICS OF ANIMAL LANGUAGE: CASE OF A COCKATIEL TALKING IN PERSIAN

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## Abstract
This study was carried out to make insure of some aspects of language learning behavior of a Cockatiel parrot with the purpose revealing the characteristics of parrot's language in contrast to human language. It is believed that some parrots could only mimic the speech sounds uttered by the human, and this behavior is not dealt with other characteristics of human language as Hockett declared in his studies. The findings of this qualitative research reveals that although animal language lacks the human language specifications, while could not be judged at the same criteria, but animals could communicate with humans in language. The sounds produced by Cockatiel in Persian, had meanings that were based on characteristics of human language.

## Introduction
### Human language
Many studies have been investigated around the language [1], but if human language is viewed as a unique form of communication then it would seem inconceivable that the other creatures would be able to develop an understating of this specialized human mode of expression off course maybe some humans however do not behave as if this is the case [2]. In this study, the authors were trying to reveal what similar characteristics of language, humans and parrots share. According to Hockett, human language has a number of characteristics that sets it apart from animal communication. The American linguist worked on this problem for many years, finally coming up with a list of 16 defining characteristics in 1963 as declared in Ambridge's book [3]. These 16 different characteristics which together help define human language and crystallize what sets it apart from animal communication systems is shown below [3].

1. **Vocal-auditory channel**. The conduit for language is sound (the human voice), transmitted to a hearing mechanism (the ears and auditory channel).
2. **Broadcast transmission and directional reception**. Sound is transmitted (broadcast) in every direction, but the listener perceives it as coming from a particular source.
3. **Rapid fading**. Speech sounds do not last very long; they are transitory.
4. **Interchangeability**. We can switch between transmitting and receiving linguistic signals.
5. Complete feedback. Speakers can hear what they are saying: they receive feedback on the signal they are sending out.
6. **Specialization**. The organs used for producing speech (including lips, tongue, larynx and throat) are specially adapted for language; they are not simply used for breathing and eating.
7. **Semanticity**. Linguistic signals (words) can be used to refer to actions, objects and ideas.
8. **Arbitrariness**. There is no intrinsic, necessary relationship between a word and the concept it denotes. There is nothing (in principle) to prevent us from dropping the word cat and switching to zug to denote the same object.

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

9. **Discreteness.** Language makes use of discrete units, for example, the two speech sounds (phonemes) /p/ and /b/.The point at which the vocal cords begin to vibrate can vary, with more /p/-like sounds shading gradually into more /b/-like sounds. But we perceive a sharp cut-off between the two sounds (they are discrete), even though, physically, they figure on a single continuum.
10. **Displacement**. We can talk about things that are remote in time or space.
11. **Creativity (openness).** We can extend the repertoire of language, by coining new words and expressions. Also, we can produce and understand sentences that have never before been uttered.
12. **Cultural tradition**. Language is transmitted from one generation to the next by teaching and learning.
13. Duality of patterning. Languages have two levels: one level comprises a set of arbitrary sounds (/p/, /I/, /g/ and so on) with no meaning by themselves; the other level concerns the combination of sounds into meaningful units (like /pIg/).
14. **Prevarication.** Human beings can lie. They also write novels and talk about entirely hypothetical entities.
15. **Reflexiveness.** Language can be used to talk about language: we have so called metalinguistic skills.
16. **Learnability**. We have the capacity to learn new languages beyond our native tongue.

**Animal Language**

In 21st century, researchers have begun to observe the imitation act as a complex and advanced behavior that accompanies with detailed investigation [4]. As an example they observed it as a behavior quite different from mimicry which is generally defined as mindless repetition [5]. And, given that imitation can also be seen as the integration of a number of familiar actions in novel ways to produce that novel act [6] , of particular interest is what happens when the targeted novel vocalization can be constructed from related elements already in the parrot's repertoire. "This particular type of combinatory behavior is actually a form of vocal segmentation. Successful segmentation shows that the bird understands that its existent labels are comprised of individual units that can be recombined in novel ways to create novel vocalizations" [4]. Moreover, such evidence suggests that a parrot has phonological awareness [4] or at least control of linguistic processing and analysis of linguistic knowledge. Some studies as Pepperberg research have implications for other fields too, notably as she suggests the evolution of language and the development of speech in robots and avatars. Demonstrating segmentation by a parrot would be an important milestone in comparing animal and human cognitive and communicative abilities [4].

Although evolutionarily distant from humans, parrots have already been shown to use elements of English speech referentially [7], and those areas of the human brain responsible for vocal learning and production appear to have analogues (and possible homologues) in parrots [8]. Despite Pepperberg's and Jarvis' findings, parrots are still sometimes regarded as mindless mimics. At least for that belief as Pepperberg indicates a reason would exist. The reason that avian imitation of English sounds does not involve intentional and accurate reproduction of human speech is the difference that exists between human articulation system and the parrots [4]. Also notice the process of manipulation of individual parts of words that is presumed to require development of an internal representation of phonological structure. That is, in order to sound out—i.e., to imitate, rather than mimic—a novel label, the child must segment the stream of sound into discrete elements, recognize a match between those elements and elements (or close approximations) that exist in its own repertoire, and then recombine these elements in an appropriate sequence [4].

Bird communication is divided into songs and calls. Songs are used primarily to attract mates, while calls are used to alert of food and danger and coordinate movement with the flock. Calls are acoustically simple, while songs are longer and more complex [9]. Bird communication is both discrete and non-discrete. Birds use syntax to arrange their songs, where musical notes act as phonemes. The order of the notes is important to the meaning of the song, thus indicating that discreteness exits. Bird communication is also continuous in the sense that it utilizes duration and frequency. However, the fact that birds have "phonemes" does not necessarily

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

mean that they can combine them in an infinite way. Birds have a limited number of songs that they can produce. The male Indigo Bunting only has one song, while the Brown Thrasher can sing over 2000 songs [10].
As far as the animal behavior and sound production is concerned in this study, the standard explanation is that the animal produces a particular behavior in response to a particular sound stimulus, but the animal does not actually "understand" the meaning of the words it utters. If it seems difficult to conceive of animals understanding' human language, then it appears to be even less likely that an animal would be capable of producing human language; After all we do not generally observe animals of one species learning to produce the signals of another species [2]. The reason for this argument could be this: You could keep you horse in a field of cows for years, but it still won't say Moo. And in many households, a new baby and a puppy may arrive at the same time Baby and puppy grow up in the same environment, hearing mostly the same things, but about 2 years later, the baby is making human noises and the puppy is not [2]. But perhaps a puppy is a poor example. It is better to work with a Cockatiel that is a better example of sound producer which is studied by some scientist for different purposes [11].

**Cockatiels**

Cockatiels are native to the Australian mainland; they are widely distributed throughout Australia, with denser populations in the southwestern region of the continent. Cockatiels are the only type of crested parrot that has a tail which comes to a point. This tapered tail is very long (ca. 15 cm), making up half of their length. In flight, these tail feathers spread out into a wide fan, the elevation angle of which can be adjusted by the bird to control altitude and stability. While long-term artificial selection for mutations in color have resulted in many different color variations in pet cockatiels (from the speckled pearl mutation to the light yellow-white lutino mutation), wild cockatiels of both sexes share similar characteristics in appearance. Males exhibit dark brown to gray plumage, with patches of white bordering areas such as the upper wing when folded. Their cheeks have bright orange circular patterns, bordered by white. Females are also mainly gray, with cheek patches of a drab, burnt-orange shade, which lack a white border. Feathers in these cheek patches are modified to protect the ear and minimize flight turbulence. The underside of the tail feathers tends to be more complex in color variation than the rest of the body, possessing distinctive bars of alternating color [12].

**Avian sound production sytem**

The role of syringeal muscles in controlling the aperture of the avian vocal organ, the syrinx, was evaluated directly for the first time by observing and filming through an endoscope while electrically stimulating different muscle groups of anaesthetised birds [13]. In cockatiels, direct observations show that even during quiet respiration the lateral tympaniform membranes (LTMs) are partially adducted into the tracheal lumen to form a narrow slot. Contraction of the superficial intrinsic muscle, m. syringealis superficialis, adducts the LTMs further into the tracheal lumen but does not close the syringeal aperture fully. The intrinsic deep muscle, m. syringealis profundus, abducts the LTMs through cranio-laterad movement of a paired, protruding half-ring. The weakly developed extrinsic m. sternotrachealis seems to increase tension in the ipsilateral LTM but does not move it in or out of the syringeal lumen. [13]. As Du Verney research revealed the vocal organ of birds, the syrinx, is a distinct differentiated part of the airway. Unlike the human larynx, the bird syrinx is positioned inside an air sac close to the lungs, where the windpipe, the trachea, bifurcates into the two primary bronchi [13]. Like the human larynx, however, the syrinx consists of specialized cartilaginous structures, connective tissue masses, membranes and a number of muscles. The syringeal muscles are intrinsic or extrinsic. Gaunt suggested the former originate and insert completely within the syrinx and probably control the position of syringeal elements. The latter originate or insert outside the syrinx and probably affect the syrinx as a whole [13]. Avian sound production is commonly believed to be initiated by the formation of a constriction of the airway, the syringeal aperture. Simultaneous muscular compression of air sacs increases subsyringeal air pressure and creates a pressure differential across the syrinx. The pressure differential increases the expired airflow

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

velocity, inducing Bernoulli forces, which act on the tissue forming the constriction (labia or membranes, see below) and pull it towards the centre of the lumen. The labia or membranes are thought to constitute a selfoscillating system, which is driven by opposing Bernoulli forces and elastic recoil forces. This system as Larsen and Goller believe generates and sustains the tissue vibrations that constrict and enlarge the syringeal aperture, which modulates the airflow like a pneumatic valve and produces the sound in the tracheal column of air [13]. Figure (1) adopted from Larsen and Goller illustrates the Cockatiel's syrinx with details.

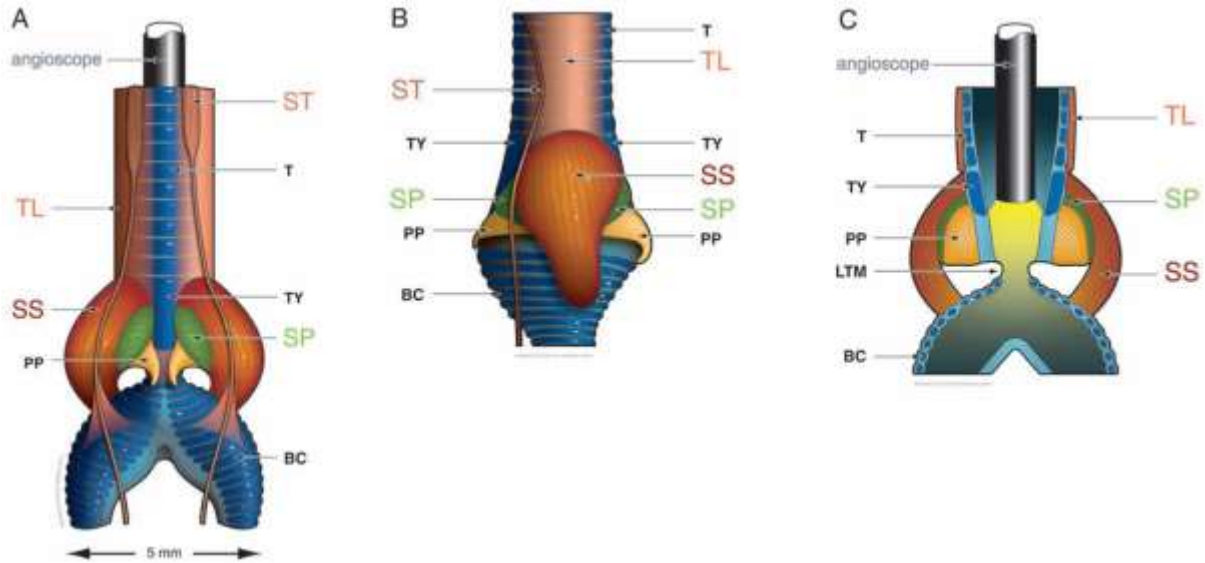


**Fig. 1 Adopted from as Larsen and Goller (2002). The cockatiel syrinx is situated at the distal end of the trachea cranial to the bronchi. (A) Schematic external ventral view of the cockatiel syrinx depicting the syringeal muscles and the inserted angioscope. Note the slightly asymmetric m. sternotrachealis (ST). (B) Schematic left-side view illustrating the extent of the paired protrusions (PP). (C) Schematic horizontal section through the cockatiel syrinx with the approximate position and field of view of the angioscope (yellow light) in Figs 6a–f and 7. SP, m. syringealis profundus; SS, m. syringealis superficialis; BC, bronchial cartilage; T, trachea; TL, m. tracheolateralis; TY, tympanum (consisting of four closely apposed or fused tracheosyringeal cartilages); LTM, lateral tympaniform membrane.**

## Material and method

As appeared in introduction, this research obeys the qualitative and ethnographies design that describes the behavior of subject of the study using direct observation method [14]. Researchers in this case study through generating data from observation immersed themselves in research setting while systematically observed the dimensions of the settings such as interactions, relationships, actions, events and so on as Mason suggested [15]. Researchers saved the field notes for detailed descriptions of the phenomena and recorded the sounds of the subject. Data analysis done comprehensively while oriented on the hypothesis with the use of description.

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

**Subject**

Subject was a cockatiel (Nymphicus hollandicus) bought from a local vendor in Lahijan then named Kiki (figure 2), was raised for the research purpose had 10 months old and had around 8-month speech training in a home situation living with a family of five Persian speakers and a canary named Sefid Barfi. The authors planned to keep the canary with the aim of showing the effects of other species communication on another species. The main tool to gather information was observation by researchers. Hadi and Mahin were family members that were selected as trainers. Bird's main living place was a large sized cage in a houseroom at all times the cage door was open and it could freely get in and out for nutrition and playing. By living with humans in a home situation, the high-pitched voice Kiki had previously learned to identify the family members. Also has showed its feelings such as request for food; need for tenderness showing it by bending his head in front of family members and waiting for rubbing his head; refusing to be in touch with unfamiliar people and also memorizing its name, "Kiki", in very early at its presence in house. Kiki the scratcher of papers is not quite unique; similar data have been observed from another cockatiel by the author of current paper who was teaching it to produce sound patterns and also other researchers around the world that working on parrots to teach other languages than Persian [16].

***Figure 2. Kiki, the subject.***

**Training procedures**

The normal color Cockatiel as the subject of this research was trained in eight stages [17] as shown below to produce the words of table 1.

1. Kiki was sitting on the hand or forearm, where it could see its trainer's face.
2. Trainer waited until Kiki was quiet and relaxed because if the bird chatters away, it will not be paying attention to what speaker says, and then says the word in a singsong voice.
3. Trainer watched the bird for signs of curiosity/enjoyment at hearing the word. Actually, the birds crest bobs up and its pupils change size, Kiki will not imitate all words, just the ones that caught its interest.
4. Trainer repeated the word several times over in the same singsong way.
5. Trainer kept his training sessions short suitably under ten minutes, so it stays fun for both the bird and the human.
6. Trainer did more than 5 sessions a day.
7. Trainer Stacked to one or two words until the bird has learned that.
8. Trainer rewarded the bird whenever it decided to produce sound patterns, even if the word came out garbled.

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

***Table 1. Main words/sounds uttered by Kiki***

| Persian | English equivalence | Type | info |
|---|---|---|---|
| Kiki | Kiki | Proper Noun | Parrot's name |
| Hadi | Hadi | Proper Noun | Trainers name |
| Sefid Barfi | White snow | Compound Noun | The name of the canary |
| Salam | Hello | Greeting | saying on occasions |
| Bia | Come | Imperative | Logical interaction |
| /Hutu/ | /Hutu/ | Noise | A noise making while moves its head up and down when feels happy |
| whistle | whistle | whistle | Imitation from father of family |
| hehehehe | hehehehe | laugh | Imitating the laugh |

***Note: These are not the natural sounds of cockatiel that produces in nature; it had its original sounds as well as the learned sounds.***

## Results and conclusion

For the sake of this study a cockatiel was trained in order to make sure whether it understands the sound/words which hears, or is only a kind of imitation at once the word uttered by the tutor, or the words had shaped a complex model in parrot's brain. The ability to mimic is a characteristic of cockatiels that has increased their popularity immensely as household pets. Although their vocabulary is not as broad as some of the larger parrot species like grey parrots which are studied more for example in Alex case [7], they can say many simple words and phrases and can learn to mimic common household noises. With enough exposure to certain tunes they can even whistle many simple melodies with surprising accuracy [18]. As it is believed, some of human language features can be shared to some extent with animal communication systems but it is the combination of all 16 features that distinguishes human language [3].

Now it is the time for investigating and discussing the words uttered (note: memorized before) by Kiki one by one. For several months, Kiki had received some words in the form of phonological sounds along with the special training. Although its accuracy was not high enough as human sounds but it was denoting it. Cockatiels can make language-like sounds, but they are using entirely different physical mechanisms from humans. Also the point that it goes against everything we know about evolution to think that an organism could develop a complex system, such as the combination of mental and physical structures necessary for language. The physical structures used in human speech-voice box, vocal chords, tongue, lips, palate and teeth are completely different from the structures in cockatiels, and some are completely absent. Even though talking cockatiels do not possess these structures, they are able to produce words and expressions used by humans, even with the same intonation.

**Kiki: /Kiki/**

"Kiki" the proper noun as parrot's name is repeated so many times by parrot and also family members during the day. Researcher and also the trainers believe that it is a memorized sound pattern which has the most frequency of repetition and also is felt by the parrot as an important sound in which directly relates to itself as an address.

Hadi: /Hadi/

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The proper noun "Hadi" that is the name of one of trainers has less frequency than any other learnt words by the parrot. This word is seen as an imitation when the trainers say it and the parrot only repeats at the time. It can be regarded as a less important sound pattern for Kiki because maybe when the trainer is on its side, Kiki does not need to say the trainer's name.

**Bia: /biya/**

The utterance of word "biya" (come) is not just kind of simply imitating one but it is intentional and kind of arbitrarily; when Kiki needs someone beside, it produces this word like the humans usually use the word imperatively. Also, repeating the word /bia/ amongst the other words without any pause / biya biya biya biya biya biya biya / implies that it is not only imitating a single word, it can be seen as phonological awareness in which the parrot could combine words in a chain like format. This word was made as a convention (Arbitrariness) between the parrot and the trainer and vice versa denoting the need for meeting. This behavior denotes Semanticity too; cause in the mind of bird denotes an action. At the very early in training procedure, trainer having food in his palm of hand while curving hand in a way of interaction so the parrot reacts to the stimulus and moves toward him to get the food; the food in hand and the shape of hand action was omitted gradually and only synchronic voice /bia/ was used as the stimulus. It could be seen as a process of stimulus and response act as while the parrot needs someone by saying this word will reach to its desire [19].

**Sefid Barfi: /Sefi:d Barfi/**

As indicated in Thorpe's study [4], and also hints in the introduction of current study, there is a believe that imitation, unlike mimicry, primarily involves the intentional copying of an improbable and novel act; thus the intentional, referential reproduction of a novel Persian vocalization by Kiki uttering the Persian compound noun /sefi:d Barfi/ (in English: white snow) is an imitative behavior not merely a mimicry act.

**Salam: /sala: m/**

Kiki after internalizing the Persian word salam (in English: hello), utters it only in some special occasions, usually in the mornings and afternoons, which can be regarded as a actual greeting between parrot and human and not parrot-like learning in which the parrot merely reproduces the word at all times in contrast to the frequent words Kiki and Sefid Barfi.

Parrots usually acquire labels by building the sound patterns gradually [20]. Although we should believe that human language is distinct from the language of other creatures [2], the purpose of this study was to reveal the characteristics of parrot's language in contrast to human language. As the researcher closely observed the animal behaviors and actions/reactions, Kiki's language shared features of human language characteristics including the vocal-auditory channel, broadcast transmission reception, rapid fading, semanticity, and arbitrariness. Also we could add some other characteristics such as Learnability, memorizing and repetition that is shared with human language. Flashing back to the introduction, in agreement to Yule's argument, a canary named Sefid Barfi sharing a home environment with Kiki couldn't communicate with parrot by speech.

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## References

INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT


1. Shoa Hasani, A., R. Rahimy, and M. Arjmandi, An investigation of reading comprehension program at a University of Technology. 2014. Vol. 3. 2014.
2. Yule, G., The Study of Language2006: Cambridge University Press.
3. Ambridge, B. and E.V.M. Lieven, Child Language Acquisition: Contrasting Theoretical Approaches2011: Cambridge University Press.
4. Pepperberg, I.M., Grey parrots do not always 'parrot': the roles of imitation and phonological awareness in the creation of new labels from existing vocalizations. Language Sciences, 2007. 29 p. 1-13.
5. Dautenhahn, K., Nehaniv, C., Imitation in Animals and Artifacts, 2002, Cambridge.
6. Piaget, J., Play, Dreams and Imitation in Childhood1962, New York: Norton.
7. Pepperberg, I.M., The Alex Studies, 1999, Harvard: Cambridge.
8. Jarvis, E.D., Gu¨ntu¨rku¨ n, O., Bruce, L., Csillag, A., Karten, H., Kuenzel, W., Medina, L., Paxinos, G., Perkel,, et al., Avian brains and a new understanding of vertebrate evolution. Nature Reviews Neuroscience, 2005. 6: p. 151-159.
9. Duhamel, D. Ornithology; Vocal Communication. 2014 October ]; Available from: http://people.eku.edu/ritchisong/birdcommunication.html.
10. All About Birds: Vocal Development. Cornell Laboratory of Ornithology. 2007 [cited 2014; Available from: http://www.birds.cornell.edu/AllAboutBirds/studying/birdsongs/vocaldev.
11. Hedrick, T.L., J.R. Usherwood , and A.A. Biewener, Wing inertia and whole-body acceleration: an analysis of instantaneous aerodynamic force production in cockatiels (Nymphicus hollandicus) flying across a range of speeds. The Journal of Experimental Biology, 2004. 207: p. 1689-1702.
12. Grindol, D., Cockatiels For Dummies2001: Wiley.
13. Larsen, O.N. and F. Goller, Direct observation of syringeal muscle function in songbirds and a parrot. The Journal of Experimental Biology, 2002. 205: p. 25-35.
14. Johnson, D.M., Approaches to research in second language learning1992, New York: Longman.
15. Mason, J., Qualitative researching1996, London: Sage.
16. Masin, S., Lenti Boero, D., Massa, R., Bottoni, L., Acoustic characteristics of vowel-like sounds of an African Grey parrot (Psittacus erithacus). in Avian Brain Conference2005.
17. Teaching a Cockatiel to Talk. [cited 2014 January]; Available from: http://cockatiel-care.info/teaching-a-cockatiel-to-talk/.
18. Watts, J.-A. Talking/Not Talking. 2004 [cited 2014; Available from: http://www.cockatielsociety.org.au/articles/talking_and_not_talking.htm.
19. Proctor, R.W. and T.G. Reeve, Stimulus-Response Compatibility: An Integrated Perspective1989: Elsevier Science.
20. Patterson, D.K., Pepperberg, I.M., A comparative study of human and parrot phonation: acoustic and articulatory correlates of vowels. Journal of the Acoustical Society of America, 1994. 96: p. 634-648.