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Jizz in birdwatching activity and clinical practice: how it works and why?

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Abstract

The word "jizz" is part of the language of birding in the English-speaking nations. It's meaning is combination of characteristics which identify kind of a bird, but this characteristics may not be distinguished individually. Jizz is described as embodied way of seeing that instantaneously reveals the identity of a birds species, suspending the laborious and meticulous study of an diagnostic characteristics. In medicine there is an idea of "clinical intuition" – making judgments and clinical diagnoses without clear awareness of consecutive stages of reasoning. Intuitive decision making has been found in some cases to improve decisions and eventually lead into better performance than analytic deliberation. Can a certain sudden conclusion that appear in minds of both birdwatchers (about bird species) and medical doctors (established diagnosis), based on the use of an incomplete set of information, be accurate? And how we can use this similarity to understand process of formulating medical diagnoses? In this paper we discuss the phenomena of jizz and "clinical intuition" in the light of theory of brain as a tool of making predictions. According to this view the primary function of the brain is to make predictions about the word, rather than laborious analysis of the stimuli coming in from the environment at each successive moment. That theory according to us can explain both Jizz observed by birdwatchers and clinical intuition in medical practice.

Jizz; clinical intuition; diagnosis; birding, inference

INTRODUCTION

Recognising objects is a big challenge for our brain, both on an individual and population level, especially during learning and the process of evolution [1]. Obviously, the proper diagnosis during evolution was necessary in many situations, for instance, to distinguish between predators and prey, as well as between neighbours or aggressive individuals in a territory [1]. However, we do not always have a complete set of features that allow us to make the correct identification of an object, which is related to light conditions, distance, time of day and related with this tiredness, as well as weather.

Currently, object identifications are not so much important to individual survival, but they still play an important role in living processes. Although sometimes is surprising, the debate on proper diagnosis makes comes from very different directions. For example, this problem is well-recognized in amateur bird watching [2,3] and medical doctors taking diagnoses while checking the patients [4]. However, can a certain sudden conclusion that appears in the minds of both

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birdwatchers (about bird species) and medical doctors (established diagnosis), based on the use of an incomplete set of information, be accurate? And how can we use this similarity to understand the process of formulating medical diagnoses?

At first view, this question seems completely weird; how could that be possible? However, let's look at some facts. Most likely, there is a substantial trade-off between the speed and correctness of the diagnosis. However, life sometimes requires quick diagnoses. The disease can progress rapidly, and deciding at the beginning, in the first stage, can improve treatment [5]. The bird, on the other hand, can fly away quickly. Without proper documentation, which is not easy in the case of mobile organisms, we are left with nothing, or rather a general impression: small, grey, without apparent diagnostic features.

However, sometimes a decision made quickly, based on individual experience, can be very valuable. Such an impressionistic, individual approach to diagnostics, especially in birdwatching, is often referred to as *jizz*. Obviously, *jizz* is not exclusively used among birders, it is also used for other species groups, such as mosses, plants, and bats [2], but we predict it can also be helpful in medical diagnosis. However, in this essay, we try not only to link bird diagnoses and medical ones, using our own experience but also provide a few pieces of information about why practising birdwatching as a kind of hobby or even a way of life [6]. In consequence, it can be valuable for physicians, not only from a leisure perspective but indeed improving the accuracy of diagnoses made and, therefore, in improving patients' health.

An example from dermatology

But in fact, what allows an experienced ornithologist to make a diagnosis on that bird you just saw for a second is not related to the colour of the feathers, not very well visible the shape of the bill or even a particular aspect of behaviour. They have another type of information that comes from experience. What is the month, what is the time of the day, are we in the woods or an open field, was the flight straight or wavy, was the bird alone or in a group, was it coming from the ground or another bush and with this "surrounding" information they just need to pick between only 2 or 3 options. And for the young non trained birdwatcher, you have in front of you maybe 300 different species to choose. Similarly, it is the same when seeing a cutaneous disease. For the student, it can be any disease present in the book with 270 different conditions [7]. For an experienced medical doctor, if the disease is in an adolescent, if it appeared some months ago, if it involves the face, and so on, you just need to rule out two or a maximum of three diagnoses. Remembering that rare diseases are rare indeed, with no obvious reason to looking for rarities. The different thing is in birding, we call this the *jizz*, and in medical practice, we call it the *clinical eye*, which made medical diagnostic something like art [4,5]. This makes practical recommendations to learn dermatology, as well as other medical sub-disciplines. Instead of teaching dermatology by groups of diseases (boxes) we should teach it by frequency and body location. Asking the question like: What is the most common disease affecting the malar area in an adolescent? At least dermatologists, know that the most prob diagnosis is acne. But if we use the same technique for all body locations and ages, we will better help our students orient themselves.

Then, if we allow the student to work for several years, then as he/she becomes experienced, they finally know what the most common disease is I see when an 8-year-old-boy complains on his soles. But if we trained them on that direction, they would get there much faster! Although, what is important to underline is not clear how individual experience can be spread to other people, even the specialists [2,4].

Why *jizz* also works in medicine?

Observation is not only crucial during birdwatching but simply belongs to the fundamental principles on which the activity of our brain is based [8]. According to one way of processing information, to recognize a bird species or similarly to make a medical diagnosis, we should analyse all the drawings in an atlas, making comparisons of the observed individual bird in terms of size, shape, colour arrangement and plumage patterns (or review the entire medical textbook page by page or currently compared with the Internet sources). This would be extremely laborious and time-consuming. According to the other way, based on Bayes theorem, we will go straight to the relevant table in the atlas and compare two similar species at most. This second approach, which is much more energy and time efficient, is governed by a basic law of brain function: a brain is a tool for prediction (Friston & Stephan, 2007; Friston et al., 2013). The primary function of the brain is to make predictions about the word, rather than laborious analysis of the stimuli coming in from the environment at each successive moment. Why? Because learning every new element that appears in our perceptual field 'from scratch' would simply be an impossible task. When a new object appears in our field of vision, we already *a priori* 'know' its characteristics and ways of behaving based on our past experiences and the generalisations we have formed from them. We make assumptions, predictions, and forecasts [9,10].

To start with, for the sake of simplicity, let's imagine that a person interested in birds goes on a birdwatching trip but has never consulted a bird atlas in any form – book, online, or on a smartphone screen. What will this person encounter? The chaos of shapes, colours, sizes, sounds, behaviours, shadows, and movements. Without pre-existing models in the head relating to the appearance, voices, and behaviour of bird species, them being divided into various categories, and the environments in which given species can be observed, such a field trip will not be satisfying. An accurate observation results from a good prediction model in the observer's mind/brain long before they observe the bird. New observations and determination of the species previously found in atlases and guidebooks serve not only to gain satisfaction from adding the species to the list of life. They also serve to create in mind a model of that species so that it can be stated again in the future. We then build quite a complex model that allows us to recognise the same species more easily in the future. The word easier is key here. The brain works so that it takes shortcuts, instead of using traditional (frequency) statistics, it uses a different statistical model based on a Bayesian approach, with pre-existing predictions. In other words, instead of systematically searching the environment step by step, it can rely on inference, suppositions, and certain *a priori* assumptions.

Creating possible models of reality objects encountered and future actions is an advantageous behavioural strategy. This *a priori* model based on prediction is, as believed, the basic principle of brain function [11]. Why? Because it allows the individual not to invest time and energy beyond what is necessary and to make choices that are relatively possible to ascertain and realise and can lead to the achievement of the goal. It allows us not to think in-depth about every species of bird we see, and every time looks it up in a bird-guide but to make classifications almost automatically and effortlessly. It is the optimal and least effortful way for the mind to function. So, we can make observations, so to speak, in the virtual reality of our preceding prediction-based model. However, if we notice the difference, and the swan turns out to be black rather than white, there is a surprise. A 'prediction error' may be detected. Detecting a 'prediction error' is an opportunity for new learning, new experiences, new knowledge, and modification of the model. Alternatively, the prediction error can be ignored. In the latter case, there is no new learning or modification of the pre-existing structure, it remains rigid and unchanging. Then, contrary to the facts, all swans will be exclusively white. We do not accept any other possibility.

Such a way of thinking was initiated as early as the end of the 19th century by Herman von Helmholtz [12], who described perception as a process of probabilistic inference based on prior learning. It was von Helmholtz who first suggested that the brain must anticipate the consequences of its sensorimotor activity in the form of unconscious inference. According to this line of thinking, the brain works the opposite of what we have come to think. In the common intuitive way of understanding, the brain receives information from the environment and, on this basis, reflects a picture of the surrounding world. First, we see a common rose finch *Carpodacus erythrinus* and, based on incoming information, we determine what species it is.

In the paradigm presented here, the brain does not build a picture of the world based on incoming stimuli but tries to predict incoming sets of stimuli (information) and their possible causes and its actions based on the best models of reality available to it at the time. In other words, the brain does not map the world based on constantly incoming stimuli. Still, it imposes a model on the incoming stimuli, comparing what comes from the environment with this model and detecting moments of incompatibility in the form of surprise ("prediction error"). As Clark [8] writes, "it's a twist" – a strategy to use connections going from the top down (from the higher levels of the nervous system to the lower ones) to try to generate, using the knowledge present at the high levels of the nervous system, virtual version of incoming sensory data, through a multi-stage information processing system. We call it hierarchical predictive coding. In this approach, perception, action, and attention serve a single purpose, to reduce prediction errors associated with the exchange of information with the environment. To structure, to sort out in a way, the image of the world and actions in it in such a way that our predictions are fulfilled and become reality. This means that prior expectations govern and shape perceptions – we cannot experience the world in isolation from what we already know about it. Ornithological knowledge, time spent with a bird atlas, experiences, heard information, and beliefs guide what we perceive. In short, a perception is an act of inference, and the brain's current model of the world – at all levels, from the physical to the social one – governs what is perceived. This balance between current sensory data and prior knowledge/experiences allows the brain to deal with disturbed and uncertain information from the environment, make predictions about data yet to come – in several time frames – and allocate motor and cognitive resources in a proactive, anticipation-based manner that optimizes interaction with the environment.

Contextual mind

Bayesian statistics are based on an understanding of probability as a measure of rational confidence in the truth of a given thesis, confidence conditioned by prior information. Unlike the frequentist approach, the Bayesian understanding of probability applies when frequency statistics do not make sense. The Bayesian approach automatically handles irrelevant parameters in statistical models. In the Bayesian approach, *a priori* information is important. Indeed, ignoring or disregarding such *a priori* facts can lead to false conclusions. Bayesian statistics always, i.e., in calculation and interpretation, refers only to data that has been obtained, whereas frequency statistics refers (in its interpretation) to the distribution of outcomes that are potentially possible but de facto not observed. Moreover, it is worth mentioning that when solving complex research problems, the Bayesian approach is increasingly common in both psychiatry and ornithology. Going back to the visual perception that Helmholtz wrote about, Ramachandran [13] points out, an important fact about the organization of visual perception. According to this author, a naïve view of the vision process says that it involves serial and hierarchical image processing. The raw data reach the retina in the form of elements, or pixels, and is then transmitted to subsequent visual areas ultimately adding up to a visual image. Ramachandran estimates that this model of vision ignores the fact that there are massive feedback connections between the higher and lower visual centres. These connections are so numerous that, in his opinion, at each stage of visual data analysis a partial hypothesis, the best one at a particular moment, is formed. It regards the incoming data and is sent to lower centers and thus modifies, even slightly, the direction of further processing. Initially, several working hypotheses may compete for dominance, but eventually, through reflexive reinforcement and successive iterations, a final perceptual solution is reached. Ramachandran believes that analysis of visual data occurs through top-down rather than bottom-up connections. This is consistent with the view presented above.

In humans, a significant part of the brain – including the occipital lobes and some parts of the temporal and parietal lobes – deals with vision. Each of the approximately thirty visual areas within this part of the brain contains a complete or partial map of the visual field. At least as many paths (in fact many more!) return from each processing stage to an earlier stage as go out from each area to an area that is located a rung higher. This author writes that the concept of vision as a sequential analysis of an image of increasing complexity does not stand up to a confrontation with the presence of such a strong feedback loop, and believes that at each stage of processing, the moment the brain obtains a partial solution to a perceptual "problem" – for example, it spots a bird – it is immediately fed back to earlier stages, to higher hierarchical areas of the brain: "It is as if each of us is constantly hallucinating, and the thing we call perception consists merely of selecting the hallucination that best fits the current data. Of course, this is an exaggerated view, but there is a grain of truth in it".

If we are hallucinating as Ramachnadran proposes, do we have ways to have more accurate perception of the world outside us? The next question is how jizz can be used in the fast thinking vs. slow thinking system (sensu [14]), and what trade-offs exist in making decisions based on experience [1].

Perhaps a way forward here is to consider the distinction between two kinds of inferences: perceptual inference and active inference. First of them, fast perceptual inference (of the unconscious manner described by Helmholtz) does not depend upon action. One recognises immediately the cause of ones sensations; when suitably equipped with all the prior knowledge about things that cause these sensory impressions. However, if we fail to resolve uncertainty about the cause of our sensations, we may take actions to actively search for more evidence. This is known as self-evidencing in active inference [15]. In this case, action is simply palpating the world with our eyes (via saccadic eye movements) to solicit more definitive evidence that resolves uncertainty about our perceptual hypotheses [16-18]. Crucially, this involves planning where to look next; sometimes referred to as planning as inference [19-21]. This means that the distinction between fast and slow may be better thought of as the distinction between perception in the moment and the more deliberative evidence accumulation that requires planning. Interestingly, the expected prediction errors following an action (e.g., eye movements foveating a bird) can be shown to comply exactly with the Bayes optimality principles of experimental design [22-24].

FUTURE DIRECTIONS

Birdwatching is increasing in many societies but was even underlined as an ideal activity for a physician [25-27], just because medical studies provide basic knowledge, especially in biology and physics. Moreover, clinical training then teaches to watch and listen. Sometimes birdwatching is like coexisting with art because the avian world is colourful, then focusing on colours and shapes is recognized as especially important in dermatology [28]. We addressed in previous paragraph the question is how *jizz* can be used in the fast thinking vs. slow thinking system [14], and what trade-offs exist in making decisions based on experience [1]. These are undoubtedly interesting issues that can be tested during observation and in the form of special experiments. It's worth noting that contemporary research with Artificial Intelligence (AI) try to establish tools that can be useful in diagnostics based on a model of clinical intuition. For example Bi et all [29] on the basis of deep learning constructed an early diagnosis system for Alzheimer Disease using Convolutional Neural Network (CNN) and deep metric learning (DML) algorithms.

In conclusion, experience and decision-making are important, but it is best to do it very critically, with appropriate procedures and documentation. Yes, in birdwatching as well as in medicine. Surprising how a hobby can help work, and work can be adopted about understanding hobbies, although some even talk [6] about lifestyle. To date, in discussion on the origin of *jizz*, was mainly linked to the slang of pilots during the war, using the description of aircraft based on acronym *GIS – General Impression and Shape'* [30, 31]. However, to our ears, it sounds rather like *jazz*, music full of expression and improvisation, which is challenging, both in ornithology as well as in medicine, especially in front of novel objects and problems, which makes science so interesting.

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