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The Mongoose Phenomenon: A New Logical Heuristic

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Abstract
Often when discussing what is considered a rarer occurring event, individuals reference the Baader-Meinhof phenomenon as insurance against fallacious thinking. Also known as the frequency bias, this logical heuristic states that rare occurring events are rare and the knowledge of the existence of rare occurrences makes the interlocutor more likely to search out the event or see it occur more frequently. These false increases in observation frequency can logically be blamed, at least in part, on the interlocutor being made aware of the event existence. This Baader-Meinhof logical heuristic is often mis-utilized in the sciences to minimize the chances of rarer phenomena from being considered within a logical framework for the work up of a problem. This article presents a new logical heuristic, the "Mongoose Phenomenon" as a counter argument and presents it in the context of the fields of medicine, the hard sciences, engineering, and philosophy. It is the intention of the authors that this logical heuristic be utilized to improve the thought process of scientists, clinicians, and others to ensure the best thought process for the work up and creation of a solution for problems.

Keywords
Baader-Meinhof Phenomenon; Logic; Logical Heuristics; Frequency Bias

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For an animated video abstract of the article, please visit Milan Sivakumar's The ScienceVerse YouTube channel: https://www.youtube.com/watch?v=wa5JjL4PNXk

The "Mongoose Phenomenon": A New Logical Heuristic

In certain areas of the world, such as Barbados, a mongoose is considered as a fairly common animal. These ferret/squirrel-looking creatures are known for being quick-moving or sneaky and are always wary of people [1]. Though it is highly likely that someone may stumble upon a mongoose every once in a while, they are rarely identified as such and often thought to be squirrels, ferrets, cats, or other mammals upon first glance. Due to this phenomenon, many people believe mongooses to be quite rare, when, in reality, they are only noticed when one is specifically looking for them. In Barbados, there is an old Bajan belief that a mongoose will never cross a road unless someone is looking [1]. Therein lies the core principle of the "Mongoose Phenomenon"; there is something "hidden in plain sight". Just as mongooses are thought to be incredibly rare, when, in fact, they are more common than many

other native animals; however, they are only noticed when an onlooker is first primed to see them [1]. This particular phenomenon stands in stark contrast to the Baader-Meinhof phenomenon and is a brand-new logical heuristic to be added as a counter argument in the literature. It is the hope of the authorial team that this paper be utilized to modify the baseline thought process when assessing a problem. This article discusses the Baader-Meinhof phenomenon, provides an introduction to the new logical heuristic, the "Mongoose Phenomenon" as a counter argument and presents it in the context of the fields of the hard sciences, engineering, medicine, and philosophy. It is the intention of the authors that this logical heuristic be utilized to improve the thought process of scientists, clinicians, and others to ensure the best thought process for the work up and creation of a solution for problems.

Background

When working up the cause of a problem, oftentimes the rarer occurring potential etiologies are discounted with statements invoking the Baader-Meinhof phenomenon. These phrases include the statement, "When you hear the beating of hoofs, don't think of zebras" or "Keep it simple, stupid", or the KISS principle [2–8]. The Baader–Meinhof phenomenon, also known as the frequency bias, states that rarely occurring events are rare. Secondarily, the logical heuristic posits that it is the knowledge that such rare occurrences do exist, that causes the interlocutor to become more likely to search out the event or see it occur more frequently [2–8]. The original researchers of the Baader-Meinhof phenomenon would state that this false increase in the frequency of observation is then blamed on the simple fact that the interlocutor is now aware [2–8]. Due to the need for proper and quick diagnosis of a problem in the development of novel devices, preventing damage or destruction of property, or in the treatment of patients, the Baader-Meinhof logical heuristic is often mis-utilized to minimize the chances of rarer phenomena from being considered [2–8]. While this is a sore point for many in the clinical or problem-solving space, it is still utilized to much frustration for those who are desirous to ensure the safe and proper consideration of all possibilities [9–11]. It is because of the consistent use of this heuristic as either the equivalent of a natural law or as a platitude, the authorial team has desired to provide the reader with a counter argument to weigh in the balance of the logical workup of a problem.

Because of the newness of this postulate within the literature, the authorial team has prepared three different phrases for future use, ranked based on the clearness of the statement. The "Mongoose Phenomenon" is best posited as "Rare occurrences might not be rare, but instead they are common occurrences just hidden in plain sight." Conversely, it might be stated as "Once new knowledge is incorporated into one's total fund of knowledge, then finding these "hidden in plain sight" natural occurrences becomes much more likely." Finally, the third version is "You cannot see what you are not looking for."

The rationale for the creation and proper documentation of this new logical heuristic follows in the mindset of the Occam's razor versus Hickam's dictum debate which focuses on the classical interpretation and utilization of Occam's razor in medicine. In medicine, Occam's razor is often used to remove multiple diagnoses from a patient list, leaving only a minimum number which can be treated. However, when mis-utilized, this principle leads to expensive treatments, diagnostic tests, potential surgeries, and much hardship and heart break for patients. As a response to this, the Chair of Medicine at Indiana University, John Hickam, wrote the famous Hickam's dictum, "A man or woman can have as many diseases as they damn well please" [12, 13]. This counter argument is useful to prevent harm to the patient or potential destruction of property and/or life and is cross applicable to other problems.

Application in Medicine

One of the best examples of the Baader-Meinhof phenomenon misuse to prematurely remove potential diagnoses from consideration is seen in patients with neuroimmunological disorders. One of the most well-known stories encapsulating this is seen in Susannah Cahalan's book, "Brain on Fire: My Month of Madness", which demonstrates the misuse of the Baader-Meinhof phenomenon a number of times [15]. The patient was misdiagnosed with a number of psychiatric disorders, with proper testing for rare disorders deferred due to the rarity of occurrence. The blame for the patient's suffering was placed on "partying too much", schizoaffective disorder, or catatonia - all without ruling out the rarer possibilities [14]. While not explicitly stated in the book or from the accounts of her physicians, this error was most likely secondary to the Baader-Meinhof principle circulating the hospitals and clinics in its platitudinous form "When you hear the beating of hoofs, don't think of zebras" [2]. The patient's eventual diagnosis of anti-NMDA receptor encephalitis and full recovery after treatment by esteemed physician Dr. Souhel Najjar and his colleagues demonstrated once again that the signs and symptoms that made this the most logical, only became obvious when this rarer diagnosis was considered – a "Mongoose-Spotting" moment.

Other disorders such as multiple sclerosis (MS) and neuromyelitis optica spectrum disorder (NMOSD) were considered as incredibly rare until the mass proliferation of magnetic resonance imaging machinery in different hospitals worldwide, increased awareness and disease modifying therapies [15, 16]. While some might postulate that the rapid increase in MS and MS-mimicking diseases is the result of increased disease burden, instead it is more likely that an increase in awareness, technological advancement, and the ability to treat has increased the overall diagnosis of these once incredibly rare disorders.

This cross application of the "Mongoose Phenomenon" may also be true for other disorders once considered incredibly rare, such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and schizophrenia [17–21]. Once considered highly rare, these disorders have been found to have much larger prevalence over the last several decades with many different research groups

making bold claims as to the reason for the increase in the number of those afflicted by these disorders [17–21]. Nevertheless, like it has been seen with other disorders, once the disease state is described, it can and should become clear that these might have just been "mongooses" hiding in plain sight – much more common than originally believed.

Application in the Hard Sciences and Engineering

In the field of the hard sciences and engineering, there is a strong emphasis on ensuring that all possibilities have been considered when creating solutions to different problems, from understanding the way how different biological systems interact to building powerful and useful circuits. Nonetheless, in a similar vein to their counterparts in medicine, many will oversimplify the problem and often blame either human error [22, 23] or equipment problems [24, 25]. However, this is seldom followed up with further testing to demonstrate that it is really the equipment fault, leading to potential delaying the discovery of natural occurrences which may have beneficial applications in the development of the sciences. Many failed experiments are never followed up on due to the researcher being so focused on obtaining the desired results that they do not take the time to pursue the unknown error which could lead to a major breakthrough. In an article published in 1996, the authorial team articulated four steps necessary to reduce errors in science: tests of equipment and programs, examination of results, peer review, and replication [26]. Nevertheless, many experiments are never replicated due to lack of funding or there is difficulty in reproducing the experiment, leading to either an increase in erroneous ideas or a loss of potential learning about necessary and important natural phenomena [27]. This is further prevented from moving forward as many negative resulting studies are never reported on due to fears of hurting the scientist's career or it being detrimental to getting further funding [28, 29].

One such example of engineering not looking for what may seem like the obvious and was hidden in plain sight came in the very early days of manufacturing devices. It was postulated that any device could be created in any atmosphere and with any manufacturing equipment. It was found, at that time, that several of the devices had some impurities. Several of the engineers who were working said it must come from some form of quantum tunneling or through touching the devices – what, at the time, was considered as more common, and, therefore, more likely causes. Through some investigation it was found that the impurities were sodium that came from the lights in one of the machines - a much rarer occurrence. This shows that engineers are also subject to this phenomenon and only through testing they were able to determine the simple explanation. The sodium being emitted from the light source was a "mongoose", hiding right in plain sight.

One final example, the discovery of penicillin, came from the further interrogation of an accidental finding [30, 31]. A number of other scientists had utilized the penicillium fungi over the years. However, in that moment of seeing the zone of inhibition on his petri dish, Fleming serendipitously asked, "Why?" and proceeded to further interrogate the finding [30, 31]. The discovery of things hidden in plain sight - again the "Mongoose Phenomenon" in action, was the catalyst which led to the creation of the world's first bioactive, lifesaving antibiotic.

Application in Philosophy

Within the field of logic, the development of counter arguments and its application and cross application towards the different fields of study have long been of importance, dating back to its origins in ancient Athens [32]. This writing of what would eventually become logical heuristics, logical fallacies, and other short-hands for making the best decision in a short period of time has been an area of great interest for several years (at least since the 1950s with some estimates in the 11th century AD). There are many fields which benefit from the utilization of heuristics with proponents of its applications in the sciences, psychology, sociology, law, politics, and medicine [33, 34].

Adding this new logical heuristic is beneficial in the crafting of logical theory, as it first adds a counter argument to the field which is currently missing and necessary to ensure that logical shortcuts which lead to fallacious thinking are not the only utilized arguments. Second, it reminds the individual of how that which is considered uncommon, may still be the answer if this new discovery is not as rare as originally thought. Thirdly, the team's postulate of considering rarer occurrences to ensure proper diagnosis of the problem works to prevent oversight of those ideas which might be of importance. Finally, the "Mongoose Phenomenon" allows for more rare occurrences to remain in consideration long enough to allow for the statement of Sir Arthur Conan Doyle to come to fruition - "When all other contingencies fail, whatever remains, however improbable, must be the truth" [35].

Conclusion

This paper presented a new wording of a logical heuristic, discussed its place in the literature, and its applications in a number of fields. This, like any other logical heuristic, is not a natural law, but instead is a way to help better understand the world at large. It is the benefit of utilizing this logical heuristic and applying this knowledge along with other logical heuristics to quickly identify the root cause of the problem without overlooking what may seem to be highly unlikely to ensure that the patient receives the optimal care. It is the hope of the authorial team that this new logical heuristic will help ensure that individuals, clinical teams, and researchers are able to "get it right" and provide the best possible answer to the problem that befuddles them expediently for the benefit of others.

Ethical Statement

No violations were noted due to the theoretical nature of the paper.

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Conflict of Interest

Thomas C. Varkey: is an Adjunct Professor at Grand Canyon University and receives payment for his teaching and grading, he is a faculty member with the National Multiple Sclerosis Society's Monthly Fellows Difficult Case Discussion Webinar, and Thomas serves on the board of editors for ProClinS Cardiology.
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