**MACHIAVELLIAN INTELLIGENCE HYPOTHESIS**

The Machiavellian Intelligence hypothesis is not just a single simple theory. It is better seen as an umbrella term for a range of hypotheses that all share a common characteristic- they link cognitive capabilities and intelligence with the problems of living in a socially complex group. The hypothesis is fairly recent, and only began to gain traction in the scientific community in the mid-1980s. We only began to investigate the evolution of our intelligence around this time, when we noticed that our close relatives, the primates like chimpanzees and bonobos, share similar high-level intelligence and increased intellect. In fact, they are so similar to us in our cognitive levels, that the psychologists Tomasello and Rakoczy noted that “if we imagine a human child born onto a desert island, somehow magically kept alive by itself until adulthood, it is possible that this adult’s cognitive skills would not differ very much—perhaps a little, but not very much—from those of other great ape”. Some of the proponents of this theory whose research I have used are Nicholas Humphrey, Richard Byrne, Andrew Whiten, Sergey Gavrilets, Aaron Vose and Alison Jolly.

Historically, intelligence is a very important characteristic. It has enabled us to achieve much of what we have, and is fairly unique to a small group of species - humans and other primates like apes, lemurs and monkeys. This leads to the question of how, and more importantly, why intelligence and complex cognition has evolved in these species. It is fair to say that humans and these few primates show the traits of increased intelligence and *creative* intellect, meaning we can think critically about certain people or situations and generate new, self-initiated actions. We can think in more abstract terms. We have a sense of self, of our individuality and our consciousness. We can believe in a subjective but collective reality, and interact with others via an unspoken but almost universally accepted social contract. Things like being able to go to a shop and barter pieces of green paper for food and water takes an enormous level of mutual understanding and intelligence that we take entirely for granted.

There are a few chronological events significant to this subject. Firstly, there was rapid development and advances in the biology of intelligence in early humans. There was differentiation of the brain’s function about 5 million years ago, along with an increase in absolute brain size, from Homo habilis having brain volume of 600 cm3, to Homo neanderthalensis having 1500 cm3. By comparison, current homo sapiens have an approximate brain volume of 1350 cm3- smaller than that of Homo Neanderthalensis, but still significantly larger than many other animals of comparable body size, and at least three times the size of the brains of other most other primates. Another characteristic that sets humans apart from other animals is a general set of behavioural and cognitive characteristics called behavioural modernity, which experienced a great leap forward around 80,000 years ago. The term encompasses a variety of “human” quirks including abstract thinking, symbolic thinking, tactical deception, future planning, arts, music, dance, etc. The psychologist Nicholas Humphrey further inferred that characteristics had the common origin of something called ‘creative intellect’. This is a rather loosely defined term. Creative intellect allows us to think ahead, plan for tomorrow, and initiate our own action and behaviours that are not coded in our genes. Although we previously thought that these characteristics were unique to humans, studies into primates and great apes show that they too show some, if not all of these characteristics. These historical developments play an important role in our intelligence and social interactions today, and when we look more critically at what exactly these interactions entail, we can make several interesting observations.

The first is that human and primate society is incredibly complex. Living in a social community effectively involves a variety of behaviors, many of which are quintessentially “Machiavellian”- the making and breaking of alliances, deception, reconciliation, and political maneuvering. One very prominent source commenting on behavioral and social complexity in primates is the book “Chimpanzee Politics: Power and Sex Among Apes” by Frans de Waal. He details his observation of the complex political interplay in a group of chimpanzees in an artificial environment. He describes how the chimps formed coalitions, and used manipulation and deception to gain power within the group.

The second is that we, along with a select group of other mammals, including primates, bats and wolves, share three characteristics in common- large social groups, social complexity and increased intelligence.

The third is that this group of mammals tend to have a greater brain mass relative to their body- that is, they have bigger brains compared to solitary animals of similar body size and mass. This leads to the interesting possibility that it is social groups and complexity, rather than any physical or environmental challenges, that lead to the development and refinement of our particular brand of intelligence. This is the essence of the Machiavellian intelligence hypothesis.

The Machiavellian intelligence hypothesis was named after Niccolo Machiavelli, a government worker, writer and political thinker in fifteenth century Florence. He is most well-known for his novel, “The Prince'', where he expands on his political theory. He is infamous for suggesting that political power and authority should be divorced from morals. From his book and the titular character of the prince, came the personality trait of Machiavellianism. This trait is associated with interpersonal manipulation, callousness, selfishness, flattery, deceit, coercion and opportunism (doing whatever is required to achieve a goal). People showing this trait are seen to be immoral, and easily switch between cooperating with peers and manipulating them. Machiavellianism is categorised as one of the “Dark Triad” in psychology, along with psychopathy and narcissism, but in this context of evolution, we can look at it in terms of its survival and fitness advantage rather than as a moral debate.

INTELLIGENCE

We need a way to objectively measure intelligence, and relative intelligence of different species. The difficulty in this arises from the fact that we don’t have a clear definition of what intelligence is in the first place. We may define intelligence biologically, by measuring absolute brain size, mass of the brain relative to the mass of the body, complexity (number of neurons) of the brain, or the size of the neocortex. On the latter two parameters, humans and primates stand out. The neocortex is chosen as it appears to be the seat of higher-order cognition, including language and reasoning. It is also the most recently evolved of the parts of the brain, and is most prominent in mammals. Humans also have an unusually large neocortex relative to the rest of the brain as compared to other mammals and primates.

An important point to keep in mind when examining the brain is that brains are metabolically expensive, and are taxing on the body. Despite only weighing a small fraction of the body’s total weight (~2% for humans), they consume a huge amount of the body’s resources and energy (~20% for humans). In general, nature is not excessive. Devoting so much energy to a single organ means that the organ must provide a significant fitness advantage, or it will be selected against.

There are other ways to define intelligence. Alison Jolly, in her 1966 paper about prosocial behavior in lemur troops, defines monkey-level intelligence as the ability to solve problems with objects- symbols, mazes, toys, boxes, etc.- under controlled laboratory conditions. However, she also notes that monkey intelligence (and likely our own) is far more suited to social situations and cues than inanimate objects. She also outlines three main ‘branches’ of insight in primates used for objects (food), other species (predators), and other members of their own species. Nicholas Humphrey, for the purposes of outlining the Machiavellian intelligence hypothesis, defined intelligence as the ability of an animal to “modify his behavior on the basis of valid inference from evidence”, or deductive reasoning and behavior. Jolly’s and Humphrey’s definitions adhere to sociological and cognitive explanations, and are more suited to the social nature of primates.

We can correlate increased intelligence and awareness with the size and complexity of the social group of a particular species. This can be seen in humans, chimpanzees and lemur societies, all of which have complex interplay between individuals and regular politics in efforts to gain power. Another example of this relationship is found in elephants, which live in matriarchal societies with a higher degree of cooperation and collaboration between conspecifics, especially with regard to the care of young elephants. Further investigation showed that social complexity and increased intelligence was more widespread than previously thought, and now is found in dolphins, wolves, monkeys and bats as well. Both intelligence and social complexity decrease in other classes of animals like birds and reptiles, both of which lay further down evolutionary branches than mammals. The second correlation, as noted by Dunbar and Whiten in their studies, is that there is a correlation between the neocortical area of the brain and the size of the social group, as noted in primate species and, surprisingly, in chiropteran bats. The larger the typical group size of a species, the larger the neocortex relative to the rest of the brain. Thus, we find that humans, living in large social groups have larger neocortices, while solitary mammals, fish and reptiles have much smaller neocortices.

LIFE IN A SOCIAL GROUP

Let us first understand why we came to live in complex social structures in the first place. Once again, we must defer to the reach of evolution and natural selection. Living in a larger community of conspecifics gives the individual members specific advantages- it increases the potential for finding food and protection against predators; the species’ young spends an extended period of time being protected by older and more experienced members of the community; and the society brings older members in contact with younger members, which allows information and survival strategies to be passed down either through direct teaching or through social imitation, all of which make the survival of the collective group far more likely than that of any solitary members. It is seen that primates have longer youths compared to other mammals of similar size, to allow for cultural intelligence, exploration and play. (Humans are dependent on their parents for a remarkably long time- upto two decades; chimpanzees are dependant on their parents for about ten years; birds, for about one to two years; and reptiles like snakes, almost two weeks) This has the consequence of a general increase in cooperation and decrease in intraspecies aggression of the individuals in the society- cooperation and friendly behaviors are favored instead.

However, living in social groups also has disadvantages. Most notably, it decreases the competition between conspecifics, which evolution naturally encourages for survival, and decreases the potential for natural selection. Competition encourages survival, which is why we see fierce rivalry between members of the same species (conspecifics). Cannibalism is actually fairly common in the animal world, in an effort by animals to promote their own offspring and genes and suppress others. However, this goes against the requirements and strength of an effective and cohesive social group. Thus, as though to compensate for the lack of obvious competition between conspecifics, there evolved a subtler manner of competition carried out cognitively. Successful individuals were those able to strike a balance between the common interest of the social group and their own selfish interests. Strategies of alliance, deception, compromise and reconciliation evolved in order to carry out complex power play and gain power. In a social group, social power almost directly leads to reproductive success, so it becomes worthwhile and advantageous for the individuals to spend longer periods of time engaging socially with their conspecifics. Social engagement may involve a variety of friendly behaviors such as grooming play-fighting and general contact. Additionally, chimpanzees and other primates have been seen to carry out plots, and form alliances and coalitions for superiority on a large scale. On a smaller scale, chimpanzees also manipulate their fellow members to get food and comfort. For example, a young chimpanzee may attempt to distract his mother to get to a delicacy she was enjoying. The individuals that are best able to manipulate the members around them for the best possible personal gain, while simultaneously maintaining the social norms and “contract” of the community, end up having the best food, and greater reproductive rights. These are the individuals that dominate the community and end up passing not only their genes to their offspring, but also the strategies by which they came to power to the other chimpanzees around them. If one chimpanzee discovers that he can ally with another to overthrow the current leader, there is nothing stopping the other chimpanzees from observing this and realizing that they can do the same, and the new leader gets overthrown himself. In response, perhaps he decides to make up with the others, and ingratiate himself back into the group, reconciling with his enemies by grooming them and accepting their dominance. Young chimpanzees in the group observe these dynamics and learn the best and most successful tactics by imitation. In order to then surpass any strategy previously learnt by observation requires creative *original* thinking to arrive at new, better strategies and the ability to predict what the other chimpanzees would do. This results in an intelligence arms race, with every animal trying to outwit the other, and this is the runaway path that resulted in the emergence of Machiavellian traits and intelligence.

Two key points to consider when examining the usefulness of machiavellian traits are reproductive rights and time-efficiency. It is critical that a machiavellian fitness advantage leads to much greater reproductive rights within the group in order for the trait to be successful (political, social and reproductive rights in a primate community often coincide, so they can be confused). Only then will the genes be passed on, which would encourage the growth of larger brains in the long term, and let the traits of machiavellian fitness and competition rise to near-universality within the social group. Due to this requirement of reproductive success, it is often examined only from the perspective of the species’ males. However, it has clearly been seen females also exhibit the same machiavellian traits of manipulation and deception. “Chimpanzee politics” describes how certain female chimpanzees were as willing and capable of manipulating the males to gain social power within the group.

The second point has to do with the efficiency of social engagement. To learn strategies, to remember and cultivate relationships with each member of the group takes up time that could have been spent in foraging for food, or simply conserving energy. This implies that for the development of machiavellian traits and intelligence, the benefits must be enough to compensate for that time lost.

Now let us look at some similar traits in the context of Homo Sapiens. Say you want to go to a party, but you need your parents’ permission to go. This is you accepting and working within the *rules and norms* of your society, or at the least your household, for the common benefit. Next, you know from *past experience* that your parents appreciate it when your room is clean, so you make sure to do that before you ask them. Here, you are anticipating their state of mind, and attempting to manipulate that state to favor your end-goal- Machiavellian by definition.

These behavioral Machiavellian traits require many complex cognitive processes. Firstly, at the bare minimum, the individual must have the capacity to distinguish between several conspecifics, from close family, to distant relatives and new acquaintances. This in itself requires considerable brain power and an excellent memory. Secondly, the individual must have the ability to recall the past history, previous alliances and conflicts, and ranks within the community of each conspecific. This too requires a significant memory, and stretches the limits of an animal’s brain. Due to the amount and depth of information that is to be remembered for each member in an individual’s circle, there is a limit to how many conspecifics we can maintain a relationship with. This number depends on our brain/neocortex capacity and the complexity of the relationships within. This number is called Dunbar’s number, and is approximately 150 for humans (Jolly noted that once a group of lemurs reached their species’ Dunbar limit, the group will split and form two separate groups of roughly equal composition of young and old, male and female, in order to maintain strong social bonds with all of the group’s members). Thirdly, the ability to invent effective strategies and manipulate conspecifics requires a curious capacity known as Theory of Mind. This is the ability to attribute different thoughts, emotions and purposes that are distinct from our own to other people. An effective strategy must account for the fact that different individuals have different cognitions and motivations. In order to succeed in gaining social power, one must be able to predict the states of mind of others, and the consequences of their actions on those states of minds. This results in a decision tree with many possible outcomes, each of which must be weighed appropriately. Humphrey compares this cognitive process to a game of chess, where each player must not only come up with effective strategies, but also anticipate their opponents’ responses to every move. These are all *unobservable* characteristics- they require abstract thinking to imagine situations beyond what we can physically sense. As I try to deceive my enemy, my enemy may be aware of this and use my plan against me. I must account for the others’ knowledge and possible actions, and they must do the same. All this is hugely complicated for a brain to achieve. Add to this the requirement for originality- to provide information, ideas and cognitions that are not simply encoded in the DNA- and the brain now needs to be incredibly efficient at information storage, retrieval and connections. All this requires a well-developed neocortex, which we do see in animals that live in complex societies. Theory of mind includes the individual having a sense of self. Although it was previously thought to be exclusive to humans, by now we have observed the ‘Theory of Mind’ capacity in multiple species, most prominently in great apes, the corvid and psittacine species of birds, elephants and toothed whales.

There are also a number of traits that both humans and great apes display that do not come under Machiavellianism, but can be explained through MI. Over time, when we play the game of social complexity, it cannot be said that it is played with only the end pursuit in mind, and a willingness to do anything to achieve it. Contrary to the principles of Machiavellianism, there is in fact a decorum, or a set of rules by which we tend to play. Humphrey uses the concept of sympathy to explain this “temperance of selfishness”, stating that it comes from identifying oneself and one’s aims with the others, encouraging cooperation in a community and creating a wider concept of morality. Other psychologists such as Furuichi (2011) noted the decrease in aggression increase in tolerance both within the group and outside in bonobos, who are closely related to humans. This is explained as a development of a biological ‘self-domesticated’ phenotype due to the promotion of cooperation and sharing within a group.

COMPUTER MODELS

When looking at the consequences of social complexity in the long term, it is easiest to do so through a designed computer model. The psychologists Gavrilets and Vose used such a computer model with parameters for the specific strategies that could be used by individuals and the cognitive capacity of each. The overall aim of each individual in the simulation was to gain maximum reproduction rights. Before we go into the details of the study, it is necessary to explain the term meme.

A meme is essentially a packet of information, an idea, or in this context, a particular Machiavellian strategy. It is not unlike a gene, in the sense that it is a replicator in its own right. Much like genes, memes can be copied and passed, with more successful memes becoming more popular as they confer a greater fitness advantage on the individual that may possess it, and thus get imitated/passed down to more conspecifics. However, the evolutionary processes and selection for memes takes place at a much faster rate than for genes. The different timescales means that the more adaptable and thus more useful memes can confer a greater fitness advantage, but that their efficacy is limited by physical constraints controlled by slow-moving genes. It is also important to note that while gene selection depends on random mutation over a prolonged period of time, meme selection involves the individual’s conscious learning and imitation of the best strategies, accelerating the process. The similarities and differences between memes and genes is where the intersection of biology and psychology becomes significant. We can see that as time passed, there has been an increase in the amount of extra-genetics information- whether it is in the form of language, writings and books, or ideas and memes. Where the passing of complex information and behavioural patterns used to rely entirely on genes, this is increasingly not the case, with animals being able to learn and pass down information within their own lifetime.

Gavrilets and Vose defined a number of characteristics in their model of a hominid community- learning ability, cerebral capacity, the Machiavellian fitness of a meme, the complexity of the meme (which impacts how easily it is learned by conspecifics) and the overall Machiavellian fitness of the individual. The first two constraints, learning capacity and cerebral capacity, control the number of memes an individual can learn and use, and are controlled by the individual’s genetics. Due to the metabolic cost of having a larger brain, these characteristics are selected against. All of the parameters are interrelated- for example, the more complex a meme, the greater its fitness benefit, and a greater learning ability is required to use it. The psychologists identified three distinct phases in their model- a dormant phase, the cognitive explosion phase, and the saturation phase. During the dormant phase, only newly-invented memes exist in the population, so they are not very complex and are limited in their Machiavellian fitness. In addition, cerebral capacity is also fairly limited, and social learning is slow, so memes cannot be easily learnt by others During the cognitive explosion phase, meme count, cerebral capacity and learning ability increase dramatically, causing the Machiavellian fitness of the individual to increase similarly. Additionally, the cerebral capacity increases at a greater rate than the learning ability, and simpler, faster memes outstrip more complex memes. Finally, during the saturation phase, the cost of having a large brain to learn and store memes now exceeds the survival benefit the memes themselves give, causing the learning of new memes plateau. Studies indicate that we may now be in the saturation stage. However, this study is only a mathematical model, and does not account for other factors like natural selection of memes, so it cannot be directly applied to a population.

Owing to the difficulties of getting a live sample of primates to observe and study in controlled isolation, other psychologists have also used computer models in lieu of this. A study by McNally, Brown and Jackson in 2012 used game theory- the iterated prisoner’s dilemma and the iterated snowdrift game- to demonstrate that decision-making and behavioural traits like reciprocity and cooperation in certain dilemmas can lead to selection pressures that promote greater cognitive capacity and skills.

FLAWS IN MACHIAVELLIAN INTELLIGENCE

There are issues with Machivellian intelligence hypothesis that arise from the ambiguity of the theory and exceptions we observe in the animal world. Inconsistencies are seen in elephants, toothed whales, and corvid and psittacine birds which (as discussed) possess theory of mind, but do not have especially complex society or dynamics. On the other hand, there are species of monkeys that live in much larger groups than certain great ape species, but do not show the corresponding intelligence and cognitive capacities as great apes. This may also have to do with the social complexity of the group of monkeys or primates, in addition to the group size.

Few of the articles or research quoted here are definitive on the subject of MI. This is due to the many complications that the investigation and analysis of the theory poses. There are often too many interconnected factors involved in evolution of primate intelligence. including social, physical, environmental, and dietary factors. Not only does this make it difficult to narrow down an exact cause and effect, it also makes it less likely that only one factor is responsible for intelligence. The interplay of factors also requires expertise in multiple subjects, predominantly psychology, sociology and biology, although there are many other areas involved.

A second difficulty in studying this hypothesis is the difficulty in measuring intelligence. As has already been stated, there are many different definitions and tests for intelligence, based on the context of said definition and affected by social perceptions. The third difficulty is in the technique of the study. Studies involving primate groups, should ideally have a large and representative sample. The group needs to be kept together to observe the subtleties of their interactions. Additionally, the effect of the external environment i.e. their natural habitat should also be considered, adding to the difficulty of the study. Even when this information is successfully gathered, the analysis can be extremely complicated.

This is why psychologists who wish to examine the MI hypothesis must come up with other means to do so. Some studies use computer models and simulations that can create the necessary complexity without the difficulty of having a live sample, but the validity of the study is reduced this way. The paper by Nicholas Humphrey was not first-hand, controlled research, but rather his inferences and conclusions of evidence he had observed. This also reduces the validity and the real world applications of the paper. However, this paper and his hypotheses were validated by the research papers of others such as Byrne and Whiten. Alison Jolly’s paper was based on her observations of lemur groups, and while the observations and inferences she makes may be applied to primate groups, lemurs and great apes are not close enough for the link to be definitive. Despite these uncertainties, there is a fair consensus on the contribution of social complexity to increased intelligence.

OTHER EXPLANATIONS

Other than the Machiavellian hypothesis, there are other theories that attempt to explain the evolution of intelligence. Before the emergence of MI, one popular theory was that intelligence evolved in response to physical and environmental constraints, and that it enabled us to make tools and survive. However, there are problems with this. Many animals, including birds, can be taught to use tools in order to access food or safety, despite the absence of increased intelligence and creative intellect. In fact, as Nicholas Humphrey put it, it does not take much brain capacity or complexity to learn tool use through social imitation, with the knowledge being passed down to others within a community. If practical problems like tool use only required low-level intelligence, high-level intelligence would have been wasteful and inefficient, so it would be selected against. He also states that tool use and superior technology would actually have become a substitute for higher-level cognition, rather than being the cause of it. For every individual to gain the advantage of a tool does not require all of them to have enough intelligence to invent it. It only requires one individual to discover or invent it, and the rest may learn the technique and gain the advantage with lower-level intelligence, through imitation. Therefore, it no longer holds any great fitness advantage for that one individual. For primates to usefully evolve bigger brains and higher-level cognition, would require something complex enough to require the huge increase in cerebral capacity, and bestow a significant fitness advantage. Both conditions are satisfied by MI, where each hominid, rather than outsmarting the environment or situation, needs to outsmart another smart hominid. Additionally, the tool use hypothesis is at odds with the type of intelligence humans display. We often try to deal with non-social problems socially, by trying to bargain with problems or with inanimate objects. Humphrey describes how scientists give fundamental particles ‘families’, ‘cousins’ and ‘siblings’, and hold the image of a “socially transacting universe.” This reflects social intelligence, where relationships and power dynamics are what we evolved to understand best, as opposed to the technical and object-oriented intelligence that tool-use would have evolved.

Another popular theory is the effect of diet on cognition, where the energy rich diet of primates allowed for the expansion of the brain and neocortex, which increased intelligence. A paper on behavioural ecology by Pual Harvey and T. H. Clutton-Brock showed that there was a difference in the comparative brain size (CBS) of genera that were folivores (those that ate foliage or leaves) versus frugivores (those that ate fruits). They found that frugivores generally had a greater CBS than folivores, and they hypothesized that this difference was due to the higher metabolic demand of a digestive system for foliage, the ubiquitous nature of a folivores diet, and the fact that folivores did not require an extensive memory for “efficient exploitation of their food supply”. Thus they argue that the evolution of large brains and cognitive capabilities were due to the requirements of a complex foraging pattern.

Psychologists/ anthropologists Russon and Begun considered a variety of factors, and concluded that great-ape cognition was due to “an integrated package of cognitive–behavioral–social–morphological traits” along with social and ecological pressures. The issue with many of these theories is that they fail to explain the runaway increase in intelligence as well as MI. In a majority of cases in the animal world, external pressures of physical and ecological conditions prompted small incremental changes through genes as fitness gradually increases. The huge difference in cognition between primates and other animals, the kind that results in a human’s brain being over three times the size of a chimpanzee’s, is best explained by the much faster propagation of memes and the cognitive explosion phase, dramatically increasing the relative fitness of one individual over another.

Other possible explanations tend to be very specific, in contrast to the wide range and effect of deity, social complexity, etc. For example, the Toba catastrophe theory suggests that a volcanic eruption caused a global winter, which killed most creatures except those who were intelligent enough to find ways to keep warm and find food. Essentially, it says that the winter selected for those with greater intellect, and promoted creativity and adaptivity.

These multiple theories appear to cast doubt on the validity of Machiavellian intelligence, but it is likely that a combination of these resulted in the runaway increase in intelligence in humans and other primates.

CONSEQUENCES

This theory has consequences for multiple fields in psychology and the sciences. Humphrey speculates on the impact of MI on the development of artificial intelligence and other scientific fields, due to the differences between social intelligence and rational, objective intelligence. MI will also have consequences on the field of ’noogenesis’. Noogenesis is a term introduced by the anthropologist Pierre Teilhard de Chardin in 1955, and further elaborated upon by Alexei Eryomin in the monograph Noogenesis and Theory of Intellect in 2005. It is the emergence and evolution of intelligence, and explores intellectual systems, information logistics, etc. It is clear why MI significantly impacts noogenesis, and any future research/theories in this field. I believe that the greatest impact will be in motivating future studies into intelligence and primates social life. Research into Machiavellian intelligence largely reveals the gaps in our understanding of such subjects and the lack of objective, controlled studies. This hypothesis can spur more effort in exploring, defining, and finding valid tests/measures of intelligence. It can also motivate more research into the habits, social structures and politics of primate groups. These will bring more validity and reliability to the hypothesis, and confirm the relative impacts of diet, social complexity, environmental factors, etc. on human and primate intelligence.

Lastly, in terms of ethics, it is possible that the theory is construed to promote amoral, unethical, and competitive behaviour. Machiavelli himself was often criticized for this in his writing. However, it is important to recognize that the hypothesis itself involves more traits than just manipulation and deception. There are prominent aspects of cooperation, alliance, sympathy and empathy, traits that we all use, consciously or unconsciously, in our everyday lives.

In conclusion, the Machiavellian intelligence hypothesis is interconnected and complex. The role of social complexity in the evolution of intelligence is accepted, but ultimately, further research is required in this field.

***BIBLIOGRAPHY***

* The dynamics of Machiavellian Intelligence- Sergey Gavrilets & Aaron Vose (2006)
* Evolutionary origins of great ape intelligence: an integrated view- Anne E. Russon and David R. Begun (2004)
* The social function of intellect- Nicholas Humphrey (1976)
* Machiavellian Intelligence- Richard W. Byrne (1996)
* Machiavellian Intelligence retrospective- Richard W. Byrne
* Unraveling the evolution of uniquely human cognition- Evan L. MacLean (2016)
* Coevolution of cultural intelligence, extended life history, sociality, and brain size in primates- Sally E. Street, Ana F. Navarrete, Simon M. Reader, and Kevin N. Laland (2017)

# The social nature of primate cognition- Louise Barett and Peter Henzi (2005)

* Lemur Social Behavior and Primate Intelligence- Alison Jolly (1966)
* Brain size and ecology in small mammals and primates- Paul H. Harvey, T. H. Clutton-Brock, and Georgina M. Mace (1980)

Other Websites:

<https://www.pnas.org/content/103/45/16823>

<https://en.wikipedia.org/wiki/Machiavellian_intelligence>

<http://www.humphrey.org.uk/papers/1976SocialFunction.pdf>

<https://en.wikipedia.org/wiki/Machiavellianism_(psychology)>

<https://en.wikipedia.org/wiki/Dark_triad>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1332935/>

<https://science.sciencemag.org/content/153/3735/501/tab-article-info>

<https://warwick.ac.uk/fac/cross_fac/iatl/study/ugmodules/humananimalstudies/lectures/32/byrne_1996_3ut.pdf>

[ink.springer.com/referenceworkentry/10.1007/978-1-4419-1428-6\_1048](http://ink.springer.com/referenceworkentry/10.1007/978-1-4419-1428-6_1048)

<https://philpapers.org/rec/BYRMIS-2>

<https://www.researchgate.net/publication/6721549_The_dynamics_of_Machiavellian_intelligence>

<https://core.ac.uk/download/pdf/161932341.pdf>

<https://www.jstor.org/stable/30051754?seq=1>

<https://www.britannica.com/science/human-evolution/Increasing-brain-size>

<https://www.cambridge.org/core/books/machiavellian-intelligence-ii/machiavellian-intelligence/06062B4E211EE640DD5280A3EBEBA4EB>

<https://www.pnas.org/content/114/30/7908>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3385471/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1559889/>

<https://en.wikipedia.org/wiki/Noogenesis>

<https://www.researchgate.net/publication/315870122_Primate_brain_size_is_predicted_by_diet_but_not_sociality>

<https://www.researchgate.net/publication/340505496_Noogenesis_and_Theory_of_Intellect_2005_-_356_p_Eremin_A_L_Noogenez_i_teoria_intellekta_Krasnodar_SovKub_2005_-_356_s>

<https://archive.nytimes.com/www.nytimes.com/books/first/b/blackmore-meme.html>