Logical Fallacies

Preprint · February 2020

DOI: 10.13140/RG.2.2.24781.18401/1

1 author:

Domina Petric
UHC Split
216 PUBLICATIONS **20** CITATIONS

SEE PROFILE

Logical Fallacies

Domina Petric, MD

Logical fallacy is the reasoning that is evaluated as logically incorrect and that undermines the logical validity of the argument and permits its recognition as unsound. Logical fallacy can occur as accidental or can be deliberately used as an instrument of manipulation.

INTRODUCTION

In reasoning to argue a claim, a **fallacy** is reasoning that is evaluated as logically incorrect and that undermines the logical validity of the argument and permits its recognition as unsound.

In mathematical logic, a logical system has the soundness property if and only if every formula that can be proved in the system is logically valid with respect to the semantics of the system[1].

FORMAL FALLACIES

A formal fallacy is an error in logic that can be seen in the argument´s form[2].

Appeal to probability is a statement that takes something for granted because it would probably be the case (or might be the case[3, 4]).

Example: *There are so many adolescents that tried drugs. Therefore, if you hang out with your adolescent peers, it is inevitable that you will try drugs at some point.*

Argument from fallacy (the fallacy fallacy) is the assumption that if an argument for some conclusion is fallacious, then the conclusion is false[5].

Example: *Anna said that it is not healthy to smoke because cigarettes are expensive. Although her argument (cigarettes are expensive) is fallacious, her conclusion that smoking is unhealthy is not incorrect.*

Base rate fallacy is making a probability judgment based on conditional

probabilities, without taking into account the effect of prior probabilities[6].

Example: *You are running the laboratory test for which is said that is 90% specific and 80% sensitive. If you think that the result is certainly correct, that is base rate fallacy, because the base rate of 10% probability that the result is non-specific and 20% probability that is non-sensitive was not taken into account.*

Conjunction fallacy is the assumption that an outcome simultaneously satisfying multiple conditions is more probable than an outcome satisfying a single one of them[7].

Example: *Mary is single. She never wears dresses and has short haircut. She likes to hang out with her female friends and she never had a boyfriend. Conclusion that Mary is homosexual woman is the conjunction fallacy. Mary can be heterosexual, homosexual, bisexual....*

Masked-man fallacy (illicit substitution of identicals) is when the substitution of identical designators in a true statement can lead to a false one[5].

Example: *Student with red hair cheated on the exam. Anna believes that student with red hair is Marry. Therefore, Marry cheated on the exam.*

A propositional fallacy is an error in logic that concerns compound propositions. For a compound proposition to be true, the truth values of its constituent parts must satisfy the relevant logical connectives that occur in it[8].

Affirming a disjunct is conclusion that one disjunct of a logical disjunction must be false because the other disjunct is true.

Example: *Mark is very successful scientist. Mark is smart, or he has a great scientific team. Mark is smart; therefore, he does not have a great scientific team. This is a fallacy because the fact that Mark is smart does not confirm that he does not have a great team.*

Affirming the consequent is when the antecedent in an indicative conditional is claimed to be true because the consequent is true.

Example: *If I find a boyfriend, I will spend less time studying. I am spending less time studying. Therefore, I have found the boyfriend. This is a fallacy because maybe I have not found the boyfriend and I have some other reason for spending less time studying.*

Denying the antecedent is when the consequent in an indicative conditional is claimed to be false because the antecedent is false.

Example: *If Jason is in love with you, he will send you flowers. Jason did not send flowers. Therefore, he is not in love with you. This is a fallacy because the fact that Jason did not send flowers does not confirm that he is not in love.*

A quantification fallacy is an error in logic where the quantifiers of the premises are in contradiction to the quantifier of the conclusion.

Existential fallacy is an argument that has a universal premise and a particular conclusion[8].

Example: *All mammals are conceived inside the uterus. All bears are mammals. Therefore, some bears are conceived inside the uterus.*

Formal syllogistic fallacies are logical fallacies that occur in syllogisms[8, 9].

Affirmative conclusion from a negative premise (illicit negative) is when a categorical syllogism has a positive conclusion, but at least one negative premise.

Example: *No students are allowed to smoke in the classroom. Some smokers are adolescents. Therefore, all students that are not allowed to smoke are adolescents.*

Fallacy of exclusive premises is a categorical syllogism that is invalid because both of its premises are negative.

Example: *No blondes are stupid. No stupid women are brunettes. Therefore, no brunettes are blondes.*

Fallacy of four terms is a categorical syllogism that has four terms[10].

Example: *A poor job is better than a good job because a poor job is better than nothing, and nothing is better than a good job.*

Illicit major is a categorical syllogism that is invalid because its major term is not distributed in the major premise but distributed in the conclusion.

Example: *All women are humans. No swans are women. Therefore, no swans are humans.*

Illicit minor is a categorical syllogism that is invalid because its minor term is not distributed in the minor premise but distributed in the conclusion.

Example: *All ducks are birds. All birds are animals. Therefore, all animals are ducks.*

Negative conclusion from affirmative premises (illicit affirmative) is when a categorical syllogism has a negative conclusion but affirmative premises.

Example: *All bees are insects. Some hymenoptera are bees. Therefore, some hymenoptera are not insects.*

Fallacy of the undistributed middle is when the middle term in a categorical syllogism is not distributed.

Example: *All men are humans. All women are humans. Therefore, all men are women.*

Modal fallacy is when confusing possibility with necessity.

Example: *It is possible to become a Nobel Prize winner when working hard. Therefore, it is necessary to become a Nobel Prize winner.*

Modal scope fallacy is when a degree of unwarranted necessity is placed in the conclusion.

Example: *Debbie knows a lot about sports. She likes to hang out with athletes. To hang out with athletes it is necessary to know everything about sports.*

INFORMAL FALLACIES

Informal fallacies are arguments that are fallacious for reasons other than structural (formal) flaws and that usually require examination of the argument´s content[2].

Argument to moderation (false compromise, middle ground, fallacy of the mean, *argumentum ad temperantiam)* is when assuming that the compromise between two positions is always correct[11].

Example: *Politician A said that corruption is good. Politician B said that there should be no corruption. Therefore, a little bit of corruption is good.*

Continuum fallacy (fallacy of the beard, line-drawing fallacy, sorites, fallacy, fallacy of the heap, bald man fallacy) is when improperly rejecting a claim for being imprecise[12].

Example: *Politician X said that corruption should be 0%. Politician Y said that corruption is never 0%. Therefore, it does not matter whether the corruption is 90% or 10%.*

Suppressed correlative is when a correlative is redefined so that one alternative is made impossible[13].

Example: *Politician A said that citizens pay too much tax. Politician B said that millionaires pay much higher taxes than*

other citizens. Therefore, no one pays too much tax.

Definist fallacy involves the confusion between two notions by defining one in terms of the other[14].

Example: *Before we discuss about abortion, let us define the human embryo as nothing but cluster of cells.*

Divine fallacy (argument from incredulity) is when arguing that, because something is so incredible or amazing, it must be the result of superior, divine, alien or paranormal agency[15].

Example: *Kate is wearing so amazing dress. Therefore, she is a goddess.*

Double counting is counting events or occurrences more than once in probabilistic reasoning, which leads to the sum of the probabilities of all cases exceeding unity.

Example: *There are 20 pupils in the classroom. The teacher accidentally counted the same pupil twice. Therefore, according to her calculation there are 21 pupils in the classroom.*

Equivocation is the misleading use of a term with more than one meaning[11].

Example: *Anna said she is so gay (meaning happy) today. Therefore, Anna is homosexual.*

Ecological fallacy is when inferences about the nature of specific individuals are based solely upon aggregate statistics collected for the group to which those individuals belong[16].

Example: *More than 60% of family doctors are women. Isabel is a female doctor. She will be family doctor.*

Etymological fallacy is the reasoning that the original or historical meaning of a word or phrase is necessarily similar to its actual present-day usage[17].

Example: *Ann said to Tom that his scientific ideas are fantastic. Therefore, she meant that his ideas can exist only in his imagination.*

Fallacy of composition is when assuming that something true of part of a whole must also be true of the whole[9].

Example: *Marry-Ann is Protestant. She is honest. Therefore, all Protestants are honest.*

Fallacy of division is when assuming that something true of a thing must also be true of all or some of its parts[9].

Example: *Croats were living in Independent State of Croatia during the World War II. Independent State of Croatia was fascist state. Therefore, all Croats are fascists.*

False attribution is when an advocate appeals to an irrelevant, unqualified, unidentified, biased or fabricated source in support of an argument.

Example: *Fabricated scientific reports.*

Fallacy of quoting out of context refers to the selective excerpting of words from their original context in a way that distorts the source´s intended meaning[17].

Example: *Victor said that he would rather kill the assaulter in self-defense rather than being a victim of a murder. Therefore, Victor is a killer.*

False authority (single authority) is when using an expert of dubious credentials or using only one opinion to sell a product or idea.

Example: *Politician Y proposes a new law in the Parliament and uses only the opinion of one politician in the Parliament as an argument. Therefore, this new law is good.*

False dilemma (false dichotomy, fallacy of bifurcation, black-or-white fallacy) is when two alternative statements are held to be the only possible options when in reality there are more[18].

Example: *Communists fight against fascists. Therefore, if you dislike communism, you are a fascist.*

False equivalence is when describing a situation of logical and apparent equivalence, when in fact there is none.

Example: *Some Christians think that marriage is a community of man and woman. Therefore, they discriminate homosexual couples.*

Incomplete comparison is when insufficient information is provided to make a complete comparison.

Example: *Wanda is a prostitute. Wendy used to hang out with Wanda. Therefore, Wendy is a prostitute.*

Mind projection fallacy is when subjective judgments are projected to be inherent properties of an object, rather than being related to personal perceptions of that object.

Example: *Claudia does not like how her colleague Donna looks like and said multiple times bad things about her. Therefore, Donna is a bad coworker.*

Nirvana fallacy (perfect-solution fallacy) is when solutions to problems are rejected because they are not perfect.

Example: *New computer-program is not perfect, it has few minor bugs, but it will serve the purpose. Therefore, new computer-program will be rejected.*

Psychologist´s fallacy is when an observer presupposes the objectivity of their own perspective when analyzing a behavioral event.

Example: *A conflict occurred between Mark and Tom. Anna was observing the event and she is sure that her judgment of the conflict is the most accurate one.*

Reification (hypostatization, fallacy of misplaced concreteness) is a fallacy of ambiguity, when an abstraction (abstract belief or hypothetical construct) is treated as if it were a concrete, real event or physical entity. It is the error of treating as a real thing something that is not a real thing, but merely an idea.

Example: *Anna thinks that it would be good for her if Julia and Willy get divorced (she is in love with Willy) and she acts like they really did divorce or will divorce, although that is not the case.*

Slippery slope (thin edge of the wedge, camel´s nose) is when asserting that a relatively small first step inevitably leads to a chain of related events culminating in some significant impact/event that should not happen, thus the first step should not happen[19].

Example: *Politician X says that we should start to fight against nepotism. Politician Y says that if we start to fight nepotism it will cause discontent of some powerful people, which can eventually even lead to political instability. Therefore, we should not fight the nepotism.*

Begging the question is when providing what is essentially the conclusion of the argument as a premise[20].

Circular reasoning is when the reasoner begins with what he or she is trying to end up with.

Fallacy of many questions is when someone asks a question that presupposes something that has not been proven or accepted by all the people involved.

These three fallacies are the improper premise fallacies.

Example: *Professor X is great. He has a lot of scientific articles, many students like him and he is always kind. Therefore, professor X is great.*

Faulty generalization means to reach a conclusion from weak premises.

Accident is when an exception to a generalization is ignored[9].

Example: *All pupils in the class got bad grades on the exam, except for the Victor.*

Therefore, all pupils in the class got bad grades on the exam.

Cherry picking is the act of pointing at individual cases or data that seem to confirm a particular position, while ignoring a significant portion of related cases or data that may contradict that position[21].

Example: *Ann was not successful student, she had bad grades and she committed suicide when she was 21. There are many students that had bad grades and did not commit suicide. Therefore, all students who have bad grades are at risk for committing suicide.*

False analogy is an argument by analogy in which the analogy is poorly suited[11].

Example: *Rose always wears a red lipstick. She is arrogant. Therefore, all ladies who wear a red lipstick are arrogant.*

Hasty generalization is when basing a broad conclusion on a small sample or the making of a determination without all of the information required to do so.

Example: *Doctor X had three patients who liked to wear colorful clothes and all three of them were psychotic. Therefore, all people who wear colorful clothes are psychotic.*

Misleading vividness involves describing an occurrence in vivid detail, even if it is an exceptional occurrence, to convince someone that it is a problem.

Example: *Marry saw her neighbor Ann talking to a handsome man briefly (she was asking him what time is it). Marry describes the encounter to Ann´s husband in vivid detail to convince him that his wife is maybe having an affair.*

Questionable cause is a general type of error with many variants. Its primary basis is the confusion of association with causation, either by inappropriately deducing (or rejecting) causation or a broader failure to properly investigate the cause of an observed effect.

Cum hoc ergo propter hoc is a faulty assumption that, because there is a correlation between two variables, one caused the other[9].

Example: *Kilian is very smart. He was once seriously depressed. Therefore, he was depressed because he is intelligent.*

Fallacy of the single cause is when it is assumed that there is one, simple cause of an outcome when in reality it may have been caused by a number of only jointly sufficient causes[11].

Example: *Gary tried drugs once in life. He also had financial problems not related to drugs. He is in complicated marriage. He is now very depressed and needs psychiatric treatment. Therefore, Gary is depressed because his wife is bad.*

Gambler´s fallacy is the incorrect belief that separate, independent events can affect the likelihood of another random event.

Example: *Carry read once a horoscope and she won on a lottery. Therefore, if you read the horoscope, you will win the lottery.*

Magical thinking is fallacious attribution of causal relationships between actions and events.

In psychology, it refers to an irrational belief that thoughts by themselves can affect the world or that thinking something corresponds with doing it.

Example: *Luke thinks a lot about having a great job, but does nothing to achieve this idea. Therefore, Luke will have a great job only by thinking about it.*

Some of the relevance fallacies are:

Appeal to the stone is when dismissing a claim as absurd without demonstrating proof for its absurdity[22].

Example: *Goran says that it is absurd that a poor girl marries a doctor.*

Argument from ignorance is when assuming that a claim is true because it has not been or cannot be proven false, or vice versa.

Example: *Leukemia can be treated with vitamin C because it has not been proven that it cannot.*

Argument from incredulity is when someone cannot imagine how something can be true. Therefore, it must be false.

Example: *I cannot imagine how someone can be so smart. Therefore, he/she is not that smart.*

Argument from repetition is when repeating an argument until nobody cares to discuss it any more.

Example: *Alexander repeated so many times that his professional rival is crazy that nobody cares to discuss it any more.*

Argument from silence is when assuming that a claim is true based on the absence of textual or spoken evidence from an authoritative source, or vice versa[23].

Example: *Sharon said that prostitution should be legalized. No one in the room said anything. Therefore, prostitution should be legalized.*

RED HERRING FALLACIES

A red herring fallacy, one of the main subtypes of fallacies of relevance, is an error in logic where a proposition is, or is intended to be, misleading in order to make irrelevant or false inferences. A speaker attempts to distract an audience by deviating from the topic at hand by introducing a separate argument the speaker believes is easier to speak[11, 24].

Ad hominem is when attacking the arguer instead of the argument.

Example: *Politician A says that the rate of corruption should be lowered as much as possible. Politician B says that politician A had an affair two years ago. Therefore, his argument is not valid (the rate of corruption should not be lowered).*

Appeal to authority is when an assertion is deemed true because of the position of authority of the person asserting it[25, 26].

Example: *Respectable professor X sexually harassed the student Y. Professor X is respected authority. Therefore, professor X did not sexually harassed the student Y.*

Appeal to consequences is when the conclusion is supported by a premise that asserts positive or negative consequences from some course of action in an attempt to distract from the initial discussion[19].

Example: *There is a public discussion about abortion. Pro-life activists argue that rights of an embryo and a fetus should be considered in the discussion. Abortion advocates say that if we prohibit abortion, there will be an increase in the rate of illegal abortions. Therefore, discussion about the rights of the embryo and the fetus should be stopped.*

Appeal to emotion is when an argument is made due to the manipulation of emotions, rather than the use of valid reasoning[11, 19]. These fallacies are **appeal to fear, appeal to flattery, appeal to pity, appeal to ridicule, appeal to spite, judgmental language, pooh-pooh and wishful thinking.**

Example: *Elizabeth argues that marihuana should be legalized. Tom says that Elizabeth is very beautiful and nice. Therefore, marihuana should be legalized.*

Appeal to novelty is when a proposal is claimed to be superior or better solely because it is new or modern[9].

Example: *It is very modern that pupils use tablets in the school, instead of writing in the notebook. Therefore, all pupils should use tablets, instead of notebooks.*

Appeal to wealth is when supporting a conclusion because the arguer is wealthy (or refuting because the arguer is poor).

Example: *Willy is very rich. He argues that artificial intelligence should replace the human workforces whenever is possible. Therefore, his argument is correct (because he is rich).*

Appeal to poverty is the opposite of appeal to wealth.

Example: *Ken is very poor. Therefore, everything he says is true.*

Argumentum ad populum **(appeal to widespread belief, bandwagon argument, appeal to the majority, appeal to the people)** is when a proposition is claimed to be true or good solely because a majority or many people believe it to be so[27]. This fallacy is similar to **appeal to popularity** (something is true because it is popular).

Example (bandwagon fallacy): *Julius argues that cigarettes should be cheaper because many people smoke. Therefore, his argument is correct (because many people agree with the argument).*

Example (appeal to popularity): *Jack composes very good music for guitar. Anna argues that Jack´s music is not very popular. Therefore, Jack´s music is not very good.*

Example (appeal to popularity): *Kathy argues that it is good to believe in magic. Kathy is very popular. Therefore, we should all believe in magic.*

Straw man fallacy is when an argument is based on misrepresentation of an opponent´s position, especially in a way to attack a weaker version of it rather than the argument actually presented[19].

Example: *Ariel wrote a good article about marine ecology. Tom argues that her article is not published in a highly cited journal. Therefore, Ariel´s article is not good.*

CONCLUSION

There are a lot of logical fallacies and only some of the most known fallacies are listed in this article.

Logical fallacy can occur as accidental or can be deliberately used as an instrument of manipulation.

When used as an instrument of manipulation, logical fallacies can be very dangerous, especially when these are used in mass media (mass media manipulation) and when are used by respectable or popular individuals.

It is not always easy to discern if something is a logical fallacy or not, but sometimes it is obvious.

The best way to avoid manipulation is stop rushing to a conclusion, than to think well what might actually be the truth.

And remember: *˝Things are not always what they seem; the first appearance deceives many; the intelligence of a few perceives what has been carefully hidden.˝* (Phaedrus, Athenian philosopher).

REFERENCES

1. Wikipedia. List of fallacies. Retrieved from (February 13, 2020) https://en.wikipedia.org/wiki/List_of_fallacies

2. Bunnin N. Yu J. The Blackwell Dictionary of Western Philosophy. Blackwell. 2004.

3. Leon J. Appeal to Probability. *Logical & Critical Thinking*. 2011.

4. McDonald S. Appeal to probability. *Toolkit For Thinking*. 2009.

5. Curtis GN. Logical Fallacies: The Fallacy Files. February 4, 2020. Retrieved from (February 13, 2020) http://www.fallacyfiles.org

6. Psychology Glossary. Base Rate Fallacy. Retrieved from (February 13, 2020) https://www.alleydog.com/glossary/definition.php?term=Base%2520Rate%2520Fallacy

7. Straker D. Conjunction Fallacy. Retrieved from (February 13, 2020) http://changingminds.org/explanations/theories/conjunction_fallacy.htm

8. Wilson WK. Formal fallacy. In: Audi R (editor). The Cambridge Dictionary of Philosophy (second edition). *Cambridge University Press.* 1999: pp. 316-17.

9. Pirie M. How to Win Every Argument: The Use and Abuse of Logic. *Continuum International Publishing Group.* 2006.

10. Introduction to Logic. Four Term Fallacy. Retrieved from (February 13, 2020) https://philosophy.lander.edu/logic/four_fall.html

11. Damer TE. Attacking Faulty Reasoning: A Practical Guide to Fallacy-free Arguments (sixth edition). *Wadsworth.* 2009.

12. Dowden B. Fallacies. *Internet Encyclopedia of Philosophy*. Retrieved from (February 14, 2020) https://www.iep.utm.edu/fallacy/

13. Feinberg J. Psychological Egoism. In: Shafer-Landau R. Ethical Theory: An Anthology. Blackwell Philosophy Anthologies. Wiley-Blackwell. 2007: p. 193.

14. Frankena WK. The Naturalistic Fallacy. Mind. Oxford University Press. 1939;48(192):464-77.

15. Baggini J. Divine fallacy. January 14, 2014. Retrieved from (February 14, 2020) http://skepdic.com/dvinefal.html

16. Fischer DH. Historians´ Fallacies: Toward a Logic of Historical Thought. Harper & Row. 1970.

17. Gula RJ. Nonsense: Red Herrings, Straw Men and Sacred Cows: How We Abuse Logic in Our Everyday Language: Anxios Press. 2002.

18. The Nizkor Project. False dilemma fallacy. Retrieved from (February 14, 2020) https://www.nizkor.org/features/fallacies/false-dilemma.html

19. Walton D. Informal Logic: A Pragmatic Approach (second edition). Cambridge University Press. 2008.

20. Begging the question. Retrieved from (February 14, 2020) https://yourlogicalfallacyis.com/begging-the-question

21. Hurley PJ. A Concise Introduction to Logic (tenth edition). Cengage Learning. 2007.

22. Patey DL. Johnson´s Refutation of Berkeley: Kicking the Stone Again. *Journal of the History of Ideas.* 1986;47(1):139.

23. Toolkit For Thinking. Logical Fallacies. Retrieved from (February 14, 2020) http://www.toolkitforthinking.com/home

24. Curtis GN. Red Herring. Retrieved from (February 15, 2020) http://www.fallacyfiles.org/redherrf.html

25. Clark J, Clark T. Humbug! The Skeptic´s Field Guide to Spotting Fallacies in Thinking. Nifty Books. 2005.

26. Walton D. Appeal to Expert Opinion: Arguments from Authority. Pennsylvania State University. 1997.

27. Appeal to Widespread Belief. Retrieved from (February 15, 2020) https://web.archive.org/web/20110613024542/http://mason.gmu.edu/~cmcgloth/portfolio/fallacies/appealwide.html