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## Heuristics in Medicine: How Cognitive Biases Influence Decision Making and Diagnosis

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## Heuristics in Medicine: How Cognitive Biases Influence Decision Making and Diagnosis

Heather L. Gillespie

### Abstract

Heuristics, or mental shortcuts, are used by everyone to make decision making easier and quicker in daily life. In jobs such as medicine, however, using heuristics can lead to biased decision making and, in turn, misdiagnosis of patients. Doctors are not immune to being biased, or stereotyping. In fact, many healthcare professions have implicit bias training to try and minimize this. Knowledge about one's own bias can make a difference short term, but the person will be thinking more about whether they are being biased and less on how they can solve the problem in front of them. Bias is, unfortunately, something that must be acknowledged in all corners of society. So, how do we accommodate our biases to get the best results – knowing that we will fall back on heuristics and stereotyping?

### Resumé

L'heuristique (aussi appelée « raccourci mental ») est utilisée par tout le monde pour faciliter et accélérer la prise de décision dans la vie quotidienne. Toutefois, dans des professions telles que la médecine, l'utilisation de l'heuristique peut conduire à une prise de décision partielle et, par conséquent, à un diagnostic erroné des patients. Les médecins ne sont pas à l'abri des préjugés ou des stéréotypes. En fait, de nombreuses professions du domaine de la santé ont mis en place des formations sur les préjugés implicites afin d'essayer de minimiser ce phénomène. Le fait de connaître ses propres préjugés peut faire une différence à court terme, mais il existe un risque que la personne passe plus de temps à se demander si elle a des préjugés qu'à tenter de résoudre le problème qui se présente à elle. Les préjugés sont malheureusement une réalité qu'il faut reconnaître dans tous les domaines de la société. Alors, comment est-il possible de tenir compte de nos préjugés pour obtenir les meilleurs résultats possibles, tout en sachant que nous risquons de retomber dans le piège de l'heuristique et des stéréotypes?

### Keywords

*Autism, adult diagnosis, clinician bias, heuristics, ASD*

### Mots-clés

*Autisme, diagnostic adulte, biais du clinicien, heuristique, TSA*

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Through quasi-systematic review, Whelehan et al. (2020) explore many of the common heuristics used every day by physicians during clinical decision-making. The insight from this paper--in addition to relevant empirical work--will allow me to explore how cognitive biases and heuristics affect decision-making overall, and then relate the findings to the context of medical diagnosis and clinical decision-making. Dual process decision making relies on the idea that there are two types of cognition used in decision making: intuitive and deliberate thinking. Type I, or intuitive processes, are where the majority of heuristics come into play, because these are automatic shortcuts made to speed up every-day decisions (Pennycook et al., 2015). Type II, or analytic thinking, takes a lot more effort on the part of the individual, is conscious, deliberate, and often more accurate/rational. Studies looking at the dual-process model of decision-making have found that individuals move from one type of processing to the other quite quickly (Croskerry, 2014). The problem with using analytical processes all of the time is that the abundance of information available to filter through when making the decision, and the inability to multitask, are often too much and can lead to cognitive fatigue (2015). This happens easier with analytic processing than with intuitive thinking processes, which are able to work in parallel with one another (2015).

Intuitive processing has been historically seen to be as faster, and taking less effort than analytic processing (Pennycook et al., 2015; McDonald, 1996; Kahneman & Tversky, 1974); however, there is evidence that some heuristics--which are typically viewed as intuitive in nature--actually take more mental effort due to attentional control and search costs in certain conditions (Bobadilla-Suarez & Love, 2018). Bobadilla-Suarez & Love (2018) continue by researching the effects of time-pressure on participants' use of heuristics and conclude that, when under time-pressure, heuristics that were accurate in previous studies now hindered performance (2018). Their research suggests that a greater number of heuristics should be looked at in detail, focusing on which cognitive processes they rely on (Bobadilla-Suarez & Love, 2018). The fact that time-pressure influences heuristics to such a great extent is an important factor when looking at the medical community, and clinicians who are making diagnostic decisions, because these are often fast paced environments which require quick thinking.

According to Arkes et al. (1986), the representativeness heuristic, where an individual estimates prevalence based on mental representations, often accounts for how psychologists make clinical-decisions; this is in line with earlier empirical studies conducted by Kahneman & Tversky (1974), which show that judgements and decision-making in everyday life can often be described using the availability and representativeness heuristics, and are shaped by cognitive-biases. Clinicians are not immune to these cognitive biases, and research has shown that there is a high level of "bias blindspot" within the medical community (Croskerry, 2014). Blindspot bias has a positive correlation with overconfidence bias, which is described by erroneously high levels of confidence in one's decision, leading to biased decision making and misdiagnosis (Croskerry, 2014). A study by McCormick and colleagues found that out of the 661 participants in their study, only one claimed to be more biased than the average person (McCormick et al., 2015).

There are other biases to be aware of in the medical community; both intrinsic and extrinsic factors can play a role in bias so internal cognitive factors, as well as external, environmental factors can change the way clinicians decide on treatment. Stereotyping, attributional biases, affective biases, in addition to cognitive biases affect clinicians

(Featherstone et al., 2020). For instance, in the emergency department – where decisions need to be made particularly quickly – if a doctor sees a patient frequently complaining of pain, they may write it off as drug-seeking, or malingering, when this patient could have a chronic condition and be in chronic pain. This is further exasperated when a patient has a pre-existing mental health condition, or previous drug abuse (O’ Sullivan & Schofield, 2018). Heuristics also play a role in under-diagnosing some rarer conditions; there is a saying in the medical community, “if you hear hoof beats think horses, not zebras.” What this means is that when a physician sees a set of symptoms, they should be looking for a more common illness that could be responsible, because those are more likely to occur than a rare condition. This goes hand in hand with the availability heuristic because more common illnesses or diseases are seen on a more regular basis, and thus are in the clinicians’ conscious thoughts more than something briefly learned in medical school, or something they see very rarely. There are many biases seen in daily life which can have an influence in medicine as well, one example is stereotype bias, where a medical professional has a set of cognitive over-generalizations—expectations or beliefs about certain groups of people—and these stereotypes remain in their mind, unchanging, even if an individual does not fit the stereotype held by the doctor (Featherstone et al., 2020). When characteristics and qualities of social categories or members of a group are not altered, even when interacting with an individual whose qualities are incongruent with the stereotype, it can lead to mistreatment of these groups of people (2020). This can be the case when looking at diagnosing based on age, gender, race, socioeconomic factors, weight, disability, or previous drug use/mental health diagnosis (2020).

There is a discrepancy in how doctors and clinicians treat male versus female patients; with male patients, pain is taken more seriously, and a male patient is less likely to be dismissed and told they are being dramatic or that their ailments are caused by anxiety. In fact, in Featherstone et al.’s 2020 analysis, gender bias was almost double that of any other bias studied. There are many reasons why this could be; firstly, female patients have historically been viewed as having psychological manifestations of illness – from the early days of medicine, women were treated differently, and psychosomatic illnesses – now known as conversion disorders – were diagnosed at a far greater rate than in men (Hamburg, 2008; McDonald, 1997). Secondly, men and women have differences in how they explain their symptoms to the practitioner, which could bias their treatment (Ruiz & Verbrugge, 1997). Furthermore, many studies of disease have been done on solely men, and the results of these studies are then carried over to treat female patients, whose symptoms may differ from those shown in these studies – meaning their treatment and assessment is based on how men present with the illness and, as such, their symptoms could be dismissed (Ruiz & Verbrugge, 1997; Hamburg, 2008).

Age can be another factor in biases toward patients; with COVID 19, the disease was seen to affect mostly older adults, which, before adequate testing was implemented, meant that younger patients were systemically seen as more resistant to the illness, and thus not treated or assessed at the same level as older adults (Hammond et al., 2021). The same is true for many illnesses. Looking at autism, it is generally seen as a disorder affecting children, and as such there are limited testing methods available for the adult population (Baron-Cohen, 2004).

Being aware of one’s biases has shown to improve them in the short-term, but there have been few studies looking at the long-term retention of these bias reductions, and knowledge of biases alone is not enough to counter cognitive-biases effectively (Satya-Murti & Lockhart, 2018).

Focusing on overconfidence bias and how to mitigate its effects is important in reducing the current estimated 10-15% diagnostic failure rate (Croskerry, 2013).

Physicians' decision-making processes are often guided by heuristics due to the biological evidence available being insufficient to guide every decision doctors make every day (McDonald, 1996). *Anchoring* can be frequently seen in medical decision-making when doctors focus on one particular symptom that they view to be the most pertinent, leading them to overlook other, as or more important symptoms (Satya-Murti & Lockhart, 2018). Another heuristic described by Kahneman & Tversky (1974), *the representativeness heuristic*, is where people estimate the prevalence of something occurring by comparing it with a mental prototype, (McDonald, 1996; Kahneman & Tversky 1974; Bowes et al., 2020). For example, when assessing someone with Autism Spectrum Disorder (ASD), clinicians bring to mind a "prototype" of their view of someone with the diagnosis and then compare the individual with this mental prototype (Garb, 1996). This is problematic because these prototypes do not always align with standardized diagnostic guidelines (Whelehan et al., 2020). This is the case particularly with an ASD diagnosis due to the paucity of research on females who have ASD. Due to the disparity in available research between sexes, the mental prototypes that doctors form of individuals who have ASD tend to be biased and are similar to the "stereotypical" presentation of the disorder, which was based on studies only including boys (Baron-Cohen, 2004). Research by Garb (1996) showed that, even if clinicians appeared to be referring to the DSM criteria for a diagnosis, that their decisions did not match the criteria verbatim, with only 18 of the 67 clinicians making consistent diagnosis which align with DSM criteria.

Heuristics can lead to doctors misdiagnosing patients, and, as such, can lead to subpar or inaccurate treatment for these patients. While teaching physicians about the biases found in the field can help improve bias toward patients to some degree, for a limited amount of time, doctors and patients should still be aware that biased diagnoses are bound to continue. Physicians need to be open to the possibility that their thinking is biased, and that they are more likely than they think to misdiagnose patients. Less common conditions need to be in their mind as well when looking at differential diagnosis, and doctors must understand that presentation of disorders and illness can differ between patients. Patients need to advocate for themselves and object when they believe they are not being listened to or have their insight into what could be happening to them ignored. For physical, and mental health conditions, the patient knows their symptoms best, and thus sometimes may need to explain, reiterate, and push for doctors to listen to them and take them seriously.

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