**Heuristics: the good, the bad, and the biased. What value can bias have for decision makers?**

This discussion paper will look at heuristics (rule of thumb techniques for decision making), (Tversky & Kahneman, 1974) and their potential value. Typically, heuristics have been viewed negatively (Gigerenzer & Goldstein, 1996), with research suggesting that heuristics bias how individuals think, which may create sub-optimal performance (Tversky & Kahneman, 1974). However, researchers, such as Gigerenzer and Goldstein (1996), have highlighted that a bias in decision making may not necessarily be a negative feature of heuristics. This paper will look at two main areas of research in an attempt to show whether the biases that heuristics cause are always detrimental. The first area of research that will be focussed upon is the heuristics and biases programme (Tversky & Kahneman, 1974). This approach to researching decision making proposes that heuristics are quick and cause biases that have a negative impact on decision making processes. The second area of research is the fast and frugal approach (Gigerenzer & Goldstein, 1996). The fast and frugal approach has shown that individuals can make accurate and quick decisions using a small amount of information. The article aims to create some debate over the usefulness of heuristics and the potential value that biases may have.

**Biases cause sub-optimal decision making**

The discussion will start of by looking at the heuristics and biases programme by Tversky and Kahneman (1974). This will be the first area of research that will be focussed upon for two reasons. One reason is because this approach revolutionised decision making research as it highlighted that human decision making has the potential to be flawed (Tversky & Kahneman, 1974). The second reason is because the research from the heuristics and biases programme has influenced many areas of society, from finance to law (Korobkin & Ulen, 2000). Nevertheless, the heuristics developed by Tversky and Kahneman (1974) were unconscious rule of thumb techniques, which suggested that decision makers sometimes emphasised speed over accuracy. Two of the most famous of these heuristics will now be explained.

The first heuristic that will be mentioned is the representative heuristic (Korobkin & Ulen, 2000; Tversky & Kahneman, 1974). This heuristic relates to the use of stereotypes, and the ignorance of statistics. Individuals will use stereotypes over probabilities to make decisions about certain questions (Korobkin & Ulen, 2000; Tversky & Kahneman, 1974). For example, if you say someone is a sociable individual, who has a fascination for the cinema, and who is good at doing accents, and then ask people to decide whether they are an actor or a carpenter, they may say the person is an actor. This may seem a reasonable response, however, it is important to consider statistics. For instance, there are more carpenters in the United Kingdom than actors, which suggest statistically it is more likely that the person, in the previous statement, is a carpenter rather than an actor. This is an obvious bias. The representative heuristic highlighted to researchers that individuals are not like computers - people are not 100% rational, 100% of the time.

A second heuristic that was discovered by Tversky and Kahneman (1974) was the availability heuristic. This heuristic was formed on the assumption that people base probabilities on the ease at which something comes to mind. For example, someone who has just watched Jaws may over-estimate the probability of a shark attack. One positive about this heuristics is that it allows quick decision making (Tversky & Kahneman, 1974). However, it does bias individuals into over-estimating the likelihood of an event, or situation, occurring. Thus the availability heuristic results in quick, but biased, decision making.

It is evident from discussing two of Tversky and Kahneman’s heuristics (1974) that rule of thumb techniques may create potentially negative biases in decision makers. These biases may have disastrous outcomes when they happen in real life decision making opportunities; such as a collection of jurors giving a guilty verdict based on a stereotype. However, the biases proposed by this research are not always negative. Research by Gigerenzer and Goldstein (1996) hints at quite the opposite.

**Biases cause optimal decision making**

Inspired by bounded rationality (which suggests we make adequate rather than optimal decisions as our environment inhibits us from the latter; Simon, 1956), Gigerenzer and Goldstein (1996) produced a non-compensatory model, known as the probabilistic mental model. This model suggests that individuals may use different types of heuristics for different environments(Mellers, 1998). They coined the term “*adaptive toolbox”* for describing the ability of decision makers to use different cognitive strategies in various environments (Gigerenzer & Goldstein, 1996**;** Mellers, 1998). Further, all the heuristics mentioned by Gigerenzer and Goldstein (1996) go through the same procedure. For instance, all heuristics start with the “recognition principle”. This can affect how decisions are made. For example, if neither of the choices are recognised, it could cause the individual to guess, but if only one alternative is recognised then it could allow the decision maker to make a fast and frugal verdict.

Nevertheless, if both alternatives are recognised then the individual will continue to search for information to discriminate between the outcomes (Gigerenzer & Goldstein, 1996). This is called information search (Gigerenzer & Goldstein, 1996). If a cue is found that discriminates between the two options then search stops; if not then the search continues, and if no discriminatory cue is found then the participant will have to guess (Gigerenzer & Goldstein, 1996). The procedure that these fast and frugal heuristics follow allows the decision maker to ignore some information, which then allows only useful information to be used. In other words, when heuristics cause a bias it allows only optimal information to be used, which allows the decision maker to use a smaller amount of information that is more manageable (Snook & Cullen, 2008). There are many of these fast and frugal heuristics that use biases to make accurate decisions. However, one specific heuristics will now be focussed upon.

The most researched fast and frugal heuristic, which was proposed by Gigerenzer and Goldstein (1996), is the “*Take The Best”* Heuristic (TTB). This heuristic has been widely researched in many decision making areas, from economics to sport (Andersson, Ekman, & Edman, 2003; Bröder & Gaissmaier, 2007). The ‘Take The Best’ heuristic follows the basic structure of heuristics, mentioned earlier, quite rigorously (Gigerenzer & Goldstein, 1996). The heuristic starts off with the recognition principle (Pachur, Bröder, & Marewski, 2008). Then, if both alternatives are recognised then more information is needed (Gigerenzer & Goldstein, 1996). This information is subsequently searched by starting off with the most valid piece of information, and ending with the least valid cue if no discriminatory piece of evidence has been found (Gigerenzer & Goldstein, 1996).

This rank order is based upon cue validity (i.e. how many correct decisions can be made from that particular cue). However, information search along these ranked cues will only stop, allowing a decision to be made, when a cue with a high discriminatory value is found (Gigerenzer & Goldstein, 1996). A high discriminatory value basically means that a cue has a high likelihood of allowing an individual to discriminate between two options (Gigerenzer & Goldstein, 1996). This therefore highlights that the Take The Best Approach is a non-compensatory model (Gigerenzer & Goldstein, 1996). This is because the most valid cue, with the highest discriminatory value, cannot be over-ruled by a collection of less valid cues (Bergert & Nosofsky, 2007; Bröder, & Schiffer 2003). This shows that the Take The Best approach is a heuristic that biases the decision maker into using only valid information.

A good way of describing this popular non-compensatory heuristic is “take the best, ignore the rest” (Gigerenzer & Goldstein, 1996). This ignorance of the rest has been found to increase accuracy (Gigerenzer & Goldstein, 1996). Consequently, it can be proposed that biased decision making can lead to accurate judgements. For instance, research shows that German and American students are better at distinguishing the sizes of cities in a foreign country when compared to their own country (Goldstein & Gigerenzer, 1996). The rationale for this was that individuals would know less about cities in foreign countries (Gigerenzer & Goldstein, 1996). This has shown that sometimes using less information can be more effective (Andersson, Ekman, & Edman, 2003). It has also been found, that the Take The Best approach was equal to, and better than some linear weighted models (i.e. more rational models; Gigerenzer & Goldstein, 1996). This consequently insinuates that simple algorithms that bias the decision maker may be more optimal, and realistic, than previous more rational decision making models. Conversely, some argue that the Take the Best approach is flawed as it may not be sensible to assume that people count information in regards to ecological validity and then have the processing capacity to rank it (Dougherty, Franco-Watkins, & Thomas, 2008). Furthermore, the Take the Best approach is promising when it highlights that bias may be beneficial. However, more research is needed to determine how conceivable these fast and frugal heuristics really are.

In conclusion, a plethora of research proposes that heuristics may be negative and may bias decision makers into making sub-optimal decisions. Nevertheless, more contemporary research suggests that heuristics may out-perform more rational methods of decision making because of the biases they create. This highlights that biased decision making may lead to accurate decision making. Further, a bias is an effective way for decision makers to ignore irrelevant information, which allows decision makers to make use of more relevant information in an efficient way. For example, biases may allow detectives to ignore irrelevant evidence, stock-brokers to focus on the most relevant information, and voters to only consider the points most important when voting (Snook & Cullen, 2008). This article will hopefully produce some debate in the academic community and influence decision making scientists to think about the potential value that biased decision making may have**.**

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**References**

Andersson, P., Ekman, M., & Edman, J. (2003). Forecasting the fast and frugal way: A study of performance and information-processing strategies of experts and non-experts when predicting the World Cup 2002 in soccer. *Working Paper Series in Business Administration*, 1-26.

Bergert, F. B., & Nosofsky, R. M. (2007). A response-time approach to comparing generalized rational and take-the-best models of decision making. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, *33*, 107-129.

Bröder, A., & Gaissmaier, W. (2007). Sequential processing of cues in memory-based multiattribute decisions. *Psychonomic Bulletin & Review*, *14*, 895-900.

Bröder, A., & Schiffer, S. (2003). Take The Best versus simultaneous feature matching: Probabilistic inferences from memory and effects of representation format. *Journal of Experimental Psychology: General*, *132*, 277-293.

Dougherty, M. R., Franco-Watkins, A. M., & Thomas, R. (2008). Psychological plausibility of the theory of probabilistic mental models and the fast and frugal heuristics. *Psychological Review*, *115*, 199-213.

Gigerenzer, G., & Goldstein, D. (1996). Reasoning the Fast and Frugal way: Models of Bounded Rationality. *Psychological review, 103*, 650- 669.

Korobkin, R. B., & Ulen, T. S. (2000). Law and behavioral science: Removing the rationality assumption from law and economics. *California Law Review*, 1051-1144.

Mellers, B. A. (1998). Judgement and Decision‐Making. *Annual Review Psychology, 49,* 447-477

Newell, B. R., Weston, N. J., & Shanks, D. R. (2003). Empirical tests of a fast-and-frugal heuristic: Not everyone “takes-the-best”. *Organizational Behavior and Human Decision Processes*, *91*, 82-96.

Pachur, T., Bröder, A., & Marewski, J. N. (2008). The recognition heuristic in memory‐based inference: is recognition a non‐compensatory cue?. *Journal of Behavioral Decision Making*, *21*, 183-210.

Simon, H. A. (1956). Rational choice and the structure of the environment. *Psychological review*, *63*, 1-11.

Snook, B., & Cullen, R. M. (2008). Bounded rationality and criminal investigations: Has tunnel vision been wrongfully convicted. Criminal investigative failures, 71-98.

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases, *Science*, New Series, *185*, 1124-1131.