

**Analysing the Limitations and Possibilities of Binary Logic and Ternary Logic
in Modelling Human Reasoning**

Illir Kola

In cognitive science and psychology there is an ongoing debate, if and how logic can be used to describe inferences humans draw. Findings indicate that humans deviate from classical logic an often regarded de-facto standard and normative framework in the psychology of reasoning. Some propose to use ternary logics to model human reasoning processes.

In this research we analyse whether binary logic is enough to model human reasoning. We do this by reanalysing the Wason Selection Task. It investigates how participants check, if a given conditional statement holds true for a given set of cards. First, we conduct a meta-analysis to identify these patterns. In a second step we analyse the patterns. If there is a two-valued interpretation of human reasoning processes, then there are truth-tables that can generate the according pattern. In a third step, we show by a search through the space of all truth table interpretations that there are answer patterns that cannot be explained by binary logic. By extending the analysis to a third truth value we show that this problem can be resolved. These results show that binary logic might not be enough to explain certain patterns of human reasoning, so further exploring ternary logic might be useful. Right now in the research we are exploring if and how can ternary logic be used to formalise mental model theories when dealing with tasks such as syllogistic reasoning.