Location:
Birkbeck College, University of London
Malet Street, Bloomsbury
London WC1E 7HX

Organizers
Mike Oaksford (Birkbeck College, University of London)
Valerie Thompson (University of Saskatchewan, Canada)
Ms. Naomi Adams, (Birkbeck College, University of London)
(n.adams@bbk.ac.uk).

The 12th London Reasoning Workshop: July 18 - 19, 2019, Rm. 532 (talks) Rm. 534 (Coffee)

The 12th London Reasoning Workshop
Thursday 18th of July 2019

09:00-09:20	**Tea & Coffee in room 534**
9:20	**Welcome by Mike Oaksford**
SYMPOSIUM 1: DEONTIC AND MORAL REASONING **[n] = Abstract number in Appendix**	
9:30-10:00	**Phil Johnson-Laird & Marco Ragni [1]** You can do that! Possibilities, permissions, and prohibitions
10:00-10:30	**Cillian McHugh, Marek McGann, Eric R. Igou, and Elaine L. Kinsella [7]** Cognitive load and moral dumbfounding: Inhibiting the identification of reasons
10:30-11:00	**Monica Bucciarelli and Philip Johnson-Laird [8]** *People should interrupt others in conversation*: Degrees of belief and emotional reactions correlate for social conventions, and affect each other
11:00-11:30	**Benjamin Sklarek, Lupita Estafania Gazzo Castañeda & Markus Knauff [21]** Legal reasoning: Balancing of basic right conflicts
11:30-12:00	**Tea & Coffee in room 534**
SYMPOSIUM 2: CONDITIONAL REASONING	
12:00-12:30	**Shira Elqayam, Igor Douven & Patricia Mirabile [2]** Inference strength predicts the probability of conditionals better than conditional probability
12:30-13:00	**Patricia Mirabile & Igor Douven [12]** Abductive conditionals as a test case for inferentialism
13:00-14:30	**Lunch**
14:30-15:00	**Niki Pfeifer & Leena Tulkki [14]** Probabilistic truth table tasks, imprecision, and delta-p
15:00-15:30	**Niels Skovgaard-Olsen [9]** Causal power and conditional probabilities
15:30-16:00	**Tea & Coffee in room 624 (Note change of room)**

16:00-16:30	**Nicole Cruz, David Over, & Mike Oaksford [13]** Further dynamic reasoning with counterfactuals
16:30-17:00	**Lupita Estefania Gazzo Castaneda and Markus Knauff [11]** Conditional probabilities for abstract content
17:00-1730	**James Vance and Mike Oaksford [18]** Experience, contrast classes, and implicit and explicit negation in conditional inference
17:30	**WINE RECEPTION ROOM 624 (Note change of room)**
19:00	**DINNER AT OLIVELLI'S RESTAURANT 35 Store Street**

The 12th London Reasoning Workshop
Friday 19th of July 2019

BBK, University of London, Malet Street, Bloomsbury, London WC1E 7HX, Location: Room B20

SYMPOSIUM 3: PREDICTION & EXPLANATION	
09:00-09:20	**Tea & Coffee in room 534**
09:30-10:00	**Laura Kelly and Sunny Khemlani [5]** The consistency of durative relations
10:00-10:30	**Neha Bhat and Sangeet Khemlani [15]** The dynamic processing of perceptual models
10:30-11:00	**Molly S. Quinn & Mark T Keane [4]** Valence flipping in predicting the unexpected
11:00-11:30	**Tea & Coffee in room 534**
SYMPOSIUM 4: DUAL PROCESSES	
11:30-12:00	**Valerie Thompson, Gordon Pennycook, Jonathan Evans, Ian Newman, Dakota Zirk [19]** Logical "intuitions" = cognitive capacity + heuristic strategies
12:00-12:30	**Matthieu Raoelison & Wim De Neys [20]** Intelligence, fast and slow: Cognitive capacity predicts intuitive rather than deliberate thinking
12:30-14:00	**Lunch**
SYMPOSIUM 5: MATHEMATICAL THINKING	
14:00-14:30	**Caren Frosch, Victoria Simms & Charli Campbell [6]** The role of non-mathematical reasoning skills in mathematics achievement in adults and children
14:30-15:00	**Uri Leron & Lisser Rye Ejersbo [16]** Bridging intuitive and analytical thinking in mathematics education
15:00-15:30	**Tea & Coffee in room 534**

SYMPOSIUM 6: JUDGEMENT AND SPATIAL REASONING	
15:30-16:00	**Ian Newman [17]** Judgments of solvability are insensitive to water jug problem difficulty
16:00-16:30	**Hiroshi Yama [3]** Hindsight bias in judgments of the predictability of flash floods: An experimental study for a court trial
16:30-17:00	**Andreas Reis & Markus Knauff [10]** Collaborative spatial reasoning
CLOSE (PUB)	

Fire instructions for students and visitors

Our fire alarms are tested between 08.00 and 08.40 on week-days.
Alarm tests involve intermittent bursts of sound of only a few seconds duration.

The main fire alarm is a *continuous* ringing bell or *continuous* siren in all Birkbeck buildings. When a *continuous* alarm sounds you must leave the building immediately.

There will be no other warning messages!

If you hear a continuous fire alarm

1. Leave the building immediately by the nearest exit. Do not delay to collect your belongings.
2. Do not use the lifts or the phone.
3. Follow the instructions of your tutor, course leader and/or fire marshals.
4. Move well away (100 metres) from the exits once outside
5. Do not stand in the road/street.
6. Do not re-enter the building unless told it is safe to do so

If you discover a fire

1. Operate the nearest fire alarm (red "break-glass" boxes on walls)
2. The Duty Attendant at Malet Street will be automatically contacted in every case and will immediately call the Fire Brigade.
3. Do not try to fight a fire unless you have been trained to use fire extinguishers.
4. Leave the building by the nearest exit

Explore the College. Get to know all the fire exit routes available to you. In the event of a fire you may need to use more than one.

Birkbeck's emergency number **555** may be dialled from any Birkbeck telephone (except Bedford and Tavistock Square) to **report** any safety/security emergency and/or to **request help. "555"** calls are routed to a dedicated 'phone manned at all times by a Duty Attendant who will summon the required assistance, by dialing 999 if need be. It is imperative that a **"555"** caller identifies him/herself, specifies the assistance required and states in which building and location in that building the emergency exists. Many classrooms and lecture theatres have phones within them for this and other purposes.

Thank you,
Birkbeck Fire Officer

Appendix: Abstracts

1. Phil Johnson-Laird & Marco Ragni

Title: You can do that! Possibilities, permissions, and prohibitions.

Abstract:
We present a theory of modal assertions, such as permissions, which is based on a semantics of finite alternatives instead of an infinitude of "possible worlds". The finitary theory elucidates the inferential relations between assertions. For example, the inference:

You can smoke or you can drink.
Therefore, you can smoke.

is valid in daily life, whether it is about permissions or possibilities. Yet, inferences of the sort: *A or B*; therefore, *B*, and invalid in all normal modal logics (of which there are infinitely many, with infinitely many different meanings for possibility). So, the inference is known as the "paradox" of free choice permission. The finitary theory, however, treats a disjunction as referring to a conjunction of possibilities that hold in default of information to the contrary, and so it implies that the inference is valid. It also implies that other inferences, which are valid in normal modal logics, are invalid, and evidence shows that individuals reject them. We discuss the study's implications for orthodox logics and probabilities as bases for reasoning.

2 Shira Elqayam, Patricia Mirabile & Igor Douven

Title: Inference strength predicts the probability of conditionals better than conditional probability

Abstract:
Hypothetical Inferential Theory, or HIT, postulates that conditionals are evaluated by the strength of the inferential connection from antecedent to consequent. In this talk, we extend HIT for the first time to include the Ramsey test. The popular interpretation of the Ramsey test is the Equation, suggesting that the probability of the conditional is based on its conditional probability. In contrast, HIT suggests an interpretation based on the strength of inferential connection from antecedent to consequent. We pitted the two interpretations against each other empirically by giving participants fifty everyday causal conditionals repeated across three different tasks: judging the probability of the conditionals, the strength of inference from antecedent to consequent, and the probabilistic truth-table task. As predicted, we found inference strength to be a much stronger predictor of the probability of conditionals relative to conditional probability, thus supporting HIT and the inference-based interpretation of the Ramsey test. Similarly, an individual differences analysis found that the majority of participants conformed to an inference-based pattern, with a very small minority conforming to conditional probability. We conclude with thoughts on the New Paradigm.

3. Hiroshi Yama

Title: Hindsight bias in judgments of the predictability of flash floods: An experimental study for a court trial.

Abstract:
As part of the author's expert testimony in a court trial, we investigated hindsight bias in perceptions of the predictability of a flash flood in a river. The defendants (three kindergarten teachers) had taken children to the river to play when a flash flood occurred that led to the drowning of one child, and a core question was if the defendants could have predicted the flood using a visible cue (specifically, the muddiness of the river). University students were presented with pictures actually taken before the flash flood and were asked to rate the muddiness of the river and to judge the likelihood of flooding in Study 1. Additionally, participants in the outcome group were informed that a flash flood had actually occurred and there had been victims. Participants with outcome knowledge perceived the river as muddier and judged a flood to be more likely than control participants. The instruction on causality between the muddiness and the flush flood was manipulated in Study 2. The hindsight bias was confirmed and participants judged the river as muddier when the causality was instructed. These data give practical indications for the judgments in a court.

4. Molly S. Quinn & Mark T Keane

Title: Valence flipping in predicting the unexpected

Abstract:
Though most of us probably worry about unexpectedly bad things happening to us, we sometimes daydream about unexpectedly good things happening, too. These opposing possibilities reflect the inherent ambiguity that arises when we consider what unexpected outcomes may occur next. Researchers do not often ask what "the unexpected" really means to participants in experiments. In the present study, participants were presented with everyday scenarios and asked to think of unexpected events. Results showed that the unexpected may include a flipping of the valence of the scenario (i.e. negative events are more often reported as unexpected next events when the scenario is mainly positive and vice versa). We discuss implications of this flipping effect on research about the unexpected as well as potential applications.

5. Laura Kelly and Sunny Khemlani

Title: The consistency of durative relations

Abstract:
Few experiments have examined how people reason about durative relations, e.g., "during". Such relations pose challenges to present theories of reasoning, but many researchers argue that people simulate a mental timeline when they think about sequences of events. A recent theory posits that to mentally simulate durative relations, reasoners do not represent all of the time points across which an event might endure. Instead, they construct discrete tokens that stand in place of the beginnings and endings of those events. The theory predicts that when reasoners need to build multiple simulations to solve a reasoning problem, they should be more prone to error. To test the theory, a series of experiments provided participants with sets of premises describing durative relations; they assessed whether the sets were consistent or inconsistent. Their ability to do so varied by whether the descriptions concerned one mental simulation or multiple simulations. We conclude by situating the study in recent work on temporal thinking.

6. Caren Frosch, Victoria Simms & Charli Campbell

Title: The role of non-mathematical reasoning skills in mathematics achievement in adults and children

Abstract:
Recent research, including a special issue of *Thinking and Reasoning* (Morsanyi et al., 2018), has provided some empirical evidence for a link between logical reasoning and mathematical achievement. We have argued that although there has been some support for the theoretical link between reasoning and mathematical ability, evaluation of empirical evidence shows that this relationship may have been influenced by measure selection (Frosch & Simms, 2015). The measures of reasoning ability frequently used in previous studies recruit domain specific mathematical reasoning skills, operationalizing logical competence via the application of logical concepts in mathematics. Thus, evidence is provided for the fact that mathematical knowledge is based on the understanding of its underlying logic, but not for the notion that logical reasoning skills are a prerequisite for mathematical ability (e.g., Nunes et al., 2007). Furthermore, mathematical ability is frequently measured using teacher-reported school achievement or other non-standardised measures and so it is difficult to know exactly which mathematical skills are being measured, making replication difficult. In three studies we measured mathematical ability using standardised fluency and calculation measures (Woodcock-Johnson-III) and reasoning ability using an extended Cognitive Reflection Test (Primi et al., 2016; Toplak et al., 2014). In our first study, 68 undergraduate students' reasoning abilities were also measured using a belief bias conditional reasoning, in our second study, we included Ravens Progressive Matrices with a further sample of 76 undergraduate students and in our third study we gave all five tasks to a group of 89 children aged 9-11. Results from the two studies with undergraduate participants suggest that variance in the mathematical calculation task is accounted for by performance on the Cognitive Reflection Test but not the other reasoning tasks when mathematical fluency is taken into consideration. However, for the children a logic index for the unbelievable items (but not a logic index for the believable items) accounted for additional variance in predicting mathematics calculation scores. Hence, our findings suggest that

the extent to which mathematical ability is related to domain general reasoning abilities shows developmental differences. We discuss the implications of these findings for research on the link between mathematical ability and reasoning skills and the importance of taking a life span perspective in exploring the relationship between cognitive abilities.

7. Cillian McHugh[1], Marek McGann[2], Eric R. Igou[1], and Elaine L. Kinsella[1]

Title: Cognitive load and moral dumbfounding: Inhibiting the identification of reasons

Abstract:
Moral dumbfounding occurs when people defend a moral judgement even though they cannot provide a reason in support of this judgement. It manifests as an admission of not having reasons, or the use of unsupported declarations ("it's just wrong") or tautological reasons ("because it's incest") as justifications for a judgment. It typically occurs for harmless taboos. It is cited as evidence for intuitionist or dual-process theories of moral judgement over rationalist approaches, however the phenomenon remains poorly understood. We test a conflict in dual- processes explanation of moral dumbfounding, where moral dumbfounding is an example of conflict between a habitual response (making a judgement) and a response that results from deliberation (providing a reason for the judgement). One prediction of this explanation is that under specific manipulations (e.g., cognitive load), responses should vary in predictable ways. The dumbfounding paradigm involves three possible responses: (a) providing reasons for a judgement (System 2/deliberative); (b) accepting the counter-arguments and rating the behaviour as "not wrong" (System 1/habitual); © a dumbfounded response (System 1/habitual). Cognitive load manipulations have been shown to inhibit deliberative responding. We present 4 studies in which dumbfounded responding was investigated under cognitive load manipulations. We hypothesised that rates of providing reasons would be reduced under cognitive load. The identification of reasons was inhibited in Studies 1 and 3, but not in Studies 2 and 4. The results do not provide strong evidence that moral dumbfounding be explained as conflict in dual-processes. Future research should investigate this further, addressing methodological limitations identified.

8. Monica Bucciarelli and Philip Johnson-Laird

Title: *People should interrupt others in conversation*: degrees of belief and emotional reactions correlate for social conventions, and affect each other.

Abstract:
Deontic assertions concern morality and social conventions. Our previous studies have shown that degrees of belief and judgments of pleasure correlate for moral assertions but not for their factual counterparts, and that, for belief and pleasure, a change in one causes a change in the other. An assumption of the model theory is that no simple principled way exists to pick out all and only those deontic assertions that concern morality. It follows that the previous patterns of results with moral assertions should also occur with deontic assertions about social conventions. We report a series of experiments that corroborated these predictions. Degrees of belief and emotions correlate for social conventions but not for their factual counterparts, such as: *people interrupt others in conversation*. Likewise, for belief and pleasure, a change in one causes a change in the other. Overall, these phenomena bear out the model theory's assumption that reasoning and emotions are two parallel systems that can have causal effects on each other.

9. Niels Skovgaard-Olsen

Title: Causal power and conditional probabilities

Abstract:
In this talk, the relationship between causal power and conditional probabilities is experimentally investigated through tasks employing both trial-by-trial learning and knowledge-rich, scenario-based reasoning. In the examined cases, it is found that participants' assessments of conditional probabilities are systematically biased towards a causal interpretation, which makes their estimates diverge from the conditional probabilities that can be calculated based on the Kolmogorov ratio definition and the manipulated cell frequencies. The implications that this finding has for recent

debates on conditional reasoning, P(if A, C) = P(C|A), and how the Ramsey test is psychologically implemented are critically discussed.

10. Andreas Reis & Markus Knauff

Title: Collaborative spatial reasoning

Abstract:
You probably came with an aircraft to London. How safe you were in the aircraft critically depended on how the crew in the cockpit worked together. The pilot was flying the machine, the first officer monitored the flight instruments and handled the controls, and the second officer communicated with the air traffic controllers on the ground. In our daily life people often collaborate with others to come to good solutions, decisions, conclusions, or explanation. For example, people often navigate through their environment in pairs or small groups, communicating and coordinating their information processing and decision making in the environment. Our current research seeks to understand these social components of reasoning in general, and spatial reasoning in particular. We present a series of experimental studies, in which participants solved spatial reasoning problems in four different conditions: (1) just individually, (2) in small groups of two or three people, (3) first alone and subsequently in groups, and (4) first in a group and then individually. We also varied the figure, determinacy, and difficulty of the problems. Results show that groups (condition 2) outperformed individuals (condition 1), but there was no difference between condition 2 and the groups in condition 3. Condition 4 is still running. We also found a main effect for the determinacy and difficulty of the task. Our results create connections between cognitive and social psychology and shed new light of the social aspects of human (spatial) reasoning. Good return flight!

11. Lupita Estefania Gazzo Castaneda and Markus Knauff

Title: Conditional probabilities for abstract content

Abstract:
Researchers have proposed that peoples acceptance of conclusions in conditional inference tasks depends on the conditional probability of *q* given *p*: the higher the conditional probability, the more an inference is accepted. This conditional probability is calculated by retrieval of prior knowledge from memory. But how does this account explain people's inferences with *abstract content* such as "If the cellphone is red, then it is on the table; the cellphone is red, thus …?" People do not have prior knowledge on the content of such inferences. Nevertheless, several researchers have found higher acceptance rates for conclusions in abstract inferences than in inferences with familiar content. Why do participants accept such inferences if they have no knowledge about the content? We argue that the conditional probabilities for abstract conditionals change depending on whether they are embedded in inference tasks or not. We base our research on findings of Klauer, Beller, and Hütter (2010). Klauer and colleagues asked participants for conditional probability ratings of familiar events, once with and once without the explicit presentation of a conditional. They found that participants gave higher probability ratings when the conditional was presented explicitly. We expect this effect to be strengthened for abstract conditionals. Without the explicit presentation of the conditional, abstract conditionals should have low conditional probabilities, because reasoners do not know whether *q* follows from *p*. However, with the explicit presentation of the conditional – as in inference tasks – abstract conditionals should have high conditional probabilities, because reasoners use the conditional rule as the only source for inferences and do not know exceptions from memory. We conducted three studies. In studies 1 and 2 we asked participants to rate the conditional probability of abstract and familiar statements, once without the explicit presentation of the conditional (Study 1) and once with (Study 2). Study 3 was a reasoning experiment. We embedded abstract and familiar conditionals from Studies 1 and 2 in conditional inference tasks and asked participants to rate the conclusions of MP and MT. Results of Study 1 show that conditional probability ratings for abstract content are indeed very low when rated without the explicit presentation of a conditional. However, in Study 2, we show that when abstract content is embedded in conditionals, participants give high conditional probability ratings. This explains why in Study 3 participants accepted more MP and MT conclusions for abstract than for familiar content. Our results show that the conditional phrasing of statements has a special effect on abstract content: it elevates the subjective conditional probabilities stronger than for familiar content and strengthens people's acceptance of inferences.

12. Patricia Mirabile & Igor Douven

Title: Abductive conditionals as a test case for inferentialism

Abstract:
According to Inferentialism, for an indicative conditional to be true, there must be a sufficiently strong inferential connection between its antecedent and its consequent. Previous experimental research found support for Inferentialism, but the materials concerned a fairly abstract context, leaving open the question how accurately the account can predict semantic judgments about more realistic materials. To address this question, we used abductive conditionals, in which there is an explanatory-inferential connection between antecedent and consequent (typically, the event cited in the consequent is or purports to be the best explanation of the event cited in the antecedent). Experiments 1 and 2 try to predict truth ratings for such conditionals on the basis of judgments of explanatory goodness. Inferentialism predicts about our materials that participants will tend to agree more with a conditional the better the consequent explains the antecedent and so the stronger is the inferential connection between antecedent and consequent. The first two experiments allow us to contrast Inferentialism with a version of the mental models account that aims to explain truth ratings in terms of accessible alternatives and disablers. A third experiment looks at abductive conditionals in the context of Modus Ponens arguments. Inferentialism predicts that endorsement rates for such arguments depend on the strength of the inferential connection between the antecedent and consequent of the major premise and so, again given our materials, on how well that premise's consequent explains its antecedent. The experiment aims to determine whether there is any support for this prediction, and it also contrasts Inferentialism with the suppositional account of conditionals. We find unequivocal support for Inferentialism across the experiments, and also find that Inferentialism yields more accurate predictions than the mental models account as well as the suppositional account.

13. Nicole Cruz, David Over, & Mike Oaksford

Title: Further dynamic reasoning with counterfactuals

Abstract:
An inherent limitation of coherence in reasoning is that it constrains the probability that a conclusion can take, given the probabilities of the premises, only for a specific point in time. But people might change their degree of belief in the premises upon learning new information, and then change the probability they assign to the conclusion accordingly. This dynamic reasoning over time cannot be captured only through the deductive constraint of coherence. But it can be modelled in precise ways using Bayesian networks. In this talk we use the Bayesian network (BN) framework to model counterfactual reasoning, a form of reasoning that typically requires assessing the probabilities of events at different points in time. We follow up on earlier work on MP with counterfactuals, assessing to what extent dynamic changes in people's degrees of belief in the premises and conclusion of MP can be captured through a Bayesian network model, in conjunction with Adams' and Pearls' "rerunning history" view of counterfactuals.

14. Niki Pfeifer & Leena Tulkki

Title: Probabilistic truth table tasks, imprecision, and delta-p

Abstract:
We present a study which fully crosses indicative and counterfactual conditionals in abductive, causal, and non-causal scenarios within the probabilistic truth table task paradigm with imprecise probabilities (N=120). The most frequent response type is consistent with the conditional probability interpretation. An interesting minority of participants apparently reduce the complexity of the tasks by ignoring the relevant imprecision involved in the premises for either the lower or the upper bound responses. We confirm these results in the light of qualitative data obtained from post-test interviews. Moreover, we discuss the relevance of probabilistic truth table tasks for accounts of conditionals which assume inferential relations between the antecedents and consequents of conditionals. Specifically, after discussing

how to interpret delta-p in the context of imprecise probabilities, we present data which suggest that the participants' responses do not depend on delta-p. We also present results on the perceived existence and strength of the causal connection between antecedents and consequents of the conditionals involved in the various experimental scenarios. Our results support the conditional probability interpretation of causal, abductive and non-causal indicative conditionals and counterfactuals.

15. Neha Bhat and Sangeet Khemlani

Title: The dynamic processing of perceptual models

Abstract:
We describe a novel computational system that processes images in order to dynamically construct and update iconic spatial simulations of the world -- the equivalent of perceptual mental models. The system couples two existing technologies: an advanced machine-learning technique for real-time object-recognition (the YOLO algorithm) along with a computational model for representing and reasoning about spatial mental models (built in the mReasoner system). The system is capable of extracting qualitative spatial relations from perceptual inputs in real-time. We describe how it can be used to investigate dynamic spatial thinking and reasoning.

16. Uri Leron & Lisser Rye Ejersbo

Title: Bridging intuitive and analytical thinking in mathematics education

Abstract:
As researchers in mathematics education we view ourselves as consumers, rather than producers, of psychological research: In the talk we demonstrate how research in different sub-disciplines of psychology (cognitive, social, evolutionary, developmental) helps illuminate important issues in the learning and teaching of mathematics. We are especially interested in the relationship between intuitive and analytical thinking. In this respect, the difference between psychologists and mathematics educators is analogous to that between scientists and engineers: While psychologists aim to understand how the mind works, thus for example documenting the gap between the two modes of thinking, we as educators are in the business of designing ways to help our students bridge this gap. Our design work branches in two different directions, both in the context of a specific *intuition trap*, namely, a task which elicits an intuitive non-normative response from a majority of people. The first branch, called *bridging down*, is designing a *bridging task*, namely, a task that is logically equivalent to the original task but is psychologically much easier. We demonstrate this kind of bridge via the famous medical diagnosis problem, where healthy and sick people are replaced by green and red pebbles, and the medical diagnostic test is replaced by a color-sensitive robot. This method does help students understand (and sometimes discover) the analytical solution, but it leaves untreated the pedagogically undesirable clash between that solution and their original intuition. For this we invoke the second branch, called *bridging up*: Following Seymour Papert, who compared students' learning to computer programming, we design interventions to help students *debug* (rather than discard) their original intuitive answer. We demonstrate this process via an interactive scenario involving a classical intuition trap: the 2-glass puzzle.

17. Ian Newman

Title: Judgments of solvability are insensitive to water jug problem difficulty

Abstract:
How do we determine whether we should give-up or persevere during problem solving? In some cases, the optimal choice is to discontinue the problem but in others, persistence will lead to success. During a water jug task, participants made judgments of problem solvability at frequent intervals. We manipulated both valid and misleading cues to problem difficulty and the option to give-up at any point on each problem was provided. Correct solutions to the problems were found infrequently but problem solvers tended to unsuccessfully persist for relatively long durations. Overall, judgments of solvability tended to decrease as time spent on the problems increased but were largely insensitive to both valid and misleading cues to actual problem difficulty. Notably, judgments of solvability prior to

correct solutions were higher than prior to giving-up at each time interval, but only after participants had begun attempting to solve the problems.

18. James Vance & Mike Oaksford

Title: Experience, contrast classes, and implicit and explicit negation in conditional inference

Abstract:

19. Valerie A Thompson, Gordon Pennycook, Jonathan St. B. T Evans, Ian R Newman, Dakota Zirk

Title: Logical "intuitions" = cognitive capacity + heuristic strategies

Abstract:
Dual process theories suggest that many reasoning biases occur because autonomous (Type 1) processes deliver answers based on readily-accessible characteristics of the problem, such as conclusion believability. These pre-empt slower (Type 2) processes, which would provide an answer based on logic or probability. Several recent papers have challenged this assumption, showing that answers based on logic and probability can be as (and even more) accessible as answers based on belief. I will discuss the results of two studies showing clear boundary conditions for this effect. In the first study, we used relatively simple and more difficult syllogisms, and showed that the hallmarks of logical intuitions manifest only for high IQ reasoners and on simple problems. In a second experiment, we tested the hypothesis that the high IQ participants were picking up on regularities in the problems that mimicked logical validity. To test this hypothesis, we created problems where the atmosphere heuristic either was either consistent or inconsistent with logical validity. There was clear evidence that reasoners relied on atmosphere, rather than logic; this was especially true for the high capacity reasoners. These data provide clear boundary conditions for the so-called "intuitive" logic effect.

20. Matthieu Raoelison & Wim De Neys

Title: Intelligence, fast and slow: Cognitive capacity predicts intuitive rather than deliberate thinking

Abstract:
People are often biased by their intuitions, as evidenced by research into heuristics and biases. The popular explanation is that sound reasoning requires us to override and correct those intuitions, which is demanding and therefore often fails. Thus, cognitive capacity is commonly assumed to predict performance in classical reasoning tasks because people higher in cognitive capacity are better at this deliberate correction process. However, recent findings suggest that people also have accurate, "logical" intuitions and that there can be a positive correlation between cognitive capacity and correct intuitive thinking. Building on this work, here we present results from 2 studies that contrasted whether cognitive capacity is more predictive of having correct intuitions or successful deliberate correction of an incorrect intuition. We used a two-response paradigm and a direction-of-change analysis to check whether correct responses were generated intuitively or whether they resulted from deliberate correction (i.e., an initial incorrect-to-correct final response change). Results showed that although cognitive capacity was associated with the correction tendency (overall $r = .13$) it was far more predictive of correct intuitive responding (overall $r = .42$). Implications for the dual process and intelligence literature will be discussed.

21. Benjamin Sklarek, Lupita Estafania Gazzo Castañeda & Markus Knauff

Title: Legal reasoning: Balancing of basic right conflicts

Abstract:
The right to life, *the right to freedom of speech*, *the right to freedom of religion*, all these are few of many other commonly recognized basic rights that are considered as fundamental in many countries. In general terms, all basic rights are equally important and have to be granted. However, sometimes two basic rights are in conflict and have to be weighed against each other. For instance, if the *right to freedom of press* conflict with the *right to privacy* - can one right

“defeat” the other? This decision falls normally in the scope of supreme courts and is called *balancing*. We are interested in how laypeople with no legal education balance different conflicting basic rights. We assume that *moral outrage* moderates this “naïve” balancing process. Our prediction was that participants choose to protect the basic right whose violations leads to the highest level of moral outrage. For this purpose, we designed two experiments. In Experiment 1, we created conditional statements containing two basic rights. The first basic right was presented as a conditional rule, which was followed by a categorical premise that triggered a legally (and logically) valid inference. As a third premise we presented the second basic right, which was also phrased as a conditional and conflicted with the first basic right. The conclusion asked participants’ preference for maintaining the first or the second basic right. In half of the problems, the violation of the first right evoked a higher level of moral outrage than the violation of the second, and in the other half it was the other way around. In Experiment 2, we used the same materials as in Experiment 1 but added an additional between subjects factor: we either phrased the conclusion as a question (“May the circumcision be performed?”) or as a statement (“The circumcision may be performed.”). In Experiment 1 and 2, participants consistently protected the basic right whose violation would cause a higher level of moral outrage. In Experiment 2, this effect was even more pronounced when the conclusion was phrased as a statement (rather than a question). We discuss the implications of our findings for law theory and psychology - especially, in light of underlying cognitive processes.