

ESF Exploratory Workshop EW05-195 on Judgment and Decision Making as a Skill

Convened by

Dr. Mandeep K. Dhami, University of Cambridge, July 10-11 2006

Executive Summary

The rationale for organising the workshop on ‘JDM as a Skill’ was to stimulate scientific interest in understanding how people learn and develop JDM abilities/skills across the lifespan for different types of tasks.

Our scientific understanding of human JDM has grown considerably over the past 50 years in terms of the normative benchmarks by which we assess performance, the models we use to describe JDM, and the prescriptive solutions we offer to improve JDM. In fact, policy and practice in several domains such as management and medical have benefited from the findings of JDM research.

However, the vast majority of theoretical literature and empirical research has discussed human JDM with little reference to its origins. This is partly due to other theoretical preoccupations such as demonstrations of heuristics and biases and limiting methodological commitments such as studying JDM in cross-sectional, single trials, among cognitive fully functioning adults. Thus, to date, we know relatively little about JDM in children and the elderly or about JDM in different stages of cognitive advancement and decline. Although there is research on multiple cue/causal learning and feedback, expert-novice differences, JDM in different age groups, and neuropsychology of JDM, these do not currently provide a coherent and comprehensive picture of the learning and development of JDM.

The workshop on brought together 14 European scientists from 5 countries. They included scientists researching human JDM, learning, and cognitive development. Collectively, they explored the acquisition (through both development and learning) of JDM abilities/skills in humans.

The workshop comprised a combination of individual presentations, small group discussions and large group synthesising sessions. The presentations served to introduce researchers and prime later discussions. Presentations included reviews of empirical research as well as presentation of new findings on the learning and development of JDM. Much of the intellectual work was done in the small group discussions where three groups each identified gaps in our knowledge of the acquisition of JDM abilities/skills, and outlined areas of potential future research on this topic and appropriate methodology. Finally, the large group synthesising sessions summarised and consolidated ideas.

Over the two days, the workshop participants:

- (1) Reviewed theories and research on how JDM abilities/skills are acquired.
- (2) Identified gaps in scientific knowledge on the acquisition of JDM skills and abilities.
- (3) Reviewed the state of the art in theories and research on human learning and cognitive development that are applicable to JDM.

- (4) Outlined areas of potential research collaboration aimed at examining the learning and development of JDM.
- (5) Proposed methodologies suitable for studying the learning and development of JDM.
- (6) Prepared future European-level research collaborations on understanding the learning and development of JDM.

The workshop aimed to prompt the development of a broad, unified knowledge base. To this end, workshop participants agreed to participate in an edited volume on the topic of learning and development of JDM, and began to develop research collaborations on this issue. In fact, participants listed the specific areas of inquiry that they would be interested in pursuing.

The cross-fertilization of ideas between scientists working in different fields can boost the emerging area of scientific enquiry on learning and development of JDM. Reconciling theories of JDM with theories of learning and cognitive development can help guide the nature of JDM theories, provide directions for improving JDM, and change assumptions about the JDM competence of children, adolescents and the elderly.

Scientific Content

Below is a list of the scientific papers presented at the workshop:

Marc Buehner - *Causal Learning and Judgment in Real Time*

Mandeep Dhami - *Developing and Learning Judgment and Decision Making*

York Hagmayer - *Causal Learning and Decision Making*

Nigel Harvey - *In What Circumstances does Feedback Produce Learning in JDM Tasks?*

Denis Hilton - *Judgment and Decision Making as a Skill*

Peter Juslin - *Judgment as a Skill: Adaptive Shifts Between Cue Abstraction and Exemplar Memory*

David Lagnado - *Learning and Judgment*

Henrik Olsson - *Judgment and Decision Making as a Skill: A Bibliometric Review*

Jose Perales - *Covariation use in Causal Judgment as a Hypothesis Testing Process: Implications for Debiasing*

Rocio Garcia-Retamero - *Do People Have the Ability of Treating Missing Information Adaptively?*

Joerg Rieskamp - *A Learning Model for Selecting Decision Making Abilities*

Anne Schlottmann - *Children's Intuitions of Expected Value and Uncertainty*

Peter Sedlmeier - *Statistical Intuitions: the Result of Associative Learning?*

Neil Stewart - *Decision by Sampling*

Below is a summary of the large group synthesizing session on understanding the acquisition of JDM abilities/skills:

In order to understand how JDM abilities/skills are acquired we need to distinguish between:

- Knowledge of JDM task v. JDM ability/skill
- Specific v. general JDM abilities/skills
- Abstract (in laboratory) v. Naturalistic (everyday) JDM tasks
- Static v. Dynamic JDM tasks
- One-off v. Repeated JDM tasks
- Automaticity v. Voluntary performance

JDM abilities/skills may be acquired via:

- Instruction/teaching/training. Analogy may be useful.

- Experience (from different forms of feedback). Simulations may be used for one-off JDM tasks.
- There is a need to ensure appropriate generalization
- Is there a difference between adapting vs. learning?
- Causal learning is useful in dynamic decision-making
- Associative learning is useful in routinised decision-making
- Different task representations may improve understanding of causal relations in JDM tasks

There are also potential constraints on acquisition of JDM abilities/skills:

- The external structure of the task and the internal representation of the task
- The cognitive capacity of the individual
- The meta-level of JDM ability/skill (or strategy) selection and meta-level awareness of the type/structure of JDM task
- The limits of information gained from experience/feedback especially outcome feedback and in situations where only one type of outcome is known and where there is time delay between performance and feedback
- There may be differential effects of supervised and unsupervised learning
- There may be effects of costs and motivation to acquire JDM abilities/skills
- There may be effects of insight (implicit and explicit)

Methods that have been useful in past research:

- Experimental design (but need to distinguish between representation of JDM task as constructed by experimenter versus that construed by subject)
- Cognitive modelling
- Multiple trials

Other comments:

- Avoid descriptive theory of JDM ability/skill acquisition
- Understand link between System 1 (intuitive) and System 2 (analytical) thinking and acquisition of JDM abilities/skills
- One goal of understanding JDM ability/skill acquisition should be to develop effective interventions and aids

Below is a summary of the small group discussion session on identifying gaps in our knowledge of the acquisition of JDM abilities/skills:

Group A:

- Framework for understanding JDM strategy selection
- Internal and external representation of JDM tasks
- Causal models used by people
- Effectiveness of different forms of feedback
- Effect of non-cognitive factors on JDM

Group B:

- Effect of practice v. guidance
- Effectiveness of education/instruction and its components

- How to integrate instruction and practice
- The extent to which we can have generalized principles of JDM
- Cognitive processes needed in different types of JDM tasks
- People's existing knowledge about JDM tasks

Group C:

- Taxonomy of JDM tasks and their underlying structures (or abilities/skills)
- 'Yardstick' for developmental psychologists studying JDM
- People's existing level of JDM competence
- People's self-awareness of JDM abilities/skills and how these affect their construction of JDM tasks and use of abilities/skills
- Effect of non-cognitive factors on JDM
- Cost and motivation of information search in JDM

Below is a summary of the small group discussion session on outlining areas of potential future research on acquisition of JDM abilities/skills:

Group A:

- Role of causal learning in JDM (especially dynamic causal systems over time)
- Effectiveness of teachers/experts of JDM
- Effectiveness of different forms of feedback on JDM

Group B:

- Impediments to good intuition about the world (e.g., different representations, cultural differences)
- Development and testing of general but precise cognitive models
- Role of reflection (meta-level cognition) on learning to make better JDMs
- Methods that facilitate learning in JDM tasks
- Experimentation – exploitation trade-off in JDM ability/skill acquisition
- Establish limits and problems of feedback in real world JDM tasks

Group C:

- Taxonomy of JDM tasks to help study JDM across the lifespan
- Role of instruction and aids for JDM tasks in different domains and for their impact on outcome v. process of JDM
- Role of non-cognitive factors such as emotions on JDM
- More understanding of JDM in child and elderly populations

Further methodological considerations in future research:

- Need to control for individual difference variables such as intelligence, cognitive styles, personality
- Need to develop cognitive process models using an iterative design (e.g., more complex followed by less complex models and vice versa) that is bottom-up or top-down
- Need to use implicit performance measures

- Need to study JDM in younger and older populations
- Need to use exploratory methods such as observation and survey

Table 1. Workshop Participants' Future Research Interests on Topic of Acquisition of JDM Abilities/Skills

Participant	Areas of Interest
Marc Buehner	Role of time in learning and decision making
Mandeep Dhami	Taxonomy of JDM tasks, measuring JDM competence, development of JDM, training to improve JDM, role of non-cognitive factors in JDM, crime/legal applications of JDM research
York Hagmayer	Causality, feedback, role of reflection in JDM
Nigel Harvey	Feedback, forecasting, time series effects, experimentation-exploitation trade-off
Denis Hilton	Causal models, representation of JDM tasks, facilitating intuition
Peter Juslin	Cognitive process models of JDM, causal models, feedback
David Lagnado	Time effects, causal models, learning, cascading influence, hypothetical thinking, cognitive models, developmental precursors to JDM
Henrik Olsson	Feedback, cognitive modelling
Jose Perales	Information weighting, role of non-cognitive factors in JDM
Rocio Garcia Retamero	Social rationality, group decision-making
Joerg Rieskamp	Learning processes, feedback, causal models
Peter Sedlmeier	Time (lag) delay effects, associative learning and JDM, effective representations for improving JDM
Anne Schlottmann	Development of basic JDM, task constraints on JDM, origins of biases, training to make better decisions
Neil Stewart	Forecasting skills, development of information integration

Assessment of the Outcomes

The workshop concluded with a summary of the topic and recommendations for the future. In sum, there is currently relatively little research on how JDM abilities/skills are acquired either in terms of learning or development. There is little collaboration between JDM researchers and researchers interested in the acquisition of JDM in other fields such as learning and development. Overall, the past research does not provide any coherent or comprehensive understanding on the learning and development of JDM, and many important issues remain unexplored. Many of these unexplored issues were identified in the workshop.

In order to fully understand how JDM abilities/skills are acquired there is a need for collaboration among JDM researchers, and researchers in the fields of human learning and developmental psychology. This requires a common language and goals for theorizing about JDM and common methods for researching JDM. The workshop led to suggestions for useful theories and methods.

It was recommended that in order to further progress in stimulating scientific interest in understanding how people learn and develop JDM abilities/skills across the lifespan for different types of tasks: (1) a website be established emerging from the workshop which provides resources (e.g., references to published research) and contacts (e.g., international researchers in different and relevant fields). (2) An edited volume be published on the theme of the workshop that provides a resource and starting point for future research on the acquisition of JDM abilities/skills. Finally, (3) preparations should be made for future research collaborations among workshop participants and others in related fields to conduct research on the learning and development of JDM in humans.

In fact, these recommendations are currently being met. A website has been established, and will continue to be updated (see <http://www.crim.cam.ac.uk/ESF/index.html>). The workshop convenor (Dr. Mandeep Dhani) and two other scientists (Dr. Anne Schlottmann and Dr. Michael Waldmann) from the fields of JDM, learning and cognitive development are preparing a proposal for a co-edited book on the topic of learning and development of JDM to be sent to Erlbaum by the end of 2006. Finally, during the workshop, participants began discussing potential research collaborations on issues related to the learning and development of JDM.

Overall, the workshop was highly successful in fulfilling its goals.

Final Programme

Sunday 9 July 2006

Evening *Arrival*

Organised group dinner

Registration / Orientation

Monday 10 July 2006

08.00 - 09.00 *Breakfast at St Catharine's College*

09.30 **Welcome and introductions at Institute of Criminology**

09.45 **Presentation of the European Science Foundation (ESF)**

Naomi Segal (Standing Committee for the Humanities)

10.00 **Review theory and research on how JDM abilities are acquired**

• *5 x 15 minutes presentations from the decision researchers including questions (M. Dhami, N. Harvey, D. Hilton, P. Juslin, D. Lagnado)*

11.15 *Coffee break*

11.30 **Review theory and research on how JDM abilities are acquired
CONT...**

• *4 x 15 minutes presentations from the decision researchers including questions (H. Olsson, R.G. Retamero, J. Rieskamp, N. Stewart)*

12.30 **Review theory and research on how JDM abilities are acquired CONT...**

• *Large group synthesizing session*

13.00 *Lunch*

14.00 **Identify gaps in knowledge on the acquisition of JDM abilities**

• *Small group discussion session*

14.45 **Identify gaps in knowledge on the acquisition of JDM abilities CONT...**

• *Large group feedback and synthesizing session*

15.15 *Coffee break*

15.30 **Review state of the art in human learning applicable to JDM**

• *4 x 15 minutes presentations from the researchers in human learning including questions (M. Buehner, Y. Hagmayer, J. Perales, P. Sedlmeier)*

16.30 **Review state of the art in human learning applicable to JDM CONT...**

• *Large group synthesizing session*

17.15 *End for first day*

18.30 *Dinner at St Catharine's College*

Tuesday 11 July 2006

08.00 – 09.00 *Breakfast at St Catharine's College*

09.30 **Review state of the art in cognitive development applicable to JDM**

• *1 x 15 minutes presentations from the researchers in cognitive development including questions (A. Schlottmann)*

• *Large group synthesizing session*

10.30 *Coffee break*

10.45 **Outline areas of potential research collaboration that will examine the acquisition of JDM abilities in humans. And propose methodologies suitable for studying this issue**

• *Small group discussion session*

12.00 **Outline areas of potential research collaboration that will examine the acquisition of JDM abilities in humans. And, propose methodologies suitable for studying this issue CONT...**

• *Large group feedback and synthesizing session*

12.30 *Lunch*

13.30 **Next steps I – plan future research collaborations**

• *1 hour self-selected small group preparation for future collaboration*

14.30 **Next steps I – plan future research collaborations CONT...**

• *Large group feedback and synthesizing session*

15.00 *Coffee break*

15.15 **Next steps II – agree on workshop outcomes**

• *Small group discussion session*

15.45 **Next steps II – agree on workshop outcomes CONT...**

• *Large group feedback and synthesizing session*

16.30 *Workshop Close*

18.30 *Dinner and farewell at St Catharine's College*

Wednesday 12 July 2006

Morning *Breakfast at St Catharine's College*

Departure

List of Participants

Dr Marc Buehner
Cardiff University

Dr Mandeep Dhami
University of Cambridge

Dr York Hagmayer
University of Goettingen

Prof Nigel Harvey
University College London

Prof. Denis Hilton
University of Toulouse

Prof. Peter Juslin
Uppsala University

Dr David Lagnado
University College London

Dr Henrik Olsson
Uppsala University

Dr. Jose C. Perales
University of Granada

Dr Rocío García Retamero
Center for Adaptive Behavior and Cognition
Max Planck Institute

Dr Jorg Rieskamp
Center for Adaptive Behavior and Cognition
Max Planck Institute

Dr. Anne Schlottmann
University College London

Dr Peter Sedlmeier
Technical University of Chemnitz

Professor Naomi Segal
University of London

Dr Neil Stewart
University of Warwick

Statistical Information

Number of participants invited: 29

Number of participants present: 14

Participants by gender (participants not present in brackets):

Men: 11 (+13)

Women: 3 (+2)

Participants by age

25 – 35 years old	7 (+5)
35 – 50 years old	6 (+8)
50 – 65 years old	1 (+2)

Participants by country:

Belgium	(+2)
France	1
Germany	4 (+5)
Netherlands	(+2)
Norway	(+1)
Spain	1
Sweden	2
Switzerland	(+4)
United Kingdom	6
USA	(+1)