

Fachbereich Erziehungswissenschaft und Psychologie
der Freien Universität Berlin

The Aging Decision Maker:
Cognitive Aging and the Use of Decision Strategies

Dissertation
zur Erlangung des akademischen Grades
Doktor der Philosophie
(Dr. phil.)

Vorgelegt von
Lic. Psic. Rui Mata

Erstgutachter: Prof. Dr. Gerd Gigerenzer
Zweitgutachter: Prof. Dr. Arthur Jacobs

Disputation: Berlin, 3 Mai 2006

para o brito-mendes

Acknowledgments

I would like to thank my advisors, Lael Schooler and Jörg Rieskamp, for precious help with all my dissertation work. I particularly need to thank Lael for his patience, guidance, and support.

Gerd Gigerenzer has been a source of inspiration for the past three years. Gerd allowed me to take part in the exciting scientific enterprise taking place at the Center for Adaptive Behaviour and Cognition (ABC) at the Max Planck Institute for Human Development and I thank him dearly for that. I must also thank Paul Baltes and Jacque Eccles for making it possible for me to benefit from the intellectually stimulating International Max Planck Research School LIFE. Additional thanks are due to all fellows, faculty, and coordinators who provided precious feedback and assistance throughout my time in LIFE.

I would like to thank Jacque for her support during my stay at the University of Michigan: Andreas and I could have not asked for more. I also want to thank Patricia Reuter-Lorenz for giving me the opportunity to work at her lab and Joseph Mikels for his help, patience, and friendship during my stay there.

I would like to thank the members of the Center for Life Span Development at the Max Planck Institute for Human Development who provided assistance of various kinds, and thus made possible running most studies reported in this dissertation. I must also thank Shu-Chen Li and Ulman Lindenberger for their helpful comments on some of my work. This dissertation would also have not been possible without Christian Elsner's technical support and the help of Gregor Caregnato, Nora Klinkowski, and Martin Rosenauer in running experimental studies.

I must also thank colleagues at ABC who have helped me escape my dissertation work: Uwe Czienskowski, for his introduction to extreme programming; Edouard Mächery, for his clarification of Fodor's weird views on concepts; Torsten Reimer, who has guided my excursions into persuasion research; Henry Brighton, for the ruminations concerning ecological rationality; and Andreas Wilke and Peter Todd, for the principled, evolutionary approach to the study of the mind. In particular, I want to thank Andreas for being a great collaborator and, above all, a true friend.

I must also thank joni for all the sleepless nights spent talking about things we never knew enough about but always wanted to discuss: What academia should be all about.

Finally, I would like to thank family, friends, and aminhamaisquetudo, jutta, for helping me endure the Lx-Berlin move, my chronic self-deprecation, and life in general.

Table of Contents

Chapter 1 – Theoretical Background	1
Cognitive Aging: The Mechanics and Pragmatics of Cognition	2
The Mechanics of Cognition	3
The Pragmatics of Cognition	6
Successful Aging: Selective Optimization with Compensation	6
The Adaptive Toolbox Approach	8
The Contents of the Adaptive Toolbox	10
Testing the Fit: Examples of Ecological Rationality	11
Extending the Metaphor: Selecting vs. Applying Tools	14
Strategy Selection	15
Strategy Application	20
Cognitive Aging and the Use of Decision Strategies	23
Summary and Outlook	31
Chapter 2 – Cognitive Aging and Strategy Selection	33
Heterogeneity in Strategy Selection	34
Individual Differences in Cognitive Capacity and Strategy Selection	35
Age-related Changes in Cognitive Capacity and Strategy Selection	37
Overview of the Studies	38
Study 1: Individual Differences in Cognitive Capacity and Strategy Selection in a Sample of Younger Adults	39
Method	41
Results	44
Discussion	53
Study 2: Individual Differences in Cognitive Capacity and Strategy Selection in a Sample of Younger Adults	53
Method	55
Results	57
Discussion	70

Study 3: Individual Differences in Cognitive Capacity and Strategy Selection in a Sample of Older Adults	73
Method	75
Results	76
Discussion	86
Age Comparisons of Information Search and Strategy Selection	87
Age Differences in Information Search: Older Adults Show Less Information-intensive Searches Compared to Younger Adults	88
Age Differences in Strategy Use: Older Adults Tend to Use Simpler Strategies Compared to Younger Adults	88
Despite Being Adaptive Older Adults Are Generally Worse Off Compared to Younger Adults	90
Age Differences in Strategy Selection Explained by Individual Differences in Speed and Reasoning	91
Discussion	94
General Discussion	95
Overview of Studies 1, 2, and 3	95
Younger and Older Adults as Adaptive Decision Makers	95
Individual Differences in Cognitive Capacity Determine Strategy Selection	96
Older Adults Show Less Information-intensive Searches and Use Simpler Strategies Compared to Younger Adults	96
Future Directions	97
Conclusion	98
Chapter 3 – Cognitive Aging and Strategy Application	99
<hr/>	
Combining the Connectionist and Adaptive Toolbox Approaches	100
The Eliminative View of Connectionism	100
The Implementationist View of Connectionism	101
Formal Modeling of Aging	102
A Neurocomputational Account of Age-related Changes in Strategy Application	104
Method	105
Results	107
Discussion	110
Study 4: Age Differences in Application of Decision Strategies	111
Method	113
Results	115
Discussion	121

General Discussion	122
Theoretical and Empirical Contribution	122
Limitations and Potential Extensions	123
Chapter 4 – General Discussion	125
<hr/>	
Where We Started From	125
Selective Optimization with Compensation	125
The Adaptive Toolbox Approach	125
What We Have Learned	126
Younger and Older Adults Select Strategies Adaptively	126
Older Adults Use Simpler Strategies Compared to Younger Adults	127
Older Adults Apply Decision Strategies Less Effectively Compared to Younger Adults	127
Scissors Have Two Blades: Adapting to Individual and Environment Characteristics.....	128
What We Still Need To Learn	129
Do People Select Environments Adaptively?	129
Towards a Unified Computational Model of Strategy Selection and Application ..	129
The Mysterious Path from Brain to Behavior	130
Applied Potential of Understanding the Aging Decision Maker	131
Conclusion	131
References	133
<hr/>	
Appendix	154
<hr/>	