CHAPTER 4  Self-regulation and social behavior during sleep deprivation

Jillian Dorrian, Stephanie Centofanti, Ashleigh Smith, Kathryn Demos McDermott

1. Introduction and overview ........................................ 74
2. Behavioral regulation .............................................. 75
   2.1. Sleep deprivation and self-regulation of eating behavior... 76
   2.2. Sleep loss, stress, and reward ................................ 78
3. Emotional regulation ............................................. 83
4. Social behavior .................................................. 87
   4.1. Sleep deprivation, negative interaction, and withdrawal... 90
5. Toward an integrated theory of the impact of sleep deprivation on social cognition ................................... 95
6. Agenda for physical, psychological, and social health promotion in the face of sleep deprivation .................... 97
7. Conclusions ..................................................... 102
References .................................................................. 102

CHAPTER 5  A dynamic attentional control framework for understanding sleep deprivation effects on cognition

Paul Whitney, John M. Hinson, Amy T. Nusbaum

1. Introduction ....................................................... 112
2. PFC functions and SD ........................................... 113
3. A dynamic attentional control framework ....................... 114
4. “Complex cognition” and SD reconsidered ....................... 119
5. Conclusions ..................................................... 121
Acknowledgments .................................................. 122
References .................................................................. 122

CHAPTER 6  Unraveling the genetic underpinnings of sleep deprivation-induced impairments in human cognition

Brieann C. Satterfield, Benjamin Stucky, Hans-Peter Landolt, Hans P.A. Van Dongen

1. Introduction ....................................................... 128
2. Pharmacogenetics to elucidate molecular-genetic contributions to sleep deprivation and cognition .................. 130
   2.1. System perturbations with pharmacological interventions and sleep deprivation .............................. 131
2.2. Theory-driven selection of gene targets: Proof of concept...132
2.3. Selective sampling: Proof of concept 133
2.4. System perturbation, theory-driven genotyping,
  and deep phenotyping 135
3. Sleep deprivation, individual differences, and cognitive
  endophenotyping 136
  3.1. Genetically explained phenotypic variance 136
  3.2. Statistical focus on between-subject variance 137
  3.3. Cognitive endophenotyping 138
  3.4. Challenges of inferring genetic mechanisms 138
4. Biomarker panels and statistical tools 139
  4.1. Data-driven and theory-driven statistical approaches 139
  4.2. Exploratory statistical techniques: Proof of concept 140
  4.3. LASSO and cvLASSO 141
  4.4. Stability selection LASSO 143
  4.5. Hierarchical inference 144
  4.6. Group LASSO 144
5. Conclusion 149
Acknowledgments 149
References 149

CHAPTER 7 Functional connectivity and the sleep-deprived
  brain 159
Michael W.L. Chee, Juan Zhou
  1. Resting state functional connectivity (rsFC) and its
    measurement 159
  2. An overview of resting state fMRI analysis techniques 160
  3. Functional connectivity alterations following sleep
    deprivation 163
  4. Dynamic functional connectivity and behavioral
    correlates 167
  5. Functional connectivity changes in other neuropsychiatric
    conditions compared to sleep deprivation 169
  6. Importance of sleep during functional connectivity studies 170
  7. Future directions 171
References 171

CHAPTER 8 Basic and applied science interactions in fatigue
  understanding and risk mitigation 177
Glenn Gunzelmann, Stephen M. James, Jo Lynn Caldwell
  1. Background 178
  2. Effects of sleep related fatigue on ground combat
    operations 180
2.1. Fatigue and interpersonal interactions............................................. 181
2.2. Fatigue and decisions to shoot......................................................... 183

3. Applying computational modeling to fatigue risk
management in air operations............................................................. 184

3.1. Cognitive architectures and models of sleep and
fatigue........................................................................................................ 187

4. Countermeasures to reduce the deleterious effects of
sleep loss................................................................................................... 190

5. Conclusion............................................................................................. 194

Acknowledgments................................................................................... 195

References............................................................................................... 195

Further reading......................................................................................... 204