

Contents

1	Technologies of Inclusive Well-Being at the Intersection of Serious Games, Alternative Realities, and Play Therapy	1
	Anthony Lewis Brooks, Sheryl Brahnam and Lakhmi C. Jain	
1.1	Introduction	1
1.2	Contributions in This Book	3
1.3	Conclusion.	10
 Part I Technologies for Rehabilitation		
2	Design Issues for Vision-Based Motor-Rehabilitation Serious Games	13
	Antoni Jaume-i-Capó, Biel Moyà-Alcover and Javier Varona	
2.1	Introduction	14
2.2	Related Work	15
2.3	Design Issues	15
	2.3.1 Development Paradigm	16
	2.3.2 Interaction Mechanism	16
	2.3.3 Interaction Elements	16
	2.3.4 Feedback	16
	2.3.5 Adaptability	17
	2.3.6 Monitoring.	17
	2.3.7 Clinical Evaluation	18
2.4	Case Study: Vision-Based Rehabilitation Serious Game	18
	2.4.1 Development Paradigm	19
	2.4.2 Interaction Mechanism	19
	2.4.3 Feedback	20
	2.4.4 Interaction Elements	21
	2.4.5 Adaptability	21
	2.4.6 Monitoring.	22
	2.4.7 Clinical Evaluation	22
2.5	Conclusions	23
	References	23

3 Development of a Memory Training Game 25
 Kristoffer Jensen and Andrea Valente

3.1 Introduction 25

3.2 Memory 26

 3.2.1 History of Memory Ideas 27

 3.2.2 Memory Overview 27

 3.2.3 Memory Assessments 29

 3.2.4 Memory and Games 30

3.3 Game Design and Development 32

 3.3.1 Levels 33

 3.3.2 Development 33

3.4 Scientific Uses 35

 3.4.1 Self-Assessment 36

 3.4.2 Other Scientific Uses 37

3.5 Conclusions 37

References 38

4 Assessing Virtual Reality Environments as Cognitive Stimulation Method for Patients with MCI 39
 Ioannis Tarnanas, Apostolos Tsolakis and Magda Tsolaki

4.1 Introduction 40

 4.1.1 Individuals with Mild Cognitive Impairment 40

 4.1.2 MCI Subtypes 41

 4.1.3 Amnesic-Type Mild Cognitive Impairment 43

4.2 Virtual Environments and aMCI 44

 4.2.1 Spatial and Visual Memory 45

 4.2.2 Virtual Reality, Spatial Memory and aMCI 46

4.3 The Virtual Reality Museum 47

 4.3.1 The Virtual Reality Museum
 Technical Components 48

 4.3.2 The Virtual Reality Museum Cognitive Theory 49

 4.3.3 The Virtual Reality Museum Cognitive Exercises 53

4.4 Research Methodology 54

 4.4.1 Design 54

 4.4.2 Participants 54

 4.4.3 Procedures 55

 4.4.4 Data Recordings and Analysis 58

4.5 Results 60

 4.5.1 Neuropsychological Variables Outcome 60

 4.5.2 Electrophysiological Measures Outcome 60

4.6 Discussion 65

4.7 Conclusion 66

References 69

5 Adaptive Cognitive Rehabilitation 75
 Inge Linda Wilms

5.1 Introduction 75

5.2 The Challenges. 76

5.2.1 Fundamental Learning and Adaptation 76

5.2.2 Brain Injury: The Damage Done. 78

5.2.3 Recovering from Brain Injury Through Training 79

5.3 Advanced Technology and Cognitive Rehabilitation 81

5.3.1 A Brief History 81

5.3.2 Assessment 82

5.3.3 Treatment 82

5.3.4 Computer-Based Rehabilitation Training Today 83

5.3.5 The Challenge of Individuality in Injury
 and Treatment 83

5.3.6 The Same is not the Same 84

5.3.7 The Prism Example. 85

5.4 Artificial Intelligence and Rehabilitation 87

5.4.1 Adjusting Level of Difficulty
 in Cognitive Rehabilitation 87

5.5 Concluding Comments 89

References 89

**6 A Body of Evidence: Avatars and the Generative
 Nature of Bodily Perception 95**
 Mark Palmer, Ailie Turton, Sharon Grieve,
 Tim Moss and Jenny Lewis

6.1 Introduction 96

6.2 Complex Regional Pain Syndrome 96

6.3 The Rubber-Hand Illusion 98

6.4 The Somatosensory System 103

6.5 The Body and Space 105

6.6 Changes in Body Perception 107

6.7 A Need to Communicate Painful Contradictions. 109

6.8 An Erie Realisation and a Form of Acceptance 112

6.9 The Nature of Pain 113

6.10 Discussion 117

References 119

**7 Virtual Teacher and Classroom for Assessment
 of Neurodevelopmental Disorders 121**
 Thomas D. Parsons

7.1 Introduction 121

7.2 Neurodevelopmental Disorders: Differentiation
 of Their Cognitive Sequelae. 123

- 7.3 Virtual Environments for Neurocognitive Assessment 126
- 7.4 Assessment of Neurodevelopmental Disorders
Using Virtual Environments 127
- 7.5 Virtual Reality for Assessment and Treatment
of Social Skills 128
- 7.6 Virtual Teacher/Classroom Environment
for Assessment/Treatment of Attention 129
- 7.7 Conclusions 131
- References 132

**8 Engaging Children in Play Therapy: The Coupling
of Virtual Reality Games with Social Robotics 139**

Sergio García-Vergara, LaVonda Brown, Hae Won Park
and Ayanna M. Howard

- 8.1 Introduction 140
- 8.2 Related Work 141
- 8.3 A Virtual Reality Game for Upper-Arm Rehabilitation 142
 - 8.3.1 Introduction 142
 - 8.3.2 Objective 143
 - 8.3.3 Description of Overall System 143
 - 8.3.4 Description of Real-Time Kinematic Assessment 147
 - 8.3.5 Pilot Study with Children 148
- 8.4 Integration of Social Robotics in Gaming Scenarios 150
 - 8.4.1 Engagement Through Behavioral Interaction 151
 - 8.4.2 Pilot Study with Children 152
 - 8.4.3 Learning from Gaming Demonstration 155
 - 8.4.4 Pilot Study with Children 157
- 8.5 Discussion and Future Work 160
- References 161

Part II Technologies for Music Therapy and Expression

**9 Instruments for Everyone: Designing New Means
of Musical Expression for Disabled Creators 167**

Rolf Gehlhaar, Paulo Maria Rodrigues, Luis Miguel Girão
and Rui Penha

- 9.1 Introduction 168
- 9.2 The Evolution of Robotic and Technology
Assisted Musical Instruments 169
- 9.3 A Description of the Process 171
 - 9.3.1 Context 171
 - 9.3.2 Designing the Instruments 173

- 9.4 Developing Musical Activities with the Newly Created Instruments 183
 - 9.4.1 Composing for and Performing with I4E 184
 - 9.4.2 The Final Composition: Viagem 185
- 9.5 Feedback from Those Involved. 187
- 9.6 Advice to Practitioners 192
 - 9.6.1 Problems Encountered and Methods for Arriving at Solutions 193
- 9.7 Concluding Remarks 194
- References 195
- 10 Designing for Musical Play 197**
 - Ben Challis
 - 10.1 Introduction 197
 - 10.2 Snoezelen and the Evolution of the Sensory Space 199
 - 10.3 Music and Sound in Therapeutic Contexts 201
 - 10.4 Sensory Spaces in Practice. 203
 - 10.4.1 Perceptions and Attitudes. 204
 - 10.4.2 The Spaces 205
 - 10.4.3 Specialist Technologies 206
 - 10.4.4 Repurposed Technologies 208
 - 10.4.5 Activities (Music and Sound) 209
 - 10.5 Technologies for Musical Play 212
 - 10.5.1 Pressure-Sensitive 212
 - 10.5.2 Touch-Sensitive 213
 - 10.5.3 Movement-Sensitive 214
 - 10.5.4 Switch-Access 215
 - 10.6 Reconsidering the Design and Use of Sensory Spaces 215
 - References 217

Part III Technologies for Well-Being

- 11 Serious Games as Positive Technologies for Individual and Group Flourishing 221**
 - Luca Argenton, Stefano Triberti, Silvia Serino, Marisa Muzio and Giuseppe Riva
 - 11.1 Introduction 222
 - 11.2 Positive Psychology 222
 - 11.3 The Hedonic Perspective: Fostering Positive Emotional States. 223
 - 11.3.1 Using Technology to Foster Positive Emotional States. 224
 - 11.3.2 Can Serious Games Foster Positive Emotional States? 225

- 11.4 The Eudaimonic Perspective: Promoting Individual Growth and Fulfillment 226
 - 11.4.1 Using Technologies to Promote Individual Growth and Fulfillment 227
 - 11.4.2 Can Serious Games Promote Individual Growth and Fulfillment? 228
- 11.5 The Social Perspective: Enhancing Integration and Connectedness 229
 - 11.5.1 Using Technologies to Enhance Integration and Connectedness 230
 - 11.5.2 Can Serious Games Enhance Integration and Connectedness? 231
- 11.6 Mind the Game™: A Serous Game to Promote Networked Flow 232
 - 11.6.1 Technology 232
 - 11.6.2 Sharing Goals and Emotional Experiences: Sport as a Narrative Tool. 232
 - 11.6.3 Creating a Space of Liminality. 235
 - 11.6.4 Identifying a Common Activity to Overcome the Space of Liminality 235
 - 11.6.5 A Pilot Study 236
- 11.7 Conclusion. 240
- References 240

- 12 Spontaneous Interventions for Health: How Digital Games May Supplement Urban Design Projects 245**
 - Martin Knöll, Magnus Moar, Stephen Boyd Davis and Mike Saunders
 - 12.1 Introduction: Morning Stroller Clubs and an iPhone Stair Climbing Game 246
 - 12.2 Active Design Guidelines and Community Games 247
 - 12.3 Spontaneous Interventions for Health 248
 - 12.3.1 Lack of Expertise to Explore ICT in Urban Design 249
 - 12.3.2 Lack of Data Evaluating Medical and Social Impact 249
 - 12.3.3 Not Stimulating User Co-design 250
 - 12.3.4 Lack of Cooperation and Business Models for Further Development 251
 - 12.4 Context-Sensitive Games as a Spring Board for Communication 251

12.5 Roadmap Towards ICT Supported Spontaneous Interventions 254

12.5.1 Encouraging Interdisciplinary Educational and Research Projects 254

12.5.2 Developing New Strategies to Evaluate the Effects of Mobile Health Games in the Wild 255

12.5.3 Improve Access to Co-design Projects with Playful Approaches 255

12.5.4 Working on New Business Models that also Target Local Neighborhoods 256

12.6 Conclusion and Outlook 256

References 257

13 Using Virtual Environments to Test the Effects of Lifelike Architecture on People 261

Mohamad Nadim Adi and David J. Roberts

13.1 Introduction 262

13.1.1 Using Virtual Reality for Testing and Evaluating 265

13.1.2 Crossover and Relations 267

13.2 Research Direction 269

13.3 Experiments 270

13.3.1 Experiment 1 272

13.3.2 Experiment 2 273

13.3.3 Experiment 3 274

13.3.4 Experiment 4 276

13.4 Discussion 278

13.5 Conclusion 280

References 281

Part IV Technologies for Education and Education for Rehabilitative Technologies

14 An Overview of Virtual Simulation and Serious Gaming for Surgical Education and Training. 289

Bill Kapralos, Fuad Moussa and Adam Dubrowski

14.1 Introduction 290

14.1.1 Alternative Educational Models 290

14.1.2 Open Problems with Virtual Simulation and Serious Games 292

14.1.3 Paper Overview 294

14.2 Virtual Simulation and Gaming in Surgical Education. 294

14.2.1 Transfer of Skills to the Operating Room 295

14.3 Serious Games: Fidelity and Multi-Modal Interactions 297

- 14.4 The Serious Games Surgical Cognitive Education and Training Framework 298
 - 14.4.1 Graphical Rendering 300
 - 14.4.2 Sound Rendering 300
 - 14.4.3 Multi-cue Interaction and Cue Fidelity 301
- 14.5 Conclusions 302
- References 303

- 15 The Ongoing Development of a Multimedia Educational Gaming Module 307**
 - Elizabeth Stokes
 - 15.1 Introduction 307
 - 15.2 The Coursework 308
 - 15.3 The Lifecycle of the Gaming Coursework 309
 - 15.3.1 Case Studies (Profiles) 309
 - 15.4 Pupils’ Profile 309
 - 15.4.1 Gender 309
 - 15.4.2 Age 310
 - 15.4.3 Medical Conditions 310
 - 15.4.4 Communication 310
 - 15.4.5 Computer Ability 311
 - 15.4.6 Reading Level 312
 - 15.4.7 Comprehension 312
 - 15.4.8 Educational Area to Consider 312
 - 15.4.9 Likes 312
 - 15.5 The Development and Production 312
 - 15.6 Feedback and the Next Cohort of Students 313
 - 15.7 The Responsibility of the Academic 314
 - 15.8 Students’ Useful Contribution and the Assets They Bring . . . 314
 - 15.9 Students’ Gain from the Coursework 315
 - 15.10 Partnership and Collaboration 315
 - 15.11 Theoretical Knowledge, Practical Skills and Design Techniques 316
 - 15.12 Relating Academia with Society and Humanity 316
 - 15.13 Gains from the Experience Itself 316
 - 15.14 Students’ Gains 316
 - 15.15 Schools, Practitioners and Pupils Gains 317
 - 15.16 Conclusion 318
 - References 319

Part V Disruptive Innovation

16 Disruptive Innovation in Healthcare and Rehabilitation 323

A. L. Brooks

16.1 Introduction 323

 16.1.1 Disruptive Innovation 323

16.2 Cloud-Based Disruptive Innovation 325

16.3 SoundScapes: Serious Games, Alternative Realities and Play 327

 16.3.1 Serious Games 328

16.4 Alternative Reality 329

 16.4.1 Analogizing from a Games Perspective 330

 16.4.2 Training Trainers Retreat 333

 16.4.3 A Cloud-Based Archive Architecture 335

 16.4.4 Justifying the Transcending of Performance Art-Related Quotes 336

 16.4.5 Aesthetic Resonance 338

 16.4.6 Neuroaesthetics/Neuroesthetics 342

 16.4.7 Games, Interactive Technology, and ‘Alternative’ Environments in Healthcare 345

 16.4.8 Presence 346

16.5 Conclusions 348

References 349

Glossary 353

About the Editors 359



<http://www.springer.com/978-3-642-45431-8>

Technologies of Inclusive Well-Being

Serious Games, Alternative Realities, and Play Therapy

Brooks, A.L.; Brahnam, S.; Jain, L.C. (Eds.)

2014, XIX, 360 p. 73 illus., 54 illus. in color., Hardcover

ISBN: 978-3-642-45431-8