

Rehabilitation Robots: Market Strategies and Forecasts, Worldwide, 2019-2025

Table of Contents

Rehabilitation Robots: Executive Summary

The study is designed to give a comprehensive overview of the Rehabilitation Robots market segment. Research represents a selection from the mountains of data available of the most relevant and cogent market materials, with selections made by the most senior analysts. Commentary on every aspect of the market from independent analysts creates an independent perspective in the evaluation of the market. In this manner the study presents a comprehensive overview of what is going on in this market, assisting managers with designing market strategies likely to succeed.

Table of Contents and List of Figures

Rehabilitation Robots Market Shares, Market Strategy, and Market Forecasts, 2019 to 2025	1
Rehabilitation Robot Executive Summary	29
Rehabilitation Robot Market Driving Forces	29
Rehabilitation Robots Assistive Devices	32
Rehabilitation Robots Decrease the Cost of Recovery	33
Rehabilitation Robot Medical Conditions Treated	35
Robotic Modules for Disability Therapy	36
Wearable Robotics for Disability Therapy	37
Rehabilitation Robots Leverage Neuroplasticity	39
Rehabilitation Robot Market Shares	40

Rehabilitation Robot Market Forecasts	41
1. Rehabilitation Robot Market Description and Market Dynamics	43
1.1 Rehabilitation Robot Market Definition	43
1.2 Rehabilitation Physical Therapy Trends	44
1.2.1 Therapy Apps	45
1.2.2 Exoskeleton Suit	45
1.2.3 Running with Robots	46
1.2.4 Use of Video Game Technology In PT	47
1.2.5 Telemedicine Growing Trend In The Physical Therapy	47
1.3 Stroke Rehabilitation	48
1.3.1 Stroke Protocols	49
1.3.2 Rehabilitation Medicine: New Therapies in Stroke Rehabilitation	50
1.3.3 Botulinum Toxin Injections	51
1.3.4 Constraint Induced Movement Therapy (CIMT)	51
1.3.5 Dynamic Splinting	52
1.3.6 Electrical Stimulation	52
1.3.7 Robotic Therapy Devices	52
1.3.8 Partial Body Weight-Supported Treadmill	53
1.3.9 Virtual Reality (including Wii-hab)	53
1.3.10 Brain Stimulation	53
1.3.11 Acupuncture	54
1.3.12 Mental Practice	54
1.3.13 Mirror Therapy	54
1.3.14 Hyperbaric Oxygen Therapy	54
1.3.15 Evidence-Based Treatment Protocols	55
1.3.16 Home Mobility Exoskeletons	55

1.4	Exoskeleton Able-Bodied Industrial Applications	56
1.5	Restoring Physical Function Through Neuro-Rehabilitation After Stroke	57
1.5.1	Traumatic Brain Injury Program	59
1.5.2	Concussion Program	60
1.5.3	Hospital Stroke Programs Rapid Response to Create Better Outcomes	60
1.5.4	Stroke Response Process Leverage Protocols that Implement Streamlined Timely Treatment	61
2.	Rehabilitation Robot Market Shares and Market Forecasts	63
2.1	Rehabilitation Robot Market Driving Forces	63
2.1.1	Rehabilitation Robots Assistive Devices	67
2.1.2	Rehabilitation Robots Decrease the Cost of Recovery	68
2.1.3	Rehabilitation Robot Medical Conditions Treated	70
2.1.4	Robotic Modules for Disability Therapy	70
2.1.5	Wearable Robotics for Disability Therapy	72
2.1.6	Rehabilitation Robots Leverage Principles Of Neuroplasticity	74
2.2	Rehabilitation Robot Market Shares	75
2.2.1	DJO Global Business Activities	79
2.2.2	AlterG Bionic Leg Customer Base	81
2.2.3	Myomo	81
2.2.4	Performance Health / Patterson Medical	83
2.2.5	DIH International Limited / Hocoma	83
2.2.6	Bionik Laboratories / Interactive Motion Technologies (IMT)	83
2.2.7	Hocoma Robotic Rehabilitation	84
2.2.8	Homoca Helping Patients To Grasp The Initiative And Reach Towards Recovery	85

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

2.2.9	Ekso Bionics Robotic Suit Helps Paralyzed Man Walk Again	88
2.2.10	Rewalk	89
2.2.11	Karman Xo-202 Standing Wheelchair Power Stand Power Drive	90
2.3	Rehabilitation Robot Market Share Unit Analysis	92
2.3.1	Medical Rehabilitation Robot Market Analysis	93
2.4	Rehabilitation Robot Market Forecasts	95
2.4.1	Rehabilitation Robot Unit Shipments	101
2.4.2	Rehabilitation Robots Market Segments: Lower Extremities, Upper Extremities, Neurological Training, Exoskeleton, Stroke CPM	102
2.5	Rehabilitation Robot And Motorized CPM Equipment	108
2.6	Global Exoskeleton Market	112
2.7	Rehabilitation Robotics Prices	115
2.7.1	Danniflex 480 Lower Limb CPM Unit	115
2.7.2	Patterson Kinetec CPM	116
2.7.3	Chattanooga Atromot	122
2.7.4	Ekso Bionics	131
2.7.5	Interaxon Muse	132
2.8	Rehabilitation Robotics Regional Analysis	133
2.8.1	Ekso Bionics Regional Presence	134
3.	Rehabilitation Robots Market Metrics and Devices	136
3.1	Upper and Lower limb Stroke Rehabilitation Devices	136
3.1.1	Upper Limb Stroke Rehabilitation Devices	136
3.2	Rehabilitation Robot Market Metrics	137
3.2.1	Types of Conditions and Rehabilitation Treatment by Condition	138
3.2.2	Clinical Evidence and Reimbursement	142
3.2.3	Stroke	143

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

3.2.4	Early Rehab After Stroke	145
3.2.5	Multiple Sclerosis	145
3.2.6	Knee-Replacement Surgery	145
3.2.7	Medicare Coverage of CPM	145
3.2.8	Hip	147
3.2.9	Gait Training	147
3.2.10	Sports Training	148
3.2.11	Severe Injury or Amputation	148
3.2.12	Neurological Disorders	149
3.2.13	Recovery After Surgery	149
3.2.14	Conditions with Severe Extremity Pain / Number of Patients	150
3.3	Types of Rehabilitation Robots and Conditions Treated	151
3.3.1	Gait Training Devices / Unweighting Systems	152
3.3.2	Euro-Rehabilitation	152
3.3.3	Prostheses	154
3.3.4	Motorized Physiotherapy CPM (Continuous Passive Motion), CAM Therapy (Controlled Active Motion) and the Onboard Protocols	155
3.3.5	Gait Training Devices / Unweighting Systems / Automated Treadmills	155
3.3.6	Rehabilitation Therapy Robotics	155
3.3.7	Upper Limb Robotic Rehabilitation	156
3.3.8	Shoulder Biomechanics	157
3.3.9	Exoskeletons	158
3.3.10	Exoskeleton-Based Rehabilitation	159
3.3.11	End-effectors	160
3.3.12	Mobility Training Level Of Distribution	160

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

3.3.13	Rehabilitation Robots Cost-Benefit-Considerations	161
3.3.14	Rehabilitation Systems	161
3.3.15	Robotic Therapeutic Stroke Rehabilitation	162
3.4	Disease Incidence and Prevalence Analysis	162
3.4.1	Aging Of The Population	162
3.4.2	Chronic Disease Rehabilitation	162
3.5	Service Robots	163
3.5.1	Next Generation Personal And Service Robotics	164
3.5.2	Focal Meditech BV Mealtime Support and Stress Reduction: Hand Function	164
3.5.3	Rehabilitation of Hip Injuries	165
3.5.4	iRobot / InTouch Health	166
3.6	Neurological Training	168
3.6.1	Neuro-Rehabilitation	168
3.7	Interaxon	168
3.7.1	Interaxon Muse: Brainwave Category Biometrics	171
3.7.2	InteraXon Motivates Brain Activity	173
3.7.3	Interaxon Muse Improves Response To Stress, Lowers Blood Pressure	173
3.7.4	Interaxon Muse Gives Self-Control	174
3.7.5	Interaxon Muse Can Improve Emotional State	174
3.7.6	Interaxon Muse Extended Use Lasting Results	175
3.7.7	Interaxon Muse Types of Feedback	176
3.8	Active Prostheses	176
3.8.1	Neuronal-Device Interfaces	177
3.9	Pererro - Switch Access Control	177

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

3.9.1	Pererro+	178
3.9.2	RSL Steeper V3 Myoelectric Hand	179
3.10	Humanware In-Home Rehabilitation	182
3.10.1	Muscle Memory	182
3.11	Rewalk	183
3.12	Permobil F5 Corpus VS Stand Sequence	186
3.13	Karman Xo-202 Standing Wheelchair Power Stand Power Drive	187
3.14	Berkeley Robotics Laboratory Exoskeletons	188
3.15	Exoskeleton Designed by CAR	189
3.16	CAREX Upper Limb Robotic Exoskeleton	191
3.17	Egto Tech	192
3.17.1	Egto Tech Luna Dynamic Resistance	193
3.17.2	Egto Tech Luna Objective Diagnostics	193
3.18	Motorized Physiotherapy CPM Continuous Passive Motion and Onboard Protocols	193
3.18.1	Movement Of Synovial Fluid To Allow For Better Diffusion Of Nutrients Into Damaged Cartilage	195
3.19	Global Medical	196
3.20	Furniss Corporation	200
3.20.1	Furniss Corporation Continuous Passive Motion DC2480 Knee CPM	205
3.21	Danniflex	206
3.21.1	Danniflex 480 Lower Limb CPM Unit	207
3.22	Rehab-Robotics Company	209
3.22.1	Rehab-Robotics Hand of Hope	211
3.22.2	Rehab-Robotics Hand & Arm Training	215
3.23	Bioxtreme	217

3.24 Corbys	218
3.24.1 Corbys System	219
3.25 Swtotek Motion Maker	223
4. Rehabilitation Robots Technology	224
4.1 Robotic Actuator Energy	224
4.1.1 Elastic Actuators	225
4.1.2 InMotion Robots Technology	226
4.2 Human Motor Error Enhancement Technology	227
4.2.1 Enhancing a Motor Error Improves Motor Skills	227
4.2.2 Adaptation to Error Enhancing Forces	227
4.2.3 Bioxtreme’s Error Enhancement Technology Potential Applications	228
4.3 Rehabilitation Robotic Risk Mitigation	229
4.4 Rehabilitation Robot Multi-Factor Solutions	232
4.4.1 Biometallic Materials Titanium (Ti) and its Alloys	232
4.5 Berkley Robotics and Human Engineering Laboratory	233
4.6 Rehabilitation Robot Automated Technique	233
4.6.1 InMotion Robots Technology	235
4.7 HEXORR: Hand EXOskeleton Rehabilitation Robot	237
4.8 ARMin: Upper Extremity Robotic Therapy	240
4.9 HandSOME: Hand Spring Operated Movement Enhancer	241
4.10 Cognitive Science	242
4.11 Lopes Gait Rehabilitation Device	242
4.12 Restoration of Sensation To A Paralyzed Man’s Arm	243
4.13 Artificial Muscle	244
4.14 ReWalk™ Exoskeleton Suit	245
5. Rehabilitation Robot Company Profiles	246
5.1 AlterG	246

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

5.1.1	AltgerG M320 Anti-Gravity Treadmill	250
5.1.2	AlterG® Anti-Gravity Treadmill in Action	251
5.1.3	AlterG: PK100 PowerKnee	253
5.1.4	AlterG Bionic Leg	254
5.1.5	Alterg / Tibion Bionic Leg	256
5.1.6	AlterG Bionic Leg Customer Base	258
5.1.7	AlterG M300	258
5.1.8	AlterG M300 Robotic Rehabilitation Treadmill	260
5.1.9	AlterG M300 Customers	263
5.2	Aretech	268
5.3	Berkley Robotics and Human Engineering Laboratory	271
5.4	Biodex	274
5.4.1	Biodex Clinical Advantage	275
5.5	Bioness	276
5.6	Bionik Laboratories / Interactive Motion Technologies (IMT)	276
5.6.1	Bionik Laboratories Acquires Interactive Motion Technologies, Inc. (IMT)	277
5.6.2	Biomarkers Of Motor Recovery	284
5.6.3	InMotion Robot Medical Conditions Treated	284
5.6.4	Interactive Motion Technologies (IMT) InMotion ARM™ Software	285
5.6.5	Bionik Laboratories Fiscal Year 2018 Revenue	286
5.7	Biodex Unweighting Systems	288
5.7.1	Biodex BioStep® 2 Semi-Recumbent Elliptical	289
5.7.2	Biodex BioStep 2 Helps Patients and Their Therapists Achieve Multiple Rehabilitation Objectives	290
5.7.3	Older Adults / Preambulation	290

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

5.7.4	Cardiac Rehabilitation	290
5.7.5	Biodex System 4 Pro	291
5.8	Bioxtreme	292
5.9	Breg	293
5.10	Catholic University of America HandSOME Hand Spring Operated Movement Enhancer	294
5.11	Clafin Rehabilitation Distribution	294
5.12	DIH International Limited / Hocoma	301
5.12.1	Swiss Hocoma Merges with Hong Kong Based DIH International	302
5.12.2	DIH and Hocoma Synergistic Collaboration	302
5.12.3	Hocoma Partnership With The Slovenian Software Company XLAB	305
5.12.4	Hocoma Andago	306
5.12.5	Hocoma Lokomat Functional Electrical Stimulation	309
5.12.6	Hocoma ArmeoSpring for Stroke Victims	311
5.12.7	Hocoma ArmeoSpring Based On An Ergonomic Arm Exoskeleton	313
5.12.8	Hocoma Armeo®Spring Clinical Success	313
5.12.9	Hocoma Armeo Functional Therapy Of The Upper Extremities	314
5.12.10	Hocoma Armeo®Spring - Functional Arm and Hand Therapy	315
5.12.11	Hocoma Valedo Functional Movement Therapy For Low Back Pain Treatment	317
5.12.12	DIH / Hocoma Revenue	318
5.13	DJO Global	319
5.13.1	DJO Global Trademarks, Service Marks And Brand Names	322
5.13.2	DJO Global Business Activities	325
5.13.3	DJO / Chattanooga	325
5.13.4	Chattanooga Active-K CPM (Continuous Passive Motion)	329

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

5.13.5	DJO Revenue	341
5.13.6	Third Quarter Highlights	342
5.13.7	Business Transformation	342
5.13.8	Sales Results	342
5.13.9	DJO Global	343
5.14	Ekso Bionics	344
5.14.1	Ekso Rehabilitation Robotics	346
5.14.2	Ekso GT	346
5.14.3	Ekso Bionics HULC Technology Licensed to the Lockheed Martin Corporation	349
5.14.4	Ekso Bionics Customers	350
5.14.5	Ekso and Lockheed	357
5.14.6	Ekso Bionics	357
5.14.7	Ekso Bionics Wearable Bionic Suit	358
5.14.8	Ekso Gait Training Exoskeleton Uses	361
5.14.9	Ekso Bionics Robotic Suit Helps Paralyzed Man Walk Again	366
5.14.10	Ekso Bionics Revenue	366
5.15	Fanuc - Industrial Robot Automation Systems and Robodrill Machine Centers	368
5.16	Focal Meditech	368
5.16.1	Focal Meditech BV Collaborating Partners:	370
5.17	Hobart Group / Motorika	371
5.17.1	Motorika	372
5.17.2	Hobart Group / MedInvest Group / Motorika	373
5.17.3	Motorika ReoGo	373

5.17.4 Hobart Motorik ReoGo Portable Platform Shoulder, Elbow, And Forearm	374
5.17.5 Motorika ReoAmbulator Innovative Robotic Gait Training System	376
5.17.6 Motorika	377
5.18 Honda Gait Training	379
5.18.1 Honda Motor ASIMO Humanoid Robot	383
5.18.2 Honda Motor	387
5.18.3 Honda Walk Assist	387
5.18.4 Honda Stride Management Motorized Assist Device	389
5.18.5 Honda Builds Unique Transportation Exoskeleton Device Market	390
5.19 Instead Technologies	390
5.19.1 Instead Technologies Services:	392
5.19.2 Instead Technologies	393
5.19.3 Instead Technologies RoboTherapist3D and 2D	394
5.19.4 Instead Technologies RoboTherapist3D	394
5.19.5 Instead Technologies Ultrasound Breast Volumes Breast Explorer	397
5.20 Interaxon	401
5.21 iRobot	401
5.21.1 iRobot / InTouch Health	401
5.22 Kinova JACO	404
5.23 KLC Services	406
5.24 Madison Dearborn Partners	406
5.25 Mobility Research	406
5.25.1 Mobility Research HugN-Go	408
5.25.2 Mobility Research HugN-Go 350	408
5.25.3 Mobility Research LiteGait	409

Rehabilitation Robots: Table of Contents

and List of Tables and Figures

5.26 MossRehab	412
5.27 Myomo	413
5.27.1 Myomo mPower 1000	414
5.27.2 Myomo MyoPro Motion G – Elbow-Wrist-Hand Orthosis	414
5.27.3 MyoPro Myoelectric Orthotics And Prosthetics	415
5.27.4 Myomo Neuro-Robotic Myoelectric Arm Orthosis System	416
5.27.5 Myomo EMG	417
5.27.6 Myomo Brace For Medical Professionals Permits A Paralyzed Individual To Perform Activities Of Daily Living	417
5.27.7 Myomo Brace For Medical Professionals Permits A Paralyzed Individual To Perform Activities Of Daily Living	419
5.27.8 Myomo Brace For Medical Professionals Permits A Paralyzed Individual To Perform Activities Of Daily Living	421
5.27.9 Myomo Brace For Medical Professionals Permits A Paralyzed Individual To Perform Activities Of Daily Living	423
5.27.10 Myomo Revenue	425
5.28 Orthocare Innovations	427
5.28.1 Orthocare Innovations Adaptive Systems™ For Advanced O&P Solutions.	428
5.28.2 Orthocare Innovations Prosthesis	429
5.28.3 Orthocare Innovations Edison™ Adaptive Vacuum Suspension System	430
5.28.4 Orthocare Innovations Edison Adaptive Prosthesis	431
5.28.5 Orthocare Innovations Intelligent Adaptive Prosthesis	431
5.28.6 Orthocare Innovations Edison Leg and Ankle	432
5.28.7 Orthocare Innovations Galileo Connector Technology	435

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

5.28.8 Orthocare Innovations Compas	436
5.29 Performance Health	437
5.29.1 Performance Health / Paterson Kinetec CPM	437
5.29.2 Paterson / Kinetec Spectra Knee CPM	439
5.30 ProMed Products Xpress	441
5.31 Reha-Stim	442
5.31.1 Reha-Stim Support Patients In Restoring Arm And Hand Function	442
5.31.2 Reha-Stim Medtec and YouRehab Merger	443
5.31.3 Reha-Stim Gait Trainer GT I	443
5.31.4 Reha-Stim Gait Trainer Target Market	447
5.31.5 Reha-Stim Support Patients In Restoring And Improving Gait Function	447
5.32 Rehabilitation Supply	448
5.33 Rehab-Robotics Company	449
5.34 ReWalk Robotics	450
5.34.1 Rewalk Robotics Revenue	452
5.35 Robotdalen	453
5.36 RSL Steeper	454
5.36.1 RSL Steeper Hand Prostheses	455
5.36.2 RSL Steeper Electronic Assistive Technology Devices for the Home	455
5.37 R U Robots	457
5.37.1 RU Robots	458
5.37.2 RU Robots Sunflower Robot	460
5.37.3 RU Robots Sophisticated Interactions	461
5.37.4 RU Robots Care-o-bot	462
5.38 Secom	463

5.38.1 Secom Co.Ltd MySpoon	463
5.38.2 Secom Co.Ltd MySpoon Manual Mode	464
5.39 Touch Bionics	467
5.39.1 Touch Bionics' i-limb	469
5.39.2 Touch Bionics i-limb Muscle Triggers	470
5.39.3 Touch Bionics I-Limb Methods For Switching Modes	471
5.39.4 Touch Bionics Prostheses	474
5.39.5 Touch Bionics Active Prostheses	478
5.40 Tyromotion GmbH	480
5.40.1 Tyromotion GmbH Network	481
5.40.2 Tyromotion Diego - Robotic-assisted arm-rehabilitation	486
5.40.3 Tyromotion Therapy for Arms and Shoulders	487
5.41 Other Rehabilitation Robot Companies	488
5.41.1 Additional Rehabilitation Robots	504
5.41.2 Selected Rehabilitation Equipment Companies	507
5.41.3 Spinal Cord Treatment Centers in the US	519
6. Rehabilitation Robot Variations	534
6.1 Automated Process for Rehabilitation Robots	534
6.1.1 Why Rehabilitation is Essential	539
6.1.2 Rehabilitation Involves Relearning of Lost Functions	540
6.2 Continuous Passive Motion CPM Definition	544
6.3 Robotic Exoskeletons Empower Patient Rehabilitation Achievements	546
6.3.1 Rehabilitation Options	548
6.3.2 Rehabilitation Robots Economies Of Scale	548
6.4 Seizing the Robotics Opportunity	549
6.4.1 Modular Self-Reconfiguring Robotic Systems	550

6.5 Public Awareness of Rehabilitation Robotics	550
6.5.1 Rehabilitation Robotics Centers Of Excellence	551
6.6 Home Medical Rehabilitation Robots	551
6.6.1 US Veterans Administration Telemedicine and Domestic Robots	552
6.6.2 Rehabilitation Robots Provide Intensive Training For Patients And Physical Relief For Therapists	553
About The Company	554
Research Methodology	554
WinterGreen Research Process	556
Market Research Study	556
WinterGreen Research Global Market Intelligence Company	557

List of Figures

2

Figure 1. Rehabilitation Robotics Products Market Driving Factors	30
Figure 2. Rehabilitation Robot Market Driving Forces	34
Figure 3. Rehabilitation Robot Medical Conditions Treated	35
Figure 4. Stroke Rehabilitation Guidelines For Interactive Robotic Therapy	36
Figure 5. Extremity Rehabilitation Robot Technology	37
Figure 6. Health Care Conditions Treated With Rehabilitation Wearable Robotics	38
Figure 7. Robotic Technologies Leverage Neuroplasticity	39
Figure 8. Neuro-Rehabilitation Patient Conditions Addressed	58
Figure 9. Neuro-Rehabilitation Services	59
Figure 10. Stroke Response Process Leverage Protocols Interdisciplinary Team Composition	61

Figure 11. Stroke Treatment State-Of-The-Art, Full-Service Stroke Treatment Facilities	62
Figure 12. Rehabilitation Robotics Products Market Driving Factors:	64
Figure 13. Rehabilitation Robot Tasks	66
Figure 14. Rehabilitation Robot Market Driving Forces	69
Figure 15. Rehabilitation Robot Medical Conditions Treated	70
Figure 16. Stroke Rehabilitation Guidelines For Interactive Robotic Therapy	71
Figure 17. Extremity Rehabilitation Robot Technology	72
Figure 18. Health Care Conditions Treated With Rehabilitation Wearable Robotics	73
Figure 19. Robotic Technologies Leverage Principles Of Neuroplasticity	75
Figure 20. Rehabilitation Robot Market Shares, Dollars, Worldwide, 2018	76
Figure 21. Rehabilitation Robot Market Shares, Dollars, Worldwide, 2018	77
Figure 22. Rehabilitation Therapy Robots Market Participant Descriptions Worldwide, 2018	78
Figure 23. DJO Smart Knee Brace	80
Figure 24. Hocoma Robotic Rehabilitation Used In Rehabilitation Medicine:	84
Figure 25. Homoca Continuum of Rehabilitation	87
Figure 26. Karman Xo-202 Standing Wheelchair Power Stand Power Drive	90
Figure 27. Rehabilitation Therapy Robots Market Shares, Dollars and Units, Worldwide, 2018	92
Figure 28. Rehabilitation Robots Market Forecasts, Dollars, Shipments, Worldwide, 2018-2025	96
Figure 29. Rehabilitation Robot Market Forecasts, Dollars, Worldwide, 2018-2025	97
Figure 30. Rehabilitation Robot Market Segment Forecasts, Stroke, Paraplegia, Concussion, Multiple Sclerosis, and Cerebral Palsy. Dollars, Worldwide, 2018-2025	99

Figure 31. Rehabilitation Robot Market Segment Forecasts, Stroke, Paraplegia, Concussion, Multiple Sclerosis, and Cerebral Palsy. Percent, Worldwide, 2018-2025	100
Figure 32. Rehabilitation Robots: Units Shipments, Worldwide, 2018-2025	101
Figure 33. Rehabilitation Robot Market Segment Forecasts, Lower Extremities, Upper Extremities, Neurological Training, CPM, Dollars, Worldwide, 2018-2025	103
Figure 34. Rehabilitation Robot Market Segment Forecasts, Lower Extremities, Upper Extremities, Neurological Training, CPM, Percent of Units, Worldwide, 2018-2025	104
Figure 35. Rehabilitation Robots Market Segments	105
Figure 36. Rehabilitation Robot Unit Installed Base Forecasts, Units, Worldwide, 2018-2025	106
Figure 37. Rehabilitation Robot Unit Percent Robots per Facility Analysis Forecasts, Units, Worldwide, 2018-2025	106
Figure 38. Motorized CPM Stroke Rehabilitation Equipment Market Shares, Unit and Dollars, Worldwide, 2018	109
Figure 39. Rehabilitation Robot CPM Market Segments, Worldwide, 2018-2025	110
Figure 40. Rehabilitation Robot Market Segment Forecasts, Lower Extremities, Upper Extremities, Neurological Training, CPM, Per Cent of Units, 2018-2025	111
Figure 41. Exoskeleton Market Shares, Dollars, Worldwide, 2018	113
Figure 42. Chattanooga Continuous Passive Motion	118
Figure 43. Rehabilitation Robot Regional Market Segments, Dollars, 2018	133
Figure 44. Rehabilitation Robot Regional Market Segments, 2018	134
Figure 45. Ekso Bionics Regional Presence	135
Figure 46. Selected Upper Limb Stroke Rehabilitation Devices	137
Figure 47. U.S. Rehab Patient Demographics	139
Figure 48. Market Metrics for Rehab Patients	140
Figure 49. Spinal Cord Injuries Causes, Number, Worldwide, 2018	142

Figure 50. US Stroke Incidence Numbers	144
Figure 51. Chattanooga OptiFlex® 3 Knee Continuous Passive Motion (CPM) Device	146
Figure 52. Rehabilitation Robot Categories	151
Figure 53. Shoulder Biomechanics Functions	157
Figure 54. Physical Therapy Enhances Recovery After Hip Injury	166
Figure 55. InTouch Health	167
Figure 56. InteraXon Muse Headband	169
Figure 57. Interaxon Finely Calibrated Brain Wave Sensors	171
Figure 58. InteraXon Measuring Brainwaves	172
Figure 59. Lower Limb Prosthetic Designed By The Center For Intelligent Mechatronics	176
Figure 60. RSLSteeper Pererro+	178
Figure 61. RSLSteeper Pererro+ Key Features:	179
Figure 62. RSL Steeper Bebionic's Standard Glove	180
Figure 63. RSL Steeper Prosthesis Hand	181
Figure 64. Rewalk-Robotics-Personal Support	185
Figure 65. Permobil F5 Corpus VS Stand Sequence	186
Figure 66. Karman Xo-202 Standing Wheelchair Power Stand Power Drive	187
Figure 67. Karman Xo-202 Standing Wheelchair Power Stand Power Drive Features	188
Figure 68. Berkeley Robotics Austin	188
Figure 69. Motorized Physiotherapy Controlled Mobilization Goals of Phase 1 Rehabilitation	194
Figure 70. Continuous Passive Motion (CPM) Device Benefits Following Knee Arthroplasty	195
Figure 71. Global Medical CPM device	196
Figure 72. Global Medical CPM device Features	197
Figure 73. Global Medical Handheld Controller	198

Rehabilitation Robots: Table of Contents**and List of Tables and Figures**

Figure 74. Furniss Corporation Model 1800™ Knee CPM	201
Figure 75. Furniss Corporation CPM 1800 Features	202
Figure 76. Furniss Corporation CP	203
Figure 77. Furniss Corporation Phoenix Model 1850 Knee CPM	204
Figure 78. Furniss Corporation Continuous Passive Motion DC2480 Knee CPM	205
Figure 79. Danniflex 480 Lower Limb CPM Unit	207
Figure 80. Danniflex Lower Limb CPM Features	208
Figure 81. Rehab-Robotics Company Hand of Hope Therapeutic Device	209
Figure 82. Rehab-Robotics Repetitive Training System	210
Figure 83. Rehab-Robotics Hand of Hope Movement Control	212
Figure 84. Rehab-Robotics Modes Provide Different Levels Of Assistance In Movement Of Patient's Hand	213
Figure 85. Rehab-Robotics Different Modes	214
Figure 86. Rehab-Robotics Arm Training	215
Figure 87. Rehab-Robotics Hand of Hope Modes	216
Figure 88. Bioxtreme Robotic Rehabilitation System	217
Figure 89. Corbys Rehabilitation Robot	218
Figure 90. Corbys System Functions	219
Figure 91. Corbys Rehabilitation System	220
Figure 92. Corbys Rehabilitation Orthosis Actuation Test Stand	221
Figure 93. Corbys Mobile Robotic Gait Rehabilitation System	222
Figure 94. Swtotek Leg Orthosis of Motion Maker	223
Figure 95. Rehabilitation Robot System Concerns Addressed During System Design	229
Figure 96. Rehabilitation Systems Initiate Active Movements	230
Figure 97. Methods of Active Initiation of Movements In Robotic Rehabilitation	231

Figure 98. Users Find Robots Preferable and More Versatile than Inadequate Human Trainers	231
Figure 99. Rehabilitation Robots Software Functions	235
Figure 100. InMotion Robots Immediate Interactive Response Sets	236
Figure 101. HEXORR: Hand Exoskeleton Rehabilitation Robot Technology Benefits	238
Figure 102. HEXORR: Hand Exoskeleton Rehabilitation Robot Technology Monitoring	238
Figure 103. HEXORR: Hand EXOskeleton Rehabilitation Robot Treatment Benefits	239
Figure 104. HEXORR: Hand EXOskeleton Rehabilitation Robot Technology Force and Motion Sensor Benefits	240
Figure 105. Hand Spring Operated Movement Enhancer	241
Figure 106. Hand Spring Robot Operated Movement Enhancer	241
Figure 107. AlterG Anti-Gravity Treadmills Features, Built On Differential Air Pressure Technology	246
Figure 108. AlterG Anti-Gravity Treadmills Target Markets	247
Figure 109. AlterG Product Positioning	248
Figure 110. AlterG Anti-Gravity Treadmill Customer Base	249
Figure 111. AltgerG M320 Anti-Gravity Treadmill	250
Figure 112. AlterG® Anti-Gravity Treadmill Functions	251
Figure 113. Alterg Therapy Functions	252
Figure 114. AlterG: PK100 PowerKnee	253
Figure 115. AlterG Bionic Neurologic And Orthopedic Therapy Leg	255
Figure 116. AlterG M300 Robotic Rehabilitation Treadmill	258
Figure 117. AlterG M300 Robotic Leg, Knee and Thigh Rehabilitation Treadmill	259
Figure 118. AlterG Anti-Gravity Treadmill Precise Unweighting Technology Patient Rehabilitation Functions	260
Figure 119. AlterG Anti-Gravity Treadmill Heals Patient	262

Figure 120. Selected US Regional AlterG M300 Customer Clusters	264
Figure 121. Afetech ZeroG Gait & Balance	269
Figure 122. Aretech Rehabilitation Robot	270
Figure 123. Berkley Robotics and Human Engineering Laboratory Research Work 272	
Figure 124. Berkley Robotics and Human Engineering Laboratory Research Work 273	
Figure 125. Selected Bionik International Clinical Partners	277
Figure 126. Interactive Motion Technologies (IMT) InMotion Biomarkers Aid Stroke Recovery	283
Figure 127. Interactive Motion Technologies (IMT) InMotion Robot Medical Conditions Treated	284
Figure 128. Interactive Motion Technologies (IMT) InMotion ARM™ Software Functions	285
Figure 129. Interactive Motion Technologies (IMT) 2D Gravity Compensated Therapy Is More Effective Than 3D Spatial Therapy	286
Figure 130. Biodex Dynamometer Target Markets	288
Figure 131. Biodex BioStep® 2 Semi-Recumbent Elliptical	289
Figure 132. Biodex System 4 Pro	291
Figure 133. Bioxtreme Robotics Rehabilitation For Cerebral Stroke Or Traumatic Brain Injuries (TBI) On Error Enhancement Technology	292
Figure 134. Breg Home Therapy CPM Continuous Passive Motion Practice Kits	293
Figure 135. Hocoma Robotic Rehabilitation Used In Rehabilitation Medicine:	303
Figure 136. Hocoma Therapy Solutions Treatments	304
Figure 137. Hocoma Lokomat Pro	307
Figure 138. Hocoma Patient Rehabilitation Conditions Addressed	308
Figure 139. Hocoma Robotic Improvements to Rehabilitation	309
Figure 140. Hocoma Lokomats Robot	310
Figure 141. Hocoma ArmeoSpring for Stroke Victims	311

Figure 142. Hocoma ArmeoSpring for Children	312
Figure 143. Hocoma Armeo Power Robotic Arm Exoskeleton	315
Figure 144. Clinical Example of Patients Using the Hocoma Armeo®Spring	316
Figure 145. Hocoma Valedo Functional Lower Back Movement Therapy	317
Figure 146. Hocoma Valedo®Motion Low Back Pain Therapy Advantages	318
Figure 147. DJO Smart Knee Brace	320
Figure 148. DJO Rehabilitation Product Target Markets	321
Figure 149. DJO Rehabilitation Product Targets Care Givers	321
Figure 150. Chattanooga OptiFlex® Knee Continuous Passive Motion (CPM)	327
Figure 151. Chattanooga CPM Unique Features:	327
Figure 152. Chattanooga CPM New/Improved Features:	328
Figure 153. Chattanooga CPM Standard Features:	328
Figure 154. Chattanooga CPM Specifications:	329
Figure 155. Chattanooga CPM	329
Figure 156. Chattanooga Active-K Functions	330
Figure 157. DJO Chattanooga Active-K	331
Figure 158. Chattanooga Active-K Motorized Physiotherapy Unit Integration Benefits	332
Figure 159. Chattanooga Active-K Motorized Physiotherapy Controlled Mobilization	333
Figure 160. Chattanooga Active-K Motorized Physiotherapy CPM (Continuous Passive Motion)	334
Figure 161. Chattanooga Active-K Motorized Physiotherapy Controller	335
Figure 162. DJO Chattanooga Active-K Features:	336
Figure 163. DJO Chattanooga Active-K Features:	337
Figure 164. Chattanooga Active-K Motorized Physiotherapy Therapeutic Benefits	338
Figure 165. Chattanooga OptiFlex® 3 Elbow Continuous Passive Motion (CPM)	339

Figure 166. Chattanooga OptiFlex® 3 Elbow Continuous Passive Motion (CPM) Specifications:	339
Figure 167. Chattanooga OptiFlex® 3 Elbow Continuous Passive Motion (CPM) Flexion340	
Figure 168. Ekso Bionics Regional Presence	350
Figure 169. Ekso Technology	359
Figure 170. Ekso Bionics Gait Training	360
Figure 171. Ekso Bionics Gait Training Functions	361
Figure 172. Ekso Gait Training Exoskeleton Functions	362
Figure 173. Ekso Gait Training Exoskeleton Functions	362
Figure 174. Ekso Bionics Step Support System	363
Figure 175. Ekso Bionics Operation Modes	364
Figure 176. Ekso Bionics Beep Bop: Rethink Robotics' Baxter Model	365
Figure 177. Ekso Bionics Bionic Suit	365
Figure 178. Ekso Bionics Financial Results	367
Figure 179. FOCAL Meditech BV Products:	369
Figure 180. Focal Meditech BV Collaborating Partners:	370
Figure 181. Motorika ReoGo	373
Figure 182. Motorik ReoGo™ Therapist Benefits:	375
Figure 183. Motorik ReoGo™ Patient Benefits:	376
Figure 184. Motorika ReoAmbulator	377
Figure 185. Motorika ReoAmbulator and Gait Training Devices	379
Figure 186. Honda Walk assist	380
Figure 187. Honda Stride Management	381
Figure 188. Honda Walk Assist Device Specifications	383
Figure 189. Honda ASIMO	384
Figure 190. Honda ASIMO Front Position	385
Figure 191. Honda ASIMO Dimensions and Weight	386

Figure 192. Honda ASIMO Intelligence Features	386
Figure 193. Honda Walk Assist	388
Figure 194. Honda Motors Prototype Stride Management Motorized Assist Device	389
Figure 195. Instead Technologies Research:	391
Figure 196. Instead Technologies Consultancy Services:	392
Figure 197. Instead Technologies Advantages of RoboTherapist3D Therapy:	395
Figure 198. Instead Technologies Robotherapist 3D RT3D Arm	395
Figure 199. Instead Technologies Robotherapist 3D RT3D Cup	396
Figure 200. Instead Technologies RT3D Hand	396
Figure 201. Instead Technologies Robotherapist 3D RT3D Ring Structure	397
Figure 202. Instead Technologies Ultrasound Breast Volumes. BreastExplorer	398
Figure 203. Instead Technologies Ultrasound Breast Volumes Breast Explorer Handheld Device	399
Figure 204. Instead Technologies Ultrasound Breast Volumes Breast Explorer Screen Display	400
Figure 205. iRobot / InTouch Health RP-VITA	402
Figure 206. iRobot / InTouch Health RP-VITA	403
Figure 207. Kinova Robot Specifications	404
Figure 208. Kinova Robot Features	405
Figure 209. Mobility Research LiteGait Device	407
Figure 210. Mobility Research HugN-Go 350	408
Figure 211. Mobility Research HugN-Go 350 Supported Ambulation Device	409
Figure 212. Mobility Research LiteGait Solution for Gait Therapy	410
Figure 213. Mobility Research LiteGait Advanced Solutions For Gait Therapy	411
Figure 214. Myomo MyoPro Motion G – Elbow-Wrist-Hand Orthosi	414
Figure 215. MyoPro Motion-G Elbow-Wrist-Hand Orthosis Benefits	415
Figure 216. Myopro Motion-G Clinical Criteria	416

Figure 217. Myomo Mpower 1000 Indications	418
Figure 218. Myomo mPower 1000 Contraindications	418
Figure 219. Myomo Mpower 1000 Indications	420
Figure 220. Myomo mPower 1000 Contraindications	420
Figure 221. Myomo Mpower 1000 Indications	422
Figure 222. Myomo mPower 1000 Contraindications	422
Figure 223. Myomo Mpower 1000 Indications	424
Figure 224. Myomo mPower 1000 Contraindications	424
Figure 225. Myomo Revenue	426
Figure 226. Orthocare Innovations Prosthesis	429
Figure 227. Orthocare Innovations Edison Prosthesis Ankle and Foot	430
Figure 228. Orthocare Innovations Edison Leg and Ankle	433
Figure 229. Orthocare Innovations Prosthetic Foot That Adjusts Automatically	434
Figure 230. Orthocare Innovations	435
Figure 231. Paterson Kinetec Knee CPM	438
Figure 232. Paterson Kinetec Spectra Knee CPM Features:	439
Figure 233. Paterson Kinetec Spectra Knee CPM Treatment Modes	440
Figure 234. Reha-Stim Gait Trainer GT I	443
Figure 235. Reha-Stim Gait Trainer Improves The Patient Ability To Walk Through Continuous Practice	445
Figure 236. ReWalker	451
Figure 237. Rewalk Robotics Revenue	452
Figure 238. RUR Key Market Areas For Robotic Technologies	458
Figure 239. RU Robots Core Technologies And Competencies	459
Figure 240. RU Robots Advanced Robotics	460
Figure 241. RU Robots Sophisticated Interactions	461
Figure 242. RU Robots Care-o-bot Large Service Robot	462

Figure 243. Secom Co.Ltd MySpoon Manual and Semi-Automatic Mode	464
Figure 244. Secom Co.Ltd MySpoon Automatic Mode	465
Figure 245. Secom Co.Ltd MySpoon Features in Semi-Automatic Mode	466
Figure 246. Secom Co.Ltd MySpoon Automatic Mode	466
Figure 247. Touch Bionics Prosthetic Technologies	468
Figure 248. Touch Bionics' i-limb Functions	469
Figure 249. Touch Bionics i-limb Muscle Triggers	470
Figure 250. Touch Bionics Quick Grips	473
Figure 251. Touch Bionics Prostheses	474
Figure 252. Touch Bionics Active Prostheses	476
Figure 253. Touch Bionics Active prostheses	478
Figure 254. Touch Bionics Products	479
Figure 255. Tyromotion GmbH Employee Group	480
Figure 256. Tyromotion GmbH Pablo®Plus System Strengthens The Upper Extremity Hand, Arm And Wrist Functions	482
Figure 257. Tyromotion Network	482
Figure 258. Tyromotion Bilateral 3D Arm Robot And Virtual Reality Glasses	483
Figure 259. Tyromotion Virtual Reality Therapy Delivers 3D Training	484
Figure 260. Tyromotion Virtual Reality Therapy 3D Training	485
Figure 261. Tyromotion Diego	486
Figure 262. Advantages of Rehabilitation Robot Therapy with Tyromotion DIEGO 488	488
Figure 263. Robotic Rehabilitation Devices Automated Process Benefits	535
Figure 264. Robotic Rehabilitation Devices Emerging Technologies	538
Figure 265. Robotic Rehabilitation Wearable Devices Benefits	539
Figure 266. Rehabilitation Involves Relearning Lost Function	541
Figure 267. Rehabilitation Lost Function Relearning Initiatives	542
Figure 268. CPM Functions:	545

Figure 269. CPM Use Indications:

545