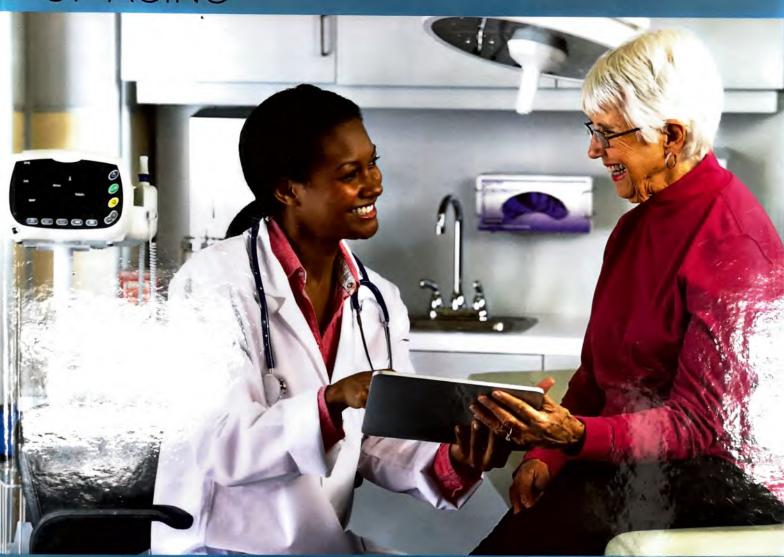
## ASSESSMENTS, TREATMENTS AND MODELING IN AGING AND NEUROLOGICAL DISEASE



THE NEUROSCIENCE OF AGING



Edited by

COLIN R. MARTIN, VICTOR R. PREEDY AND RAJKUMAR RAJENDRAM



## **Contents**

Preface	xvii xxiii		Experience of various QoL instruments among older people	18
			Key facts of quality of life in older people	18
			Summary points	18
			References	19
Part I			references	15
Introductory chapters: Setting the	9	3.	Successful aging and diet	
scene for the neuroscience of agi	ng		Ekavi N. Georgousopoulou, Duane D. Mellor and Demosthenes B. Panagiotakos	
1. The concept of productive aging				
			List of abbreviations	21
Premchand Dommaraju and Shawn Wong			Introduction	21
Mini-dictionary of key terms	3		Defining successful aging	21
The concept of productive aging	3		Aging and lifestyle	22
What is productive aging?	3		Diet, cognition, and mental health	22
Work participation	4		Diet, physical and cardiometabolic health	23
Lifelong learning	6		Sarcopenia, musculoskeletal and bone	-20
Volunteering	7		health	24
Family care	8		Aging meaningfully	24
Conclusion	9		Discussion	25
Applications to other areas of aging	9		Applications to other areas of aging	26
Key facts	9		Summary points	26
Summary points	9		References	26
References	9			
		4.	The impact of positive social	
2. Quality of life in older people			relations on the quality of life of older people. An alternative to	
Timo E. Strandberg			medicalization from an integral	
List of abbreviations	13		perspective	
Introduction: what is quality of life?	13		Luis Miguel Rondón García and	
Dimensions of quality of life	14			
Important dimension of QoL-health-related	d		Rosa Raquel Ruiz Trascastro	
quality of life (HRQoL)	14		List of abbreviations	29
How to assess QoL	15		Mini-dictionary of terms	29
Instruments for measuring QoL and HRQoL	15		Introduction. Positive aging as a strategy for	
Instruments for patients with dementia	17		the current scenario	29
Problems in assessing QoL in older people	17		Quality of life as a link between health from	
Positive aspects of QoL are important in old	er		a physical and social point of view	30
people	17		Social relations as a metavariable that prevents	
Problems in assessing QoL in special			illness and fosters the cognitive reserves of	
subgroups of older people	18		the elderly	31

	The centrality of medication with the elderly: social alternatives to polimedicalization	34	uliu i i i i	
	Conclusions References	35 36	Vin Zhang Punam Rawal. Long WU and Lidin	
5.	The brain in life span: use of phase		List of abbreviations	65
	functional magnetic resonance		Mini-dictionary of terms	65
	imaging		Introduction	66
			AD versus normal aging	66
	Zikuan Chen, Zeyuan Chen and Bihong T. Chen		Sex differences in AD	67
	List of abbreviations	39		68
	Mini-dictionary of terms	39	c I A - F !- towast to influence the risk of	
	Introduction	39	I I I I I I I I I I I I I I I I I I I	69
	Complex-valued BOLD fMRI model	40		69
	Brain fMRI data collection	41	Preclinical studies	73
		41	ApoE genotype modifies efficacy of hormone	
	Phase fMRI theory	41		73
	Standard magnitude fMRI for brain study			73
	Phase fMRI image processing and ICA	41	Preclinical studies	74
	decomposition	42		74
	Phase fMRI functional connectivity analysis Whole brain FC balance (mean(FC) ~ 0)	43		74
		44		74
	Aging effect on individual FC elements	44		75
	Aging effect on whole FC average	46		
	Maxmin age correlations with FC	46	8. The moderating effect of BDNF	
	Significant age correlations with FC	48	Val66Met polymorphism on	
	Limitations and future research	48	inhibitory control in elderly	
	Applications to other areas of aging	49		
	Key facts of brain functional connectivity aging	49	individuals	
	Summary points	50	Michel Audiffren, Nathalie André,	
	Acknowledgments	50	Delphine Fagot, Christian Chicherio and	
	References	30	Cédric Albinet	
6.	Neuronal structure in aging:		List of applications	9
	cytoskeleton in health and disease		Willia dictionary of terms	9
			Introduction 8	0
	Daniele Cartelli		Inhibitory control: an important high-level	
	Mini-dictionary of terms	53	cognitive function	
	Introduction	53	Unity and diversity of inhibitory control	
	Neuronal cytoskeleton and axonal transport	54	Two main forms of inhibitory control 8	
	Aging and neurodegeneration	55	The effect of aging on inhibitory control 8	1
	Application to other areas of aging	55	BDNF and the gene that codes for its	
	Alzheimer's disease and other dementias	56	synthesis 82	2
	Parkinson's disease and motor disorders	57	Moderating role of BDNF polymorphism in	
	Charcot-Marie-Tooth disease and other		cognitive performance 84	4
	neuropathies	58	The benefit of being a Met carrier during	
	Cytoskeleton rejuvenation and axon		aging 84	
	regeneration	59	Applications to other areas of aging 85	
	Closing remarks	60	Key facts	
	Key facts	60	Key facts about the psychology of aging 85	
	Summary points	60	Key facts about brain plasticity 87	
	Acknowledgment	61	Summary points 87	
	References	61	References 87	

9.	Alcohol use disorder pharmacotherapy options for postmenopausal females: age and gender issues and considerations		Key facts about aging and pathology Summary points References	110 110 111
	Jelena Milić, Janko Zeković, Dunja Stankić, Ed van Beeck and Janko Samardžić		Part II	
	List of abbreviations	91	Impairments and diseases	
	Mini-dictionary of terms	91		
	Introduction	91	11. Dementia or no dementia in the	
	Understanding the postmenopausal response	31	elderly. Why?	
	to alcohol drinking	92	Lewis H. Kuller	
	Pharmacotherapy	94		
	Leading medications	95	List of abbreviations	115
	Naltrexone	95	Mini-dictionary of terms	115
	Disulfiram	95	Introduction	116
	Acamprosate	96	Successful longevity	116
	Selective serotonin reuptake inhibitors (SSRIs)	96	Aging and dementia	117
	Other potential medications as treatment of	30	Alzheimer's disease, dementia	118
	AUD	97	Brain vascular disease	118
	Nalmefene	97	Pathology of dementia in the elderly	119
	Topiramate	97	Imaging of the brain in vivo	120
	Gabapentin	98	Relation between vascular disease and AD	121
	Baclofen	98	Discussion	121
	Applications to the other areas of aging	98	Applications to other areas of aging	122
	Key facts of AUD pharmacotherapy	100	Key facts of dementia	122
	Summary points	100	Summary points	123
	Acknowledgments	101	References	123
	References	101		
	nerenees	101	12. Neuropsychology, social cognition,	
10	. The aging brain and brain banking		and loss of insight in	
			frontotemporal dementia	
	R.C. Jeżewski, G.M. Halliday and		nontotemporar dementia	
	C.E. Shepherd		Fiadhnait O'Keeffe and Derval McCormack	
	List of abbreviations	103	List of abbreviations	127
	Mini-dictionary of terms	103	Mini-dictionary of terms	127
	Introduction	103	Introduction	127
	Macroscopic age-related brain changes	104	Clinical subtypes of FTD	128
	Neurodegenerative pathologies	104	Overlap of FTD and other disorders	128
	Alzheimer's disease neuropathological		Pathology	128
	change	104	Behavioral variant frontotemporal dementia	120
	Cerebrovascular changes	106	(BvFTD)	128
	Lewy body pathology	107	Primary progressive aphasias FTD (PPA FTD)	129
	Frontotemporal lobar degeneration	107	Neuropsychology of FTD	130
	Age-specific pathologies	108	Social cognition in FTD	132
	Primary age-related tauopathy	108	Loss of insight	133
	Ageing-related tau astrogliopathy	109	Interventions	135
	Limbic-predominant age-related TDP-43		Applications to other areas of aging	135
	encephalopathy	109	Key facts of FTD	135
	Use of aged brain tissue for human		Frontotemporal dementia (FTD)	
	brain tissue research	110	Summary points	135
	Applications to other areas of aging	110	References	135
	Applications to other areas of aging	110	References	136

13.	Neuroinflammation and aging			Methodologic differences in epidemiologic	166
	João O. Malva, Ricardo Moreira,			studies	166
	Beatriz Martins, João Novo,			Socioeconomic confounding: access to	1//
	Frederico C. Pereira, Ramon Raposo,			resources	166
	Reinaldo B. Oriá and Carlos Fontes Ribeiro			Epidemiologic classification: measurement	
	Remaido B. Oria and Carios rontes Ribeiro			error	166
	List of abbreviations	139		Residual differences: mortality and risk	167
	Mini-dictionary of terms	139		Conclusion	167
	Introduction	140		Applications to other areas of aging	167
	The neuroinflammatory cascade	140		Key facts	167
	Cell death and neuroinflammation	142		Summary points	167
	Neuroinflammation and synaptic			References	168
	function	142			
	Neuroinflammation and neurogenesis	143	16.	Hearing loss among the elderly	
	Neuroinflammation and cognition	145			
	Neuroinflammation and aging	145		Gary Jek Chong LEE	
	Conclusion	146		List of abbreviations	173
		146		Epidemiology of hearing loss in older adults	173
	Applications to "other areas of aging"	147			1/3
	Key facts			Social and psychological impact of hearing	173
	Summary points	147		loss	
	Acknowledgments	148		Overview of the auditory system	174
	References	148		Peripheral auditory system	174
				Central auditory pathway	174
14.	Cortical microinfarcts and the aging			Pathophysiological process associated with	
	brain			presbycusis	175
	Enikö Kövari and Gabriel Gold			Peripheral presbycusis	175
	Eniko kovari and Gabriel Gold			Central presbycusis	176
	List of abbreviations	153		Risk factors for presbycusis	176
	Mini-dictionary of terms	153		Noise exposure	176
	Introduction	153		Genetics	176
	Age-related vascular changes	154		Diabetes mellitus	177
	Age-related vascular lesions and their			Use of ototoxic drugs	177
	cognitive consequences	154		Smoking	177
	Cortical microinfarcts	155		Health impact of hearing loss	177
	Conclusion	159		Tinnitus	177
	Applications to other areas of aging	159		Dementia	177
	Key facts of cortical microinfarcts	160		Falls and physical functioning	178
	Summary points	160		Diagnosis of hearing loss	178
	References	160		Treatment for hearing loss	178
	References	100		Hearing aids	178
15	Cerebrovascular and neuro-			Cochlear implants	179
15.				Auditory training	179
	degenerative racial/ethnic health			Pharmacological approaches and ongoing	
	disparities			areas of research	179
	Astrid M. Suchy-Dicey				180
	Astria M. Sacry-Diccy			Applications to other areas of aging	180
	List of abbreviations	163		Summary points	
	Mini-dictionary of terms	163		References	180
	Brain imaging	164			
	Vascular dementia	164	17	. Aging auditory cortex: the impact	
	Risk factors and racial/ethnic groups	164		of reduced inhibition on function	
	Associations common to multiple				
	racial/ethnic populations	164		Björn Herrmann and Blake E. Butler	
	Associations specific to individual			List of abbreviations	18
	racial/ethnic populations	166		Mini-dictionary of terms	18

	Introduction	183	20.	Methylmercury exposure and its	
	Anatomy and function of auditory cortex	184		implications for aging	
	Anatomical organization	184		Andrew N. Shen and M. Christopher Newland	
	Functional organization	185			
	Anatomy in the aged auditory cortex	185		List of abbreviations	213
	Cortical morphometry	185		Introduction	213
	Loss of inhibition	185		Chronic human exposure to methylmercury	214
	Function in the aged auditory cortex	185		Interaction among mechanisms of	
	Hyperexcitability	186		methylmercury toxicity and normal	
	Reduced neural adaptation	186		aging	214
	Periodicity processing	187		Calcium homeostasis	214
	Spectral processing	187		Oxidative stress	214
	Spatial processing	188		Selenium	215
	Loss of inhibition facilitates neural plasticity Discrepancies between work in animals	189		Aging and gestational methylmercury exposure	215
	and humans	189		Aging and adult-onset methylmercury	
	Conclusion and future directions	189		exposure	215
	Applications to other areas of aging	190		DHA does not protect against sensorimotor	
	Key facts of auditory aging	190		impairment but benefits aging	215
	Summary points	190		Selenium protects against select signs of	
	Acknowledgments	190		methylmercury toxicity and benefits aging	216
	References	191		Nimodipine protects against select signs of methylmercury toxicity	217
18	Aging and vestibular disorders			Age-dependent rescue by nimodipine	218
				Application with other areas of aging:	210
	Augusto Pietro Casani and Elena Navari	100		methylmercury and neurodegenerative	220
	List of abbreviations	193		diseases	220
	Mini-dictionary of terms	193		Key facts of methylmercury exposure	221
	Introduction	193		Summary points	221
	Physiological aspects of aging	194		References	222
	Vestibular disorders in the elderly	195	24	AlL-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-L-	
	Final considerations	198	21.	Alcohol and the aging brain:	
	Applications to other areas of aging	198		increased alcohol sensitivity	
	Key facts of aging	199		potentially magnifying oxidative	
	Summary points	199		stress	
	References	199		Candice E. Van Skike and Douglas B. Matthews	
19.	Brain aging in HIV and retrovirals				
	Jasmina Boban, Majda M. Thurnher and			List of abbreviations	225
	Dusko Kozic			Mini-dictionary of terms	225
		2.27		Introduction	225
	List of abbreviations	203		Increased alcohol sensitivity across the	
	Mini-dictionary of terms	203		lifespan	226
	Introduction	204		Alcohol-induced cognitive impairments	227
	Diagnostic of HAND	204		Chronic alcohol exposure in aged animals	227
	Pathogenesis of neurocognitive impairment in HIV	205		Alcohol exposure during adolescence can persist into late life	227
	Proposed models of brain aging in HIV	206		Alcohol negatively affects pathways	227
	Treatment and potential preventive	200			222
	measures	208		associated with aging	228
		209		Alcohol alters the rate of cognitive	
	Practical conclusion			decline	228
	Applications to other areas of aging	210		Revisiting alcohol's effects on mortality	229
	Key facts of brain aging in HIV infection	210		Concluding remarks	229
	and retrovirals	210		Applications to other areas of aging	229
	Summary points	210		Key facts of alcohol and aging	230
	References	211		References	230

Par	t III			Cognitive decline and beyond	260
				microRNA epigenetic signatures	260
RIO	markers and diagnosis			microRNA function	262
				MiRNA expression, longevity, and	
22.	Brain aging: radiological biomarkers			aging	262
	Banu Alicioglu and Hakki Muammer Karakas			Circulating miRNAs, cognitive decline, and	
	band Anciogia and Hakki Maaniner Karakas			neurodegeneration	262
	List of abbreviations	235		Circulating miRNAs and cognitive decline in	
	Mini-dictionary of terms	235		aging Danish twins	263
	Introduction	236		miRNA and neuroplasticity	263
	Postmitotic nature of the brain	236		Circulating markers and inflammation	264
	Brain atrophy	236		miRNA in neurodegenerative	
	Gray matter	237		diseases	264
	White matter	238		Summary	264
	The hippocampus	239		Key facts	265
	Vascular aging	239		Summary points	265
	Iron accumulation	240		References	265
	MR spectroscopy	241		Note: Circles	
	Progress to MCI and AD	244		DUEL Liamanhor of aging in	
	Applications to other areas of aging	245	25.	DHEA as a biomarker of aging in	
	Key facts of aging brain	245		humans and nonhuman primates:	
	Summary points	245		synthesis, neuroprotection, and	
	References	245		cognitive function	
23	ADAM10 as a biomarker for			Henryk F. Urbanski	
	Alzheimer's disease			List of abbreviations	269
				Mini-dictionary of terms	269
	Mariana Luciano de Almeida,			Introduction	270
	Izabela Pereira Vatanabe,			Intracrine conversion of DHEA to sex steroid	
	Patricia Regina Manzine, Rafaela Peron,			hormones	270
	Carlos Roberto Bueno Júnior and			Circulating patterns of DHEA(S) across the	
	Márcia Regina Cominetti			day and during aging	271
	List of abbreviations	249		Oral DHEA supplementation in the	
	Mini-dictionary of terms	249		elderly	272
	Introduction	249		DHEA as a biomarker of aging and caloric	
	Aging, Alzheimer's disease characteristics,	2.13		restriction	273
	and epidemiology	250		Applications to other areas of aging	274
	Alzheimer's disease pathological	250		Key facts	275
	hallmarks	250		Summary points	276
		252		References	276
	Biomarkers in CSF and blood ADAM10 structure and functions	253			
		254	26	Evaluation of subjective memory	
	ADAM10 levels and activity	255	20.	Evaluation of subjective memory	
	Applications to other areas of aging	255		abilities in elderly people	
	Key facts of Alzheimer's disease biomarkers	256		Luigi Trojano, Gabriella Santangelo and	
	Summary points	256		Simona Raimo	
	References	256			276
	CI Liting miles DNIA			List of abbreviations	279
24.	Circulating microRNAs as			Mini-dictionary of terms	279
	biomarkers of health in elderly			Introduction	279
	individuals			Definition and relevance of subjective	
	Land Mangal From			memory complaints	279
	Jonas Mengel-From			Prevalence and predictors	280
	List of abbreviations	259		Correlates of SMC	28
	Mini-dictionary of terms	259		Subjective memory assessment in the	
	Applications to other areas of aging	259		elderly	28.
	Introduction	260		The Metamemory in Adulthood	
	The health of elderly citizens	260		Questionnaire (MIA)	28

	The Memory Functioning Questionnaire (MFQ)	204		Mini-dictionary of terms	315
	The Memory Complaint Questionnaire	284		Introduction	315
	(MAC-Q)	201		The memory functioning questionnaire	
	The Everyday Memory Questionnaire	284		(MFQ)	317
	(EMQ)	201		The everyday memory questionnaire (EMQ)	317
	The Prospective and Retrospective Daily	284		The memory complaint questionnaire	
	Memory Failure Questionnaire (PRMQ)	204		(MAC-Q)	322
	The Multifactorial Memory Questionnaire	284		Conclusions	326
	(MMQ)	200		Application to other areas of aging	326
	The Cognitive Failures Questionnaire	286		Key facts of subjective memory	227
	(CFQ)	286		questionnaires	327
	Conclusions	286		Summary points References	327 327
	Application to other areas of aging	287		References	32/
	Key facts of subjective memory abilities	287	20	The Keep deduced Advances Advances	
	Summary points	287	30.	The Knowledge of Memory Aging	
	References	287		Questionnaire	
		207		Celinda Reese-Melancon, Katie E. Cherry and	
	The functional activities			Erin E. Harrington	
	questionnaire: applications to aging			List of abbreviations	329
	Ondrej Bezdicek			Mini-dictionary of terms	329
	List of abbreviations	202		Introduction	329
	Mini-dictionary of terms	293		Memory aging	329
	Introduction	293		Measuring memory aging knowledge: the	
	Psychometric description of FAQ	294		KMAQ	330
	Applications of FAQ to healthy aging	295 296		Age and individual differences in memory	
	Applications of FAQ to abnormal aging	298		aging knowledge	330
	FAQ: applications to other areas of aging	299		Relevance	334
	Summary points	300		Applications to other areas of aging	335
	References	300		Cognition and public health	335
	Kererences	300		Ageism	335
28.	Autobiographical memory as a			Educational efforts	336
	diagnostic tool in aging			Clinical implications Conclusion	337
	0 0				337
	Juan C. Meléndez and Encarnación Satorres			Key facts of knowledge of memory aging Summary points	337
	List of abbreviations	305		References	338
	Mini-dictionary of terms	305		References	338
	Introduction	305			
	Temporal distribution of autobiographical	505	Pa	rt IV	
	memory throughout the life cycle	307			
	Comparison of autobiographical memory in healthy older adults, amnestic mild		Ma	anagement and treatments	
	cognitive impairment, and Alzheimer's		31.	Pharmacological use of transient	
	disease	308		receptor potential (TRP) ion	
	Autobiographical memory evaluation	309		channel agonists in neurological	
	Applications to other areas of aging	311		disease and aging: effects on	
	Key facts of autobiographical memory	312		swallowing and implications for	
	Summary points	312		nutrition	
	References	312		Noemí Tomsen and Pere Clavé	
20	Assessment tools for subjective			List of abbreviations	2.12
43.	memory abilities in elderly people			Mini-dictionary of terms	343 343
				Introduction	344
	Simona Raimo, Gabriella Santangelo and			Transient receptor potential channel	344
	Luigi Trojano			family	345
	List of abbreviations	315		TRPV1	345

	TRPA1 TRPM8	345 347	33.	Cognition-enhancing drugs and applications to aging	
	Other TRP	348		Jelena Milić, Janko Zeković, Dunja Stankić,	
	Chemical and pharmacological sensory			Boris Henčić, Jasna Jančić and	
	stimulation treatments	349		Ianko Samardžić	
	Capsaicin	349		Janko Samaruzio	
	Piperine	349		List of abbreviations	36
	Menthol	350		Mini-dictionary of terms	36
	Combination treatment and comparative			Introduction	368
	effect	350		Cognition	368
	The future of sensory stimulation			Age-related decline in cognition	368
	treatment	350		Memory and drugs enhancing memory	369
	Applications to other areas of aging	350		AchE inhibitors as cognitive enhancers	37
	Key facts of oropharyngeal			Glutamate NMDA receptor: a focus on	
	dysphagia	351		memantine	374
	Summary points	351		The role of the noradrenergic system in	
	References	351		cognition	374
				Stimulating influence of nicotine and	
32.	Aripiprazole: features and use in			caffeine in cognition	374
	the aged			Applications to other areas of aging	374
				Drugs enhancing cognition in healthy adults	376
	Unax Lertxundi, Rafael Hernández and			Concluding remarks	376
	Juan Medrano			Key facts of cognition enhancing drugs	377
	List of abbreviations	355		Summary points	377
	Mini-dictionary of terms	355		References	377
	Introduction	356		Neierences	
	Clinical pharmacokinetics	356	34	Creatine supplementation in the	
	Interactions	356	54.		
	Uses of aripiprazole	357		aging brain	
	Schizophrenia	357		Marina Yazigi Solis, Eimear Dolan,	
	Bipolar disorder I	357		Guilherme Giannini Artioli and	
	Major depressive disorder	358		Bruno Gualano	
	Dementia	358		List of abbreviation	379
	Parkinson's disease	360			379
	Antipsychotic-induced hyperprolactinemia	360		Mini-dictionary of terms Introduction	380
	Miscellaneous indications	361		Creatine in brain	381
	Safety issues	361			382
	Impulse control disorders	361		Aging brain	302
	The problem of the use of the term "month"	501		Effect of creatine supplementation on	382
	on pharmacotherapy	361		cognitive function Neurodegenerative conditions	384
	Aripiprazole as a hazard for the	501			384
	environment	362		Amyotrophic lateral sclerosis	385
	Applications to other areas of aging	362		Huntington's disease	385
	Key facts about antipsychotic use in	302		Parkinson's disease	386
	dementia	363		Applications to other areas of aging	386
	Summary points	363		Key facts of creatine in aging brain	387
	References	363		Summary points	387
	References	505		References	30/

Photobiomodulation as a brain-boosting strategy in aging			Conclusions Applications to other areas of aging	420 420 422
Farzad Salehpour, Marvin H. Berman and Saeed Sadigh-Eteghad			References	422
List of abbreviations Mini-dictionary of terms Introduction	389 390 390	38.	Linking cognitive decline and ballroom dance as a therapeutic intervention in the elderly	
Behavioral outcomes  Molecular outcomes	391 391		Jacqueline C. Dominguez, Maria Clarissa O. del Moral, Ma Fe P. de Guzman and Jeshya A. Chio	
Healthy subjects PBM in treating neuropathological	394		List of abbreviations Mini-dictionary of terms	425 426
conditions Conclusions and future outlook Applications to other areas of aging	399 399 399		Introduction Cognitive decline in aging Complexity of ballroom dance	426 426 427
Key facts of photobiomodulation Summary points	400 400		Neural networks involved in ballroom dance	428 430
	400		Dancer role and improvisation, communication, and decision-making	430
stimulation in aging: a focus on Parkinson disease			Music/acoustic stimulation and audiomotor entrainment	431 431
Paolo Amami	8220		Neurocognitive benefits of ballroom dancing	431
Mini-dictionary of terms	403		Ballroom dance as intervention in the	431
DBS programming phase: constant-voltage and constant-current stimulation	404		Mechanistic link between ballroom dance and cognition	434
Conclusion Applications to other areas of aging	411 411		Key facts of ballroom dance	434 435 435
Summary points References	411 412 412	30	References	436
Exergames: what they are and how they can be used to successful		55.	life. A new neuroscientific paradigm of cognitive training	
aging?  Renato Sobral Monteiro-Junior,			Carmen Requena, Paula Álvarez-Merino and Francisco Javier Belchí	
Ana Carolina de Mello Alves Rodrigues, Laís Francielle Francisca Felício,			Mini-dictionary of terms Introduction Transfer of the training to daily functioning	439 439 440
Túlio Brandão Xavier-Rocha	415		A new neuroscientific paradigm of the evaluation of everyday life	440
Introduction Historical exergame aspects	415 415		Cognitive processes of daily life activities The evaluation of errors and microerrors in	441
Exergames and mental health perspectives	417		"Staying activities" versus "staying sharp" to preserve long-term functional autonomy in	441
Exergames use by the institutionalized elderly Neurobiological exergames hypotheses: from	418		adulthood Leisure activities for "staying active" in	442
Musculoskeletal and immune system	419		New activities to "stay sharp" in a dynamic environment	442
	Farzad Salehpour, Marvin H. Berman and Saeed Sadigh-Eteghad  List of abbreviations Mini-dictionary of terms Introduction PBM in the aging brain: animal studies Behavioral outcomes Molecular outcomes Molecular outcomes PBM in the aging brain: human studies Healthy subjects PBM in treating neuropathological conditions Conclusions and future outlook Applications to other areas of aging Key facts of photobiomodulation Summary points References  Innovations in deep brain stimulation in aging: a focus on Parkinson disease Paolo Amami List of abbreviations Mini-dictionary of terms Introduction DBS programming phase: constant-voltage and constant-current stimulation Conclusion Applications to other areas of aging Key facts Summary points References  Exergames: what they are and how they can be used to successful aging? Renato Sobral Monteiro-Junior, Ana Carolina de Mello Alves Rodrigues, Lais Francielle Francisca Felicio, Luiz Felipe da Silva Figueiredo and Túlio Brandão Xavier-Rocha List of abbreviations Introduction Historical exergame aspects The role of exergames and mental health perspectives Exergames effects on institutionalized elderly Neurobiological exergames hypotheses: from biomarkers to functional status	brain-boosting strategy in aging  Farzad Salehpour, Marvin H. Berman and Saeed Sadigh-Eteghad  List of abbreviations 390 Introduction 390 Introduction 390 PBM in the aging brain: animal studies 391 Behavioral outcomes 391 Molecular outcomes 391 PBM in the aging brain: human studies 394 Healthy subjects 394 Healthy subjects 394 PBM in treating neuropathological conditions 399 Conclusions and future outlook 399 Key facts of photobiomodulation 400 Summary points 400 References 400  Innovations in deep brain stimulation in aging: a focus on Parkinson disease  Paolo Amami List of abbreviations 403 Introduction 403 DBS programming phase: constant-voltage and constant-current stimulation 404 Conclusion 401 Applications to other areas of aging 411 Key facts 411 Summary points 412 References 412  Exergames: what they are and how they can be used to successful aging?  Renato Sobral Monteiro-Junior, Ana Carolina de Mello Alves Rodrigues, Laís Francielle Francisca Felício, Luiz Felipe da Silva Figueiredo and Túlio Brandão Xavier-Rocha List of abbreviations 415 Introduction 415 Introduction 415 Historical exergame aspects 415 Introduction 415 Introduction 415 Historical exergame and mental health perspectives 417 Exergames and mental health perspectives 417 Exergames use by the institutionalized elderly 418 Neurobiological exergames hypotheses: from biomarkers to functional status 419 Musculoskeletal and immune system	brain-boosting strategy in aging  Farzad Salehpour, Marvin H. Berman and Saeed Sadigh-Eteghad  List of abbreviations 390 Introduction 390 PBM in the aging brain: animal studies 391 Behavioral outcomes 391 Molecular outcomes 391 PBM in the aging brain: human studies 394 Healthy subjects 394 Healthy subjects 399 PBM in treating neuropathological conditions 399 Applications to other areas of aging 399 Key facts of photobiomodulation 400 Summary points 400 References 400  Innovations in deep brain stimulation in aging: a focus on Parkinson disease Paolo Amami List of abbreviations 403 Mini-dictionary of terms 403 Introduction 403 DBS programming phase: constant-voltage and constant-current stimulation 404 Conclusion 411 Applications to other areas of aging 411 Key facts 411 Summary points 412 References 412  Exergames: what they are and how they can be used to successful aging?  Renato Sobral Monteiro-Junior, Ana Carolina de Mello Alves Rodrigues, Laís Francielle Francisca Felicio, Luiz Felipe da Silva Figueiredo and Túlio Brandão Xavier-Rocha  List of abbreviations 415 Introduction 415 Historical exergame aspects 415 The role of exergame aspects 415 Exergames and mental health perspectives 417 Exergames affects on institutionalized elderly 418 Neurobiological exergames hypotheses: from biomarkers to functional status 419 Musculoskeletal and immune system	brain-boosting strategy in aging  Farzad Salehpour. Marvin H. Berman and Saeed Sadigh-Eteghad  List of abbreviations 389 introduction 390 intervention in the aging brain: animal studies 391 Molecular outcomes 399 Conclusions and future outlook 390 Conclusions 391 Molecular outlook 390

Conclusion	443	Social relations	402
Applications to other areas of aging	443	Emotions and cognition in suicide in older	
Key facts of functionally autonomy	443	adults	462
	444	Psychosocial interventions for suicide	
	444	prevention	463
		Future directions and advances	465
Integrated medical and psychiatric		Applications to other areas of aging	466
			466
		Key facts of Centers for Disease Control and	
			466
serious mental illness			466
Karen L. Fortuna and Cynthia Bianco		References	466
List of abbreviations	447		
Mini-dictionary of terms	447	D V	
. The control of the	447		
	448	Models and modelling	
	448		
		42. p-galactose-induced aging and	
		brain mitochondria	
	450	7.71	
Self-management smartphone technologies		Fereshteh Farajdokht, Saeed Sadigh-Eteghad and Javad Mahmoudi	
illness	450	List of abbreviations	471
A novel integrated self-management smart-		Mini-dictionary of terms	472
			472
	450		473
			473
	451		473
	451		474
			475
			475
	452		475
			475
	452		476
	453		476
. TO THE PROOF OF	454		476
	454		476
References			476
Daughasacial interventions for			477
rsychosocial interventions for			478
suicide prevention in the elderly.		References	
advances and future directions		43 Drosophila models of neuronal	
Theresa Fho. Hannah Reich.			
Flizabeth Arslanoglou, Claudia Heidenreich,		aging	
Jody Monkovic and Dimitris Kiosses		Víctor López del Amo, Andrea Tapia and Máximo Ibo Galindo	
		List of abbreviations	481
			481
	459		482
	160		402
			107
			482
			103
Personality traits			483
Physical illness and disability	461		484
	1.2		
behavior	462	brains	484
	Applications to other areas of aging Key facts of functionally autonomy Summary points References  Integrated medical and psychiatric self-management smartphone technologies for older adults with serious mental illness  Karen L. Fortuna and Cynthia Bianco List of abbreviations Mini-dictionary of terms Introduction Definition of oxidative stress Definition of neuroinflammation Definition of telomeres Integrated self-management interventions for older adults with serious mental illness Self-management smartphone technologies for older adults with serious mental illness A novel integrated self-management smart- phone technologies for older adults with SMI Considerations for designing smartphone apps for older adults with serious illness Schizophrenia and cognitive impairments Bipolar disorder and cognitive impairments Major depressive disorder and cognitive impairments User-centered design with older adults with SMI Applications to other areas of aging Summary points References  Psychosocial interventions for suicide prevention in the elderly: advances and future directions  Theresa Ebo, Hannah Reich, Elizabeth Arslanoglou, Claudia Heidenreich, Jody Monkovic and Dimitris Kiosses  List of abbreviations Mini-dictionary of terms Introduction Epidemiology and characteristics of late-life suicide Factors associated with suicide in late life Demographic factors and early experiences Personality traits Physical illness and disability Psychiatric illness and previous suicidal	Applications to other areas of aging Key facts of functionally autonomy Summary points References  Integrated medical and psychiatric self-management smartphone technologies for older adults with serious mental illness  Karen L. Fortuna and Cynthia Bianco List of abbreviations Mini-dictionary of terms Jefinition of oxidative stress Definition of neuroinflammation Definition of neuroinflammation Definition of neuroinflammation Definition of telomeres Jefinagement smartphone technologies for older adults with serious mental illness Self-management smartphone technologies for older adults with serious mental illness A novel integrated self-management smartphone technologies for older adults with serious illness Schizophrenia and cognitive impairments Bipolar disorder and cognitive impairments Major depressive disorder and cognitive impairmen	Applications to other areas of aging Key facts of functionally autonomy 443 summary points 444 References 444 Agreements martphone technologies for older adults with serious mental illness 47 Mini-dictionary of terms 10 Mini-d

	Conclusions	533	Behavioral analyses of aging in inbred	
	Applications to other areas of aging	533	mice	554
	Key facts of nonhuman primate models	534	Emotion	555
	Summary points	534	Motor behavior	556
	References	534	Social behavior	556
	References	334	Cognition	557
10	Linking aging and animal models to		Physical health, strength, and resistance	558
40.	Linking aging and animal models to		Olfaction	558
	neurodegeneration: the striatum,		Longevity-associated mice models	550
	substantia nigra, and Parkinson's		Senescence-associated mice models and their	
	disease		behavior	559
	Rodrigo Portes Ureshino and		Avoiding bias in behavioral assessment: why	33.
	Ana López Ramírez		strain and sex matter?	559
	Alla Lopez Kallinez		Critical checkpoints in a behavioral	33
	List of abbreviations	539	evaluation of the aging process: time and	
	Mini-dictionary of terms	540	order	560
	Introduction to Parkinson's disease (PD)	540	Applications to other areas of aging	561
	History, epidemiology, and hallmarks		Key facts of animal models for anxiety and	30
	of PD	540	depression	561
	Nigrostriatal pathway: neurotransmitters		Summary points	562
	and neuronal circuits	540	References	562
	Factors that contribute to PD	541	References	302
	Genetic factors and models	541		
	Mitochondrial impairment in PD	544	Part VI	
	Glutamate excitotoxicity	545		
	Autophagy impairment in PD	546	Resources	
	Animal models of PD	546		
	MPTP	546	50. Recommended resources on the	
	Pesticides	548	neuroscience of aging	
	Other models of PD	548	Rajkumar Rajendram and Victor R. Preedy	
	Conclusion and perspectives	548	Kajkumar Kajendram and Victor K. Treedy	
	Applications to other areas of aging	549	Introduction	567
	Key facts of Parkinson's disease models	549	Resources	568
	Summary points	549 550	Summary points	574
	References	330	Acknowledgments	574
1	O Pobovioral evaluation of aging in		References	574
4	<ol> <li>Behavioral evaluation of aging in experimental animals</li> </ol>			
	Ana Perez-Villalba and Isabel Fariñas		Index	575
	Mini-dictionary of terms	553	Water American	
	Why evaluating behavioral aging in animal			
	models: short-living animals for long-term			
	conclusions	553		