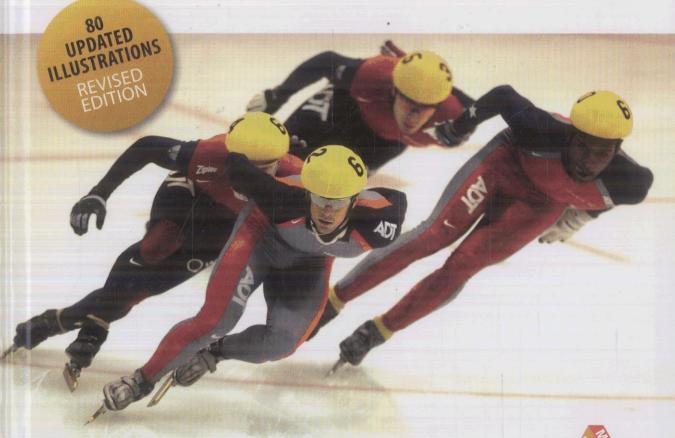
## PETER BRUKNER AND KARIM KHAN

WITH COLLEAGUES

## Clinical Sports Medicine



REVISED THIRD EDITION



## **Contents**

For	eword to the first edition	v		Joint	20
For	eword to the third edition	vi		Ligament	20
Pre	face	xxvii		Muscle	20
Gui	ded Tour of Your Book	xxix		Tendon	21
The	authors	xxxii		Bursa	23
Cha	pter co-authors	xxxiv		Nerve	24
	Other contributors	xxxvii		Skin	24
Ack	nowledgments	xxxix		But it's not that simple	24
	v			Pain: where is it coming from?	24
Par	t A Fundamental Principles			Masquerades	24
1	Sports Medicine: The Team Approach	3		The kinetic chain	24
	The sports medicine team	3			
	Multiskilling	3	3	Pain: Where Is It Coming From?	27
	The sports medicine model	4		Pain-producing structures	27
	The challenges of management	5		Joints	28
	Diagnosis	5		Muscle	28
	Treatment	6		Neural structures	29
	Meeting individual needs	6		Referred pain	29
	The coach, the athlete and the clinician	6		Radicular pain	30
	'Love thy sport'	7		Somatic pain	30
	• •			Clinical assessment of referred pain	30
2	Sports Injuries	8		Pain syndromes	31
	Acute injuries	9		Complex regional pain syndrome	
	Bone	9		type I	31
	Articular cartilage	10		Myofascial pain syndrome and	
	Joint	11		fibromyalgia	32
	Ligament	11		Conclusion	33
	Muscle	12			
	Tendon	14	4	Beware: Conditions Masquerading	
	Bursa	15		as Sports Injuries	34
	Nerve	15		How to recognize a condition	
	Skin	15		masquerading as a sports injury	34
	Overuse injuries	16		Conditions masquerading as sports	
	Bone	16		injuries	34
	Osteitis and periostitis	19		Bone and soft tissue tumors	34
	Articular cartilage	20		Rheumatological conditions	36

	Disorders of muscle	36		Biomechanics of swimming	67
	Endocrine disorders	37		Swimming biomechanics and	
	Vascular disorders	37		shoulder pain	67
	Genetic disorders	38		Biomechanics of tennis	68
	Granulomatous diseases	38		Tennis biomechanics and elbow pain	68
	Infection	38		Tennis racquets	68
	Regional pain syndromes	39		Biomechanics of other overhead sports	69
	regional pain synatomes			Water polo	69
5	Biomechanics of Common Sporting			Volleyball	69
	Injuries	40		Biomechanics of cycling	69
	Correct biomechanics	40		Set-up and positioning on the bike	69
	Lower limb biomechanics	42		Bike set-up in other forms of cycling	74
	Stance position	42		Aerodynamics and wind resistance	74
	Range of motion of joints in neutral	120		Pedaling technique	74
	position	42		Assessment	74
	Biomechanics of walking	45		Rehabilitation	75
	Joint motion during walking	45		Conclusion	76
	Biomechanics of running	48		Conclusion	, 0
	Angle and base of gait in walking	10	6	Principles of Injury Prevention	78
	and running	49	v	Systematic injury prevention	78
	Abnormal lower limb biomechanics	49		Warm-up	81
	Excessive pronation	50		Stretching	81
	Excessive pronation  Excessive supination	51		Static stretching	82
	Abnormal pelvic mechanics	51		Ballistic stretching	82
	Common structural abnormalities	51		Proprioceptive neuromuscular	02
	Forefoot varus	52		facilitation stretching	82
	Forefoot valgus	52		Principles of stretching	82
	Plantarflexed first ray	52		Taping and bracing	82
	Rear foot varus	52		Taping	85
	Rear foot valgus	53		Bracing	86
	Ankle equinus	53		Protective equipment	87
	Tibial alignment	54		Suitable equipment	87
	Genu varum	5 <del>4</del>		Running shoes	87
	Genu valgum	54		Running snices Running spikes	89
	Leg length differences	5 <del>4</del>		Football boots	89
	Assessment of lower limb	54		Ski boots	89
	biomechanics	55		Tennis racquets	90
	Correction of biomechanics	59		Appropriate surfaces	91
	Orthoses	60		Appropriate training	92
	Correction of abnormal pelvic	00		Principles of training	92
	-	61		Training methods	95
	biomechanics Upper limb biomechanics	61		Adequate recovery	98
	The biomechanics of throwing	61		Psychology and injury prevention	98
	2	01		Nutrition and injury prevention	98
	Normal biomechanics of the scapula	61		Nutrition and many prevention	90
	in throwing	64	7	Восомони	102
	Abnormal scapular biomechanics	CE.	/	Recovery Ensuring adequate recovery	102
	and physiology	65		Warm-down or active recovery	102
	Clinical significance of scapular	<i>(</i> =		•	
	biomechanics in shoulder injuries	65		Deep-water running Ice immersion, contrast baths,	103
	Changes in throwing arm with	66		whirlpools and spas	103
	repeated pitching  Common biomechanical abnormalities	66		Soft tissue massage	103
		67		Lifestyle factors	$103 \\ 104$
	specific to pitching	67		Litestyte factors	104

	The role of nutrition in aiding		Only order investigations that will
	recovery	104	influence management
	The role of psychology in aiding		Provide relevant clinical findings on
	recovery	105	the requisition
	•		Do not accept a poor quality test
8	Principles of Diagnosis: Clinical		Develop a close working relationship
Ü	Assessment	108	with the investigators
	Making a diagnosis	108	Explain the investigations to the
	History	109	patient
	Allow enough time	109	Radiological investigation
	Be a good listener	109	Plain X-ray
	Know the sport	109	Radioisotopic bone scan
	Discover the exact circumstances	107	Computed tomographic scanning
	of the injury	109	
	Obtain an accurate description of	109	Magnetic resonance imaging Ultrasound scan
		109	
	symptoms  History of a previous similar injury		Neurological investigations
	History of a previous similar injury	110	Electromyography
	Other injuries General health	110	Nerve conduction studies
		110	Neuropsychological testing
	Work and leisure activities	110	Muscle assessment
	Consider why the problem has	110	Compartment pressure testing
	occurred	110	Cardiovascular investigations
	Training history	110	Electrocardiography
	Equipment	110	Stress electrocardiography
	Technique	111	Echocardiography
	Overtraining	111	Respiratory investigations
	Psychological factors	111	Pulmonary function tests
	Nutritional factors	111	The diagnosis
	Determine the importance of the		
	sport to the athlete	111	10 Treatments Used for Musculoskeletal
	Examination	111	Conditions: More Choices and More
	Develop a routine	111	Evidence
	Where relevant, examine the other		Evidence for treatment effectiveness is
	side	111	continuously changing
	Consider possible causes of the		Minimizing extent of injury (RICE)
	injury	111	Rest
	Attempt to reproduce the patient's		Ice
	symptoms	111	Compression
	Assess local tissues	111	Elevation
	Assess for referred pain	111	Other minimizing factors
	Assess neural tension	111	Immobilization and early mobilization
	Examine the spine	111	Protected mobilization
	Biomechanical examination	112	Continuous passive motion
	Functional testing	112	Mobilization and exercise therapy
	The examination routine	112	Therapeutic drugs
			Analgesics
9	Principles of Diagnosis:		Topical analgesics
	Investigations including Imaging	120	Non-steroidal anti-inflammatory
	Investigations	120	drugs
	Understand the meaning of test		Topical anti-inflammatory agents
	results	120	Corticosteroids
	Know how soon changes can be		Ketorolac tromethamine
	detected by investigations	120	Nitric ovide donor

	Sclerosing therapy	135		Efficacy of core strengthening exercise	167
	Prolotherapy	136		Prevention of injury and performance	
	Glucosamine and chondroitin sulfate	136			171
	Hyaluronic acid therapy	136			171
	Antidepressants	137			171
	Local anesthetic injections	137			172
	Heat and cold	137		Conclusion	., _
	Cryotherapy	137	12	Principles of Rehabilitation	174
	Superficial heat	137		1	174
	Contrast baths	137		1 8	174
	Electrotherapeutic modalities	142		Keys to a successful rehabilitation	1, 1
	Ultrasound	142			174
	TENS	142		1 - 6	175
	Interferential stimulation	143		1 , ,	176
		143		· · · · · · · · · · · · · · · · · · ·	176
	High voltage galvanic stimulation			, , 1	177
	Low voltage stimulation	143		1 0	177
	Neuromuscular stimulators	143		1	1//
	Point stimulators	143		Muscle activation and motor	177
	Laser	143			177
	Diathermy	144		5	179
	Magnetic therapy	144			183
	Extracorporeal shock wave therapy	144		0	183
	Manual therapy	144			183
	Joint mobilization	144		, 0	184
	Joint manipulation	146		,	184
	Joint traction	146		Neuromuscular control (proprioception	
	Soft tissue therapy	147		,	186
	Muscle energy techniques	149		Functional exercises	188
	Neural stretching	150		Sport skills	188
	Acupuncture	151		Correction of biomechanical	
	Dry needling	151		abnormalities	190
	Hyperbaric oxygen	152		Cardiovascular fitness	190
	Surgery	152		Deep-water running	190
	Arthroscopic surgery	152		Hydrotherapy	191
	Open surgery	153			191
					191
11	Core Stability	158			191
	Anatomy	160		•	191
	Osseous and ligamentous structures	160			192
	The thoracolumbar fascia	160			192
	Paraspinals	160			192
	Quadratus lumborum	160		_	192
	Abdominals	160			193
	Hip girdle musculature	161		Ç .	194
	Diaphragm and pelvic floor	161			195
	Assessment of core stability	161		*	195
	Exercise of the core musculature	162			195
	Decreasing spinal and pelvic viscosity			, , ,	196
	Grooving motor patterns	164		Conclusion	170
	Ultrasound imaging in rehabilitation	164	Dan	t B Regional Problems	
	Stabilization exercises	164		——————————————————————————————————————	201
			13	- <u>-</u> .	201
	Functional progression	167			201
	Core strengthening for sports	167		Applied pathophysiology	202

	a track and the contract of	202		Ouletes Literature	222
	Grading of concussion	202		Orbital injuries	223
	Complications of concussion	202		Prevention of eye injuries	224
	Management of the concussed athlete	202		Teeth	224
	Exclude serious injury	202		Prevention of dental injuries	225
	Assess severity	203		Fractures of facial bones	225
	Neuropsychological testing	203		Fractures of the zygomaticomaxillary	
	Return to activity	204		complex	225
	Mandatory exclusion	205		Maxillary fractures	226
	Post-concussion syndrome	205		Mandibular fractures	226
	Recurrent episodes of concussion	205		Temporomandibular injuries	227
	Prevention of concussion	205		Prevention of facial injuries	227
14		207	16	Neck Pain	229
	Clinical approach to the patient with			Clinical perspective	229
	headache	207		History	230
	History	209		Examination	231
	Examination	210		Investigations	232
	Vascular headaches	210		Treatment of the athlete with neck	
	Migraine	210		pain	233
	Cluster headache	211		Muscles and fascia	233
	Cervical headache	212		Joint abnormalities	233
	Mechanism	212		Neural tissue mobilization	236
	Clinical features	213		Exercise therapy	236
	Treatment	213		Posture	238
	Exercise-related causes of headache	214		Stress management	238
	Benign exertional headache	214		Neck pain syndromes	239
	Exertional migraine	214		Cervical postural syndromes	239
	Post-traumatic headache	214		Acute wry neck	240
	External compression headache	215		Acceleration/deceleration injury	240
	High-altitude headache	215		Acute nerve root pain	241
	Hypercapnia headache	215		'Stingers' or 'burners'	241
	Пурегсарта псацаенс	213		strigers of burners	241
15	Facial Injuries	216	17	Shoulder Pain	243
	Functional anatomy	216		Functional anatomy	243
	Assessment	216		Clinical perspective	245
	Soft tissue injuries	217		A practical approach to shoulder	
	Nose	218		pain	245
	Epistaxis (nosebleed)	218		History	246
	Nasal fractures	219		Examination	246
	Septal hematoma	219		Investigations	253
	Ear	219		Impingement	254
	Auricular hematoma	219		Primary external impingement	254
	Perforated eardrum	220		Secondary external impingement	254
	Otitis externa	220		Internal impingement	256
	Eye	220		Rotator cuff injuries	256
	Assessment of the injured eye	220		Rotator cuff tendinopathy	256
	Subconjunctival hemorrhage	222		Rotator cuff strains/tears	260
	Eyelid injuries	223		Calcific tendinopathy	260
	Hyphema	223		Glenoid labrum injuries	261
	Lens dislocation	223		Dislocation of the glenohumeral joint	262
	Vitreous hemorrhage	223		Anterior dislocation	262
	Retinal hemorrhage	223		Posterior dislocation of the	202
	Retinal detachment	223		glenohumeral joint	264
	Actinal detachillent	223		gienonumerarjonn	204

	Shoulder instability	264		Medial collateral ligament sprain	300
	Anterior instability	264		Ulnar nerve compression	301
	Posterior instability	266		Posterior elbow pain	302
	Multidirectional instability	266		Olecranon bursitis	302
	Shoulder stiffness (adhesive capsulitis,	200		Triceps tendinopathy	302
	'frozen shoulder')	266		Posterior impingement	302
	Fracture of the clavicle	267		Acute elbow injuries	303
	Distal clavicle fractures	267		Fractures	303
	Acromioclavicular joint injuries	268		Posterior dislocation	304
	Chronic acromioclavicular joint pain	268			JU4
		271		Acute rupture of the medial collateral	305
	Referred pain	271		ligament Tendon ruptures	305
	Less common causes of shoulder pain	272		-	305
	Biceps tendinopathy	212		Forearm pain Fracture of the radius and ulna	305
	Rupture of the long head of the	272			305
	biceps	272		Stress fractures	303
	Pectoralis major tears	272		Forearm compartment pressure	205
	Subscapularis muscle tears	273		syndrome	305
	Levator scapulae syndrome	273		Upper arm pain	306
	Nerve entrapments	273		Myofascial pain	306
	Fractures around the shoulder joint	275		Stress fracture of the humerus	306
	Guidelines for shoulder rehabilitation	276		TATEL TO STATE OF THE STATE OF	200
	Make a complete and accurate	276	19	Wrist, Hand and Finger Injuries	308
	diagnosis	276		Acute wrist injuries	308
	Early pain reduction	276		History	310
	Integration of the kinetic chain into	255		Examination	310
	rehabilitation	277		Investigations	313
	Scapular stabilization	278		Fracture of the distal radius and ulna	314
	Early achievement of 90° of			Fracture of the scaphoid	315
	abduction and improved	250		Fracture of the hook of hamate	316
	glenohumeral rotation	278		Dislocation of the carpal bones	318
	Closed chain rehabilitation	278		Scapholunate dissociation	318
	Plyometric exercises	280		Subacute onset and chronic wrist pain	319
	Rotator cuff exercises	282		History	319
	Summary of the principles	283		Examination	319
	Putting it all together: specific			Extra-articular conditions	320
	rehabilitation protocols	283		Injuries to the distal radial epiphysis	324
	Acute phase	283		Articular causes of subacute and	
	Recovery phase	285		chronic wrist pain	324
	Functional phase	285		Numbness and hand pain	325
	Criteria for return to play	286		Hand and finger injuries	325
				History	326
18	Elbow and Arm Pain	289		Examination	326
	Lateral elbow pain	289		Investigations	327
	History	289		Principles of treatment of hand	
	Examination	291		injuries	329
	Investigations	291		Fractures of the metacarpals	330
	Extensor tendinopathy	292		Fractures of phalanges	332
	Entrapment of the posterior			Dislocation of the	
	interosseous nerve (radial tunnel			metacarpophalangeal joints	333
	syndrome)	298		Dislocations of the finger joints	333
	Other causes of lateral elbow pain	299		Ligament and tendon injuries	334
	Medial elbow pain	299		Lacerations and infections of the	
	Flexor/pronator tendinopathy	300		hand	337

	Overuse conditions of the hand and			Structural lumbar instability	372
	fingers	337		Sacroiliacjoint disorders	373
				Rehabilitation following low back pain	373
20	Thoracic and Chest Pain	340		Posture	373
	Thoracic pain	340		Daily activities	374
	History	340		Sporting technique	375
	Examination	342		Core stability	375
	Investigations	343		Specific muscle tightness	375
	Thoracic intervertebral joint			Conclusion	377
	disorders	343			
	Costovertebral and costotransverse		22	Buttock Pain	381
	joint disorders	343		Clinical approach	381
	Scheuermann's disease	345		History	381
	Thoracic intervertebral disk prolapse	345		Examination	382
	T4 syndrome	345		Investigations	384
	Chest pain	347		Referred pain from the lumbar spine	385
	History	347		Sacroiliac joint disorders	386
	Examination	348		Functional anatomy	386
	Investigations	348		Clinical features	387
	Rib trauma	348		Treatment	387
	Referred pain from the thoracic spine	349		Iliolumbar ligament sprain	388
	Sternoclavicular joint problems	349		Hamstring origin tendinopathy	388
	Costochondritis	350		Fibrous adhesions	390
	Stress fracture of the ribs	350		Ischiogluteal bursitis	390
	offess fractare of the frog	550		Myofascial pain	390
21	Low Back Pain	352		Less common causes	390
41	Epidemiology	352		Stress fracture of the sacrum	390
	Clinical perspective	352		Piriformis conditions	391
	Somatic low back pain	354		Posterior thigh compartment	371
	Functional (clinical) instability in	JJ4		syndrome	391
	low back pain	356		Apophysitis/avulsion fracture of the	371
	History	357		ischial tuberosity	391
	Examination	357		Conditions not to be missed	393
	Investigations	359		Conditions not to be missed	393
	Severe low back pain	361	23	Acute Hip and Groin Pain	394
	Clinical features of severe acute low	301	2.5	Clinical approach	394
	back pain	361		History	394
		301		Examination	395
	Management of severe acute low	361			398
	back pain Mild to moderate low back pain			Investigations	
	Mild-to-moderate low back pain	363		Adductor muscle strains	398
	Clinical features	363		Recurrent adductor muscle strain	398
	Treatment of mild-to-moderate low	2/2		Acute presentation of adductor	200
	back pain	363		tendinopathy	398
	Acute nerve root compression	368		Iliopsoas strains	398
	Clinical features	369		Hip joint injuries	399
	Treatment	369		Clinical features	399
	Stress fracture of the pars interarticularis	369		Synovitis	401
	Clinical features	369		Labral tears	401
	Treatment	370		Chondral lesions	402
	Spondylolisthesis	371		Other hip injuries	402
	Clinical features	372		Trochanteric bursitis/gluteus medius	
	Treatment	372		tendinopathy	402
	Lumbar hypermobility	372		Specific concerns for adolescents	403

24	Longstanding Groin Pain	405		Proximal rectus femoris strains	436
	Epidemiology, terminology and			Differentiating between a mild quadriceps	5
	pathogenesis	405		strain and a quadriceps contusion	437
	'Osteitis pubis' and other popular			Less common causes	437
	diagnoses	405		Stress fracture of the femur	437
	Local overload causing failure of			Referred pain	438
	various structures	406			
	What role does bone stress play?	407	26	Posterior Thigh Pain	439
	Clinical approach	408		Anatomy	439
	History	408		Clinical perspective	440
	Examination	409		History	440
	Investigations	411		Examination	441
	Adductor-related longstanding groin			Investigations	441
	pain	411		Hamstring muscle strains	443
	Early warning signs: overlooked at			Epidemiology	443
	peril!	411		Biomechanics of hamstring injury	443
	Treatment	412		Factors that predispose to hamstring	
	Iliopsoas-related longstanding groin			strain	443
	pain	417		Prevention of hamstring muscle	
	Treatment	418		injuries	445
	Abdominal-wall-related longstanding			Clinical features	445
	groin pain	418		Imaging	445
	Posterior inguinal wall weakness			Management of hamstring strain	446
	('sports hernia', 'sportsman's hernia')	418		Referred pain to posterior thigh	454
	'Gilmore's groin'	419		Trigger points	454
	Tear of the external oblique			Lumbar spine	454
	aponeurosis ('hockey groin')	419		Sacroiliac complex	455
	Inguinal hernia	419		Less common causes	456
	Rectus abdominis tendinopathy	419		Nerve entrapments	456
	Pubic-bone-stress-related longstanding			Upper hamstring tendinopathy	456
	groin pain	420		Ischial bursitis	456
	Treatment	421		Lower hamstring tendinopathy	456
	Less common causes	421		Adductor magnus strains	456
	Obturator neuropathy	421		Compartment syndrome of the	
	Other nerve entrapments	422		posterior thigh	456
	Stress fractures of the neck of the			Avulsion of the hamstring from the	
	femur	422		ischial tuberosity	457
	Stress fracture of the pubic ramus	423		Vascular	457
	Hip injuries	423			
	Referred pain to the groin	424	27	Acute Knee Injuries	460
	,			Functional anatomy	460
25	Anterior Thigh Pain	427		Clinical perspective	461
	Clinical approach	428		History	462
	History	428		Examination	463
	Examination	428		Investigations	467
	Investigations	428		Meniscal injuries	468
	Quadriceps contusion	430		Clinical features	468
	Treatment	431		Treatment	469
	Compartment syndrome of the			Rehabilitation after meniscal surgery	470
	thigh	434		Conservative management of menisca	
	Myositis ossificans	435		injuries	470
	Quadriceps muscle strain	435		Medial collateral ligament injury	472
	Treatment	436		Treatment	472

	Anterior cruciate ligament tears	472		Partial tendon tears: acute versus	
	Clinical features	472		chronic	532
	Conservative or surgical treatment?	482		Less common causes	532
	Surgical treatment	482		Synovial plica	532
	Combined injuries	483		Osgood-Schlatter lesion	532
	Rehabilitation after ACL			Sinding-Larsen-Johansson lesion	533
	reconstruction	483		Quadriceps tendinopathy	533
	Problems encountered during ACL			Bursitis	533
	rehabilitation	485			
	Conservative management	488	29	Lateral, Medial and Posterior Knee	
	Outcomes after ACL treatment	488		Pain	538
	Prevention of ACL injury	490		Lateral knee pain	538
	ACL rupture among children with			History	539
	open physes	493		Examination	539
	Posterior cruciate ligament tear	494		Investigations	541
	Clinical features	495		Iliotibial band friction syndrome	542
	Treatment	495		Lateral meniscus abnormality	546
	Lateral collateral ligament tears	497		Osteoarthritis of the lateral	
	Articular cartilage damage	497		compartment of the knee	546
	Acute patellar trauma	498		Excessive lateral pressure syndrome	546
	Fracture of the patella	498		Biceps femoris tendinopathy	546
	Patellar dislocation	498		Superior tibiofibular joint injury	547
	Less common causes	499		Referred pain	547
	Patellar tendon rupture	499		Medial knee pain	547
	Bursal hematoma	499		Patellofemoral syndrome	548
	Fat pad impingement	499		Medial meniscus abnormality	548
	Fracture of the tibial plateau	499		Osteoarthritis of the medial	0.10
	Superior tibiofibular joint injury	501		compartment of the knee	548
	Ruptured hamstring tendon	501		Pes anserinus tendinopathy/bursitis	549
	Coronary ligament sprain	501		Pellegrini-Stieda syndrome	549
	Coronary ngament optam	301		Other causes of medial knee pain	549
28	Anterior Knee Pain	506		Posterior knee pain	549
20	Clinical approach	506		History	550
	History	507		Examination	550
	Examination	509		Investigations	550
	Investigations	509		Popliteus tendinopathy	550
	Patellofemoral pain	511		Gastrocnemius tendinopathy	552
	What is patellofemoral pain?	511		Biceps femoris tendinopathy	552
	Functional anatomy	511		Baker's cyst	552
	Factors that may contribute to	511		Deep venous thrombosis	553
	development of pain	512		Claudication	553
	Treatment of patellofemoral pain	514		Claudication	555
	Patellofemoral instability	522	30	Shin Pain	555
	Primary patellofemoral instability	522	30	Clinical perspective	555
		523		Role of biomechanics	556
	Secondary patellofemoral instability	524			556
	Fat pad irritation/impingement	524		History Examination	558
	Patellar tendinopathy				
	Nomenclature	524		Investigations	560
	Pathology and pathogenesis of patellar			Stress fracture of the tibia	564
	tendinopathy	524		Treatment	565
	Clinical features	525 527		Prevention of recurrence	566
	Investigations	527		Stress fracture of the anterior cortex	F//
	Treatment	527		of the tibia	566

	Medial tibial traction periostitis Treatment	567 568		Corticosteroid injection around and into tendon	602
		200			603
	Chronic exertional compartment	560		Sclerosing injections	604
	syndrome	569		Electrophysical agents	
	Deep posterior compartment	570		Adjunct non-operative treatments	605
	syndrome	570		Surgical treatment	605
	Anterior and lateral exertional			Insertional Achilles tendinopathy,	
	compartment syndromes	572		retrocalcaneal bursitis and Haglund's	
	Less common causes	574		disease	605
	Stress fracture of the fibula	574		Relevant anatomy and pathogenesis	605
	Referred pain	574		Clinical assessment	606
	Nerve entrapments	574		Treatment	606
	Vascular entrapments	574		Achilles tendon rupture (complete)	606
	Developmental issues	574		Surgical management	607
	Acute bony injuries	574		Non-surgical management	607
	Periosteal contusion	574		Posterior impingement syndrome	607
	Fractured tibia and fibula	575		Sever's lesion	608
				Less common causes	608
31	Calf Pain	578		Accessory soleus	608
	Clinical perspective	578		Other causes of pain in the Achilles	
	History	579		region	608
	Examination	580		108.011	
	Investigations	582	33	Acute Ankle Injuries	612
	Gastrocnemius muscle strains	582	55	Functional anatomy	612
	Acute strain	582		Clinical perspective	613
	Chronic strain	584		History	613
	Soleus muscle strains	585		Examination	614
		585 585			616
	Accessory soleus			Investigations	617
	Claudicant-type calf pain	586		Lateral ligament injuries	017
	Vascular causes	586		Treatment and rehabilitation of lateral	<b>610</b>
	Neuromyofascial causes	588		ligament injuries	618
	Superficial compartment syndrome	588		Initial management	618
	Conditions not to be missed	588		Treatment of grade III injuries	620
		=00		Less common causes	622
32	Pain in the Achilles Region	590		Medial (deltoid) ligament injuries	622
	Functional anatomy	590		Pott's fracture	622
	Clinical perspective	590		Maisonneuve fracture	622
	History	591		Persistent pain after ankle sprain—	
	Examination	591		'the problem ankle'	622
	Investigations	594		Clinical approach to the problem	
	Midportion Achilles tendinopathy	597		ankle	623
	Histopathology and basic molecular			Osteochondral lesions of the talar	
	biology	598		dome	624
	Predisposing factors	598		Avulsion fracture of the base of the	
	Clinical features	599		fifth metatarsal	626
	Practise tips relating to imaging			Other fractures	627
	Achilles tendinopathy	599		Impingement syndromes	628
	Treatment of midportion Achilles			Tendon dislocation or rupture	628
	tendinopathy	599		Other causes of the difficult ankle	629
	Alfredson's painful heel-drop	-		Sinus tarsi syndrome	629
	protocol	600		Complex regional pain syndrome	
	Nitric oxide donor therapy	601		type I	630
				/ r	

	. 11 70 1	(22		C+	
34	Ankle Pain	<b>632</b> 632		Stress fracture of the great toe	668 669
	Medial ankle pain	632		Freiberg's osteochondritis Joplin's neuritis	669
	History Examination	632		Morton's interdigital neuroma	669
	Investigations	634		Toe clawing	669
		634		Corns and calluses	670
	Tibialis posterior tendinopathy	635		Plantar warts	670
	Flexor hallucis longus tendinopathy	636		Subungual hematoma	670
	Tarsal tunnel syndrome Stress fracture of the medial malleolus			Subungual mematoma Subungual exostosis	670
		637		Onychocryptosis	670
	Medial calcaneal nerve entrapment Other causes	638		Onychociyptosis	071
	Lateral ankle pain	638	36	The Patient with Longstanding	
	Examination	638	30	Symptoms	673
	Peroneal tendinopathy	638		What is the diagnosis?	673
	Sinus tarsi syndrome	640		Going back to square one	673
	Anterolateral impingement	641		Thorough examination	674
	Posterior impingement syndrome	641		Reassess the results of investigations	674
	Stress fracture of the talus	641		Treatment	675
	Referred pain	642		Be sure the diagnosis is correct	673
	<u> </u>	642		Is there a persisting cause?	675
	Anterior ankle pain	643		Obtain details of treatment	675
	Anterior impingement of the ankle	644			67.
	Tibialis anterior tendinopathy	644		Make the multidisciplinary team available	676
	Inferior tibiofibular joint injury	044			676
35	Foot Pain	646		Appropriate referral Summary	676
33	Rear foot pain	646		Summary	071
	History	646	Dar	t C Enhancing Sport Performance	
	Examination	646	37	Maximizing Sporting Performance:	
	Investigations	648	37	Nutrition	681
	Plantar fasciitis	648		Maximizing energy stores	683
	Fat pad contusion	651		Carbohydrates and fats	68.
	Calcaneal stress fractures	651		Protein—a fuel	682
	Lateral plantar nerve entrapment	652		Achieving ideal body weight for	002
	Midfoot pain	652		performance	688
	History	652		Assessment of body composition	688
	Examination	652		Dietary regimens for weight loss	690
	Investigations	652		Other methods of weight control	69
	Stress fractures of the navicular	652		The safe way to lose body fat	69
	Extensor tendinopathy	655		Bulking up	693
	Midtarsal joint sprains	656		Methods commonly used by athletes	0).
	Lisfranc's joint injuries	656		to gain weight	69.
	Less common causes	659		Ensuring sufficient intake of vitamins	07.
	Forefoot pain	660		and minerals	694
	History	660		The B complex vitamins	693
	Examination	661		Vitamin C	69
	Investigations	662		Fat-soluble vitamins (A, D, E and K)	698
	Stress fractures of the metatarsals	662		Iron	699
	Metatarsophalangeal joint synovitis	664		Calcium	699
					70
	First metatarsophalangeal joint sprain			Magnesium Zinc	70
	('turf toe')	665 666		Selenium	
	Hallux Initus	666 667		Chromium	702
	Hallux valgus	667			70:
	Sesamoid injuries	667		Vitamin and mineral supplements	703

	Maintaining adequate hydration	702	Water flotation tanks	721
	Clinical perspective	702	Music	722
	Sports drinks	702	Massage	722
	Drinking before exercise	703	Mental skills' training aiding physical	
	Drinking during exercise	703	preparation for sport	722
	Rehydration after exercise	703	Facilitating physical training	722
	Caffeine	703	Enhancing motor skill development	722
	Alcohol	704	Facilitating rehabilitation	722
	Fluid intake in children and older		The roles of a sports psychologist in	
	adults	704	a team	723
	The effect of 'making weight' on fluid		On-field team	723
	status	704	Off-field team	723
	Optimizing the pre-competition meal	704		
	Endurance sport	704	Part D Special Groups of Participants	
	Short duration events	705	40 The Younger Athlete	727
	Competition diet between events	705	Management of musculoskeletal	
	The pre-event meal	705	conditions	727
	The athlete's menu	705	Anatomical differences between adult	. – .
	Conclusion	706	and growing bone	727
		,	Acute fractures	728
38	Maximizing Sporting Performance:		Shoulder pain	731
	To Use or Not to Use Supplements?	708	Elbow pain	731
	Extent of use of supplements among	,	Wrist pain	731
	sportspeople	708	Back pain and postural abnormalities	732
	Supplements for strength and power	, , ,	Hip pain	733
	sports	708	Knee pain	734
	Proteins and amino acids	708	Painless abnormalities of gait	737
	Beta-hydroxy-beta-methylbutyrate	700	Foot pain	737
	(HMB)	710	Other considerations in the younger	, ,,
	Supplements for weight-restricted sports	710	athlete	738
	Carnitine	710	Children with chronic illness	738
	Supplements for high-intensity exercise	711	Asthma	738
	Creatine	711	Cystic fibrosis	738
	Alkaline loading	712	Diabetes mellitus	739
	Antioxidants	712	Cardiovascular disease	739
	Other nutrients	713	Hemophilia	739
	Supplement contamination	713	Epilepsy	739
	Conclusion	713	How much is too much?	739
	Conclusion	713	General guidelines	740
39	Maximizing Sporting Performance:		Long distance running	740
3)	Psychology Principles for Clinicians	716	e e	740
	Fundamental psychological skills	716	Sprints Throwing events (shot put discus	740
	Control of arousal level for optimal	/10	Throwing events (shot put, discus, javelin, hammer)	740
	performance	716		
	Mental imagery	717	Jumping events (long jump, triple jum high jump, pole vault)	_
	Progressive muscle relaxation			741
		718	Gymnastics	741
	Centering	718	Swimming	741
	Routine Positive self-talk	718	Resistance training	741
		719	Nutrition for the younger athlete	743
	Goal-setting	721	Energy	743
	Modification of harmful psychological		Protein	744
	characteristics	721	Carbohydrates	744
	Mental skills' training and relaxation	721	Fat	744

	Vitamins and minerals	7 <b>4</b> 4		Aerobic fitness	764
	Thermoregulation and hydration	745		Stress urinary incontinence	764
	Body image	745		Exercise guidelines	764
	Obesity	745		Risks of exercise	765
	The 'ugly parent' syndrome	745		The breast	765
	Coaches' role	746		Trauma	765
	30.00			Nipple problems	765
11	Women and Activity-Related Issues			Sports bras	765
	Across the Lifespan	749		Environmental factors	766
	Similarities and differences between			Nutrition	766
	the sexes	749		Eating disorders	767
	Skeletal differences	750		Injuries	767
	Body composition	750		,	
	Physiological differences	750	42	The Older Person who Exercises	773
	Training and performance	751		The benefits of physical activity in the	
	Physiology of the menstrual cycle	751		elderly	773
	Effect of the menstrual cycle on			Risks of exercise in the elderly	774
	performance	752		Reducing the risks of exercise	774
	Dysmenorrhea	752		Exercise prescription for the older	
	Pre-menstrual syndrome	753		individual	774
	Manipulation of the menstrual cycle	753		Inactive older people	774
	Menstrual irregularities associated with			Generally active older people	774
	exercise	753		Interaction between medication and	
	Delayed menarche	753		exercise in the older person	775
	Luteal phase defects	754		Medications affecting the	
	Oligomenorrhea and amenorrhea	754		renin-angiotensin system	775
	Causes of exercise-associated			Beta-blockers	775
	menstrual cycle irregularities	754		Diuretics	775
	Complications of exercise-associated			Other cardiac drugs	775
	menstrual cycle irregularities	756		Non-steroidal anti-inflammatory	
	Reduced fertility	756		drugs	775
	Reduced bone mass	756		Medications affecting the central	
	Treatment of exercise-associated			nervous system	776
	menstrual cycle irregularities	756		Insulin and oral hypoglycemic drugs	776
	Contraception	756			
	Oral contraceptive pill	757	43	The Disabled Athlete	778
	Exercise and pregnancy	758		Historical perspective	778
	Potential risks of maternal exercise			Health benefits of physical activity	778
	to the fetus	758		Choosing a suitable sport	778
	Risks to the mother	759		The sportsperson with a physical	
	Advantages of exercise during			disability	780
	pregnancy	759		Spinal cord injury and sports	
	Contraindications to exercise during			medicine	780
	pregnancy	759		The sportsperson with a limb	
	Guidelines for exercise during			deficiency	782
	pregnancy	759		The sportsperson with cerebral palsy	782
	Menopause	761		The sportsperson with visual	
	Osteoporosis	762		impairment	782
	Maximizing bone mass	762		The sportsperson classified as	
	Minimizing bone loss	762		'Les Autres'	782
	Reducing falls risk	763		Classification	783
	Pharmacotherapy	763		Adapting performance testing and	<b>5</b> 0.
	Coronary heart disease	764		training for disabled athletes	784

	Winter sports and common injuries	784		Holter monitors and event	
	Anti-doping issues	784		recorders	816
	Travel with teams	784		Electrophysiological studies	816
D	. F B			Prevention of sudden death	816
rar	t E Management of Medical Problems		4.0	D	
4.4			46	Respiratory Symptoms During	010
44	Sport and Exercise-Associated	700		Exercise	819
	Emergencies: On-Site Management	789 780		Common respiratory symptoms	819
	Preparation	789		Shortness of breath and wheeze	819
	Personnel and training	789		Cough	820
	Equipment	790		Chest pain or tightness	820
	Approach to the acutely ill or injured athlete	701		Asthma	820
		791 701		Epidemiology	821
	Scene safety	791		Clinical features	821
	Primary survey	791		Types of asthma	821
	Secondary survey	797		Precipitating factors	822
	Summary	802		Risk factors	822
4.5	Continue Samuel Samuel Samuel			Asthma management	822
45	Cardiovascular Symptoms During	002		Exercise-induced bronchospasm	823
	Exercise	803		Epidemiology	823
	Cardiovascular changes with exercise	803		Pathophysiology	823
	Palpitation	803		Etiology	824
	Clinical approach	804		Clinical features	824
	Management	804		Diagnosis	824
	Syncope	806		Treatment	827
	History	808		Conditions that may mimic EIB	829
	Examination	808		Sinus-related symptoms	831
	Investigations	808		Management of sinusitis Other exercise-related conditions	831
	Heart murmur	808			831
	Chest pain	808		Exercise-induced anaphylaxis	831
	Sudden cardiac death	808		Cholinergic urticaria	832
	Hypertrophic cardiomyopathy	808		Exercise-induced angioedema	832
	Differentiating between HCM and	010	47	Control of Symptoms Daving	
	athlete's heart	810 811	47	Gastrointestinal Symptoms During Exercise	025
	Eligibility for sport				835
	Marfan's syndrome	811		Upper gastrointestinal symptoms	835
	Coronary artery disease	812 812		Treatment	836 836
	Other significant cardiac conditions	012		Gastrointestinal bleeding	
	Congenital anomalies of the coronary	012		Treatment	836
	arteries	812		Abdominal pain	836
	Arrhythmogenic right ventricular	013		Diarrhea	837
	dysplasia	812		Treatment	837
	Myocarditis	813		Exercise and gastrointestinal diseases Lactose intolerance	838
	Arrhythmia and conduction	012			838
	abnormalities	813		Celiac disease Irritable bowel syndrome	838
	Aortic stenosis	813			838
	Mitral valve prolapse	813		Prevention of gastrointestinal symptoms	020
	Commotio cordis	814		that occur with exercise	838
	Special cardiac investigations	814		Limit dietary fiber intake prior to	020
	Echocardiography	814		competition	838
	Exercise stress testing	814		Avoid solid foods during the last	030
	Thallium studies	815		3 hours prior to the race	838
	Radionuclide ventriculography	816		Select the pre-event meal carefully	839

	Prevent dehydration	839		The patient with joint pain who 'hurts all over'	050
	Avoid fat and protein intake during exercise	920			859
		839		Ordering and interpreting	960
	Sample pre-event diet	839		rheumatological tests	860
	Consult a sports psychologist	839		Rheumatoid factor	860
	1 . 15 Hz			Erythrocyte sedimentation rate	861
<b>48</b>	Diabetes Mellitus	841		Antinuclear antibodies	861
	Type 1 diabetes	841		HLA B27	861
	Type 2 diabetes	841		Serum uric acid	861
	Clinical perspective	841			
	Diagnosis	841	51	Common Sports-Related Infections	863
	Diabetic screening	842		Hepatitis	863
	Complications	842		Acute viral hepatitis and activity	864
	Treatment	842		Prevention of viral hepatitis	864
	Exercise and diabetes	844		Human immunodeficiency virus (HIV)	864
	Benefits of exercise	845		Infectious mononucleosis	865
	Exercise and type 1 diabetes	845		Skin infections	866
	Exercise and type 2 diabetes	845		Viral infections	866
	Diabetes and competition	846		Bacterial skin infections	867
	Diabetes and travel	846		Fungal skin infections	868
	High-risk sports	846		Viral respiratory infections	869
	Exercise and the complications of	010		Influenza	869
	diabetes	846		Travelers' diarrhea	869
	Complications of exercise in the diabetic	040		Exercise and infection	869
	athlete	847			870
				Exercise and the immune system	
	Hypoglycemia	847		Exercise and infections	871
	Diabetic ketoacidosis in the athlete	847		Infection and athletic performance	871
	Musculoskeletal manifestations of	0.40		Should an athlete train during	0.71
	diabetes	848		illness?	871
	Conclusion	849			
			52	The Tired Athlete	875
49	The Athlete with Epilepsy	850		History	875
	Epidemiology and nomenclature	850		Training diary	876
	Pathology	850		Psychological factors	876
	Generalized tonic-clonic seizure	850		Nutrition diary	876
	Convulsions that are not due to			Medical causes	876
	epilepsy	850		Examination	876
	Diagnosis of epilepsy	851		Investigations	876
	Investigations	851		Overtraining syndrome	878
	Treatment	851		Development of the overtraining	
	Exercise prescription	851		syndrome	878
	Management of a seizure	852		Physiological changes	878
	Conclusion	852		Biochemical changes	879
	Concident	032		Hormonal changes	880
50	Joint-Related Symptoms Without			Immunological changes	880
50	Acute Injury	854		Psychological changes	881
	The patient with a single swollen joint	854			881
				Central fatigue and overtraining	
	Clinical perspective	854		Monitoring of overtraining	881
	The patient with low back pain and	057		Prevention of overtraining	882
	stiffness	856		Viral illness	882
	Clinical perspective	856		Nutritional deficiencies	883
	The patient presenting with multiple			Depletion of iron stores	883
	painful joints	858		Glycogen depletion	883

	Inadequate protein intake	884	Internal active rewarming	903
	Chronic fatigue syndrome	884	Other rewarming methods	903
	Definition	884	Treatment of hypothermia in sport	903
	Etiology	884	Treatment of mild hypothermia	903
	Symptoms	884	Treatment of moderate hypothermia	903
	Management	885	Treatment of severe hypothermia	903
	CFS and the sportsperson	885	Treatment of immersion	
	Other causes of tiredness	885	hypothermia	904
	Summary	886	Frostbite	904
			Clinical features	904
53	Exercise in the Heat	888	Prevention of cold injuries	904
	Mechanisms of heat gain and loss	888	General guidelines	904
	Clinical perspective	889	Running and cycling	905
	Heatstroke—a temperature above		Mountaineers, hikers and cavers	905
	41°C (106°F)	890	Back-country and cross-country	
	Management of heatstroke	891	skiing	905
	Is hospital admission indicated?	891	Water sports	905
	Complications of heatstroke	891	Exercise at altitude	905
	Exercise-associated collapse	892	ltinerary	905
	Management of exercise-associated		Previous altitude history	906
	collapse	893	Patient characteristics and previous	- 00
	Cramps	893	medical history	906
	Management of cramps	893	General preventive measures	907
	Fluid overload: hyponatremia	893	Prophylactic medications	908
	Management of hyponatremia	894	Conclusion	909
	Etiology of exercise-associated	051	Gonerasion	707
	hyponatremia and hyponatremic	55	Exercise Prescription for Health	912
	encephalopathy	894	Pre-exercise evaluation	912
	Other causes of exercise-related collapse	071	Establish lifestyle goals	912
	in hot weather	896	Discuss activity preferences and	714
	Heat acclimatization	896	interests	913
	Treat accommunization	070	Physical examination	916
54	Exercise at the Extremes of Cold and		Management	916
<i>J</i> 1	Altitude	900	Contingency plans and follow-up	916
	Exercise in the cold	900	Other tips	917
	Generation of body heat	900	Components of exercise prescription	919
	Heat loss	900	Aerobic activities: endurance	719
	Conduction	900		919
	Convection	900	training Resistance training	919
	Radiation	900		717
	Evaporation		Exercise prescription for the older individual	010
		900		919
	Minimizing heat loss	901	Inactive	919
	Measurement of body temperature	901	Generally active	920
	Effects of hypothermia	901	Exercise prescription for the patient	004
	Cardiovascular effects	901	with hypertension	924
	Respiratory effects	901	Resistance training for the cardiac	0.5.4
	Other effects	901	patient	924
	Clinical features	902	Exercise prescription in patients with	
	General principles of managing	000	osteoarthritis	927
	hypothermia	902	Exercise prescription in patients with	
	Methods to achieve rewarming	902	osteoporosis	929
	Passive rewarming	902	Community-based exercise program	
	External active rewarming	902	for osteoporosis	931

	Exercise prescription in practise: a case			Advice for team members	960
	study	932		The medical bag	962
	Case report	932		Clinician's hip bag	962
	Cust 1-1			Self-preparation	962
Dar	F Practical Sports Medicine			Air travel and jet lag	964
56	The Preparticipation Physical			The medical room	964
30	Evaluation	937		Illness	964
	Objectives	937		Traveler's diarrhea	964
	Who should undergo the PPE	938		Upper respiratory tract infections	966
	Who should perform the PPE	938		Injury	966
	When to perform the PPE	938		Drug testing	966
	Where to conduct the PPE	938		Local contacts	966
	What to include in the PPE	938		Psychological skills	966
	History	938		Personal coping skills	967
	Physical examination	939		Why some clinicians 'fail' on tour	967
	Diagnostic tests	940	<b>C</b> 0	M-4:-1C	
	Why do the PPE for competitive	0.41	60	Medical Coverage of Endurance	0.00
	athletes? What is 'clearance'?	941		Events	969
	Conclusions	941		Race organization	969
	o to de mite and the			The medical team	970
57	Screening the Elite Athlete	944		First-aid stations	970
	Aims of medical screening	944		Medical facility at the race finish	971
	Benefits of screening	944		Conclusion	974
	When should athletes be screened?	944			
	The screening protocol	945	61	Drugs and the Athlete	976
	Cardiovascular screening	945		Historical perspective	976
	Medical health	946		Why athletes take drugs	977
	Musculoskeletal screening	946		Prohibited substances	978
	Optimize performance	947		Prohibited classes of substances	978
	Injury prevention	947		Anabolic agents	978
	Medications and vaccinations	947		Hormones and related substances	985
	Baseline data collection	947		Beta-2 agonists	988
	Develop professional relationship			Agents with anti-estrogenic activity	989
	with athlete	947		Diuretics and other masking agents	989
	Education	948		Stimulants	990
	Problems	948		Narcotics	992
				Cannabinoids	992
58	Providing Team Care	954		Glucocorticosteroids	992
	The off-field team	954		Prohibited methods	993
	Coaching and fitness staff	954		Enhancement of oxygen transfer	993
	Pre-season assessment	955		Chemical and physical manipulation	994
	Educate team members	955		Gene doping	994
	Other essentials	955		Classes of drugs banned in certain	
	Facilities	955		sports	996
	Record-keeping	955		Alcohol	996
	Confidentiality	956		Beta-blockers	996
	The 'team clinician's bag'	956		Specified substances	997
	Being part of the 'team chemistry'	956		Therapeutic use of a prohibited	221
	Zonig part of the team eleminon's	,,,,,		substance	997
59	Traveling with a Team	959		Permitted substances	998
	Preparation	959		Recently deleted drugs	998
	Things to do before travel	959		Caffeine	998
	Assessing team members' fitness	960		Non-intentional doping in sports	999
	vissessing regin memoris inness	200		rion-intentional doping in sports	フンフ

	Short-term gain, long-term pain	1008
999	Informed consent	1008
1000	Guidelines for resolution of conflict	
1001	of interest	1009
1002	Confidentiality	1009
	The media	1010
1006	Performance-enhancing drugs	1010
1006	Infectious diseases	1011
	Ethics in sport	1012
1007	•	
1007	Index	1014
	1000 1001 1002 <b>1006</b> 1006	1000 Guidelines for resolution of conflict 1001 of interest 1002 Confidentiality The media 1006 Performance-enhancing drugs 1006 Infectious diseases Ethics in sport