UNDERSTANDING ADOLESCENT BACK PAIN AND MANAGEMENT

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INTRODUCTION TO ADOLESCENT BACK PAIN

- ADOLESCENCE AGES 10-19 (WHO)

- PREVALENCE
- COMMON CONDITIONS
- WHAT NOT TO MISS – (RED FLAGS)
- MANAGEMENT
- BIOPSYCHOSOCIAL APPROACH

EPIDEMIOLOGY & PREVALENCE

- First incident between age 7 and 18 years of age
- Lifetime prevalence of back pain range 4.7% - 74.4% (Jeffries 2007)
- Back pain in adolescents has steadily increased over past decade, annual incidence ranging 11.8% - 33% (Jeffries 2007)

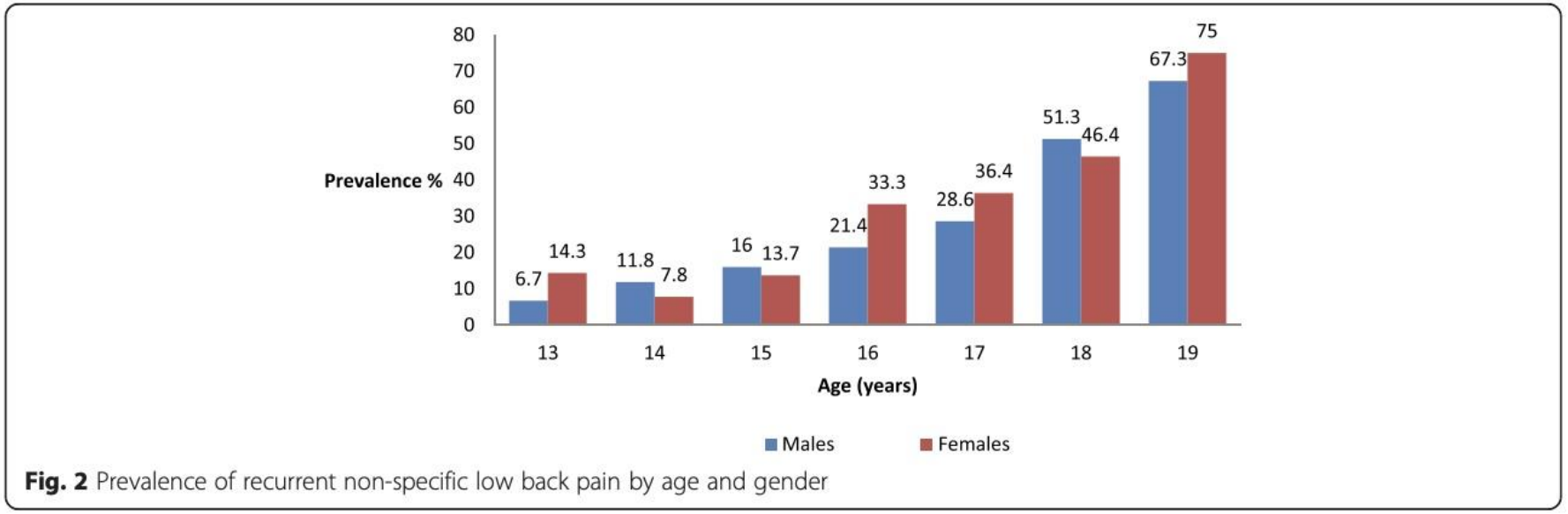


Fig. 2 Prevalence of recurrent non-specific low back pain by age and gender

Chiwaridzo 2015

ARE ADOLESCENTS JUST SMALL ADULTS?

GROWTH AND DEVELOPMENT FACTORS

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

ROLE OF GROWTH SPURTS

- Peak Height Velocity

IMPACT OF SKELETAL IMMATURITY

- Timing of ossification – lumbar vertebra fuse by age 25 (Costa 2021)
- Peak Bone Mass

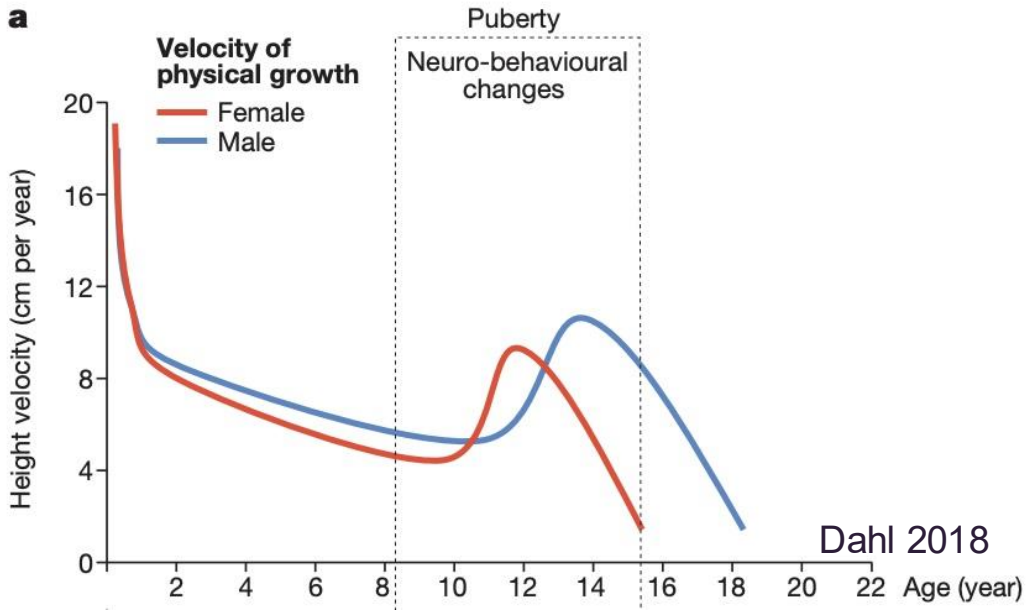
HORMONAL INFLUENCES

- Menstruation, Spermarche
- Emotion, Cognition, Motivation

Table 1. Growth characteristics during the adolescent growth spurt for girls and boys.[13]

Growth Characteristics	Girls	Boys
Age at start	9-10 y	11-12 y
Age at maximum growth	12 y	14 y
Age at which growth slows	>12 y	>14 y
Age until growth continues	16-18 y	18-20 y
Age at maximum height growth	11-13 y	13-15 y

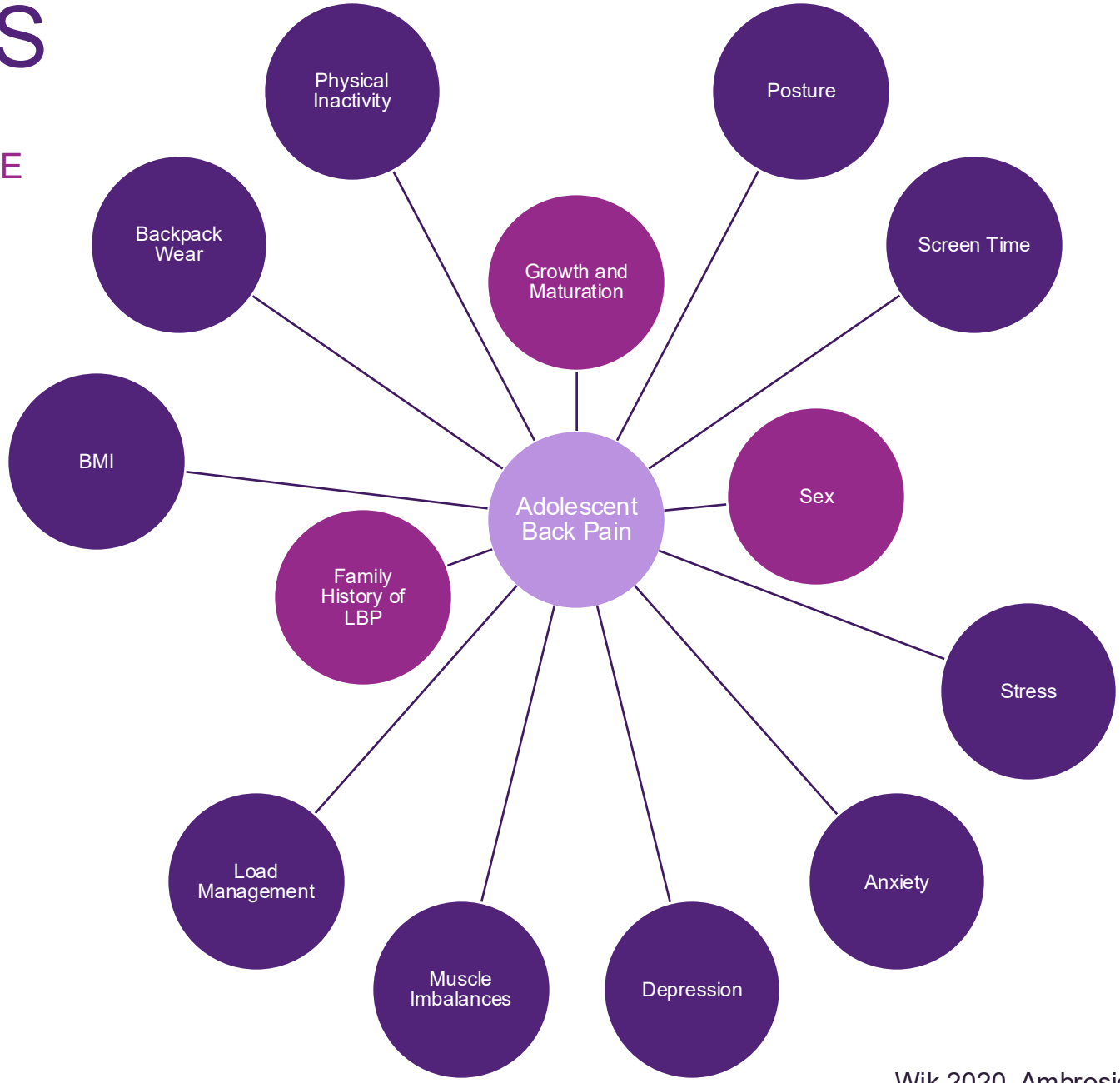
Purcell 2009



Dahl 2018

RISK FACTORS

MODIFIABLE VS NON-MODIFIABLE



Wik 2020, Ambrosio 2023, Vitta 2021

CLINICAL ASSESSMENT

HISTORY

- Ask specific questions for Red Flags
- Recent growth spurts, menstruation began
- Onset, Duration, Nature of the pain
- Recent training load
- Explore effects on daily activities, sport
- Duration of time spent on screens
- Past history of injuries

PHYSICAL EXAMINATION

- Observation - gait, posture, abnormal curvature of spine
- Palpation – spinal tenderness, palpable step
- Limited and painful lumbar extension
- Examine both hips
- Neurological Exam – if indicated
- One-legged hyperextension for Spondylolysis

OUTCOME MEASURES

- OREBRO
- STarTBack
- Youth BAQ

RED FLAGS

POSSIBLE PATHOLOGY	KEY FEATURES
INFECTION – Discitis, Osteomyelitis	FEVER, NIGHT PAIN, WEIGHT LOSS, ONSET OF SEVERE LBP
INFLAMMATORY – AS, RA, SpA, JIA, Scheuermann's	FEVER, STIFFNESS>PAIN, SYSTEMIC SIGNS, PROLONGED MORNING STIFFNESS >30MINS
MALIGNANCY – Osteosarcomas, Tumour	FEVER, NIGHT PAIN, UNRELIEVED BY REST, WEIGHT LOSS, HX OF CANCER
FRACTURE – Stress	ACUTE PAIN, TRAUMA, CAUDA EQUINA, NEUROLOGICAL DEFICIT, NIGHT PAIN, LOAD

COMMON CONDITIONS OF BACK PAIN

MECHANICAL

- Non-specific back pain
- Postural
- Muscle strains / sprains
- Psychosocial contributions
- Disc injuries

INFLAMMATORY

- Scheuermann's Disease

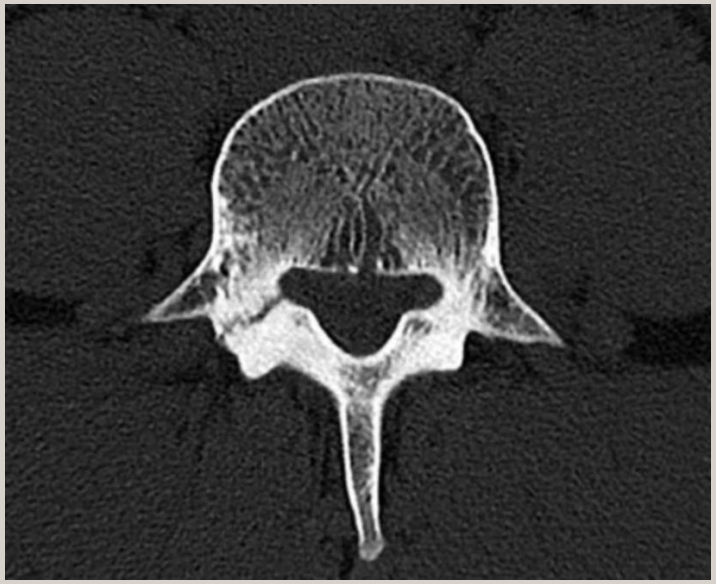
STRUCTURAL

- Idiopathic Scoliosis
- Spondylolysis
- Spondylolisthesis
- Disc injuries
- Posterior ring apophyseal fracture

DIFFERENTIAL DIAGNOSIS

POSSIBLE DIAGNOSIS	KEY FEATURES
MUSCLE STRAIN	LOCALISED, **ACUTE ONSET**, **PAIN DURING ACTIVITY,** PAIN WITH TWISTING AND LIFTING, TENDERNESS NOT RADIATING, ALL AGES, NON-SPECIFIC MSK – PSYCHOSOCIAL FACTORS, COMORBID MEDICAL CONDITIONS
SCHEUERMANN'S DISEASE DISEASE	MAY START WITH THORACIC ACHE, AGGRAVATED BY PHYSICAL ACTIVITY, PROLONGED SITTING, STANDING AND FORWARD FLEXION, **KYPHOTIC POSTURE**, MORE COMMON IN BOYS
ADOLESCENT IDIOPATHIC SCOLIOSIS	**SPINAL CURVATURE**, **UNEVEN SHOULDERS AND WAISTLINE**, SHOULDER BLADE MORE PROMINENT, OFTEN ISN'T SYMPTOMATIC UNLESS SEVERE
SPONDYLOLYSIS	**GRADUAL ONSET, PAIN WITH EXTENSION, PAIN ON REPETITIVE ARCHING OF LOW BACK**, EASES WITH REST, STIFFNESS, BUTTOCK REFERRAL, HAMSTRING CRAMP OR TIGHTNESS
SPONDYLOLITHESIS	**PAIN W EXTENSION**, RADIATING PAIN TO BUTTOCK OR LEGS, NEUROLOGICAL SYMPTOMS
DISC INJURIES	ACUTE PAIN, PAIN WITH FORWARD FLEXION, NEUROLOGICAL SIGNS, COUGH/SNEEZE ?
POSTERIOR RING APOPYSEAL	ACUTE PAIN, PAIN WITH FORWARD FLEXION, POSSIBLE RADIATING PAIN
NONSPECIFIC BACK PAIN	DIAGNOSIS OF EXCLUSION

IMAGING



CT Kountouris 2018

MODAILITY	PROS	CONS
XRAY	• Inexpensive • Low dose of ionizing radiation • Bony alignment • Scheuermann's	• Very low sensitivity for detecting bone marrow oedema
CT SCAN	• Best for assessing skeletal morphology, cortical integrity and occult fractures • Establish extent of healing in Spondylolysis	• Higher level of ionizing radiation in growing population
MRI	• Able to detect early bone marrow oedema • No ionizing radiation • Soft tissue • Recommendation MRI STIR is preferred modality • Best for suspicious spondylolysis	• Expensive • May not be as accessible • Need to lay still for 30-45mins

RUFF2019, DUNN 2008, KRIZ 2024, K O'Sullivan 2019

BONE MARROW OEDEMA

MRI STIR Kountouris 2018

Table 1. *MRI Grading System for Stress Fractures of the Pars Interarticularis*[9]

Grade	Description	MRI Features
0	Normal	Normal marrow signal Intact cortical margins
1	Stress reaction	Marrow edema Intact cortical margins
2	Incomplete fracture	Marrow edema Cortical fracture incompletely extends through pars
3	Complete active fracture	Marrow edema Fracture completely extends through pars
4	Fracture nonunion	No marrow edema Fracture completely extends through pars

DUNN 2008

EARLY DETECTION IS KEY

IMAGING PLAYS A KEY ROLE IN DIAGNOSIS OF BONE MARROW OEDEMA

THEREFORE OUR MANAGEMENT!

HOW DO WE MANAGE THIS POPULATION?

MANAGEMENT - NONSPECIFIC BACK PAIN

IDENTIFY

- EARLY DETECTION IS KEY
- PREDICTOR OF CHRONIC BACK PAIN IN ADULTHOOD
- NEED CBT ✓
- INTERDISCIPLINARY TEAM ✓

MODIFY

- ACTIVITIES
- TRAINING LOAD
- REST AND RECOVERY

EDUCATION

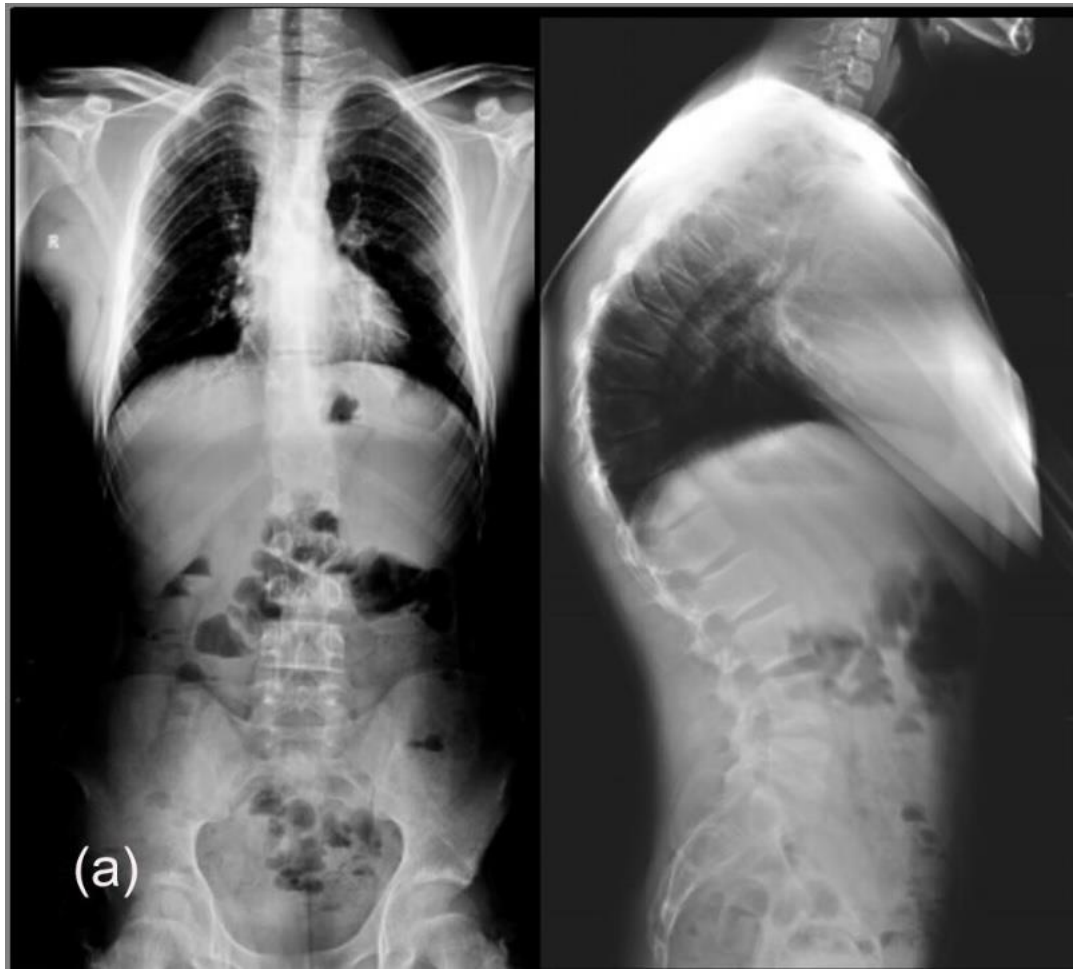
- HOME EXERCISE ✓
- POSTURE
- PREVENTION ✓
- PHYSICAL ACTIVITY ✓
- MEDICATION ✗
- BACKPACK
- PARENTS

EXERCISE THERAPY

- STRENGTHENING
- TECHNIQUE
- CORE
- NEUROMUSCULAR CONTROL
- MOBILITY/FLEXIBILITY

Frosch 2022

SCHEUERMANN'S DISEASE



Cetik 2023

Physiotherapy

- Extension based stretching and strengthening
- Hanging stretch – spinal elongation
- Manual therapy

Education & Advice

- Posture
- Daily stretching
- Breath Work

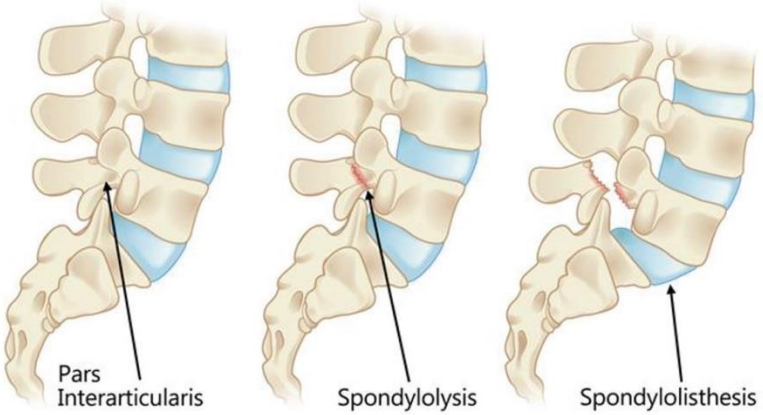
Bracing

- Combined with Physiotherapy
- Milwaukee Brace

Cetik 2023, de Mauroy 2010

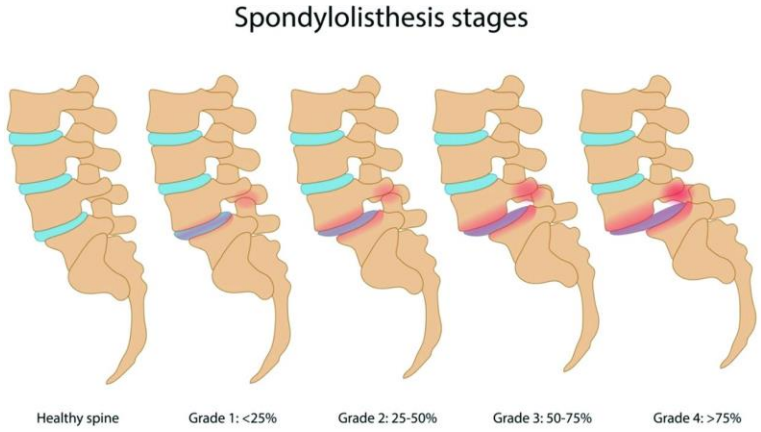
SPONDYLOLYSIS

SPONDYLOLISTHESIS



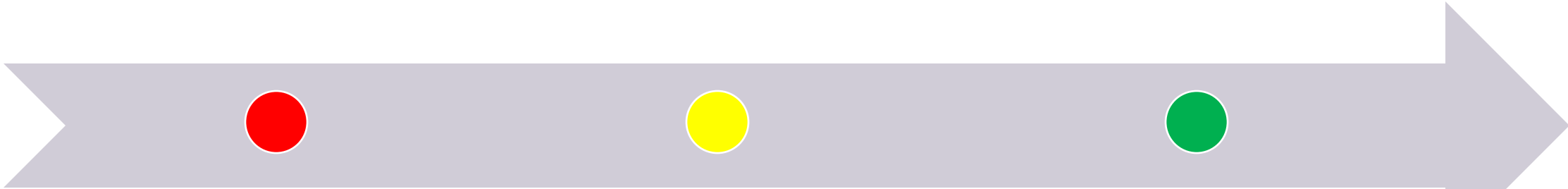
Mohile 2022

- Early detection
- Avoiding aggravating activities
- Pain free movement
- Individualised aerobic and strength-based program
- TLSO Brace



Mohile 2022

THE CONTINUUM OF BONE STRESS MANAGEMENT



Phase 1

Fracture Protection 6-8 weeks duration

- Protect bone stress lesion
- Create optimal healing environment
- Stop sport/activity
- Avoid repeated end range aggravating spinal position
- Bracing may be used

Phase 2

Protected Reloading 6-12 weeks duration

- Resolution of key clinical signs
- Advanced bone healing
- Lower impact activities
- Monitor adverse changes

Phase 3

Transition to Pre-Injury Function / Sport

- Symptom free
- Monitoring
- Radiological evidence of near complete bone healing (4-5 months)
- Mindful planning with gradual increase in training load

Kountouris 2018

BIOPSYCHOSOCIAL APPROACH

Cognitive Factors

- Thoughts towards pain

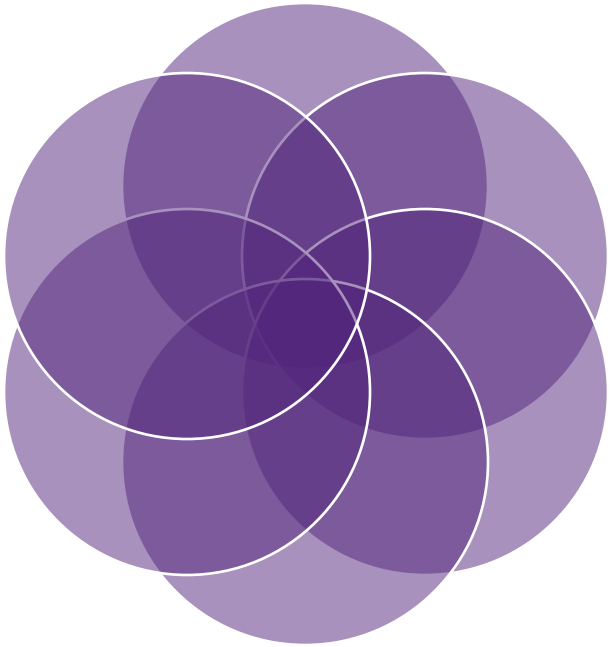
Lifestyle Factors

-Physical Activity

- Sleep

- Screen Time
- Smoking / Alcohol Use

- Diet
- Obesity



Social Factors

- Cultural
- Societal
-Exposure
- Environment

Emotional Factors

- Feelings

- Fear

- Anxiety
- Depression
- Aggression

Peer Pressure

- Coaches
- Parents
- Friends

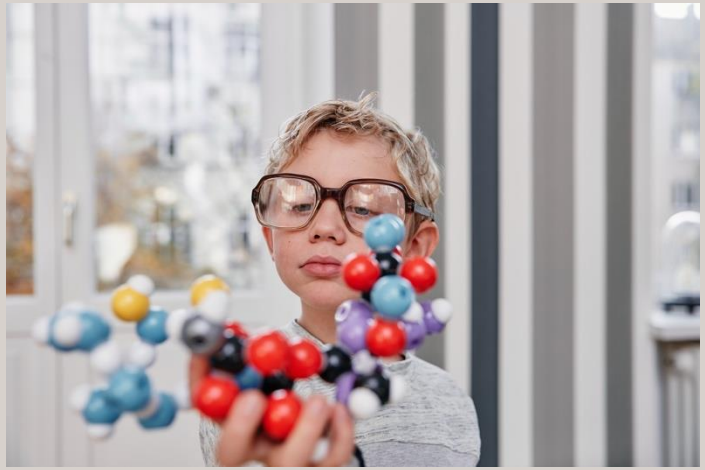
- Early Specialisation

- Self-Pressure

CBT Consideration

Frosch 2022, K O'Sullivan 2019

FUTURE RESEARCH



- FUTURE DIRECTION OF ADOLESCENT BACK PAIN
- NEED FOR HIGH QUALITY RESEARCH ON TREATMENT
- PRIORITISE PREVENTION

FROM PRESENTATION TO PRACTICE

- **EARLY DETECTION IS KEY FOR OPTIMAL OUTCOMES**
- **DETAILED ASSESMENT IS KEY**
- **USE OF IMAGING**
- **PATIENT CENTRED APPROACH**

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