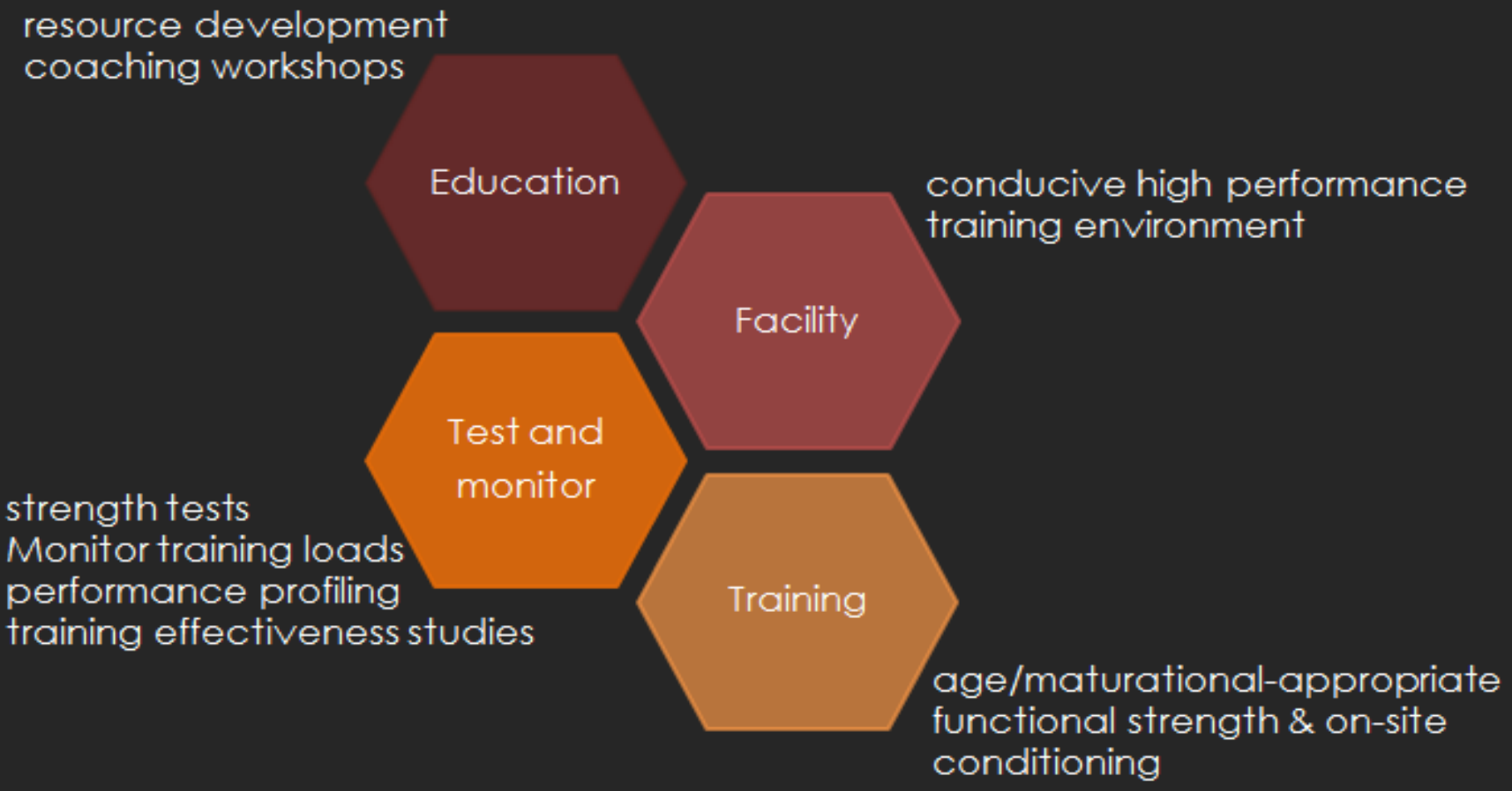
NATIONAL YOUTH SPORTS INSTITUTE

Sport Science Workshop
Strength & Conditioning

What do Strength and Conditioning Coaches do?



Youth Athletes

Support for RT

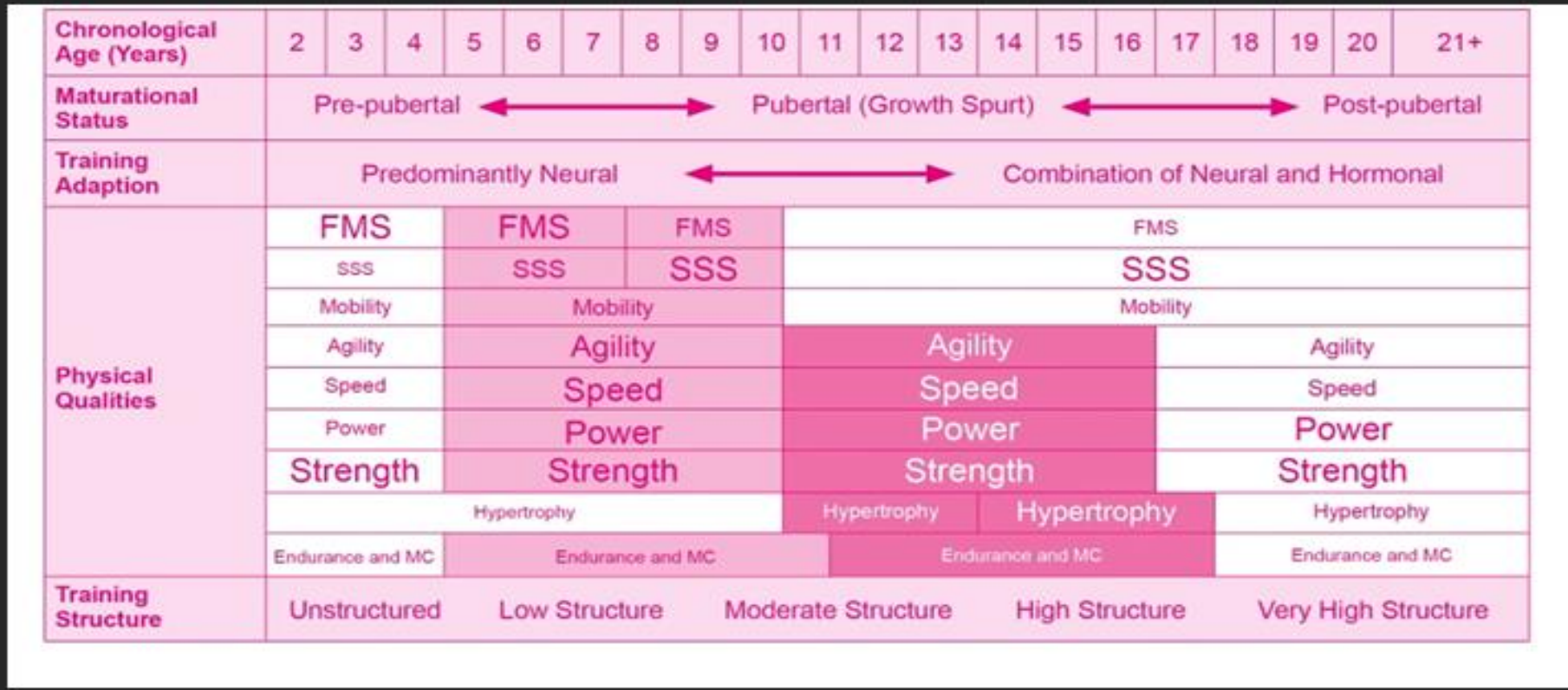
Controlled studies on RT and injury reduction

Reference	*n*	Subjects M/F	Subjects Age	Resistance training	Other training	Training duration	Results *
Heidt et al., 2000 (14)	EX = 42 C = 258	F	14–18	WT, PY, SC	CV, SA, FX	7 wk	DEC injuries in EX versus C
Hewett et al., 1999 (16)	EX = 366 C = 463 C = 434	F F M	HS	WT, PY	FX	6 wk	DEC injuries in EX versus C
Wedderkopp et al., 1999 (31)	EX = 111 C = 126	F	16–18	PR, PY		10 mo	DEC injuries in EX versus C
Hejna et al., 1982 (15)	EX = 232 C = 29	MF	13–19	WT	CV, SA	≤1 yr	DEC injuries in EX versus C†
Cahill and Griffith, 1978 (5)	EX = --- C = ---	M	HS	WT	CV, FX, SA	5–6 wk	DEC injuries in EX versus C

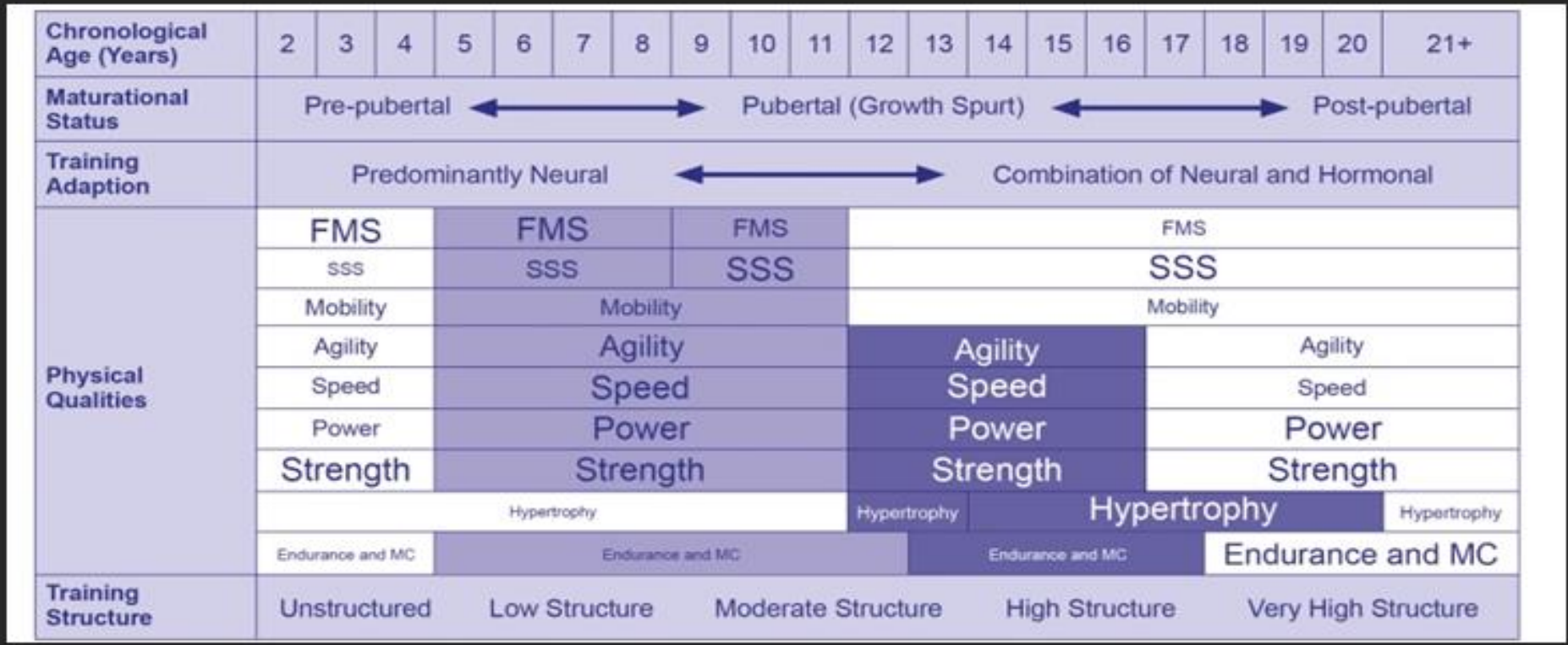
*Statistically significant unless otherwise indicated; †Descriptive observation.
EX = intervention group, C = control group, F = female, M = male, HS = high school students, WT = weight training, PY = plyometrics, SC = sport cord drills, CV = cardiovascular exercises, SA = speed and agility drills, FX = flexibility exercises, PR = proprioceptive training, DEC = decrease, --- = not reported. WK=weeks, MO=months, yr=year

National Strength and Conditioning Journal , 2004

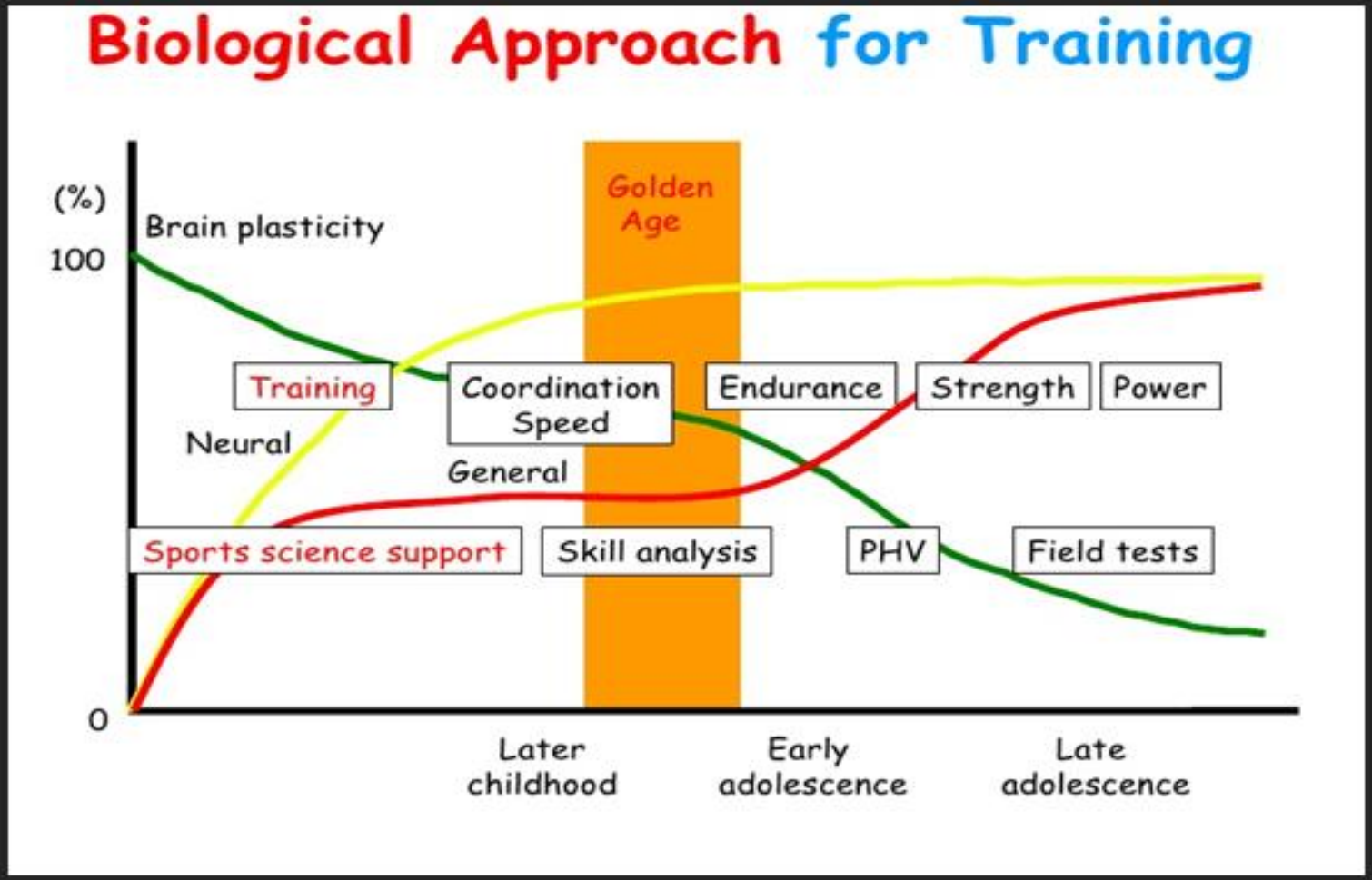
Youth Dev. Model (Female)



Youth Dev. Model (Male)



Youth Dev. Model



PRE-PUBESCENT TRAINING PROGRAMS

PROGRAMS	FOCUS	EQUIPMENT	INTENSITY
Level 1-2	•Bodyweight exercises and progressive variations •Develop speed, agility, quickness and proprioception • Joint and core stability •Circuit training / strength endurance / aerobic based •Competency based variations	medicine balls, Swiss balls, resistance tubes, jump ropes, mini hurdles, jump ropes, agility ladders, unstable surface variations	• low to moderate • 10+ repetitions • 2-3 day frequency • 1-2 minutes rest between sets • 3:1 T:R

PUBESCENT TRAINING PROGRAMS

PROGRAMS	FOCUS	EQUIPMENT	INTENSITY
Level 2-3	•Combination of unilateral + bilateral exercise variations •Progress to multi joint movements •Focus on weight training safety and correct lifting technique education •Introduce mechanical loading to improve strength development •Females: 2 Strength window after PHV + onset of menarche •Males: Strength window at PHV •Low to mod intensity plyometrics •Remaining to quadriceps ratio	Light free weights (examples include kettlebells, body bars, medicine balls), stack weight machines	• Moderate to High • 8-15 RM • 2-3 sets • 2-3+ Frequency • 1-2 minutes rest (dependent on exercise intensity) • 3:1T1 to 3D1 TUL

POST-PUBESCENT TRAINING PROGRAMS

PROGRAMS	FOCUS	EQUIPMENT	INTENSITY
Level 3-4	•Towards specific exercises and adult type training •Complex (Re and split routines Eg. Cleans and snatches) •Refine lifting techniques •Explosive, single leg jumps, un-anticipated changes of direction, game specificity + with good jump land mechanics •High intensity metabolic conditioning •Periodized training cycles	Power Platforms and heavier free weights (dumbbells and barbells)	• Training volume and intensity dependent on training goals and competitive calendar • Hypertrophy 10-12RM • Strength 4-12RM • Max Strength 0-6RM • Power 3-6RM

Adolescent growth and maturation: Assessments, injuries and strength training. J. Aust. Strength Cond. 24(2)70-94. 2016 © ASCA.

ADOLESCENT GROWTH AND MATURATION: ASSEMENTS, INJURIES AND STRENGTH TRAINING

Quintin Roman

INTRODUCTION

Age based competition where adolescents are commonly pitted to compete against others of the same age can no longer be seen as an "all's equal". Recent contentions have raised questions about age based relevance for participation in sport and training. These contentions are based on the co-existing age, growth and maturation variations.

Age measured by time (years or months) or chronological age (CA) based training has tremendous limitations. CA is a poor indicator of the physiological and growth changes in adolescents (10-18 years as defined by the World Health Organization). This makes CA based training and competition systems ineffective.

As Istvan Balyi famously put it "adolescence is not only a time of great growth potential but is also a time of great sensitivity and risk". A deeper understanding is therefore required to effectively plan safe training systems that complement adolescent's functional capabilities. This paper details a review of adolescent growth and maturation assessment indicators, associated injuries and outlines effective strength training structures.

WHAT IS GROWTH AND MATURATION?

Growth refers to the progression in the size and shape of the body, its organs and circulatory systems until adulthood is reached. Growth generally follows a definite sequence during puberty which generally starts from the outside in, from the hands and feet, the limbs (arms and legs) and spine. Lastly, the shoulders grow broader and chest expands for boys and hips and pelvis widen for girls. Although this growth sequence is fairly standard in all adolescence, the timing and rate of this sequence differs from person to person.

Maturation is the process whereby humans progress from childhood to adulthood. The timing and tempo of this process varies from individual to individual because we all have our own biological clocks. Specific maturational indicators suggest that there are gender differences in growth timing and tempo (35). In males, maturational ageing is reflected by the development of the genitals (penis and testes), volume of testes and pubic hair development. In females, maturational indicators are reflected in pubic hair, breast development and menarche or first period. Timing describes how chronological age corresponds with biological age, while tempo refers to the rate of how quickly children pass through their growth spurts to attain sexual maturity.

Strength and Conditioning Unit, Athletic Training Competencies

Movement/Action	Post-Puberty (Iron Eagles)		Puberty (Growing Grizzlies)		Pre-Puberty (Mighty Mites)
	Level 4 (Sec 3 & 4)	Level 3 (Sec 2 & 3)		Level 2 (Sec 1 & 2)	Level 1 (Sec 1)
	Primary Barbell	Associated Barbell	Dumbbell Assisted	Isolated	Bodyweight
Upper Body (Push)	Bench Press	Bench Press	Incline/Decline Press hammer/close grip	DB Bench Press (All angles)	Push-ups + variations
	Bar Dips	Bench Dips	DB Triceps Extension	DB Flyes	Unstable surfaces
	Military Press	Bench behind neck	DB Press	Triceps Push/Extension	Suspension systems
Upper Body (Pull)	Chins(pull-up)	Pull Down/Lats	DB Pullovers	Bicep curl	incline Pull-up
	Bent Rows	Seated Rows	DB/Machine Rows + Pulls	1-Arm	Pull-up (Static)
	High Pull	Upright Rows	DB Upright	1-Arm	Suspension systems
Lower Body (Push)	Squat (Back & Overhead)	Front Squat	DB Squats/Unstable surface	1-leg Squats	Squat & SAQ variations
	Lunge* (All angles)	Split Squat	DB Lunge	Leg Extension & Press	Split leg variations (Side/Forward)
Lower Body Pull	Deadlift	Romanian Deadlifts & Good-mornings	DB Hi-leg KB Swing	Back/Reverse Extensions Leg Curl	Isolandic Curl KB Deadlift
Abdominals & Low Back	Refer to Core Strength and Stability Manual	Refer to Core Strength and Stability Manual	Refer to Core Strength and Stability Manual	Refer to Core Strength and Stability Manual	Refer to Core Strength and Stability Manual
			Basic Power Exercises and Others		
Upper Body Push	Bench Throw (Smith Machine)		1-arm Throws (Medicine Ball)	Push-up variations Medicine Ball Throws	1-arm Throws (Small Ball)
Lower Body Push	Jump Squat (Free or Smith Machine)	Alternating Leg Jump Squats	Not more than 80 contacts All jumping/bounding Plyometric exercises	Not more than 80 contacts Lower Body Leg Push	Not more than 40 contacts Jumping and Landing
Whole Body Pull	Olympic Lifts & Progressive Variants	High Pull	Power Shrug/Tug-pull		Shuttle Run (SAFFA)
Whole Body Push	Push Press	Split Leg Push Press	DB Push Press		Sprinting Mechanics

Warm-up Routines

Help prepare athletes for training and competition.

Goal → Maximize sports performance, ↑ROM & ↓ injuries.

3 Key Components:

i Increase core body temperature.
ii Establish and improve ROM through dynamic drills.
iii Sport/training specific drills.

PRACTICAL SESSION