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CUET · PHYSICAL EDUCATION · CLASS XI · CODE 321

Measurement and Evaluation

CUET unit: Test, Measurement and Evaluation in Sports / Physical Fitness Components

By **UniDrill** · NCERT-grounded study material

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📌 Snapshot

- Defines the interrelated triad of **Test, Measurement and Evaluation (TME)** and shows why each is dependent on the other.
- Lists and explains tests for the five major physical fitness components: muscular strength, muscular endurance, flexibility, BMI and Waist-to-Hip Ratio (WHR).
- Provides procedural detail (procedure + scoring) for Push-up, Abdominal Curl, Squat Thrust, 1000 m Run/Walk, Sit and Reach Test.
- Gives WHO norms for BMI categorisation and WHR health-risk levels (men vs women).
- Introduces Sheldon's three **somato types** — Endomorph, Mesomorph, Ectomorph — with their physical characteristics and suitable sports.

📖 Detailed Notes

2.1 Core concepts

- Test, measurement and evaluation are **interrelated, interdependent and follow a continuous process**; no idea takes constructive shape without evaluation, which rests on measurement, which in turn requires an appropriate test (NCERT §What are Test⋯, p. 288).
- **Test** is a tool to obtain information about a person's knowledge, physical abilities, skill abilities, etc. — e.g., unit test, annual examination, fitness or body measurement (height, weight) (NCERT §Test, p. 288).
- **Measurement** can be quantitative, qualitative or both; it is the score/data in numerical or grading values obtained on the basis of an applied test (NCERT §Measurement, p. 288).
- **Evaluation** is interpreting the collected data to make a professional judgement of value/worth; it may be formative or summative and uses three steps — process education, objectives, learning experiences and change of behaviour, performed in sequence (NCERT §Evaluation, p. 289).
- The TME programme aids achievement, **diagnosis, prescription, improvement, classification, grading, motivation and prediction of performance** (NCERT §Evaluation, p. 289).

- Major physical fitness components measured in this chapter: (i) Muscular Strength — Push-ups, Abdominal Curls, Squat Thrust; (ii) Muscular Endurance — 1000 m run/ walk; (iii) Flexibility — Sit and Reach; (iv) BMI; (v) Waist-Hip Ratio (NCERT §Measurement and Evaluation of Selected Physical Fitness Components, p. 289).
- **Muscular strength** = ability of a muscle/group of muscles to overcome resistance; depends on cross-section of muscle, ratio of slow/fast twitch fibres, agonist–antagonist coordination, ATP & CP store, and psychic factors like anger, aggression, motivation (NCERT §Muscular Strength, p. 289).
- **Push-up test** measures upper-limb muscular strength and endurance; elbows go to 90°, body in straight line from head to ankles; score = maximum correct push-ups in given rate/time (NCERT §Push-up, pp. 290-291).
- **Abdominal Curl test** measures strength and endurance of abdominal muscles; supine with flexed knees and elbows, hands clubbed behind the head; score = number of curl-ups in specified time/rate (NCERT §Abdominal Curl, p. 291).
- **Squat Thrust test** measures muscular strength and endurance of the **lower body**; score = maximum successive squat thrusts performed in **1 minute** (NCERT §Squat thrust, p. 292).
- **Muscular endurance** = ability of muscles to perform muscular activity over a period of time; **slow twitch fibres** are responsible for endurance; sometimes called stamina (NCERT §Muscular Endurance, p. 292).
- **1000 m run/walk test** assesses cardio-vascular endurance; walking allowed; score = recorded time (in minute and second) to cover 1000 m (NCERT §1000 Metre Run or Walk Test, pp. 292-293).
- **Flexibility** = range of motion around the various joints; helps execute movement with less muscle tension (NCERT §Flexibility, p. 293).
- **Sit and Reach Test** measures flexibility of **lower back muscles and hamstring group** using a sit-and-reach box; score is recorded in **centimetres**; norms: Poor 15 cm, Fair 25 cm, Good 30 cm, Very Good 35 cm, Excellent 40 cm (NCERT §Sit and Reach Test, pp. 293-294).
- **BMI = Weight in Kg / (Height in metres)²**; expressed in kg/m²; WHO norms: <15 very severely underweight, 15–16 severely underweight, 16–18.5 underweight, 18.5–24 normal, 25–29.9 overweight, ⩾30 obesity (NCERT §BMI Calculation, p. 295).
- For children **2–20 years**, BMI is calculated by the same formula but interpreted via **percentile tables** for same sex and age: <5 percentile underweight, 5–85 normal, 85–95 overweight, >95 obese (NCERT §BMI Calculation, p. 295).
- **Waist-to-Hip Ratio (WHR) = Waist ÷ Hip**; indicates fat distribution and overall health risk; example: waist 76 cm, hip 97 cm → WHR = 0.78 (NCERT §Waist-to-hip ratio, p. 295).
- WHO WHR health-risk norms — Men: ⩽.95 low,.96–1.0 moderate, ⩾1.0 high; Women: ⩽.80 low,.81–.85 moderate, ⩾.85 high (NCERT §WHR table, p. 296).

- **Somato types** were developed by American Psychologist **William Herbert Sheldon in the 1940s**, named after the three germ layers — endoderm (digestive tract), mesoderm (muscle, heart, blood vessels), ectoderm (skin, nervous system) (NCERT §Somato Types, p. 296).
- **Endomorph**: pear-shaped body, rounded head, wide hips/shoulders, lot of fat; suited to power lifting, rugby, rowing; large lung capacity; gains/loses weight easily (NCERT §1. Endomorph, p. 297).
- **Mesomorph**: wedge-shaped body, cubical head, wide broad shoulders, muscled arms/legs, narrow hips, minimum fat; excels in strength, agility, speed sports (NCERT §2. Mesomorph, p. 297).
- **Ectomorph**: high forehead, receding chin, narrow shoulders/hips, narrow chest, thin arms/legs, little muscle and fat; dominates endurance sports and gymnastics; unsuitable for power/strength sports (NCERT §3. Ectomorph, pp. 297-298).

2.2 Definitions to memorise

Term	Definition	Page
Test	A tool to obtain information to determine specific characteristics or qualities of an individual regarding knowledge, physical abilities, skill abilities, etc.	288
Measurement	A score or data in numerical/grading values indicating the capacity or ability of an individual, obtained on the basis of an applied test	288
Evaluation	Process of interpreting the collected data to make professional judgement of value or worth	289
Muscular Strength	Ability of a muscle or group of muscles to overcome or act against resistance	289
Muscular Endurance	Ability of muscles to perform muscular activity over a period of time	292
Flexibility	Range of motion around the various joints	293
BMI	Weight in Kg divided by square of Height in metres (kg/m^2)	294-295
WHR	Ratio of circumference of the waist to circumference of the hip (W ÷ H)	295
Somato types	Three body types (Endomorph, Mesomorph, Ectomorph) developed by W. H. Sheldon in the 1940s	296
Endomorph	Pear-shaped, wide hips/shoulders, lot of fat; large lung capacity	297
Mesomorph	Wedge-shaped, broad shoulders, muscled limbs, minimum fat	297
Ectomorph	Narrow chest, thin limbs, little muscle and fat	297–298

Term	Definition	Page
Endoderm	Germ layer forming the digestive tract	296
Mesoderm	Germ layer forming muscle, heart, blood vessels	296
Ectoderm	Germ layer forming skin and nervous system	296
Sit-and-Reach box	Apparatus for measuring lower-back + hamstring flexibility	293
Push-up	Strength/endurance test for upper limb	290
Abdominal Curl	Strength/endurance test for abdominal muscles	291
Squat Thrust	Strength/endurance test for lower body — 1 min duration	292
Stadiometer	Instrument for measuring height precisely	295
Anthropometer	Body-measurement instrument used alongside the stadiometer	295
Cooper 12-min Run	Standard CV-endurance benchmark test (cross-reference for CUET)	(cross-ref)
Harvard Step Test	Standard cardiovascular fitness test (cross-reference)	(cross-ref)
AAHPER Youth Fitness	American battery of fitness tests (cross-reference)	(cross-ref)
Rikli & Jones Senior Fitness Test	Battery for older adults (cross-reference)	(cross-ref)

2.3 Diagrams / processes to remember

- **Fig. 9.1**: Good push-ups (above) vs bad push-ups (below) — body must be in straight line from head to ankles, elbows reach 90° (p. 290).
- **Fig. 9.2**: Abdominal curl test — supine position, flexed knees, hands behind head (p. 291).
- **Fig. 9.3**: Five steps of squat thrust — stand → squat → plank → squat → stand (p. 292).
- **Fig. 9.4**: 1000 metre run/walk test illustration (p. 293).
- **Fig. 9.5**: Sit and reach test (two phases) (p. 294).
- **Fig. 9.6 & 9.7**: Measurement of body weight on weighing machine, and height with anthropometer/stadiometer (pp. 294-295).
- **Fig. 9.8**: Three body types — Endomorph, Mesomorph, Ectomorph (p. 296).
- **Table 1**: BMI Calculation categories (p. 295); **WHR norms table** (p. 296); **Sit and Reach norms table** (p. 294).

2.4 Common confusions / NTA trap points

- Squat thrust measures **lower body** strength/endurance — students often confuse it with the push-up (upper body). Push-up = upper limb; Squat thrust = lower limb.
- The 1000 m run/walk test assesses **cardio-vascular endurance**, not pure muscular endurance — but it is listed under muscular endurance.
- BMI formula uses **height in metres squared**, NOT in centimetres. Trap: option giving "Weight ÷ Height² (in cm)".
- Sit-and-Reach norm scale: **Excellent = 40 cm / 16 in**, Poor = 15 cm / 6 in. Don't reverse the scale.
- WHR cut-off for women's low-risk is **⩽ 0.80** and men's is **⩽ 0.95** — these are easy to swap.
- Somato types are named after **germ layers** (endoderm/mesoderm/ectoderm), not body shapes. Mesomorph (mesoderm) → muscle/heart; Ectomorph (ectoderm) → skin/nervous system; Endomorph (endoderm) → digestive tract.
- Slow twitch fibres = endurance; fast twitch fibres ≠ endurance. Students mix this up.
- BMI for children **2–20 years** is interpreted via **percentile tables** for age and sex — NOT by the adult WHO bands. <5 = underweight, 5–85 = normal, 85–95 = overweight, >95 = obese.
- Squat thrust duration = **1 minute**; push-up score depends on rate/time set by tester.
- Endomorph → power-lifting/rugby/rowing; Mesomorph → speed/strength/agility sports; Ectomorph → endurance running/gymnastics.
- The TME triad — Test then Measurement then Evaluation. NTA may reverse the sequence in a stem.
- Sheldon was an **American psychologist**, not a physiologist or coach — exact attribution matters.

2.5 Key concepts table — fitness tests, norms and somato types

#	Test / concept	Component measured	Procedure / norm	Page
1	Push-up	Upper-limb muscular strength + endurance	Elbow to 90°; body straight; score = max correct in given time	290–291
2	Abdominal Curl	Abdominal strength + endurance	Supine, knees flexed, hands behind head; score = curl-ups in time	291
3	Squat Thrust	Lower-body strength + endurance	Stand → squat → plank → squat → stand; score = max in 1 min	292
4	1000 m Run/Walk			

#	Test / concept	Component measured	Procedure / norm	Page
		Cardio-vascular / muscular endurance	Cover 1000 m, walking allowed; score = time in min/sec	292–293
5	Sit and Reach	Flexibility — lower back + hamstring	Sit-and-reach box; score in cm	293–294
6	Sit and Reach norms	Poor 15 cm; Fair 25 cm; Good 30 cm; V.Good 35 cm; Excellent 40 cm	—	294
7	BMI formula	Weight (kg) / Height² (m²)	kg/m²	294–295
8	BMI norms (WHO)	<15 v severe; 15–16 severe; 16–18.5 under; 18.5–24 normal; 25–29.9 over; ⩾30 obese	—	295
9	BMI children 2–20	Percentile tables by sex/age	<5 under, 5–85 normal, 85–95 over, >95 obese	295
10	WHR formula	Waist ÷ Hip	—	295
11	WHR — Men	⩽.95 low;.96–1.0 moderate; ⩾ 1.0 high	—	296
12	WHR — Women	⩽.80 low;.81–.85 moderate; ⩾.85 high	—	296
13	Worked WHR example	Waist 76, Hip 97 → 0.78	—	295
14	Sheldon	American psychologist, 1940s, three somato types	—	296
15	Endomorph	Pear-shaped, wide hips/ shoulders, much fat	Power lifting, rugby, rowing	297
16	Mesomorph	Wedge-shape, broad shoulders, muscled limbs, min fat	Strength, speed, agility sports	297
17	Ectomorph	Narrow chest, thin limbs, little muscle/fat	Endurance running, gymnastics	297–298
18	Endoderm	Germ layer → digestive tract	(Endomorph base)	296
19	Mesoderm	Germ layer → muscle, heart, vessels	(Mesomorph base)	296
20	Ectoderm	Germ layer → skin, nervous system	(Ectomorph base)	296
21	Test	Tool to obtain info on knowledge/abilities	—	288
22	Measurement		—	288

#	Test / concept	Component measured	Procedure / norm	Page
		Score/data — quantitative/ qualitative/both		
23	Evaluation	Interpretation of data — formative or summative	—	289
24	TME uses	Diagnosis, prescription, classification, grading, motivation, prediction	—	289
25	Standard fitness tests referenced in PE	Harvard Step Test, Cooper's 12-minute run, AAHPER Youth Fitness Test, Rikli & Jones Senior Fitness	Cooper 12-min mirrors chapter's CV endurance approach	(cross-ref)

2.6 Extended discussion — TME architecture, fitness-test taxonomy, somato-type sport mapping

The intellectual spine is the **TME triad**. Test produces data; measurement converts that data into a score (numerical or graded); evaluation interprets the score against benchmarks to inform decisions about diagnosis, prescription, improvement, classification, grading, motivation and prediction. The three are interrelated, interdependent and continuous — a key one-liner CUET regularly converts into a stem.

The **fitness-test taxonomy** in this chapter is deliberately compact and CUET-friendly. The five components map onto five canonical tests: Muscular Strength (Push-up — upper limb; Squat Thrust — lower limb), Abdominal Strength + Endurance (Abdominal Curl), Muscular/CV Endurance (1000 m run/walk), Flexibility (Sit and Reach), Body Composition (BMI + WHR). For each test, examiners can ask three styles of question: (a) which component it measures, (b) procedural detail (body position, duration, scoring metric), and (c) norm interpretation (rating a given score). The own worked example — WHR = 76 / 97 = 0.78 — is the most likely numerical CUET stem because it provides a turnkey calculation already.

The **BMI block** has its own twin-rule architecture. For adults, WHO bands rule: under-18.5 = underweight; 18.5–24 = normal; 25–29.9 = overweight; ⩾ 30 = obese (with sub-bands above and below). For children 2–20, the same formula applies but interpretation shifts to age- and sex-specific percentile tables: < 5th = underweight, 5–85th = normal, 85–95th = overweight, > 95th = obese. CUET examiners exploit this duality by giving a child's age and asking which interpretation framework applies.

The **WHR block** has gendered cut-offs. Men: ⩽ 0.95 low risk, 0.96–1.0 moderate, ⩾ 1.0 high. Women: ⩽ 0.80 low risk, 0.81–0.85 moderate, ⩾ 0.85 high. The classic NTA trap is to swap gender bands or to invert the ratio (Hip ÷ Waist).

The **Sit-and-Reach norms** form a clean ascending scale: 15 / 25 / 30 / 35 / 40 cm = Poor / Fair / Good / Very Good / Excellent. Imperial equivalents (6 / 10 / 12 / 14 / 16 inches) sometimes appear in distractors.

Finally, the **somato types** are sport-aligned: Endomorphs (rounded, fat-storing, large lung capacity) excel at power-lifting, rugby, rowing — sports that reward mass and short bursts. Mesomorphs (wedge-shaped, muscular, low-fat) dominate sports needing strength + agility + speed (sprint, gymnastics, combat). Ectomorphs (narrow, thin, lean) dominate endurance sports (long-distance running, marathon, road cycling) and high-skill / low-mass sports such as artistic gymnastics. Pairing the germ-layer etymology with the dominant sport gives a single memory trace per type. CUET regularly tests atypical pairings — e.g. an endomorph attempting a marathon, or an ectomorph attempting power-lifting — and asks for the most suitable somato type.

🎯 Practice MCQs

📊 PYQ Alignment

This chapter is a high-yield CUET source: factual recall on the test–measurement–evaluation triad, the specific tests (push-up, squat thrust, abdominal curl, sit-and-reach, 1000 m run/walk), the BMI formula and WHO norms, the WHR formula with the 76/97 example, and Sheldon's three somato types appear repeatedly. Expect 1–2 calculation/norm-band questions (BMI category, WHR value, sit-and-reach rating) and 2–3 matching/statement-based questions on test–component pairing and somato-type characteristics.