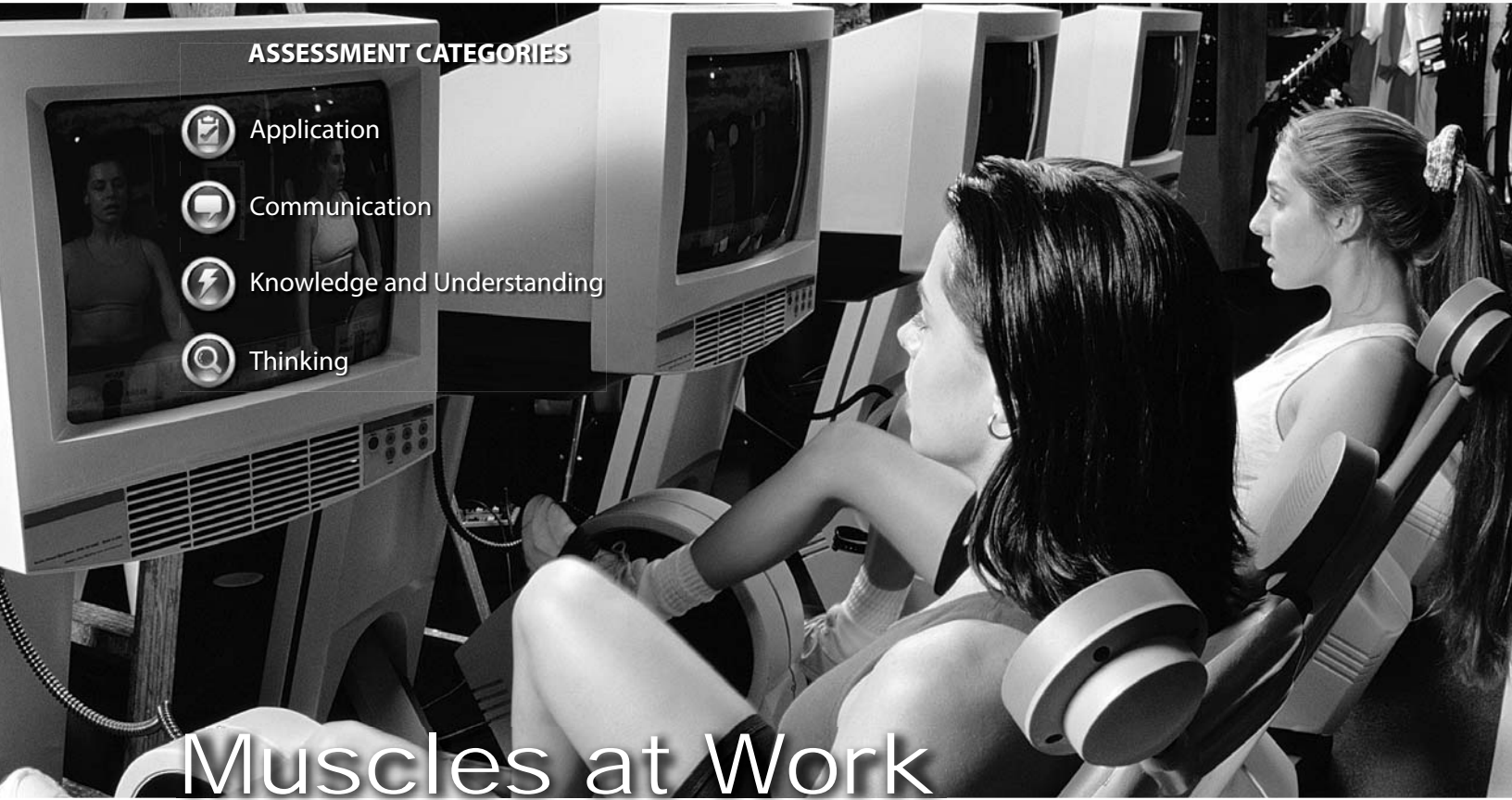


CHAPTER 5



Muscles at Work

Activities in this chapter:

.....

1 **Types of Muscle Contraction** 80
Key Terms and Definitions
Contract This!

2 **Factors Influencing Muscle Contraction** 82
Key Terms and Definitions

Graph the Relationships
Factors Affecting Muscle Contraction

3 **Check Your Understanding** 85

4 **Chapter Culminating Assignment** 87

1

TYPES OF MUSCLE CONTRACTION (Textbook pages 106–111)**1 Key Terms and Definitions**

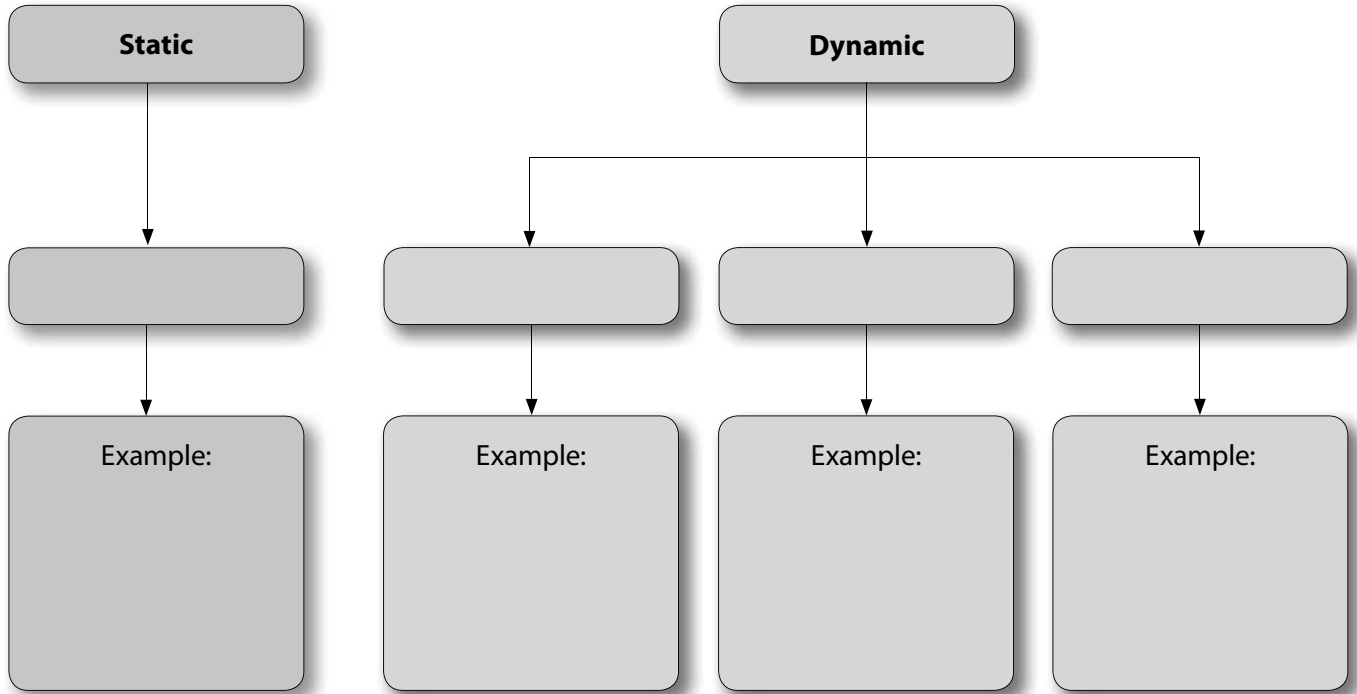
Define the key terms below in your own words.

Key Term	Definition
concentric contraction	
dynamic contraction	
eccentric contraction	
isokinetic contraction	
isometric contraction	
isotonic contraction	
plyocentric contraction	
static contraction	
submaximal static contraction	






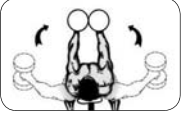




Contract This!

A. Complete the flow charts below, providing an example for each type of muscle contraction.



B. Identify the types of muscle contraction represented by each of the following activities.

Activity	Type of Muscle Contraction	Activity	Type of Muscle Contraction
			
			
			
			

2

FACTORS INFLUENCING MUSCLE CONTRACTION

(Textbook pages 111–120)



1 Key Terms and Definitions



Define the key terms below in your own words.

Key Term	Definition
apoptosis	
maximal (absolute) strength	
muscular endurance	
one repetition maximum (1RM)	
power	
relative strength	
repetition maximum (RM)	
sarcopenia	
speed–strength	
strength endurance	

3

CHECK YOUR UNDERSTANDING

**Multiple Choice**

- Which of the following statements regarding static contraction is **false**:
 - Maximal static contraction can occur in sports such as gymnastics and wrestling.
 - Most sport activities require low to submaximal static contraction.
 - Maximal static contraction is very common in most sports.
 - Flexing the arm against the resistance of a fixed bar is an example of static contraction.
 - None of the above.

Answer: _____

- Which of the following statements regarding isotonic contraction is **false**:
 - It occurs in exceptional cases, such as lowering an extremely heavy barbell at a slow and constant speed against maximal resistance.
 - In its pure form, it is rarely encountered in sports events.
 - It involves the muscle changing its length but not its tension.
 - It literally means “same speed.”
 - None of the above.

Answer: _____

- Which of the following is **not** a factor that affects a muscle's force and power output:
 - muscle length
 - joint angle
 - age
 - sex
 - none of the above

Answer: _____

- Which of the following statements regarding power is **true**:
 - It is often referred to as speed–strength.
 - It is desirable in sporting events such as the high jump.
 - It determines the speed of movement execution.
 - All of the above.
 - A and B only.

Answer: _____

- Which of the following statements regarding the relationship between maximal strength and power is **false**:

- The higher the external resistance to be overcome, the more important maximal strength is for power performance.
- The greater the proportion of maximal strength mobilized to perform the movement, the slower the movement occurs.
- The greater the maximal strength, the higher the movement acceleration.
- All of the above.
- None of the above.

Answer: _____**Fill in the Blanks**

Fill in the blanks for the following statements using words from the **word bank** below. Place the corresponding letter from the word bank in the blank spaces provided.

- _____ contraction occurs whenever the internal force generated by the muscle contraction results in movement.
- In _____ contraction, the neuromuscular system can work at a constant speed during each phase of movement against a preset high resistance.
- The main components of strength are _____, _____, and _____.
- The ability of an athlete to resist fatigue in strength performances of longer duration is known as _____.
- During maximal responses, the greater the FT fibre content of a muscle, the greater the force output, the _____ the overall speed of contraction, and the _____ the resistance to fatigue.

Word Bank

- | | | |
|---------------|-----------------------|----------------------|
| a. concentric | e. isometric | i. power |
| b. dynamic | f. lower | j. relative strength |
| c. greater | g. maximal strength | k. stamina |
| d. isokinetic | h. muscular endurance | l. static |

True or False

Indicate whether each statement is **true (T)** or **false (F)**. If the statement is false, provide the correct answer.

1. Isometric contraction occurs against a load that is beyond the capability of the muscle(s) to move.

Answer: _____

2. During a concentric contraction, extension usually occurs.

Answer: _____

3. The importance of maximal strength for an athletic performance decreases as the resistance that must be overcome in competition is reduced and as the period of competition decreases.

Answer: _____; _____

4. Strength training and increases in maximal strength lead to slowed muscle performance.

Answer: _____

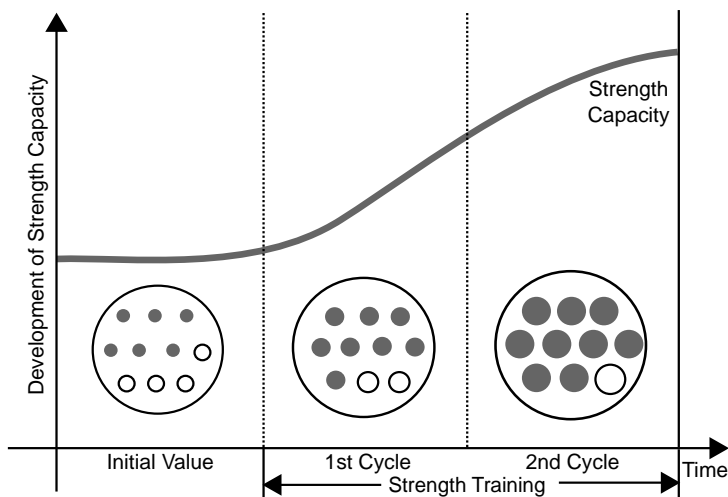
5. The process of preprogrammed death of muscle cells is called sarcopenia.

Answer: _____

Think and Link

1. Using an arm curl to provide examples, explain the difference between concentric and eccentric contraction.

2. Explain the figure below, and describe the relationship between FT muscle fiber hypertrophy and strength training.





Case Study: An Absolute and Relative Comparison



Pia, Michelle, Marco, and Paul decide to have a weightlifting competition on the bench press using a 150-pound barbell. Use the following information to determine and then compare their absolute (1RM) and relative muscle strength (pound for pound). Use information in Table 5.1 on page 117 to aid in your calculations.

Athlete	Athlete's Weight (lb)	No. of Repetitions	1RM or Absolute Strength (lb)	Relative Strength (lb)
Pia	119	1		
Michelle	172	3		
Marco	187	12		
Paul	220	16		

Define absolute strength. Who has the greatest absolute strength?

Define relative strength. Who has the greatest relative strength?

Describe two ways to increase relative strength.
