MODULE 3

Instrument Grasp

Module Overview

Module 3 introduces the modified pen grasp for holding a periodontal instrument. The correct instrument grasp—called the modified pen grasp—allows precise control of the working-end of a periodontal instrument, permits a wide range of movement, and facilitates good tactile conduction (allows the clinician to feel rough areas on the tooth).

Module Outline

Online resources for this module: Instrument Grasp
Available online.

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Key Terms

Modified pen grasp
Handle
Shank
Working-end
Joint hypermobility

Learning Objectives

- Given a variety of periodontal instruments, identify the parts of each instrument.
- Identify the fingers of the hand as thumb, index, middle, ring, and little fingers.
- Understand the relationship among correct finger position in the modified pen grasp, the prevention of musculoskeletal problems, and the control of a periodontal instrument during instrumentation.
- Demonstrate the modified pen grasp using precise finger placement on the handle of a periodontal instrument:
  - Finger pads of thumb and index finger opposite one another on the handle
  - Thumb and index finger NOT overlapping each other on the handle
  - Pad of middle finger rests lightly on the shank
  - Pad of middle finger touches the ring finger
  - Thumb, index, and middle fingers in a neutral joint position
  - Ring finger is straight and supports weight of the hand
- Describe the function each finger serves in the modified pen grasp.
- Define joint hypermobility and describe how hyperextended joints in the modified pen grasp can affect periodontal instrumentation.
- Recognize incorrect finger position in the modified pen grasp and describe how to correct the problem(s).
- Select the correct glove size for your own hands and explain how the glove size selected meets the criteria for proper glove fit.
- Understand the relationship between proper glove fit and the prevention of musculoskeletal problems in the hands.
- Perform exercises for improved hand strength.

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Section 1
Grasp for Periodontal Instrumentation

THE MODIFIED PEN GRASP

The modified pen grasp—as shown in Figure 3-1—is the recommended method for holding a periodontal instrument (1,2). The modified pen grasp facilitates precise control of the instrument as it moves over the tooth, allows the clinician to detect rough areas on the tooth surface, and lessens musculoskeletal stress to the clinician's fingers during periodontal instrumentation.

Figure 3-1. The Modified Pen Grasp. The right-handed clinician pictured here is using a **modified pen grasp** to hold a periodontal instrument.

PARTS OF THE PERIODONTAL INSTRUMENT

In order to master the modified pen grasp, the preclinical student must be able to identify the parts of a periodontal instrument (Fig. 3-2).

- **Handle**—the part of a periodontal instrument used for holding the instrument.
- **Shank**—a rod-shaped length of metal located between the handle and the working-end of a dental instrument. The shank generally is circular, smooth, and much smaller in diameter than the handle. The shank may be straight or it may be bent in one or more places.
- **Working-End**—the part of a dental instrument that does the work of the instrument. The working-end begins where the instrument shank ends. On a periodontal instrument the working-end may be shaped or flattened on some of its surfaces. The working-end could appear wire-like, look like a tiny ruler, or even be a small mirror. A single instrument may have one or two working-ends.

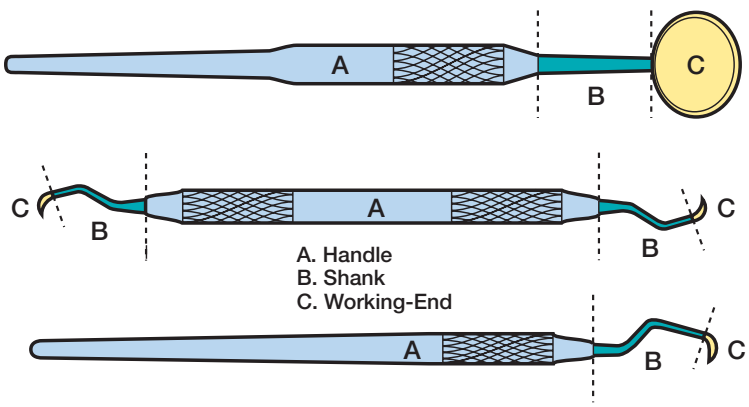

Figure 3-2. Parts of a Periodontal Instrument. The parts of a periodontal instrument are (**A**) the handle, (**B**) the shank, and (**C**) the working-end.

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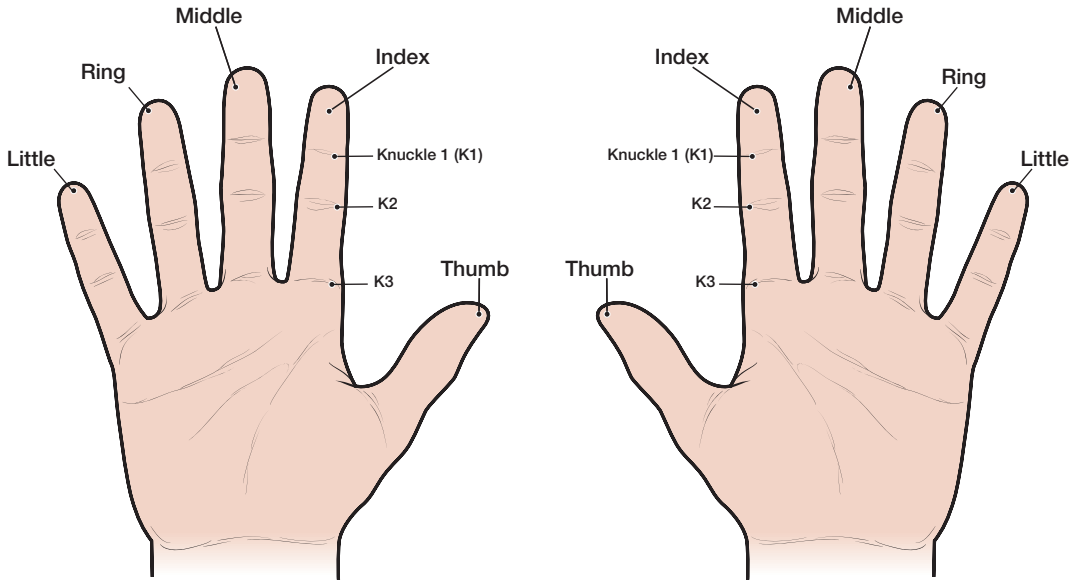
FINGER IDENTIFICATION FOR THE INSTRUMENT GRASP

The correct instrument grasp requires precise finger placement on the instrument (2–4). Figure 3-3 shows how the fingers of the hand are identified for purposes of the modified pen grasp. Table 3-1 outlines the placement and function of each finger in the instrument grasp.



A: Right-handed clinician. **B: Left-handed clinician.**

Figure 3-3. Finger Identification and Placement in Modified Pen Grasp. A: Right-handed clinician. **B:** Left-handed clinician.

TABLE 3-1. FINGER PLACEMENT AND FUNCTION

Digit(s)	Placement	Function
Index and Thumb	• On the instrument handle	• Hold the instrument
Middle Finger	• Rests lightly against the shank	• Helps to guide the working-end • Feels vibrations transmitted from the working-end to the shank (5)
Ring Finger	• On oral structure; often a tooth surface • Advances ahead of the other fingers in the grasp	• Stabilizes and supports the hand for control and strength
Little Finger	• Near ring finger, held in a natural, relaxed manner	• Has no function in the grasp

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SKILL BUILDING

Modified Pen Grasp: RIGHT-Handed Clinician

The correct grasp allows the clinician to achieve precise control of the working-end during instrumentation and reduce musculoskeletal stress to the hands and fingers (2–4,6).

Directions: Practice the modified pen grasp for the right-handed clinician by referring to the criteria labeled in Figure 3-4. Left-handed clinicians should refer to Figure 3-5.

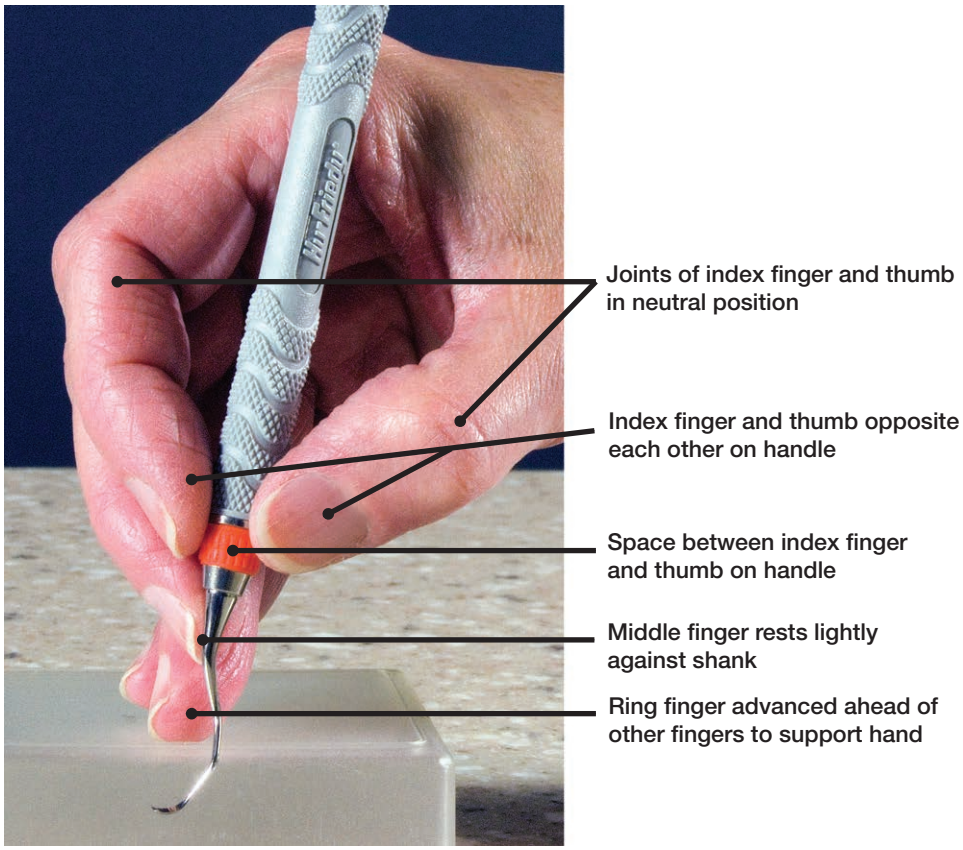

Figure 3-4. Modified Pen Grasp for Right-Handed Clinician. A side view of a right-handed clinician holding a periodontal instrument in a modified pen grasp.

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SKILL BUILDING

Modified Pen Grasp: LEFT-Handed Clinician

The correct grasp allows the clinician to achieve precise control of the working-end during instrumentation and reduce musculoskeletal stress to the hands and fingers (2–4,6).

Directions: Practice the modified pen grasp for the left-handed clinician by referring to the criteria labeled in Figure 3-5.

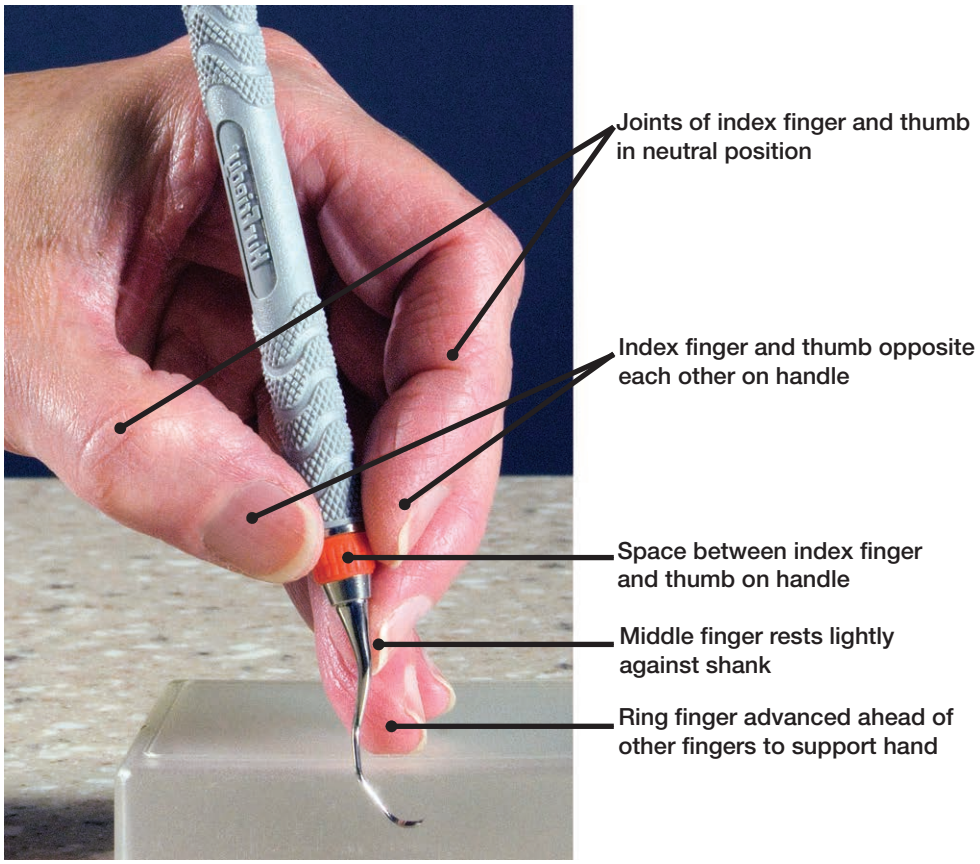

Figure 3-5. Modified Pen Grasp for Left-Handed Clinician. A side view of a left-handed clinician holding a periodontal instrument in a modified pen grasp.

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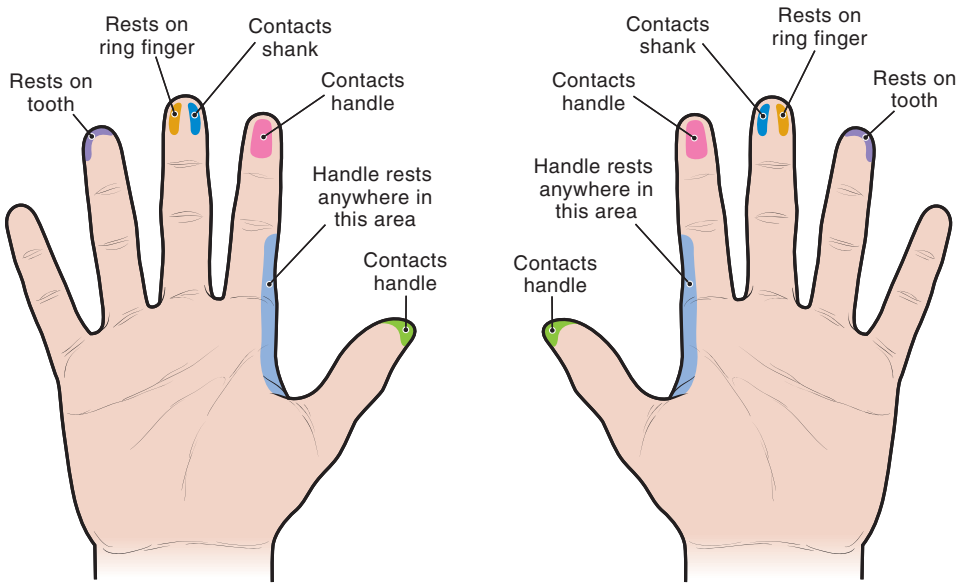
FINE-TUNING YOUR GRASP

Precise finger placement in the modified pen grasp is critical to successful instrumentation (Table 3-2). Note the finger placement for a modified pen grasp differs from that used when writing.

TABLE 3-2. SUMMARY SHEET: CORRECT FINGER PLACEMENT



Digit	Recommended Position
Thumb and Index Finger	• The finger pads rest opposite each other at or near the junction of the handle and the shank (2). • The fingers do NOT overlap; there is a tiny space between them (2). • The fingers hold the handle in a relaxed manner. If your fingers are blanched, you are holding too tightly. • The instrument handle rests against the hand anywhere between the second and third knuckles.
Middle Finger	• One side of the finger pad rests lightly on the instrument shank. The other side of the finger pad rests against (or slightly overlaps) the ring finger. • Not used to hold the instrument. You should be able to lift your middle finger off of the shank without dropping the instrument. If you drop the instrument, then you are incorrectly using the middle finger to help hold the instrument.
Ring Finger	• Fingertip of the ring finger—not the pad—balances firmly on a tooth to support the weight of the hand and a periodontal instrument. • When grasping a dental mirror, the ring finger may rest on a tooth or against the patient's lip or cheek area. • The ring finger of the dominant hand advances ahead of the other fingers in the grasp. It is held upright and rigid to act as a strong support beam for the hand. The finger should not feel tense, but it should not be held limply against a tooth. Fingernail length must not impede the ability to keep the ring finger upright and rigid.
Little Finger	• The little finger is held in a relaxed manner close to the ring finger.

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Section 2
Grasp Variations

IMPACT OF FINGER LENGTH ON THE GRASP

A clinician's finger length determines the location where he or she grasps the instrument handle and stabilizes the hand in the mouth. Figures 3-6 and 3-7 show two individuals with very different finger lengths.

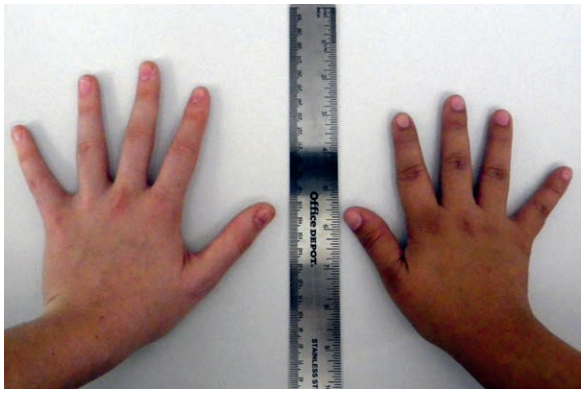
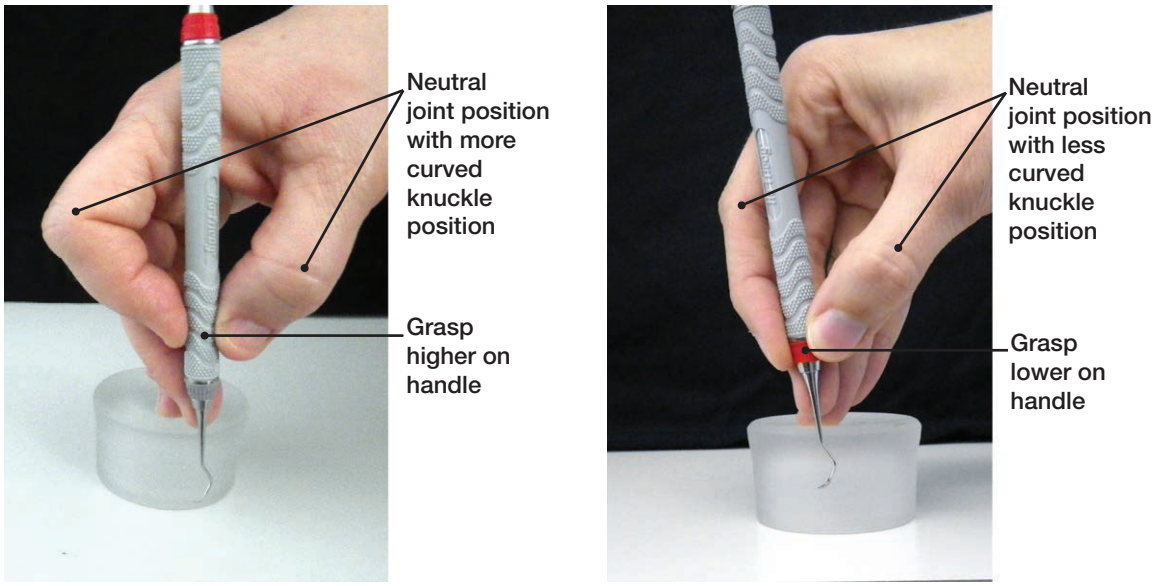


Figure 3-6. Finger Length. Hand size and finger length of clinicians varies greatly. Each clinician must adjust the finger rest and grasp according to his or her own unique hand size and finger length.



A: Short-fingered clinician. **B: Long-fingered clinician.**

Figure 3-7. Variations in Modified Pen Grasp. The exact position of the fingers in the modified pen grasp will vary slightly among clinicians. A clinician with shorter fingers will tend to hold the knuckles of the index finger and thumb in a more curved—knuckles up—position and grasp the instrument higher on the handle. A clinician with longer fingers might hold the knuckles of the index finger and thumb in a less curved—knuckles flat—position and grasp the instrument nearer to the junction of the handle and the shank. **A:** Short-fingered clinician. **B:** Long-fingered clinician.

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PROPER GLOVE FIT FOR PERIODONTAL INSTRUMENTATION

Proper glove fit is important in avoiding muscle strain during instrumentation. Gloves should be loose fitting across the palm and wrist areas of the hand (Fig. 3-8).

- Surgical glove-induced injury is a type of musculoskeletal disorder that is caused by improperly fitting gloves. Symptoms include numbness, tingling or pain in the wrist, hand, and/or fingers. This disorder is caused by wearing gloves that are too tight or by wearing ambidextrous gloves (Fig. 3-9).
- It is best to wear right- and left-fitted gloves rather than ambidextrous gloves that are designed to fit either hand. Ambidextrous gloves do not fit as well as fitted gloves, causing them to exert greater force on the hands. Tight ambidextrous gloves can produce significant and debilitating hand pain (7). Over time, this force could contribute to vascular constriction, nerve compression, muscle fatigue, and hand pain (7–9).
- Tactile sensitivity—touch perception—is enhanced when wearing thin gloves with a good fit in the fingertip area (10). Thin gloves may improve dexterity when performing tasks that require fine motor control, such as periodontal instrumentation.
- Nitrile gloves provide more grip friction than latex gloves when grasping periodontal instruments in the wet environment of the oral cavity (11). Gloves are available with texture on the fingertip area of the glove; texturing may help increase friction in the pinch grip.

Select a glove size that is loose fitting across the palm of the hand and wrist. Try gloves from several manufacturers to find the brand that fits best. Clinicians with long fingers need to find a brand that accommodates their finger length. Conversely, clinicians with shorter fingers should find a brand of gloves with fingers that do not hang over the fingertips.

Figure 3-8. Correct Glove Fit. Gloves should be loose fitting across the palm and wrist areas of the hand. The index finger of your opposite hand should slip easily under the wrist area of the gloved hand.

Figure 3-9. Incorrect Glove Fit. Gloves that are tight fitting across the palm and/or wrist area of your hand can cause muscle strain during periodontal instrumentation.

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Section 3
Predisposing Conditions for Hand Injuries

Physical conditions can be predisposing factors to hand pain and injury during periodontal instrumentation.

JOINT HYPERMOBILITY IN THE HAND

1. **Joint Hypermobility**
   a. Many people have flexible or loose joints. Their joints move farther and more easily than most people's joints. The medical term for joints that move too far is **joint hypermobility** or joint laxity. Figure 3-10 shows an individual with joint hypermobility.
   b. The term *double-jointed* often is used to describe hypermobility, however the name is a misnomer as the individual with hypermobility does not actually have two separate joints where others have just one (12).
   c. Experts estimate that 4% to 13% of normal children have hypermobile joints or joints that can move beyond the normal range of motion (13,14).
2. **Hypermobility and Proprioception**
   a. If everything is working properly, an individual can close his eyes and easily touch his nose. This act is possible because he can sense his body, as well as its position and movement through space. This ability is called **proprioception.**
      1. Proprioception includes the sense of position and movement of our limbs and trunk, the sense of effort, the sense of force, and the sense of heaviness.
      2. Proprioception works because of sensory receptors within muscles and joints.
   b. ***Studies show that individuals with joint hypermobility have reduced proprioceptive sensitivity in the joints of the hands*** (15,16).
      1. Decreased proprioceptive sensitivity may require greater power—tighter gripping—to hold something that is small or narrow.
      2. Muscles of the hand frequently are stressed in an attempt to compensate for joint instability (17,18).

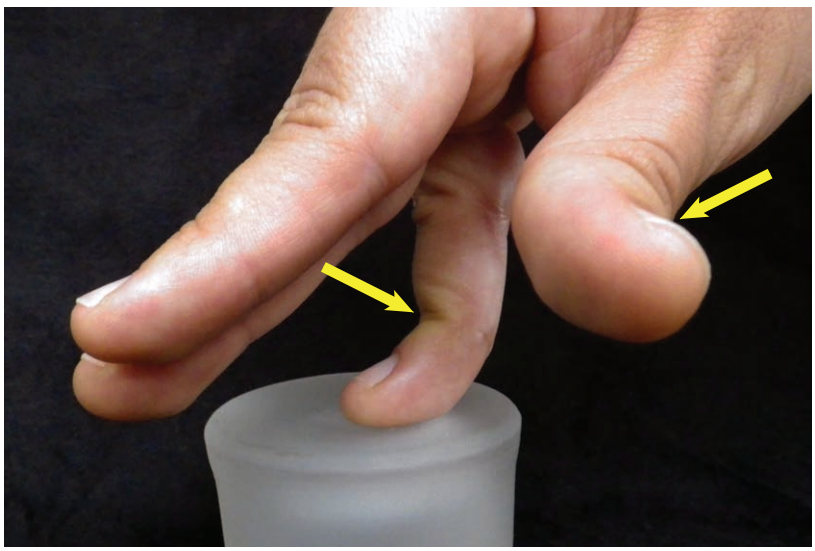

Figure 3-10. Joint Hypermobility of the Fingers. The individual pictured here has joint hypermobility allowing her to bend her fingers beyond the normal range of movement.

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3. **Periodontal Instrumentation and Hypermobility.** Clinicians may not know they have joint hypermobility as this condition usually is not disfiguring (19). It is important for the dental hygienist to recognize joint hypermobility because this condition may cause problems during periodontal instrumentation:
   a. Increased flexibility in the finger joints make the hands less stable and the muscles have to work a lot harder when using the hands to grip and manipulate objects (18).
   b. ***An individual with hypermobility must learn to grasp an instrument without having the joint of the thumb or index finger hyperextend with the joint "collapsed inward".***
      1. Since proprioceptive sensitivity may be reduced, the individual should take care not to grip the instrument handle with too much force.
      2. Retraining of the clinician's grasp may be helpful. ***The use of a Lycra or silicon sleeve, such as a Silipos sleeve, can assist with proprioceptive retraining while grasping the instrument handle*** (Fig. 3-11A–D) (20).
   c. In addition, performing periodontal instrumentation with the joints in a hyperextended position may cause injury to a hypermobile joint by overstretching it (21).
4. **Interventions**
   1. An orthopedic hand specialist should evaluate a clinician who experiences pain or weakness due to joint hypermobility. Physical therapy, as well as joint stabilizing devices that can be worn under surgical gloves, may be helpful (22). Brandfonbrener (23) comments that the use of ring splints helps to prevent joint hyperextension and to retrain proprioceptivity (perception) of finger position.
   2. Depending upon the extent of joint hypermobility and the number of fingers involved, a clinician may need to modify the finger placement in the grasp.

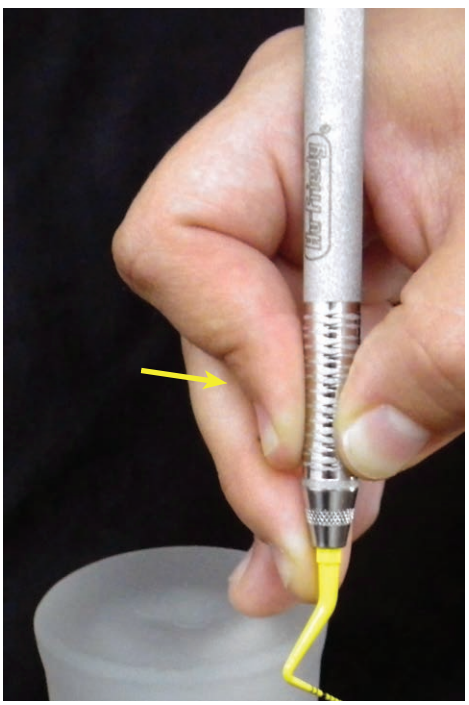

Figure 3-11. A: Joint Hypermobility in Grasp. Note how this clinician's index finger is hyperextended in the grasp. This hyperextension places stress on the joint.

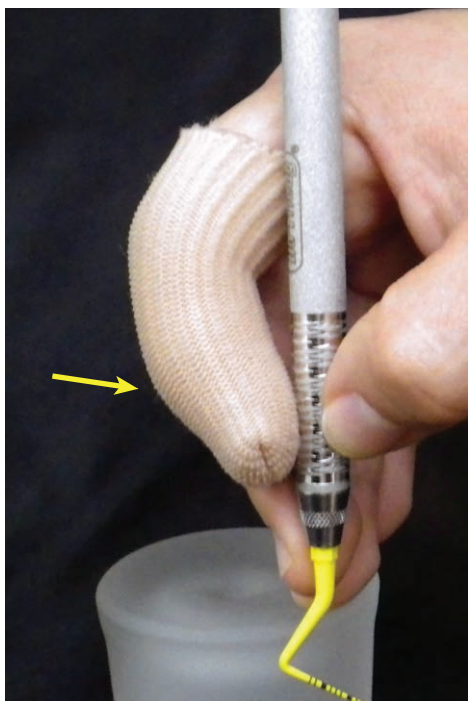

Figure 3-11. B: Grasp with Silicone Sleeve. The same clinician as pictured in **A** grasps an instrument while wearing a silicone sleeve.

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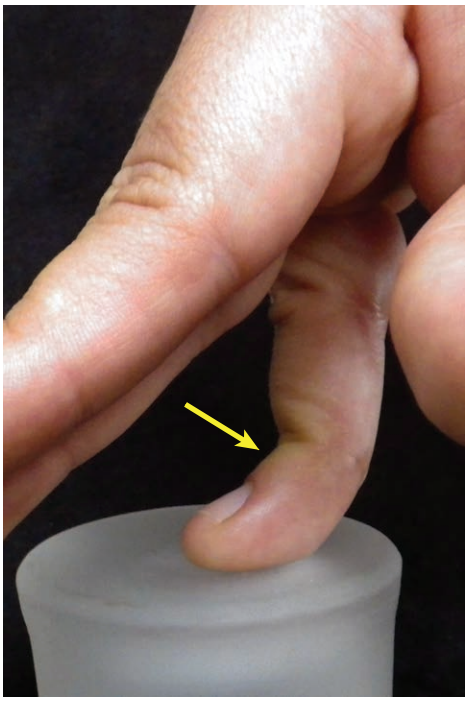

Figure 3-11. C: Joint Hyperextension of Ring Finger. When the clinician pictured here attempts to establish a finger rest with her ring finger, the joint hyperextends resulting in stress on the joint.

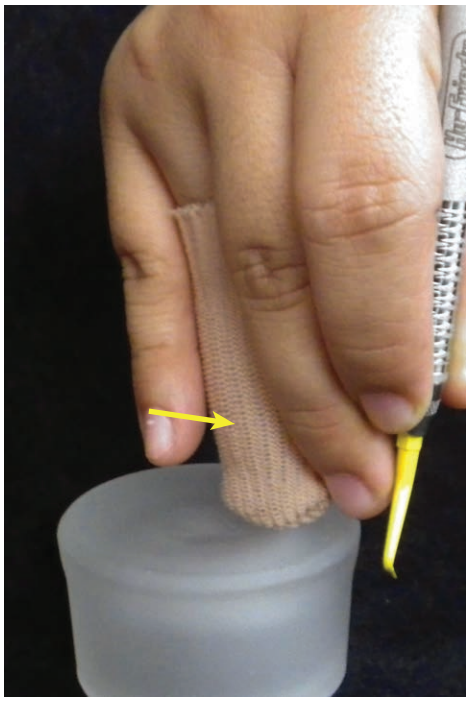

Figure 3-11. D: Finger Rest with Silicone Sleeve. The silicone sleeve is helpful to the clinician in training the joint of her ring finger. The silicone sleeve may be worn under surgical gloves during instrumentation.

ARTHRITIS

A condition less commonly seen in dental hygiene students is arthritis of the hands.

- Arthritis may cause the hygienist to reduce work hours or leave the profession. An orthopedic hand specialist or a rheumatologist can diagnose the type and severity of arthritis and recommend treatment and physical therapy.
- Employing ergonomic principles during periodontal instrumentation—especially those relating to grasp, grip force, and relaxation of grip force between strokes—can make a difference in whether the hygienist with arthritis can practice dental hygiene (19).

MUSCLE STRENGTH

Although anyone can have weak hands, hand weakness is most common in female clinicians with petite hands (24). The research literature indicates that hand size and optimal grip is correlated in women, but not in men, with small hand size (25).

- Orthopedic hand specialists assess muscle strength with a hand-held dynamometry device (24). Figure 3-12 shows an example of one type of dynamometer.
- Weak hand strength in a female clinician may contribute to pain associated with periodontal instrumentation.
- Hand strengthening exercises are beneficial for all clinicians but essential for those with poor hand strength (26,27).

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Figure 3-12. Dynamometer. A dynamometer is a device used to measure hand strength.

FINGERNAIL LENGTH

The research literature shows that long fingernails reduce hand strength and pinch force while performing psychomotor tasks.

- A study by Jansen et al. (28) tested the impact of fingernails not extending past the fingertips and with fingernails extending 2, 1, and 0.5 cm beyond the tip of the finger.
  - Analyses show that fingernails extending ***any length beyond the fingertips*** result in a decreased pinch grip strength.
  - Fingernails 1 or 2 cm in length result in decreased ability to manipulate the fingers and limited flexion of the finger joints, particularly the metacarpophalangeal joints.
- Longer fingernails also interfere with the clinician's ability to stabilize the dominant hand in the patient's mouth. Figure 3-13 depicts how long fingernails interfere with correct grasp and finger rest technique. Stabilization of the hand for periodontal instrumentation with a finger rest is discussed in Modules 5, 6, and 7.
- In addition to the ergonomic problems that long fingernails present, longer nails may pinch the soft tissues in the patient's oral cavity causing patient discomfort.

Figure 3-13. Long Fingernails and the Instrument Grasp. Fingernails that extend beyond the fingertips result in (1) reduced pinch grip strength, (2) decreased ability to manipulate the fingers, (3) decreased ability to stabilize the hand for periodontal instrumentation, and (4) patient discomfort during instrumentation.

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Section 4
Exercises for Improved Hand Strength

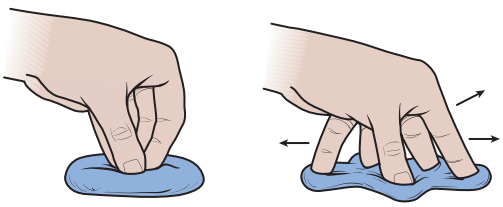
Well-conditioned hand muscles have improved control and endurance, allow for freer wrist movement, and reduce the likelihood of injury. Skilled finger movement training improves the ability to control finger-force, hand steadiness, and multi-finger coordination (26,27). The hand exercises shown here will help to develop and maintain muscle strength for periodontal instrumentation.

Directions: These exercises use Power Putty, a silicone rubber material that resists both squeezing and stretching forces. For each exercise illustrated, squeeze or stretch the Power Putty for the suggested number of repetitions. The exercise set, for both hands doing all nine exercises, should take no more than 10 to 20 minutes. When exercising, maintain your hands at waist level.

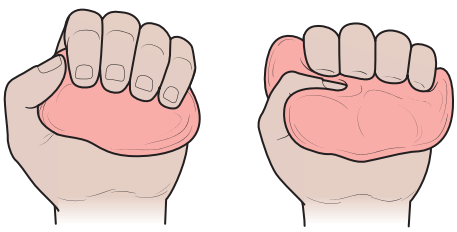
CAUTION: Not all exercise programs are suitable for everyone; discontinue any exercise that causes you discomfort and consult a medical expert. If you have or suspect that you may have a musculoskeletal injury, joint hypermobility, or arthritis, do not attempt these exercises without the permission of a physician. Any user assumes the risk of injury resulting from performing the exercises. The creators and authors disclaim any liabilities in connection with the exercises and advice herein.

1. **Full Grip (flexor muscles).** Squeeze putty with your fingers against the palm of your hand. Roll it over and around in your hand and repeat as rapidly and with as much strength as possible. Suggested Repetitions: 10

2. **All Finger Spread (extensor and abductor muscles).** Form putty into a thick pancake shape and place on a tabletop. Bunch fingertips together and place in putty. Spread fingers out as fast as possible. Suggested Repetitions: 3



3. **Fingers Dig (flexor muscles).** Place putty in the palm of your hand and dig fingertips deep into the putty. Release the fingers, roll putty over and repeat. Suggested Repetitions: 10



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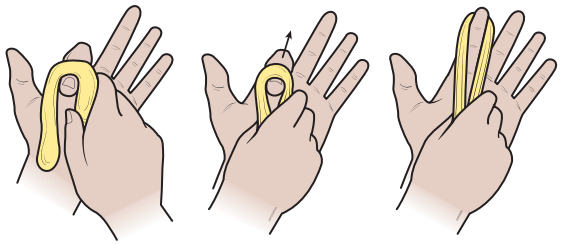
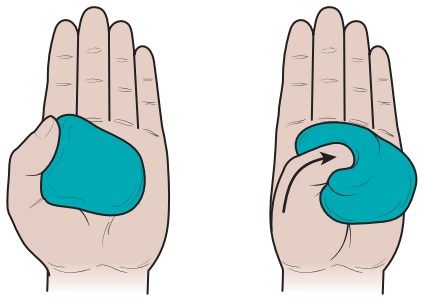
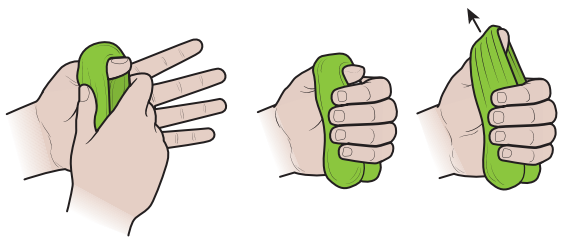
4. **Finger Extension (extensor muscles).** Close one finger into palm of hand. Wrap putty over tip of finger and hold loose ends with the other hand. As quickly as possible, extend finger to a fully opened position. Regulate difficulty by increasing or decreasing thickness of putty wrapped over the fingertip. Repeat with each finger. Suggested Repetitions: 3



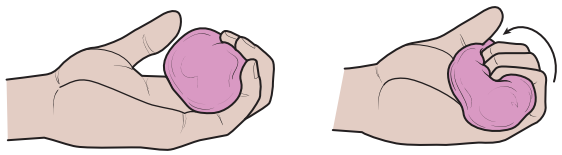
5. **Thumb Press (flexor muscles).** Form putty into a barrel shape and place in the palm of your hand. Press your thumb into the putty with as much force as you can. Reform putty and repeat. Suggested Repetitions: 5



6. **Thumb Extension (extensor muscles).** Bend your thumb toward the palm of the hand; wrap putty over the thumb tip. Hold the loose ends down and extend the thumb open as quickly as possible. Regulate difficulty by increasing or decreasing the thickness of putty wrapped over tip of thumb. Suggested Repetitions: 3



7. **Fingers Only (flexor muscles).** Lay putty across fingers and squeeze with fingertips only. Keep the palm of your hand flat and open. Rotate putty with thumb and repeat. Suggested Repetitions: 10



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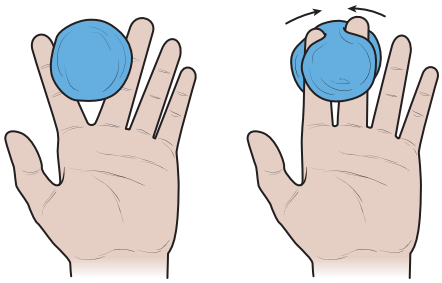
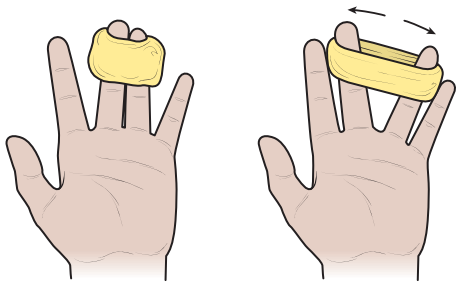


8. **Finger Scissors (adductor muscles).** Form putty into the shape of a ball and place between any two fingers. Squeeze fingers together in scissors-like motion. Repeat with each pair of fingers. Suggested Repetitions: 3



9. **Finger Splits (abductor muscles).** Mold putty around any two fingers while they are closed together. Spread fingers apart as quickly as possible. Repeat exercise with each pair of fingers. Suggested Repetitions: 3

Power Putty can be purchased in sport stores or directly from ***SportsHealth***, 527 West Windsor Road, Glendale, California 91204 USA, 818-240-7170; http://www.powerputty.com

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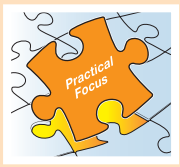
Section 5
Skill Application



PRACTICAL FOCUS
Evaluation of Modified Pen Grasp and Glove Fit

Directions, Part 1: Evaluate the modified pen grasps pictured in Figures 3-14 to 3-22. Indicate if each grasp is correct or incorrect. For each incorrect grasp element describe (1) what is incorrect about the finger placement and (2) what problems might result from the incorrect finger placement.


Figure 3-14


Figure 3-15

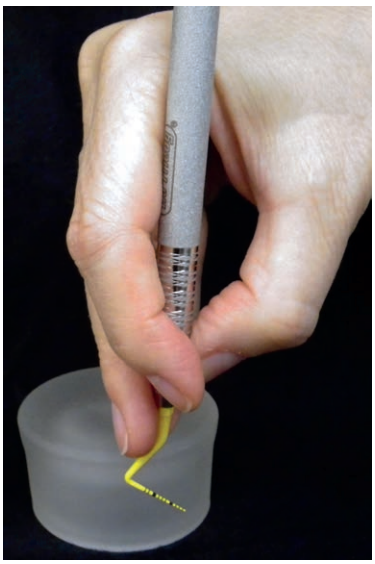


Figure 3-16


Figure 3-17


Figure 3-18

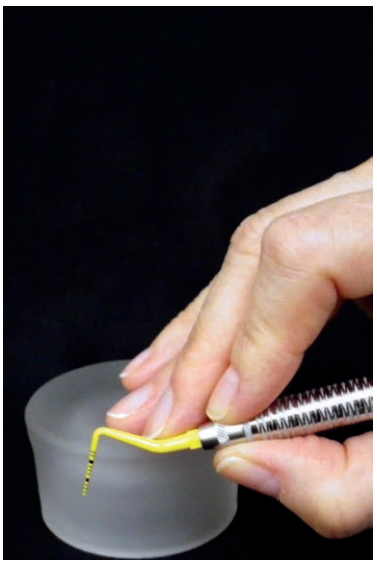


Figure 3-19

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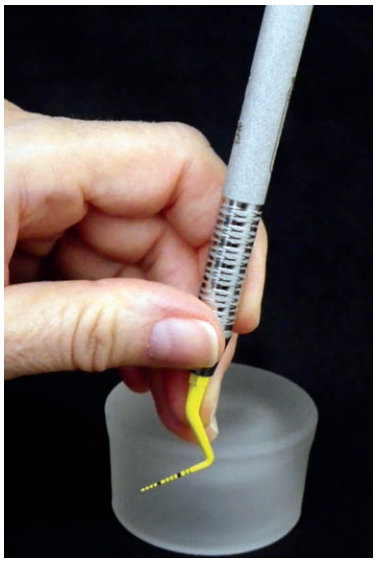

Figure 3-20

Figure 3-21

Figure 3-22

Directions, Part 2: Examine the gloved hands pictured in Figure 3-23. Evaluate the glove fit for the right and left hands pictured below.

Figure 3-23

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Student Self Evaluation Module 3: Instrument Grasp

Student: _____

Date: _____

1 = Grasp with mirror hand
2 = Grasp with instrument hand

DIRECTIONS: Self-evaluate your skill level as: **S** (satisfactory) or **U** (unsatisfactory)

Instrument Grasp: Dominant Hand	1	2
Identifies handle, shank, and working-end(s) of a mirror and periodontal instruments		
Describes the function each finger serves in the grasp		
Describes criteria for proper glove fit		
Grasps handle with tips of finger pads of index finger and thumb so that these fingers are opposite each other on the handle, but do NOT touch or overlap		
Rests pad of middle finger lightly on instrument shank; middle finger makes contact with ring finger		
Positions the thumb, index, and middle fingers in the neutral joint position; hyperextended joint position is avoided		
Holds ring finger straight so that it supports the weight of hand and instrument; ring finger position is "advanced ahead of" the other fingers in the grasp		
Keeps index, middle, ring and little fingers in contact; "like fingers inside a mitten"		
Maintains a relaxed grasp; fingers are NOT blanched in grasp		

NOTE TO COURSE INSTRUCTORS: To download Module Evaluations for this textbook, go to the Navigate 2 Advantage Access site and log on to access the Instructor Resources for *Fundamentals of Periodontal Instrumentation and Advanced Root Instrumentation*.

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