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Stick It: Kinesiotaping Applications To Augment Neuro-Interventions
REBECCA MARTIN, OTR/L, OTD, CKTP, CPAM

How to Make Your Patients into Happy Athletes.
Objectives

By the end of this course, the participants will be able to:
- Identify appropriate candidates for kinesiotaping
- List indications and precautions for treatment with kinesiotaping
- Recognize strategies to incorporate kinesiotaping into commonly used interventions
- Identify learning through interactive case studies

NOT Objectives

- Tape application for every muscle
  - Learn the principles
  - Pair with the anatomy you already know
- Discuss specific populations or diagnoses
  - KT is an impairment level intervention
  - Principles are applicable across diagnoses
- Review musculoskeletal assessment
Practice Poll

- Setting?
- Population?
- Experience with tape?

Activity in Neurorehabilitation

Why more is better and how taping might help...
A Paradigm Shift

Compensation ➔ Restoration

- Scientific evidence of activity-dependent plasticity in CNS
- Development and acceptance of rehabilitation interventions aimed at restoration (FES, LT)
- Patients pushing previous established limits and expectations

Patient Perspective: Not Good Enough

- Patients want to be near normal
- Specific environments/equipment can be limiting
- As demographic rehab skews younger, push for community integration
Repetitions in Traditional Rehab

- 312 therapy sessions in post-stroke rehab
- Average duration (min) 36 (±14)
- UE (functional movement) 32
- LE (functional movement) 6
- Gait (steps) 357
- Transfers 11

Lang et al., 2009

NOT ENOUGH!

“Amount of practice...is small compared with animal models...Current doses...during rehabilitation are not adequate to drive neural reorganization needed to promote function poststroke optimally.”

Lang et al., 2009
Impact of Long-Term Disuse and Compensation

- Overuse syndromes
  - Incidence of shoulder pain in SCI = 84%
  - Incidence of shoulder pain 1 year post stroke = 29%
- Pts. abandon equipment, resulting in caregiver burden
- Worsening disability: Learned non-use

Alm et al. 2008; Adey-Wakeling et al., 2015;

Train the Affected Limb

“[In rats,] behavioral experience with the less-affected forelimb early after unilateral [brain] lesions has the potential to increase disuse and dysfunction of the impaired forelimb, consistent with a training-induced exacerbation of learned non-use. These findings are suggestive of competitive processes in experience-dependent neural restructuring after brain damage.”

Allred, et al. 2005
Feasibility in In-patient Rehab

- 15 pts. with UE paralysis s/p CVA in IRF
- 4 days/week of individually tailored UE training
  - Ex: lifting cans to a shelf
  - Reaching, grasping, manipulating, releasing
  - >/=300 reps in 60 min
- 2 days/week of ADL training

Waddell et al., 2014

Massed Practice Does Not Inhibit Skill Acquisition

- 289 repetitions/session; 47min engaged
- Fatigue was a complaint, pain was not
- Sessions were not often missed
- Improvements in ARAT, grip/pinch strength, UE-FIM
  - Pts with various UE capacities could participate
  - Higher doses were associated with better outcomes
  - ADL retraining was not sacrificed.

Waddell et al., 2014
Don’t Let Bad Habits Persist

- Use it or lose it: Abhorrent patterns and compensatory strategies have to be overcome by rehabilitation
- Patients will figure out how to get things done (ex: tenodesis)
- Cortical reorganization responds to non-use as much as therapy
- The body learns what we teach it

TAPE SENDS YOUR HANDS HOME WITH THE PATIENT!
Kinesiotape Technology

- Cotton, latex free, elastic tape
- Heat activated, hypoallergenic, waterproof adhesive
- Wave pattern to promote breathability
- Designed to mimic skin
- Allows for multiday wear
Different Brands

www.theratape.com

Comparison to Other Tape Methods

<table>
<thead>
<tr>
<th>KT</th>
<th>Athletic Taping</th>
<th>McConnell Taping</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Elastic tape</td>
<td>- Rigid tape over prep</td>
<td>- Combination of rigid tape over mesh tape</td>
</tr>
<tr>
<td>- Allows normal ROM</td>
<td>- Limit or assist motion</td>
<td>- Mimics bracing to limit movement</td>
</tr>
<tr>
<td>- Application varies by desired effect</td>
<td>- Acute injuries or prevention</td>
<td>- Intended to correct pathology</td>
</tr>
<tr>
<td>- Worn 3-5 days</td>
<td>- Compressive force</td>
<td>- Limited wear time</td>
</tr>
<tr>
<td></td>
<td>- Worn for specific activity</td>
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</tbody>
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continued™
Indications for Taping

- Improve the localized effect of fluid circulation (blood and lymph)
- Re-educate the neuromuscular system through enhanced proprioception
- Improve joint range of motion and muscle strength
- Reduce inflammation and pain
- Prevent injury and provide anatomical support
Mechanism of Action

- Microscopically lift the skin
- Promote lymph drainage
- Expose mechanoreceptors, providing a low load, long duration cue
- Provides support and stability to muscles and joints
- Does not restrict range of motion
- Can be combined with other therapies

Systems Affected by KT

- Skin
- Fascia
- Lymphatic
- Muscle
- Joint
Skin, Fascia, and Lymph

Before Kinesiology Taping
- Skin
- Fascia
- Compressed pain receptor
- Compressed blood vessel
- Compressed lymph vessel
- Inflamed muscle

After Kinesiology Taping
- Uncompressed pain receptor
- Dilated blood vessel
- Dilated lymph vessel

Muscle and Joint
- Speed tissue recovery
- Relieve pain and reduce muscle guarding
- Correct muscular imbalances (length/tension, agonist/antagonist)
- Facilitate muscle function (increase ROM/strength and reduce fatigue)
- Support function of ligament and tendon
- Provide joint alignment
- Promote proprioceptive and kinesthetic awareness
Cutaneous Mechnoceptors

Image: http://classes.midlandstech.edu/carterp/Courses/bio110/chap09/chap09.htm

WHO

continued™
Everyone!

All ages, diagnoses, and populations.

Do a test strip in treatment area to test for tolerance.

Sample Applications

Neuro Populations
- Shoulder subluxation
- Upper Trap inhibition
- Pec relaxation
- Facilitation of wrist extension

Friends and Family
- Overuse and sports injuries
- Upper trap/Pec/Levator inhibition
- Support a pregnant belly
- SI joint correction
Precautions and Contraindications

Don't
- Over active malignancy
- Over active cellulitis or skin infection
- Over open wounds
- Over DVT

Maybe
- Diabetes
- Kidney disease
- CHF
- CAD
- PVD
- Fragile or healing skin
Chronic Low Back Pain
(Paoloni et al., 2011)

- Compared exercise alone, KT alone, and exercise + KT in 39 pts with chronic low back pain
- Pain, pain related disability, and flexion relaxation (sEMG) improved in all three groups
- KT provided immediate and short term pain relief and reduced abnormal paraspinal sEMG activity

Shoulder Impingement Syndrome
(Kaya et al., 2011)

- Compared KT application to standard PT in 55 pts with shoulder impingement
- KT group had improved rest and pain scores at 1 week, improved DASH scores at two weeks, but groups were equal at four weeks
- KT provides immediate improvements in pain and pain related disability. May be better option when time is limited.
Patellofemoral Pain Syndrome
(Akbas et al., 2011)

- Compared PT alone to KT+PT in 31 pts with PFPS
- Pain significantly improved in both groups
- Hamstring tension and ITB/TFL length improved in both groups, but three weeks faster in KT+PT group
- KT doesn’t increase effects of exercise in PFPS, but shows results faster

Pain and Sensory Dysfunction in Focal Dystonia
(Pelosin et al., 2013)

- Compared KT to ShamTaping in 26 pts with cervical or focal hand dystonia in a crossover control study
- KT group reported a subjective decrease in pain and an improvement in sensory discrimination. No change was observed in the sham group.
Acute Pediatric Rehabilitation
(Yasukawa, Patel, Sisung, 2006)

- Followed UE changes in response to KT intervention in 15 children in IRF
- Encephalitis, brain tumor, cerebral vascular accident, traumatic brain injury, and spinal cord injury
- All children showed improvement in UE function (Melbourne), suggesting that KT as an adjunct to therapy may be helpful
Taping Terminology

- Target tissue: The structure you are looking to treat
- Anchor: Beginning of tape application, applied with NO tension
- End: Last part of tape laid down, applied with NO tension
- Therapeutic zone: Area between the anchor and end, which causes effect to target tissue
Tape Cuts
Choose cut based on shape of target tissue

Tension Guidelines
- Whenever possible, apply tape to stretched tissue
- Never put any tension in tape anchor or end
- Err on the side of less
- Too much tension may cause skin irritation
- Tape is applied to paper with 10-15% tension

INHIBITION
FACILITATION
CORRECTION
Application Guidelines: ALWAYS

- Assess, tape, re-assess
- Tape for pain and causes of pain
- Inspect, clean, and dry skin prior to application
- Anchor to skin in neutral position
- Apply therapeutic zone with target tissues in lengthened position
- Avoid tension in anchor and end
- Rub to activate adhesive
- Apply 30 minutes prior to vigorous activity or swimming
- Educate patients on indications, expectations, and precautions

Application Guidelines: NEVER

- Blow dry tape
- Attach to the nape of the hair, through axilla or groin
- Leave tape on if itching, mottled erythemia, or increased pain is noted
- “Pull” joint into position with tape
- Avoid touching adhesive prior to placement on skin
- Attempt multiple applications with same piece of tape
Inhibition Concept

- **Goals:**
  - Rest overused muscles, acute conditions, muscle spasm
  - Restore muscle balance
  - Increase muscle length (low load, long duration)
- **Technique:**
  - Apply tape distal insertion to proximal origin of muscle, in lengthened position
  - 15-25% tension
  - Tape recoils toward anchor, pushing insertion away from origin
Upper Trap Inhibition

Anchor at insertion (distal acromion).

With head flexed away, stretch tape and adhere superior to spine of scapula. End tape with no tension.

Repeat with other tail along upper border.

Upper Trap Inhibition Con’t

Aim to end at the mastoid process, with no tension.

Rub to activate adhesive.
Facilitation Concept

- Goals:
  - Facilitate weak muscles, chronic conditions
  - Support healing muscles, acute conditions
  - Correct over stretched muscle

- Technique:
  - Apply tape proximal origin to distal insertion of muscle, in lengthened position
  - 20-40% tension
  - Tape recoils toward origin, pulling insertion to origin
Ext. Digitorum Facilitation

Anchor tape to proximal forearm, no tension

With wrist/fingers in flexion, pull tape tails to each finger tip

Rub to activate adhesive on each tail

Ext. Digitorum Facilitation Con’t

Repeat to remaining fingers

Wrap tails of tape over fingers to improve adhesion

Non-therapeutic tape may be applied to improve adhesion with no tension
Deltoid Facilitation

- I-strip
- Y-strip

Abdominal Facilitation

- Adhere tape bottom rib to ASIS
- Can try X (rib to contralateral ASIS) for additional support
Mechanical Correction Concept

- **Goals:**
  - “Positional Hold”: Positional stimulus to influence a desired resting position, discourage pathological movement
  - Full AROM is maintained
  - Circulation is maintained

- **Technique:**
  - Apply tape around joint with inward, downward pressure
  - 50-75% tension
Scapular Depression Mechanical Correction

Apply anchor perpendicular to upper trap, superior to scapula.

Stretch tape (50+%) and adhere in the direction of depression and retraction.

End tape at or just medial to inferior angle with no tension.

Glenohumeral Mechanical Correction: Part 1

Anchor on lateral pec.

With arm in external rotation, stretch and wrap tape around humeral head.

Anchor medial to axilla, inferior to spine of scapula.
Glenohumeral Mechanical Correction: Part 2

Split paper backing in the middle of the strip, fold back paper to expose adhesive.

Apply over AC joint with downward pressure.

Apply tails with no tension.

Functional Correction Concept

- **Goals:**
  - “Spring assist”: Provide sensory cue to assist or limit motion
  - Prevention of tissue overstretch, joint hyper-mobility
- **Technique:**
  - While muscle is in shortened range, anchor distally with no tension
  - Apply through therapeutic zone with 50+% tension, creating a “tent”
  - End proximally with no tension
  - Holding anchor/end, move muscle into lengthened range, and adhere
Wrist Extension Functional Correction

Anchor on dorsum of hand with no tension.

With wrist in extension, stretch (50+%) tape to end at ms. origin.

Move wrist into flexion and adhere.

Thumb Opposition Functional Correction

Start with Y-strip, with long tail.

Wrap split tails distal to the IP with no tension.

With thumb in opposition, stretch tape across to hypothenar eminence. End on the dorsum of the hand.
Thumb Opposition Con’t

Move thumb into extension.
Rub to adhere tape.
Finished!

Space Correction Concept

- Goals:
  - “Lifting”: create recoil and lift over target tissue
  - Decrease pressure on target tissue
- Technique:
  - 10-35% tension in center of tape
  - I-strip, ex: carpal tunnel
  - Star (3-4 I-strips), ex: SI joint
  - Donut hole, ex: lateral epicondylitis
Carpal Tunnel Correction

1. Button hole to relax wrist flexors
2. I-strip for special correction over carpal tunnel

Put fingers through button holes, anchor on dorsum of hand. Stretch tape (20%) to proximal forearm.
End at muscle origin with no tension.

Carpal Tunnel Con’t

Split paper backing in middle, exposing adhesive. Stretch tape (50%) and affix over carpal tunnel.
Apply tails with no tension.
Dorsal view
Fascial Correction Concept

**Goals:**
- "Oscillating Tissue": Unwind or direct movement of fascia
- Move tape side to side through therapeutic zone

**Technique:**
- Use cut that matches target tissue shape
- Apply anchor with no tension
- With muscle in lengthened range, stretch tape across target tissue and oscillate while laying it down
  - Superficial fascia: 10-25%
  - Deep fascia: 25-50%
- End tape with no tension

Circulatory/Lymphatic Correction

**Goals:**
- "Channeling": directional pull of tape allows fluid to flow to less congested areas through superficial lymphatic pathways
- Hematoma evacuation, lymph drainage

**Technique:**
- Anchor proximally, near healthy lymph node
- Apply fan cut over congested area with 10-20% tension
Circulatory Application

Summary Guidelines

<table>
<thead>
<tr>
<th>Type</th>
<th>Direction</th>
<th>Tension</th>
<th>Recoil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibition</td>
<td>Insertion to Origin</td>
<td>15-25%</td>
<td>Distally</td>
</tr>
<tr>
<td>Facilitation</td>
<td>Origin to Insertion</td>
<td>20-40%</td>
<td>Proximally</td>
</tr>
<tr>
<td>Functional Correction</td>
<td>Insertion to Origin in shortened position</td>
<td>30-50% adhered in lengthened position</td>
<td>Proximally</td>
</tr>
</tbody>
</table>

The greater the tension, the longer the anchor.
Combining Techniques and Layering

Shoulder Impingement
1. Inhibit deltoid
2. Inhibit supraspinatus
3. Mechanical correction

Frozen Shoulder
1. Inhibit subscapularis
2. Inhibit deltoid
3. Facilitate supraspinatus
4. Facilitate coracobrachialis
5. Inhibit pec minor

Shoulder Approximation
1. Facilitate deltoid
2. Facilitate supraspinatus
3. Mechanical correction to reduce humeral head

Helpful Tips
- Avoid touching exposed adhesive
- Hold anchor when stretching tape to prevent spread
- Remove tape proximal to distal
- Use Milk of Magnesia under tape if skin irritated
- When applying multiple strips, apply in order of tension
  - Least tension first, most tension last
  - Can remove more irritating pieces without losing everything
- Tension >50% does not lift skin
RULE BREAKING

Tape applications for tone management and sensory disturbances

EDF Taping

- Increases sensory input
  - Normalizes afferent input
  - Brain changes?
- Increases capillary/lymph flow
  - Encourages hydration and fluid exchange
  - Encourages tissue mobility
EDF Guidelines

<table>
<thead>
<tr>
<th>Target Tissue</th>
<th>Direction</th>
<th>Tension</th>
<th>Width (Tails from 2 in. I-strip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
<td>D to P</td>
<td>0-5%</td>
<td>1/4” (8)</td>
</tr>
<tr>
<td>Dermis</td>
<td>P to D</td>
<td>5-10%</td>
<td>1/3” (6)</td>
</tr>
<tr>
<td>Fascia</td>
<td>Depends on goal</td>
<td>10-15%</td>
<td>1/2” (4)</td>
</tr>
</tbody>
</table>

EDF Taping
Scar Management

- Apply with >50% tension in line with scar to encourage flat linear collagen formation
- Apply short strips in “stiff” direction to simulate cross friction massage and break adhesions
- Appropriate for later phase healing (2-4 weeks post closure)

Case Studies

continued
Case Study: Joe

- 45 year old, right handed male diagnosed with Complex Regional Pain Syndrome secondary to Neuromyelitis Optica
- Symptoms include pain, weakness, lack of coordination throughout (R)UE
- Goals:
  - Decrease pain
  - Increase grip strength to open containers
  - Increase shoulder range of motion
Case Study: Sam

- 64 year old, right handed male diagnosed with incomplete central spinal cord injury secondary to fall from bicycle (C3 AIS D)
- Symptoms include right rotator cuff tear, left ulnar nerve compression, balance impairment, bicipital tendonitis, and left ear hearing loss
- Goals:
  - Decrease shoulder pain
  - Increase bilateral grip strength to open containers
  - Increase independence
What would you do?