



Objectives for Article Critique

- Identify the difference between a simple movement and a proprioceptive task.
- Explain blood oxygenation level-dependent (BOLD) contrast detected through functional magnetic resonance imaging (fMRI).
- Identify differences in brain activity with and without patellar taping.
- Assess whether the study (using healthy participants and simple taping) has application to clinical practice.

Research Article Critique:

**Research Report:
Effects of Patellar Taping on Brain
Activity During Knee Joint
Proprioception Tests Using Functional
Magnetic Resonance Imaging**

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Simple vs. Proprioceptive Task

- All movements of the body send messages to the brain about body position through muscles, tendons and joints, this is called proprioception.
- This study refers to a proprioceptive task as the movement from resting at 40 degrees of knee flexion to extending the knee to 20 degrees.
- It refers to a simple task as the movement from resting at 40 degrees of knee flexion to extending the knee completely.
- The difference was conscious decision making by the participants in order to accurately achieve the movement from 40 to 20 degrees of flexion.

Objective of the study

The purpose of this study was to investigate the sensory input hypothesis using functional magnetic resonance imaging when taping was applied to the knee joint during a proprioception task.

Participants

8 healthy males who are right leg dominant, were not participating in any special training or sports, and had no abnormalities of the lower extremities.

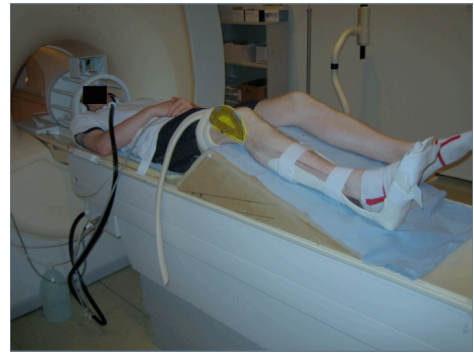
The Taping

Patellar taping was done with the knee in full extension, the tape was applied without tension with the center as close to the center of the patella as possible and the medial and lateral edges aligned with the medial and lateral joint lines. The tape length measuring 50% of the total circumference of the knee.



Positioning

The participants were positioned supine in the scanner with their leg supported with 40 degrees of knee flexion and 45 degrees hip flexion. Their head was strapped down, hips were also strapped down. The ankle, foot, and toes were held in neutral by a molded cast. A universal goniometer was aligned from greater trochanter to lateral malleolus through the joint line.



fMRI

This study used functional magnetic resonance imaging (fMRI) which is able to map active areas of the brain by determining where blood flow has increased.

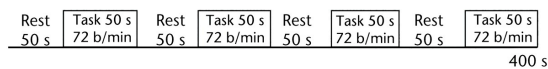
The term blood oxygenation level-dependent (BOLD) is used. A positive BOLD response is an increase in activity shown by an increase in oxygenated blood to the area. A negative (BOLD) response is a decrease in activity seen through a decrease in oxygen rich blood in the area.

Scans

Each participant had four scans done:

1. Simple task without tape
2. Proprioceptive task without tape
3. Simple task with tape
4. Proprioceptive task with tape

Each of these consisting of four 50 second task blocks and four 50 second rest blocks in between.



Start position 40°

Simple task end position 0°

Proprioception task end position 20°

Simple task compared to proprioceptive task:

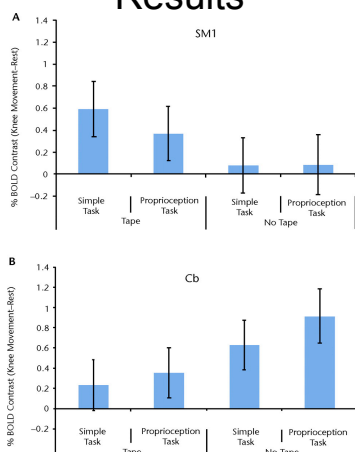
- During the proprioceptive task there was an increase in SMA proper, S1, bilateral precentral gyrus, cerebellum, and VTA of brainstem.

This reflects the greater demand on coordination and decision making during the task.

- During the simple task there was an increase in SMA and pre-SMA.

Due to the movement through a greater ROM.

Results



Patellar tape compared to no tape:

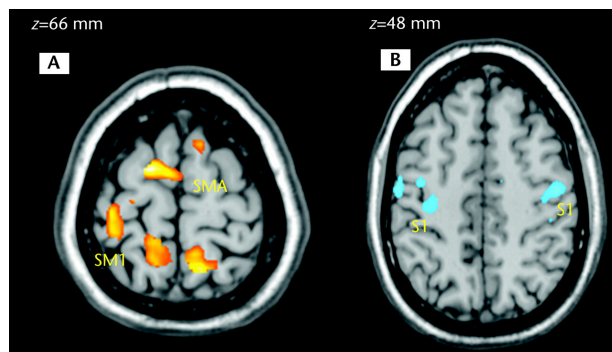
- In both tasks there was an increase in SM1 activity with patellar taping due to sensory input from the tape.
- There was decreased activity with the tape in the anterior cingulate and cerebellum which the researchers speculate is because the participants perceived the task to be easier with the tape, so these areas of the brain did not need to work as hard.

Movement compared to rest:

- Increase in SM1, SMA, SMA proper, and cerebellum. All areas that detect or guide movement or coordinate movements.
- Decrease in S1, SMA, and SM1. Also areas involved in sensing and coordinating movements.

They do not understand why there is decreased activity in some parts of the brain. They speculate that there is a correlation of small hand and wrist movements which were not controlled altering the results.

Task and Tape



- Both tasks with tape had a lower response in the cerebellum than without tape, therefore there was decreased activity with the tape.
- The proprioceptive task with tape had a relative increase (was less negative) in the lateral SM1 and SMA. Possibly due to UE movements that were not controlled.
- There was a decrease in the lateral S1 areas when the proprioceptive task was done with tape. Possibly because the tape hindered proprioception, or the task was perceived as easier with the tape, or interference from UE movements.

Discussion

- These researchers claim that the tape does not significantly change the mediolateral alignment of the patella, and in the conclusion they state “this finding reveals a potentially nonbiomechanical effect of patellar taping during active knee movement”. In your experience, is there a taping technique that does assist with patella alignment? Do you agree that because they were able to prove proprioception differences, that the effects of taping are nonbiomechanical?

Clinical Implications

- There are multiple taping techniques used to alter patellar alignment, muscle activity, or pain. This study showed that simple taping of the patella has an effect on areas of the brain associated with sensation, coordination, decision making, and planning of complex tasks and the coordination of unconscious proprioception.

Conclusion

This study proves that there are changes in brain activity with the use of patellar taping, but they did not explain in detail what each area of the brain that was altered did, and how that effects the movements. They also speculated on why certain areas of the brain had increased or decreased activity. Although it is an interesting study, I was confused with the results and how they would change the way patellar taping is done in a clinical setting.

Discussion

- This study had healthy participants with no knee pain or mechanical issues. Do you think that patellar taping has different results for patients with PFPS, why?
- The single joint movements that were tested are not the most functional use of the knee. Do you believe the altered proprioception of the knee with tape would affect the movement of the hip and ankle/foot?