

# Flex Therapist CEUs

## Gait Rehabilitation - Brain Computer Interfaces

### Introduction

1. Amputees have to compensate for the leg prostheses available on the market not having a self-propulsion capability and are then faced with which of the following?

- A. Reduced locomotion speed.
  - B. Considerable fatigue.
  - C. Recurrent pain and injuries at the interface between their residual limb and the prosthesis.
  - D. All of the above.
- 

### Deciphering Human Locomotion Control

2. Although the amplitude of the hip joint movement clearly increases as a function of the walking speed, the movement pattern remains about the same, except at very slow walking speeds, and a similar behavior is found for the knee joint. However, clear changes in amplitude and movement patterns occur in the ankle joint at speeds slower than \_\_\_\_\_ km/h.

- A. 1.0
  - B. 2.0
  - C. 3.0
  - D. 4.0
- 

3. During which phase of the gait cycle is the body's center of gravity not truly over the base of support?

- A. Loading response
  - B. Mid-stance
  - C. Terminal stance
  - D. The body's center of gravity is over the base of support during all of the above phases.
- 

4. A growing body of evidence suggests that the patterns for stepping in mammals are produced at the spinal level by the central pattern generators network.

- A. True
  - B. False
- 

5. Which of the following types of sensory information is integrated to regulate our way of stepping?

- A. Somatosensory input from the receptors of muscles and skin.
  - B. Input from the vestibular apparatus.
  - C. Visual input.
  - D. All of the above.
- 

6. During normal walking, the tibialis anterior shows two activity periods, one at the end of the stance and one at the end of the swing. It has been suggested that the first burst is of cortical origin, whereas the second is primarily due to output of a spinal CPG.

- A. True
  - B. False
- 

7. Intact supra-spinal centers are necessary for functional walking in humans.

- A. True
  - B. False
- 

8. All of the following come from the superior central nervous system, except for:

- A. Initiation of movements
  - B. Balance
  - C. Rhythm modulation
  - D. Stopping
- 

## **Supra-Spinal Control of Human Locomotion**

9. The hemodynamic response of the brain allows one to distinguish active from less activated neurons, as the blood releases glucose to active neurons at a greater rate than in the area of inactive neurons.

- A. True
  - B. False
-

**10. Motion artifacts affect signal integrity most prominently at frequencies above 4 Hz during steady walk.**

- A. True**
  - B. False**
- 

**11. Each of the following pertain to electrocorticography (ECoG), except for:**

- A. ECoG is a non-invasive technique.**
  - B. ECoG provides higher temporal and spatial resolution than EEG.**
  - C. ECoG signals are characterized by higher amplitudes and a lower vulnerability to artifacts, such as blinks and eye movement.**
  - D. All of the above pertain to ECoG.**
- 

**12. Which of the following is an appropriate measurement modality for everyday use, as its equipment is relatively cheap, portable, simple to attach, and requires little user training?**

- A. MEG**
  - B. fMRI**
  - C. NIRS**
  - D. All of the above**
- 

**13. NIRS indicates that the gait-related responses along the central sulcus are medial and caudal to the activity associated with arm swing.**

- A. True**
  - B. False**
- 

**14. fMRI indicate an increase in the activation of the cerebellum during motor imagery of:**

- A. Running**
  - B. Walking**
  - C. Standing**
  - D. All of the above**
- 

**15. Oscillation-based synchrony is the most energy-efficient physical mechanism for temporal coordination.**

- A. True**
  - B. False**
-

**16. Power increases in the left/right sensorimotor cortex is less important for contralateral limb push-off (ipsilateral heel strike) than for ipsilateral limb push-off (contralateral heel strike).**

- A. True**
  - B. False**
- 

**17. Local field potentials spectra of GPi recordings made during which of the following, showed significantly higher power values in the lower frequency bands (4 - 12 Hz) and in the gamma band (60 - 90 Hz), but significantly reduced power in the beta band (15 - 25 Hz), changes that may initiate or sustain gait-related activity in locomotor brainstem centers?**

- A. Sitting**
  - B. Standing**
  - C. Walking**
  - D. All of the above**
- 

## **Development of Non-Invasive Brain-Computer Interfaces Dedicated to Rehabilitation Systems**

**18. Which of the following is the main challenge in the case of BCI dedicated to walk rehabilitation systems?**

- A. Detect the user intention.**
  - B. Generate a realistic human walking movement corresponding to the detected user intent.**
  - C. Feedback sent to the user to help them control the system.**
  - D. All of the above are main challenges.**
- 

**19. The event-related desynchronizations occur in the mu (8 - 12 Hz) and beta (12 - 30 Hz) bands, which are directly linked to which of the following?**

- A. Stepping backwards, forwards, or laterally**
  - B. Movement planning and execution**
  - C. Gait backwards or forwards**
  - D. None of the above**
- 

**20. It is important that patients do not swing their arms during gait training in rehabilitation as this will interfere with developing control with a prosthetic/rehabilitation device.**

- A. True**
  - B. False**
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