# CLAIMS

1. A system for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the system comprising:

a first signal-providing component configured to provide pulsed peripheral stimulation signals at the peripheral body part;

a second signal-providing component configured to provide a pulsed motor cortex stimulation signal to a motor cortex area;

a substantially DC signal-providing component configured to provide direct current spinal stimulation signal at a neural spinal junction; and

a controller component configured to control timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; the timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal is being controlled such that a pulsed motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the substantially DC signal.

2. The system of claim 1 wherein the substantially DC signal-providing component is also configured to provide a cathodal stimulation to an area associated with said spinal junction.

3. The system of claim 2 wherein the controller component is configured to:

provide the direct current spinal stimulation signal at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal;

subsequently provide a first pulse as a peripheral stimulation signal to effect a muscle in a distal area;

provide, after a time delay after providing the first pulse, a second pulse as the peripheral stimulation signal to effect the muscle in the distal area; and

provide, after another time delay after providing the first and second pulses, the pulsed motor cortex stimulation signal;

said time delay and said another time delay being selected such that the motor signal from the muscle in the distal area and the pulsed motor signal from the motor cortex are

substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the substantially DC signal.

4. The system of claim 3 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

5. The system of claim 3 wherein the sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 17 ms to about 28 ms.

6. The system of claim 5 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

7. The system of claim 3 wherein the sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 18 ms to about 27 ms.

8. The system of claim 7 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

9. The system of claim 2 wherein the substantially DC signal-providing component comprises a sponge electrode.

10. The system of claim 9 wherein a characteristic dimension of the sponge electrode is selected based on a predetermined current density.

11. A method for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the method comprising:

providing pulsed peripheral stimulation signals at the peripheral body part;

providing a pulsed motor cortex stimulation signal to a motor cortex area;

providing a direct current spinal stimulation signal at a neural spinal junction; and

timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal being selected such that a motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal.

12. The method of claim 11 wherein the direct current spinal stimulation signal is provided at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; wherein a first pulse is subsequently provided as a peripheral stimulation signal to effect a muscle in a distal area; wherein, after a time delay from providing the first pulse, a second pulse is provided as the peripheral stimulation signal to effect the muscle in the distal area; and wherein, after another time delay from providing the first and second pulses, the pulsed motor cortex stimulation signal is provided; said time delay and said another time delay being selected such that the motor signal from the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal.

13. The method of claim 12 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

14. The method of claim 12 wherein the sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 17 ms to about 28 ms.

15. The method of claim 14 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

16. The method of claim 12 wherein the sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 18 ms to about 27 ms.

17. The method of claim 16 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

18. The method of claim 12 wherein said effecting said muscle includes the pulsed peripheral stimulation signals being applied to a nerve at said peripheral body part for stimulating said muscle.

19. The method of claim 12 wherein the pulsed peripheral stimulation signals are applied to the trunk of a nerve at said peripheral body part for stimulating muscles associated with said nerve.

20. The system of claim 3 wherein said effecting to effect said muscle includes the pulsed peripheral stimulation signals being applied to a nerve at said peripheral body part for stimulating said muscle.

21. The system of claim 3 wherein the pulsed peripheral stimulation signals are applied to the a nerve at said peripheral body part for stimulating said muscle.

22. The system of claim 3 wherein the pulsed peripheral stimulation signals are applied to the trunk of a nerve at said peripheral body part for stimulating muscles associated with said nerve.

## CLAIMS

1. A system for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the system comprising:

a first signal-providing component configured to provide pulsed peripheral stimulation signals at the peripheral body part;

a second signal-providing component configured to provide a pulsed motor cortex stimulation signal to a motor cortex area;

a substantially DC signal-providing component configured to provide a direct current spinal stimulation signal at a neural spinal junction; and

a controller component configured to control timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; the timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal being controlled such that a pulsed motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by a substantially DC signal;

wherein the controller component is configured to:

provide the direct current spinal stimulation signal at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal;

subsequently provide a first pulse as a peripheral stimulation signal to effect a muscle in a distal area;

provide, after a time delay after providing the first pulse, a second pulse as the peripheral stimulation signal to effect the muscle in the distal area; and

provide, after another time delay after providing the first and second pulses, the pulsed motor cortex stimulation signal;

said time delay and said another time delay being selected such that the motor signal from the muscle in the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the substantially DC signal.

2. The system of claim 1 wherein the substantially DC signal-providing component is also configured to provide a cathodal stimulation to an area associated with said spinal junction.

3. The system of claim 2 wherein the substantially DC signal-providing component comprises a sponge electrode.

4. The system of claim 3 wherein a characteristic dimension of the sponge electrode is selected based on a predetermined current density.

5. The system of claim 1 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

6. The system of claim 1 wherein providing the first pulse as the peripheral stimulation signal to effect said muscle includes adapting the first signal-providing component to apply the pulsed peripheral stimulation signal to a nerve at the peripheral body part for stimulating the muscle.

7. The system of claim 1 wherein the first signal-providing component is adapted to apply the pulsed peripheral stimulation signal to a trunk of a nerve at the peripheral body part for stimulating muscles associated with the nerve.

8. A system for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the system comprising:

a first signal-providing component configured to provide pulsed peripheral stimulation signals at the peripheral body part;

a second signal-providing component configured to provide a pulsed motor cortex stimulation signal to a motor cortex area;

a substantially DC signal-providing component configured to provide a direct current spinal stimulation signal at a neural spinal junction; and

a controller component configured to control timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; the timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal is being controlled such that a pulsed motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by a substantially DC signal;

wherein the controller component is configured to:

provide the direct current spinal stimulation signal at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal;

subsequently provide a first pulse as a peripheral stimulation signal to effect a muscle in a distal area;

provide, after a time delay after providing the first pulse, a second pulse as the peripheral stimulation signal to effect the muscle in the distal area; and

provide, after another time delay after providing the first and second pulses, the pulsed motor cortex stimulation signal;

said time delay and said another time delay being selected such that the motor signal from the muscle in the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the substantially DC signal; wherein a sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 17 ms to about 28 ms.

9. The system of claim 8 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

10. A system for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the system comprising:

a first signal-providing component configured to provide pulsed peripheral stimulation signals at the peripheral body part;

a second signal-providing component configured to provide a pulsed motor cortex stimulation signal to a motor cortex area;

a substantially DC signal-providing component configured to provide a direct current spinal stimulation signal at a neural spinal junction; and

a controller component configured to control timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; the timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal is being controlled such that a pulsed motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by a substantially DC signal;

wherein the controller component is configured to:

provide the direct current spinal stimulation signal at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal;

subsequently provide a first pulse as a peripheral stimulation signal to effect a muscle in a distal area;

provide, after a time delay providing the first pulse, a second pulse as the peripheral stimulation signal to effect the muscle in the distal area; and

provide, after another time delay after providing the first and second pulses, the pulsed motor cortex stimulation signal;

said time delay and said another time delay being selected such that the motor signal from the muscle in the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the substantially DC signal wherein a sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 18 ms to about 27 ms.

11. The system of claim 10 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

12. A method for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the method comprising:

providing pulsed peripheral stimulation signals at the peripheral body part;

providing a pulsed motor cortex stimulation signal to a motor cortex area; and

providing a direct current spinal stimulation signal at a neural spinal junction;

timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal being selected such that a motor signal from the peripheral body part and a pulsed motor signal

from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal; wherein the direct current signal stimulation signal is provided at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; wherein a first pulse is subsequently provided as a peripheral stimulation signal to effect a muscle in a distal area; wherein, after a time delay from providing the first pulse, a second pulse is provided as the peripheral stimulation signal to effect the muscle in the distal area; and wherein, after another time delay from providing the first and second pulses, the pulsed motor cortex stimulation signal is provided; said time delay and said another time delay being selected such that the motor signal from the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal.

13. The method of claim 12 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

14. The method of claim 12 wherein effecting the muscle includes the pulsed peripheral stimulation signals being configured to be applied to a nerve at said peripheral body part for stimulating the muscle.

15. The method of claim 12 wherein the pulsed peripheral stimulation signals are configured to be applied to a trunk of a nerve at the peripheral body part for stimulating muscles associated with the nerve.

16. A method for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the method comprising:

providing pulsed peripheral stimulation signals at the peripheral body part;

providing a pulsed motor cortex stimulation signal to a motor cortex area; and

providing a direct current spinal stimulation signal at a neural spinal junction;

timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal being selected such that a motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal; wherein the direct current spinal stimulation signal is provided at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; wherein a first pulse is subsequently provided as peripheral stimulation signal to effect a muscle in a distal area; wherein, after a time delay from providing the first pulse, a second pulse is provided as the peripheral stimulation signal to effect the muscle in the distal area; and wherein, after another time delay from providing the first and second pulses, the pulsed motor cortex stimulation signal is provided; said time delay and said another time delay being selected such that the motor signal from the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal; wherein a sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 17 ms to about 28 ms.

17. The method of claim 16 wherein the pulsed motor cortex stimulation signal is a magnetic field signal.

18. A method for improving neural communication impairment of a vertebrate being and affecting motor activity of a peripheral body part, the method comprising:

providing pulsed peripheral stimulation signals at the peripheral body part;

providing a pulsed motor cortex stimulation signal to a motor cortex area; and

providing a direct current spinal stimulation signal at a neural spinal junction;

timing of the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal being selected such that a motor signal from the peripheral body part and a pulsed motor signal from the motor cortex area are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal; wherein the direct current spinal stimulation signal is provided at the neural spinal junction before the pulsed peripheral stimulation signals and the pulsed motor cortex stimulation signal; wherein a first pulse is subsequently provided as peripheral stimulation signal to effect a muscle in a distal area; wherein, after a time delay from providing the first pulse, a second pulse is provided as the peripheral stimulation signal to effect the muscle in the distal area; and wherein, after another time delay from providing the first and second pulses, the pulsed motor cortex stimulation signal is provided; said time delay and said another time delay being selected such that the motor signal from the distal area and the pulsed motor signal from the motor cortex are substantially simultaneously present at the neural spinal junction when the neural spinal junction is being stimulated by the direct current spinal stimulation signal; wherein a sum of said time delay and said another time delay is about 30 ms; and wherein said another time delay is from about 18 ms to about 27 ms.

19. The method of claim 18, wherein the pulsed motor cortex stimulation signal is a magnetic field signal.