Het leren controleren van spiersignalen in de arm

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Ethische beoordeling	Niet van toepassing
Status	Werving gestart
Type aandoening	-
Onderzoekstype	Interventie onderzoek

Samenvatting

ID

NL-OMON26803

Bron
NTR

Aandoening

Electromyogram (EMG) control, learning, feedback, myocontrol

Ondersteuning

Primaire sponsor: University Medical Center Groningen (UMCG)
Overige ondersteuning: The European Council

Onderzoeksproduct en/of interventie

Uitkomstmaten

Primaire uitkomstmaten

Repeatability Index, Similarity Index, and Mean Semi-Principal Axes. Motion Test outcomes (completion rate, Accuracy)

Toelichting onderzoek

Achtergrond van het onderzoek

To perform a movement muscles get activated that produce a torque around a joint. As a by-product of this muscle activation an electric current is produced at the muscle (i.e., electromyogram (EMG), also called a myosignal) that can be picked up by surface electrodes. From a motor control perspective the control of myosignals to steer an assistive device or an avatar in a virtual environment represents an intriguing task because a by-product of movement is used in a goal-directed way. Moreover, feedback of myosignal features such as amplitude or frequency is not directly available to human perception and even though muscle force and mechanical joint response are related to those myosignal features, the relation is far from linear or intuitive. Nevertheless, surface EMG (myosignal) control is being employed in several devices, such as upper limb prostheses in which electrodes in the prosthesis socket pick up surface EMG (myosignals) and translate it to active movements of the prosthesis hand and wrist. However, until today the underlying mechanisms of learning a task controlled through myosignals are poorly understood. From a fundamental motor control perspective, the way humans learn to precisely control their myosignals remains unclear when the goal response to their muscle activation is not a physiological one, but instead related to a virtual avatar or an active prosthesis. We compare three training paradigms to find out which is most effective and to test the idea that even in such an abstract learning goal as controlling myosignals, the learning process is highly task specific and humans are able to improve specific parameters in myosignal feature space, if those are fed back to the user. To measure which training paradigm is the most effective participants will perform a myocontrol task using a pattern-recognition control algorithm. When applying a pattern-recognition control algorithm on the myosignal, control becomes more complex and the skill ceiling is very high, which makes it suitable for evaluating training paradigms. The outcome of this study could give a first insight into the dynamics of learning myosignal control. In future work this could help to advise user training for myosignal gaming or the clinical practice in amputee rehabilitation.

Doel van het onderzoek

In learning to control myosignals, groups will improve on the metrics that they receive feedback on. Group PatRec will have little improvement in all metrics. Group PatRecFeedback and group Game will have significant improvements in Repeatability Index, Similarity Index, and Mean Semi-Principal Axes leading to improvements in the Motion Test metrics.

Onderzoeksopzet

Pre-test/Post-test design. Measurements at day 1 and day 5.

Onderzoeksproduct en/of interventie

This study consist of 4 groups that receive different kind of training.

A) Pattern-Recognition system training (PatRec)

B) Pattern-Recognition system training with extended feedback (PatRecFeedback)

C) Serious game which trains robust distinct myosignal generation (Game)

D) Sham training (Sham)

Contactpersonen

Publiek

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Wetenschappelijk

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Deelname eisen

Belangrijkste voorwaarden om deel te mogen nemen (Inclusiecriteria)

Able-bodied participants

Belangrijkste redenen om niet deel te kunnen nemen (Exclusiecriteria)

Participants with prior experience in myoelectric control based on pattern recognition.
Participants with any neurological diseases and musculoskeletal problems in their arms and trunk.

Onderzoeksopzet

Opzet

Type:	Interventie onderzoek
Onderzoeksmodel:	Parallel
Toewijzing:	Gerandomiseerd
Blindering:	Enkelblind
Controle:	Geneesmiddel

Deelname

Nederland

Status:	Werving gestart
(Verwachte) startdatum:	15-02-2017
Aantal proefpersonen:	64
Type:	Verwachte startdatum

Ethische beoordeling

Niet van toepassing

Soort:	Niet van toepassing

Registraties

Opgevolgd door onderstaande (mogelijk meer actuele) registratie

Geen registraties gevonden.

Andere (mogelijk minder actuele) registraties in dit register

Geen registraties gevonden.

In overige registers

Register	ID
NTR-new	NL6269
NTR-old	NTR6611
Ander register	Ethische Commissie Bewegingswetenschappen, UMCG, Groningen (ECB) : ECB/2017.01.12_1

Resultaten