# Tremor

A tremor is an involuntary, somewhat rhythmic, muscle contraction and relaxation involving to and from movements (oscillations or twitching) of one or more body parts. It is the most common of all involuntary movements and can affect the hands, arms, eyes, face, head, vocal folds, trunk, and legs. Most tremors occur in the hands. In some people, tremor is a symptom of another neurological disorder. A very common kind of tremor is the chattering of teeth, usually induced by cold temperatures or by fear.

## Classification

Resting Tremor

Postural Tremor

see Cerebellar tremor.

see Essential tremor.

see Functional tremor

see Physiologic tremor.

see Posttraumatic tremor.

see Voice tremor.

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Tremor is one of the most common movement disorders but the correct diagnosis of tremor disorders, especially the differentiation between Parkinson's disease tremor (PT) and essential tremor (ET) remains a challenge for clinicians.

Mahendran et al. examined a novel hand position to distinguish PT from ET. They prospectively collected accelerometric tremor data in 14 ET patients and 14 PT patients with arms and hands fully stretched against arms stretched and hands relaxed, i. e. hanging down. The total acceleration from the three pairwise-perpendicular accelerometric axes during the 1-minute blocks of the two hand positions were computed and high-passed filtered at 2 Hz. The power spectral density during each hand position was calculated and summed up over the frequency domain.

The results showed a significantly higher occurrence of tremors in the hands hanging down position in PT patients compared to ET patients ($p = 0.0262$). Moreover, in PT patients the tremor intensity significantly increased when transitioning from the stretched hand position to the hanging-down position (83 % of cohort) and vice versa in ET patients (75 % of cohort).

In conclusion, the new hand posture can differentiate between PT and ET with high accuracy (sensitivity 83 %, specificity 75 % for PT) and maybe a helpful tool in the clinical assessment of tremor [1].

# Scores

Tremor scores.

### Etiology

Tremor can be a symptom associated with disorders in those parts of the brain that control muscles throughout the body or in particular areas, such as the hands. Neurological disorders or conditions that can produce tremor including multiple sclerosis, stroke, traumatic brain injury, chronic kidney disease and a number of neurodegenerative diseases that damage or destroy parts of the brainstem or the cerebellum, Parkinson's disease being the one most often associated with tremor. Other causes include the use of drugs (such as amphetamines, cocaine, caffeine, corticosteroids, SSRI), alcohol, mercury poisoning; or the withdrawal of drugs such as alcohol or benzodiazepine. Tremors can also be seen in infants with phenylketonuria (PKU), overactive thyroid or liver failure. Tremors can be an indication of hypoglycemia, along with palpitations, sweating and anxiety. Tremor can also be caused from lack of sleep, lack of vitamins, or increased stress.[citation needed] Deficiencies of magnesium and thiamine have also been known to cause tremor or shaking, which resolves when the deficiency is corrected. See magnesium in biology. Some forms of tremor are inherited and run in families, while others have no known cause. Tremors can also be caused by some spider bites, e.g. the redback spider of Australia.

Characteristics may include a rhythmic shaking in the hands, arms, head, legs, or trunk; shaky voice; and problems holding things such as a fork or pen. Some tremors may be triggered by or become exacerbated during times of stress or strong emotion, when the individual is physically exhausted, or during certain postures or movements.

Tremor may occur at any age but is most common in middle-age and older persons. It may be occasional, temporary, or occur intermittently. Tremor affects men and women equally.

# Treatment

Tremor treatment.

# Case series

Fourteen tremor patients (7 Essential Tremor and 7 Parkinson's Disease) implanted with directional DBS electrodes in the ventral intermediate nucleus (VIM) were enrolled. Side-effect thresholds of monopolar directional stimulation (DIRECT) were compared to circular DBS as well as, in a randomized design, to those of two different bipolar stimulation settings (BIPOLAR = circular anode; BI-DIRECT = directional anode). Tremor suppression (Tremor Rating Scale, TRS) right below the side-effect threshold was also assessed.

Directional DBS in the individually best direction showed higher side-effect thresholds than circular DBS ($p = 0.0063$). The thresholds were raised further using either one of the bipolar stimulation paradigms (BIPOLAR $p = 0.0029$, BI-DIRECT $p = 0.0022$). The side-effect thresholds did not differ

between both bipolar settings, but side-effects were less frequent with BI-DIRECT. No difference in TRS scores with stimulation just below the side-effect threshold was found between all stimulation conditions.

Side-effect thresholds of monopolar directional and bipolar stimulation with both circular and directional anodes were higher compared to traditional monopolar circular stimulation in the VIM. Bipolar DBS with directional anodes evoked side-effects less frequently than bipolar and monopolar directional stimulation. All stimulation settings had comparable effects on tremor suppression just below their side-effect thresholds. Thus, directional and different bipolar settings should be explored in patients with bothersome side-effects of thalamic stimulation when monopolar stimulation settings are not satisfying. Further studies are needed to explore the efficiency of the different bipolar stimulation paradigms [2].

1)
Mahendran S, Bichsel O, Gassert R, Baumann CR, Imbach LL, Waldvogel D. Differentiation of Parkinson's disease tremor and essential tremor based on a novel hand posture. Clin Park Relat Disord. 2022 May 21;7:100146. doi: 10.1016/j.prdoa.2022.100146. PMID: 35647517; PMCID: PMC9136132.
2)
Steffen JK, Reker P, Mennicken FK, Dembek TA, Dafsari HS, Fink GR, Visser-Vandewalle V, Barbe MT. Bipolar Directional Deep Brain Stimulation in Essential and Parkinsonian Tremor. Neuromodulation. 2020 Feb 10. doi: 10.1111/ner.13109. [Epub ahead of print] PubMed PMID: 32040883.