

Field feasibility of ocular microtremor assessment following blast exposure in Ukraine

Victoria Sparkes¹, Roman Kuziv², Serhii Machuskyi², Ihor Tsymbal², Serhii Potebenko², Andrii Bilenkyi²

¹ Independent Researcher
² Zaporizhzhia Military Hospital, Ukraine



Role 2 field study, Eastern Ukraine

What OMT measures

Ocular microtremor (OMT) is a tiny, involuntary eye movement during fixation. It reflects extraocular muscle activity driven by neural inputs from brainstem oculomotor systems.[1,2] We measured its frequency in hertz, an indirect physiological signal rather than a direct recording of brainstem neurons.

Why this study?

Forward casualty care offers limited time and resources for neurological assessment after blast exposure. Portable physiological measurements could complement neurological assessment after blast exposure, particularly where specialist resources are limited. We investigated whether portable OMT acquisition was feasible in a Role 2 hospital in Eastern Ukraine and whether repeated readings revealed patterns that merit clinical follow-up. The nature of data acquisition in a Role 2 facility in an active conflict zone could provide real world evidence for device deployment and ascertain whether OMT could be further investigated as a meaningful triage device to identify early neurological changes.

Participants and methods

A descriptive pilot of 66 blast-exposed male service members in eastern Ukraine. Investigators attempted two iTremor readings per eye (L1, L2, R1, R2), then examined individual frequencies and patterns within each participant.

Cohort characteristics

Age, mean (SD)	37.5 (8.9) years
Age range	19–57 years
Male	66/66 (100%)
OMT within 72 hours	54/66 (81.8%)
Symptoms marked present	64/66 (97.0%)
Drone-related exposure	40/66 (60.6%)

Assessment dates: 19 April–6 June 2026.
Symptom type and severity were not recorded.
No numerical tolerability scores were available.



iTremor

Study bands

Low ≤74 Hz, reference 75–85 Hz, high ≥86 Hz. These bands derive from unpublished manufacturer data on neurologically unimpaired individuals and are used here for exploratory analysis, not as validated diagnostic thresholds.

98.9%

Successful acquisition

261/264 valid readings. 65/66 participants had four valid readings.

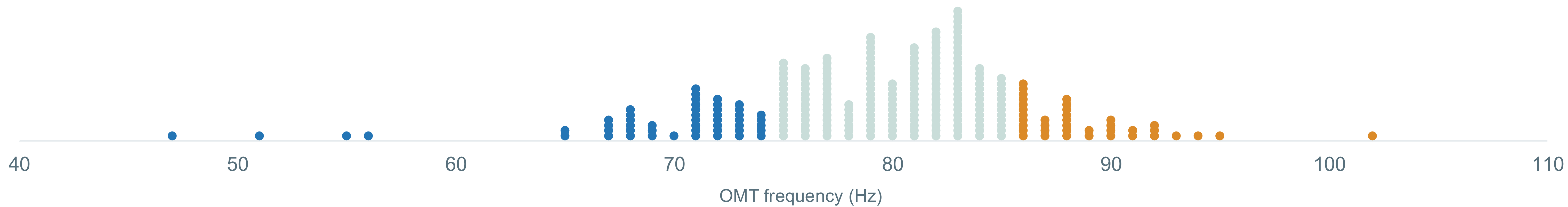
01 Individual readings

One dot represents one valid frequency reading (n = 261)

50 low (19.2%)

173 in range (66.3%)

38 high (14.6%)



Mean 79.4 Hz, but 88/261 readings (33.7%) lie outside the reference band.

02 Patterns within participants

Each column represents one participant. Four rows show the two readings from each eye.

	All in range n = 21	Single low n = 8	Single high n = 9	Repeated low n = 15	Repeated high n = 11	Other n = 2
L1	79 81 76 76 78 80 85 84 83 82 81 79 81 77 79 83 82 81 79 83 77	75 77 77 77 80 81 74 83	83 78 85 82 81 84 84 83 92	74 68 81 68 71 75 71 75 74 78 76 55 73 77 75	90 86 85 82 88 87 84 88 90 84 85	91 ×
L2	78 75 76 77 77 80 84 83 81 84 83 82 79 77 80 82 83 79 81 81 84	80 83 83 74 76 73 80 75	86 82 86 87 86 86 76 81 84	82 68 72 69 76 72 68 71 76 73 68 56 75 73 79	89 91 86 88 90 93 92 88 89 88 82	88 ×
R1	82 81 77 81 79 79 82 83 82 84 84 76 78 79 81 79 80 82 80 84 83	78 72 73 80 76 76 82 75	83 86 79 79 77 83 102 88 85	72 85 71 65 71 75 67 69 75 73 70 47 72 73 71	83 85 84 85 87 85 86 95 79 90 87	72 ×
R2	77 75 79 77 79 82 81 85 83 81 84 83 76 76 82 80 79 83 79 82 85	72 75 80 78 74 77 79 67	83 85 82 83 79 82 77 83 82	75 77 69 67 71 71 68 75 72 76 65 51 71 71 67	81 82 88 86 86 83 83 92 81 94 86	75 83

Low ≤74 Hz

Reference 75–85 Hz

High ≥86 Hz

× No valid reading

Other: one mixed low/high profile and one incomplete profile. Repeated means ≥2 out-of-range readings within this assessment.

What might low and high frequencies mean?

Hypotheses to test, not diagnoses or direct measures of brainstem activity

Low frequency: reduced neural drive?

Lower OMT may reflect reduced oculomotor drive or lower arousal. Anaesthesia studies demonstrate frequency suppression.[1,2] Whether the low readings here reflect blast-related dysfunction, fatigue or other physiological influences remains untested.

High frequency: activation or dysregulation?

Higher OMT could reflect transient arousal or altered oculomotor regulation. OMT rose with stimulation during anaesthesia.[2] This provides a rationale to investigate high readings after blast, but does not establish brainstem hyperactivity or injury.

Conclusion and next steps

Field acquisition was feasible. Repeated outliers in 27/66 participants (40.9%) warrant controlled follow-up. No concurrent control group or follow-up was reported. Exposure timing, prior injury, medication and arousal require consideration.

Conflict of interest: The presenting author declares no conflicts of interest and has no affiliation with the manufacturer of iTremor. The device used in this study was donated by Head Diagnostics. The donor had no role in study design, data collection, analysis, interpretation or preparation of this poster