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Fall Risk and Functional Stability Before vs After Computerized Vestibular Retraining Among Adults With Unilateral Vestibular Deficits

Computerized vestibular retraining is associated with changes in qualitative measures of vestibular disability in patients with stable unilateral vestibular deficits.[1] Patients reported increased confidence, decreased disability, and reduced perceived fall risk after 12 sessions of retraining.[1] We assessed posturographic measures in that cohort.[1] The limits of stability (LOS) test is an objective measure of dynamic postural stability. Lower LOS scores are associated with an elevated risk of falling.[2,3] We evaluated changes in the LOS and functional stability region (FSR; area described by controlled anteroposterior and lateral lean distance) after computerized vestibular retraining.

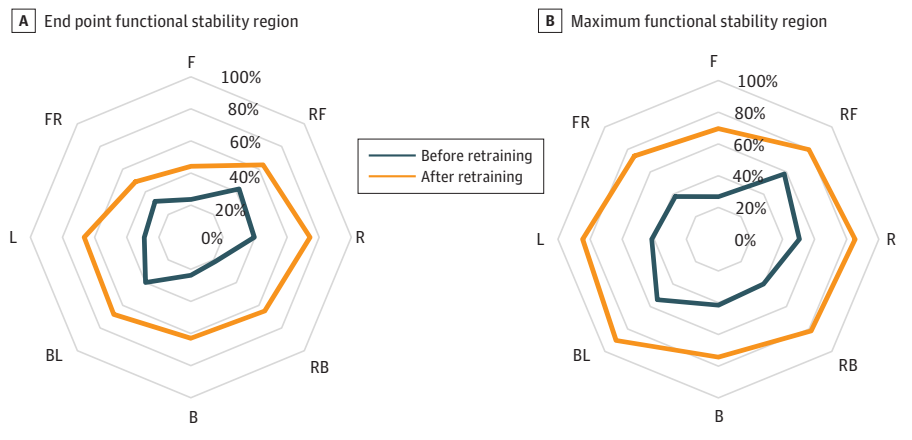
Methods | The Clinical Research Ethics Board at the University of British Columbia approved this cohort study. Participants provided written informed consent. Participant eligibility and a description of the intervention were reported previously.[1] This study followed the STROBE reporting guideline.

The LOS test was administered before and after 12 sessions of computerized vestibular retraining. The LOS excursion scores (possible score range, -100 to 100) were calculated according to established methods[4]; from those, we calculated the sums of the areas between adjacent end point excursion limits and adjacent maximum excursion limits using published methods.[5]

An LOS test consists of 8 trials, 1 in each of 8 directions (**Figure**). If the participant took a step, lost balance and required harness support, or failed to move toward the target during a trial of the LOS test, that trial was assigned a score of 0. Statistical analysis was performed between July 7, 2021, and May 9, 2022, using Prism 9, version 9.3.1.

Results | Of 13 participants, 8 (62%) were male; mean (SD) age was 48.7 (16.9) years. Demographics and vestibular diagnosis for the participants were reported previously.[1] All participants completed all retraining sessions and follow-up. Before retraining, participants failed (relied on the harness to prevent falling) in a median of 3 (range, 0-6) of 8 LOS test trials. After retraining, the median number of fails was 0 (range, 0-2). The median improvement in end point excursion was 36 percentage points (95% CI, 2-51 percentage points); in maximum excursion, 47 percentage points (95% CI, 10-85 percentage points); and in directional control, 41.1 percentage points (95% CI, 5.9-79.0 percentage points). After retraining, the end point FSR increased by a median of 6226 (95% CI, 24-14 547) and the maximum FSR

Figure. Functional Stability Region Before and After Computerized Vestibular Retraining



The functional stability region is the area described by controlled anteroposterior and lateral lean distance. A, Mean end point excursion and B, mean maximum excursion for each of 8 directions of the limits of stability test before and after retraining. The area bounded by the mean excursion values delineates the functional stability region. B indicates back; BL, back left; F, front; FR, front right; L, left; R, right; RB, right back; and RF, right front.

Table. Limits of Stability Test Results Before and After Computerized Vestibular Retraining

Measure	Median (range)		Median change (95% CI)
	Before retraining	After retraining	
Fails among 8 sessions, No.	3 (0 to 6)	0 (0 to 2)	−2 (−5 to −1)
End point excursion, %	2 (0 to 66)[a]	52 (0 to 82)[a]	36 (2 to 51)[b]
Maximum excursion, %	3 (0 to 81)[a]	83 (17 to 91)	47 (10 to 85)[b]
Directional control, %	4.6 (0 to 79.7)[a]	78.1 (0 to 87.1)[a]	41.1 (5.9 to 79.0)[b]
Functional stability region[c]			
Calculated from end point excursion	2765 (0 to 7785)	7640 (222 to 14 054)	6226 (24 to 14 547)
Calculated from maximum excursion	13 618 (3196 to 20 687)	23 173 (11 410 to 25 394)	9802 (2248 to 21 168)

[a] Score was set to 0 for trials when the software did not report a score owing to a PULL reading (a reduction in force consistent with support by the safety harness) or a STEP reading (the participant had moved their feet from the start position).

[b] Data are presented as percentage points.

[c] Area described by controlled anteroposterior and lateral lean distance.

by a median of 9802 (95% CI, 2248-21168) (Figure and Table).

After retraining, the number of participants within the minimum detectable change with 95% confidence (MDC-95) of the mean for healthy adults[6] increased from 1 to 5 for end point excursion and from 0 to 7 for maximum excursion. Increases exceeding the MDC-95 were measured for 9 participants for end point excursion and 11 for maximum excursion.

Discussion | The LOS test assesses volitional displacement of center of gravity in the lateral and anteroposterior directions. The displacement achieved relative to the theoretical limit can be used to calculate an individual's FSR, which is lower among those with unilateral vestibulopathy.[5] A smaller FSR implies a constant state of being about to fall, and although evidence is lacking, interventions that increase the FSR are posited to reduce the risk of falls.[5]

Participants in this study demonstrated significant increases in end point and maximum FSR after retraining, and for many participants, excursion values were within the reference range after retraining. Larger angles of displacement with greater control were achieved than before retraining because there were fewer instances of relying on the harness to prevent falls. Concordantly, we previously reported reduced perceived fall risk in this cohort.[1]

Limitations of this study are the small sample size and lack of a control group. These preliminary data suggest that after computerized vestibular retraining, patients were able to lean their center of gravity further in all directions with lower risk of falling than before retraining.

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Administrative, technical, or material support: Both authors.
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Two-Year Prevalence and Recovery Rate of Altered Sense of Smell or Taste in Patients With Mildly Symptomatic COVID-19

Before the advent of the Omicron variant, smell and taste dysfunction were among the most commonly reported symptoms of mildly symptomatic COVID-19.[1,2] Moreover, smell and/or taste dysfunction are prevalent symptoms of long-term COVID-19, with 7% of patients being functionally anosmic 1 year after SARS-CoV-2 infection.[3] Given the high case rate of COVID-19, it is important to estimate the long-term persistence of these symptoms. We previously described the prevalence of an altered sense of smell or taste in mildly symptomatic patients at onset, 4 weeks, 8 weeks, and 6 months after COVID-19.[1,4,5] The aim of the present study was to estimate the 2-year prevalence and recovery rate of smell or taste dysfunction in the same series of patients.