

## Introduction

Vestibular information is intuitively important for accurate navigation. Navigational abilities may be abnormal in patients with peripheral vestibular damage, but the literature on this topic is inconsistent and contradictory.

## Objective:

To compare performance in virtual reality spatial navigation (VRSN) tasks in patients with bilateral vestibular loss (BVL) and normal control (NC) subjects.

Study Design: Cross sectional study

Setting: Academic medical center.

## Methods

Subjects used a virtual reality headset to perform a “complete the triangle task” in a visually barren virtual environment in three conditions: (1) “dynamic,” in which subjects walked in place on a 1-meter diameter circular platform and received proprioceptive, visual, and vestibular cues; (2) “stationary,” in which subjects’ heads were secured in a fixed position and rotation and translation occurred within the VR environment using an Xbox controller; and (3) “vestibular-only” in which subjects were seated in a rotary chair and rotated in the yaw plane with access only to vestibular and visual cues.

## Results

Male BVL subjects (n=10) demonstrated lower accuracy and decreased precision in a dynamic navigation task compared to age- and sex-matched male NC subjects (U=74,  $p < 0.05$  and U=71,  $p < 0.01$ , respectively). While BVL males were less precise in the dynamic task compared to the stationary task ( $p < 0.05$ ), NC males were comparatively more precise in the dynamic task ( $p < 0.01$ ). Female BVL and NC subjects performed similarly on both the dynamic and stationary tasks. Results from the “vestibular-only” condition are pending; 10 BVL and 10 NC subjects have undergone testing.

## Conclusions

Patients with vestibular loss may perform more poorly on dynamic spatial navigation tasks compared to age-matched healthy subjects. Further research is needed to characterize the specific vestibular contributions to spatial navigation and to isolate potential differences between sexes.