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# Is Regression Gain or Instantaneous Gain the most reliable and reproducible gain value when performing video Head Impulse Testing of the lateral semicircular canals?

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## Introduction

With the advancement of vestibular testing modalities, the video Head Impulse Test (v-HIT) has earned a prominent place in the clinical setting. It is now possible to test all of the semi-circular canals (SCCs) fast and efficiently.

The v-HIT systems provide information about the function of the vestibular ocular reflex (VOR) by means of two modalities: SACCADES and GAIN (the ratio between eye and head velocities).

The EyeSeeCam® v-HIT system presents the gain value as:

- ***Regression gain*** (a best fittet line through the data plots)
- ***Instantaneous gain*** value at 40, 60 and 80ms. (The mean value at specific latencies)

## Objective

***Primary endpoint:***

- Is instantaneous gain or regression gain the most reproducible and reliable gain value when performing v-HIT with testing of the lateral SCCs?

***Secondary endpoints :***

- Comparison of each of the instantaneous gain values at 40, 60, and 80ms with the regression gain values of the lateral SCCs.
- Investigate any intra- and inter examiner variability when comparing gain values between an inexperienced and an experienced neurotologist.

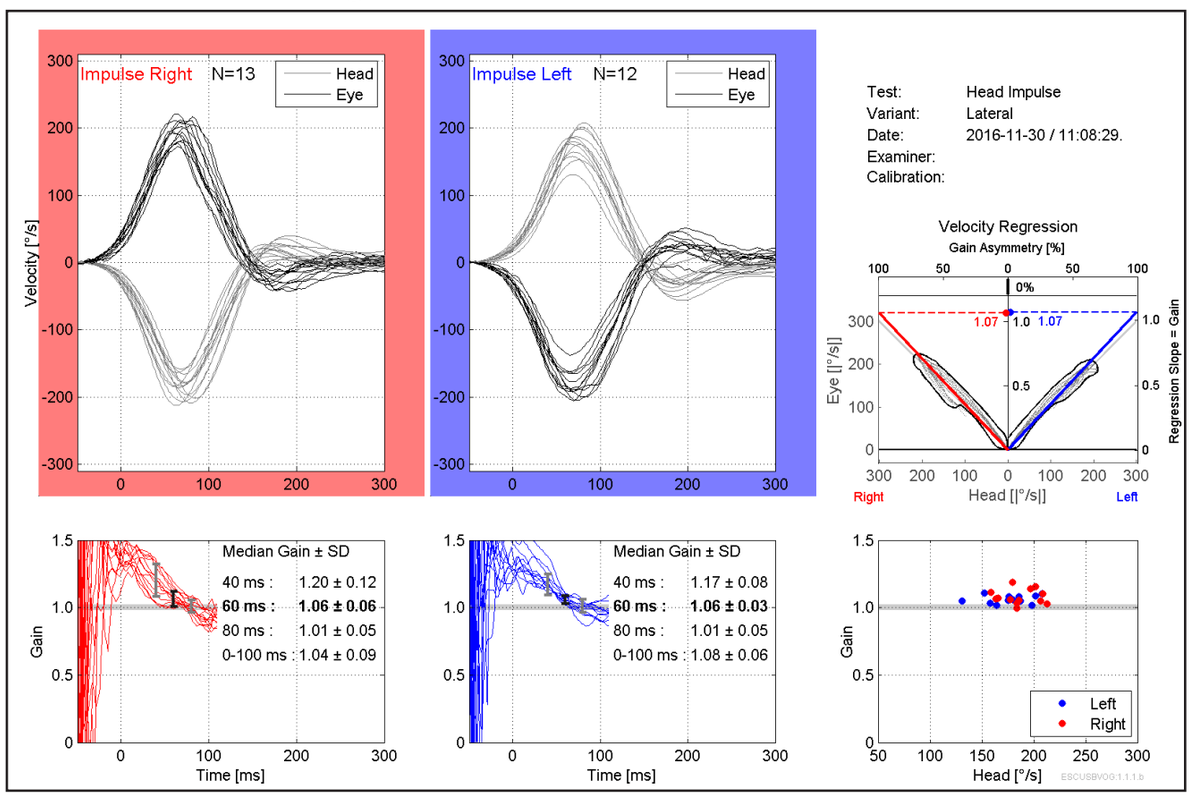


*Fig. 1 Report after lateral SCC testing of a person without vestibular pathology depicting both Instantaneous and Regression gain.*

## Materials

The v-HIT system -EyeSeeCam® from Interacoustics, Denmark, was used to perform the v-HIT tests on all lateral SCCs.

## Methods

60 subjects between 18-65 years without any prior history of vestibular disease were included.
Prior to inclusion all subjects filled out a questionnaire as well as the Dizziness Handicap Inventory (DHI). All subjects underwent testing with video frenzel googles to rule out nystagmus and eye muscle disorders.

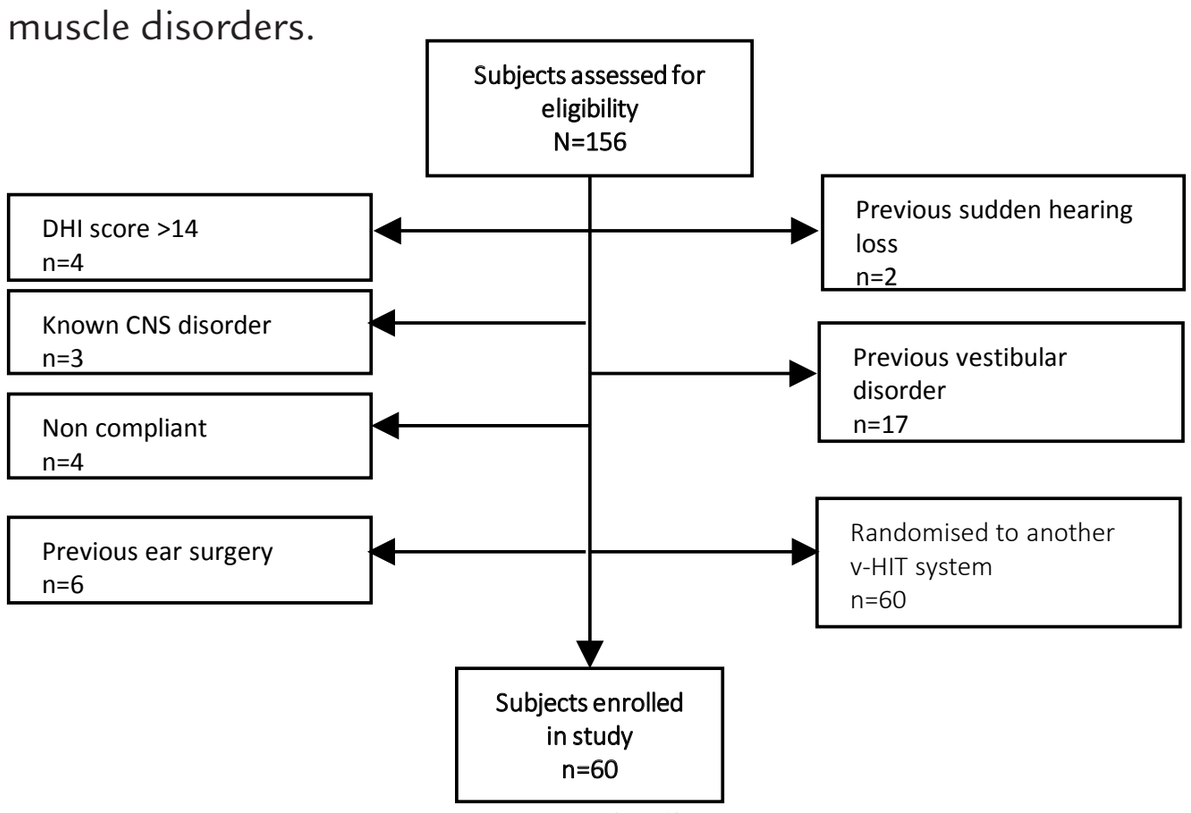


*Fig. 2 Trial profile*

All subjects underwent two complete v-HIT test sessions by an experienced and an inexperienced examiner respectively. The order of the examiners and the sequence of the SCC being tested were randomized.

## Results

- When testing the lateral SCCs we found that the regression gain was the most reproducible gain value when comparing it with instantaneous gain.

| *Instantaneuos Gain vs. Regression Gain* | *mean sd* | *95% ci* | *p-value* |
|---|---|---|---|
| Regression Gain | 0.05 | [0.03;0.06] | <0.001 |
| Instantaneuous gain vs. regression gain | 0.02 | [0.01;0.03] | <0.001 |
| Right lateral vs. Left lateral | 0.02 | [0.00;0.02] | 0,005 |

*Table 1 Instantaneous vs regression gain with regression gain as reference*

- When comparing the individual instantaneous gain values (40, 60, 80ms) with the regression gain, we found that the gain values at 40ms had the greatest standard deviation (sd) when comparing with regression gain (p-value <0.001, 95% ci [0.03;0.05] mean sd 0.04
- When holding instantaneous gain latencies up against each other there was significant deviation at 40ms but not at 60 nor 80ms.

| *Instantaneuos gain 60ms as reference* | *mean sd* | *95% ci* | *p-value* |
|---|---|---|---|
| Instantaneuos gain 40ms | 0.033 | [0.02;0.04] | <0.001 |
| Instantaneuos gain 80ms | 0.001 | [-0.01;0.01] | 0,809 |

*Table 2 Instantaneous gain values at 40 and 80ms compared to 60ms*

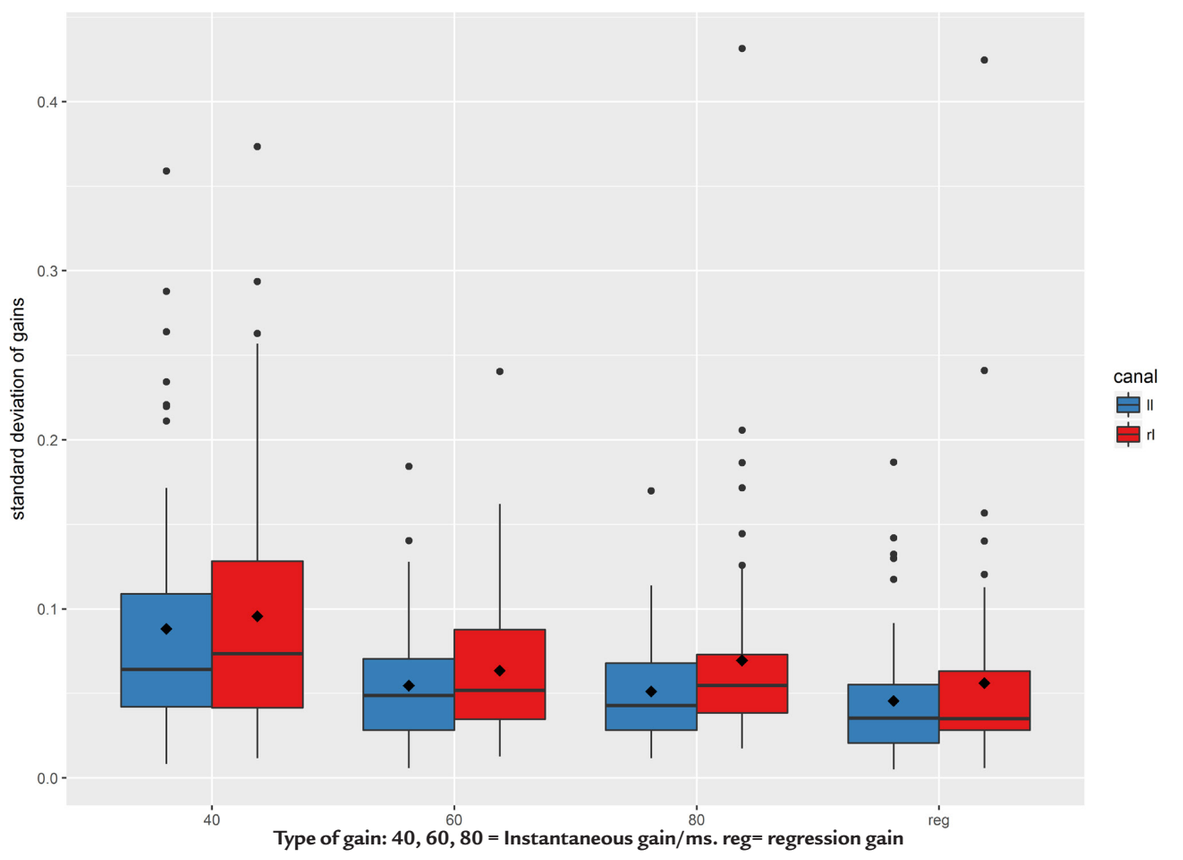


*Fig. 3 Mean standard deviation of the different gain types.*

- When comparing the experienced to the inexperienced doctor no significant gain deviation was found.

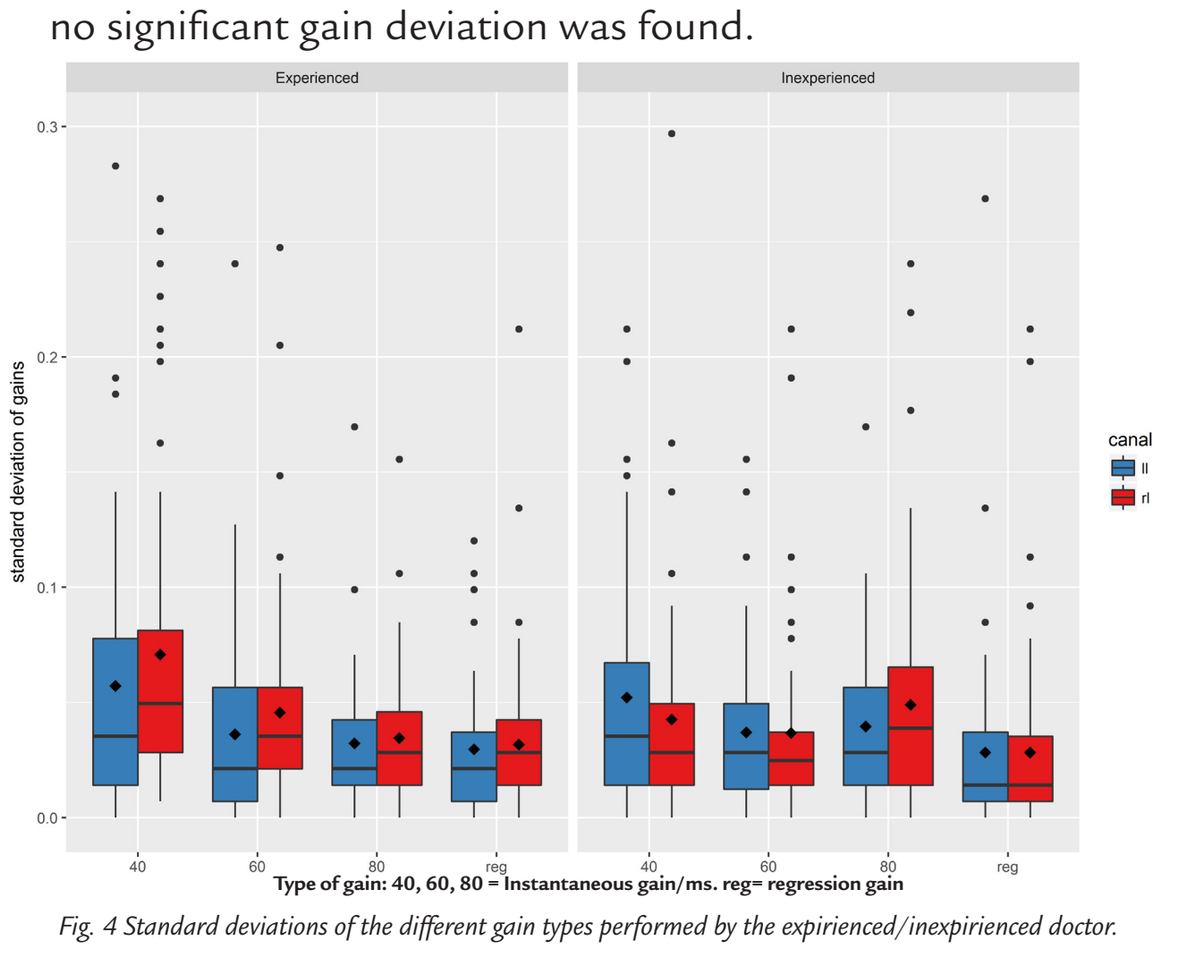


*Fig. 4 Standard deviations of the different gain types performed by the expirienced/inexpirienced doctor.*

## Conclusion

- Regression gain is more reproducible than instantaneous gain.
- 40ms is the least reproducible of the instantaneous values.
- There was no significant difference at 60ms or 80ms of the instantaneous gain.
- No significant intra or inter examiner variability (experienced/inexperienced)

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