Accuracy, Validity, and Reliability of the Infrared Optical Head Tracker (IOHT)

We were interested to read the paper by Kim et al., published in the March 2012 issue of *Investigative Ophthalmology & Visual Science*.¹ The authors aimed to evaluate the accuracy, validity, and reliability of a newly developed infrared optical head tracker (IOHT) using Nintendo Wii remote controllers (WiiMote; Nintendo Co. Ltd., Kyoto, Japan) for measurement of the angle of head posture. They reported that, in comparison with the data from the cervical range of motion (CROM), the IOHT-derived results showed high consistency.¹ Why did the authors not use seven well known statistical tests to evaluate validity of IOHT compared to CROM as gold standard (sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV], likelihood ratio positive and negative [LR+ and LR-], and odds ratio)?²⁻⁵ Moreover, high consistency between IOHT and CROM results neither prove reliability nor validity of IOHT.²⁻⁵ They reported that correlation coefficients of 1- and 3-D positions between the IOHT and the CROM were more than 0.99 and 0.96 ($P < 0.05$, Pearson's correlation test), respectively.¹ Pearson's correlation has nothing to do with reliability as well as validity, and actually is one of the common mistakes in reliability analysis.²⁻⁵ As the authors point out in their conclusion, the IOHT showed strong concordance with the CROM, thus proving its validity and reliability as a head-posture-measuring device.¹ Why did they not use intra-class correlation coefficient (ICC) exact type or weighted kappa to evaluate the reliability of IOHT?²⁻⁵ It is good to know that validity (accuracy) and reliability (precision) are

two completely different issues being evaluated with different tests that should be interpreted with caution.²⁻⁵

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References

1. Kim J, Nam KW, Jang IG, Yang HK, Kim KG, Hwang JM. Nintendo Wii remote controllers for head posture measurement: accuracy, validity, and reliability of the infrared optical head tracker. *Invest Ophthalmol Vis Sci*. 2012;53:1388-1396.
2. Jeckel JF, Katz DL, Elmore JG, Wild DMG. *Epidemiology, Biostatistics and Preventive Medicine*. 3rd ed. Philadelphia, PA: W.B. Saunders Co.; 2007.
3. Rothman KJ, Greenland S, Lash TL. *Modern Epidemiology*. 4th ed. Baltimore, MD: Williams & Wilkins; 2010.
4. Szklo M, Nieto FJ. *Epidemiology Beyond the Basics*. 2nd ed. New York, NY: Jones and Bartlett Learning; 2007.
5. Bland JM, Altman DG. Agreed statistics: measurement method comparison. *Anesthesiology*. 2012;116:182-185.

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