

## Technical Comment on “Saccadic eye movement performance as an indicator of driving ability in elderly drivers”

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Extrapolation is defined as the process through which estimation has gone beyond the original observations. Schmidt et al's [1] conclusion on the clinical usefulness of eye saccade movements for detecting aged drivers who are unable to drive safely is a perfect example of such an extrapolation. Given their observations and the methodology they used, the risk of this assumption being wrong is high. This type of claim could nevertheless lead to dramatic consequences on people's lives and should clearly be avoided in a peer-reviewed paper without clear scientific evidence. In this study, the published information suggests this study suffers from selection bias, misclassification, confounding, observer bias, and possibly of random error.

When studying the screening properties of an innovative test, we expect a sample of participants representing the entire spectrum of the target population to be included and not only extremes. This principle will avoid what is called “spectrum bias” [2]. We also expect a clear definition of how participants were classified as fit or unfit to drive (gold standard) and of the instrument's ability to correctly classify drivers as fit or unfit to drive. In this study, the authors simply assumed that all patients who were referred to the Institute of Legal Medicine were unfit to drive and all those who attend the University of Zurich's Senior Citizens' University were fit to drive. The authors themselves state that this led to a misclassification of 8 of the 21 (38%) drivers from the Institute of Legal Medicine, given that these drivers had successfully passed their on-road test and were deemed fit to drive. The authors were, however, unable to classify other drivers correctly as none of the remaining 123 study participants performed an on-road evaluation. The study design therefore makes it impossible to link eye movement to driving performance.

During the analysis phase, two important limitations need to be accounted for: the failure to adjust for confounders and to account for missing data. When analysing group differences, the authors should have adjusted their analysis for the level of education or age given that university participants were five years younger than those attending the In-

stitute of Legal Medicine. This could help to assure readers that the small observed differences between groups were not solely due to these confounders. There were also important discrepancies in the amount of eye saccade movements that were excluded from the analysis (52% in the Legal Medicine group vs 31% in the university group). Apparently, missing data were not replaced. This makes it difficult to justify comparing the total number of correct eye movements (table 4) rather than the proportion of correct eye movement (figures 1–4). Therefore, the only significant differences that can be accounted for were those for anti-saccades and visuovisual interactive saccades when comparing the youngest group (mean age 30 years, n = 34) with the eldest group (mean age 79 years, n = 21). In other words, this study only showed a significant association between eye movements and age.

At most this study could suggest that anti-saccades are affected by cognitive decline as suggested by other studies [3]. In other words, those performing well during the anti-saccade task are more likely to be free from cognitive impairment. The opposite is, unfortunately, not necessarily true given that many “healthy” participants also performed badly at this task. Furthermore, cognitive impairment is not necessarily associated with reduced driving performances [4, 5] and reduced eye movements in laboratory settings do not necessarily transpose to the real world [6]. Assuming that those who perform badly at the anti-saccade test are unfit to drive would therefore lead to an important number of people being unjustly deprived of their right to drive. This study therefore does not have enough scientific foundation to support the claim that eye saccade movement can serve to screen older drivers and detect those that are unable to drive. Further studies are undeniably needed before applying such criteria for legal decisions.

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