

**TEST-RETEST RELIABILITY OF STANDARD DEVIATION OF LANE POSITION
AS ASSESSED ON A PC-BASED DRIVING SIMULATOR**

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ABSTRACT

Driving is an everyday activity that is commonly affected by neurologic disorders and medical treatments. A frequently used metric for assessing driving ability is the standard deviation of lane position (SDLP), or the amount that subjects “swerve” within their driving lane. This measurement has been used with individuals under the influence of alcohol, illicit drugs, and prescribed medications in both on-road and simulator studies. Although good test-retest reliability is critical if one is to measure change in individuals over time, there is surprisingly limited data regarding the test-retest reliability of SDLP.

Objective. To examine the test-retest reliability of SDLP in subjects tested at (1) a 3-month retest interval (a time frame common to clinical trials), and (2) a year or longer retest interval (a time period over which one might track changes in neurologic patients).

Methods. Group 1 completed retesting an average of 84 (s.d. = 8.1) days after their initial simulator assessment. Both HIV negative (HIV-; n = 16) and positive (HIV+; n = 13) subjects were included to explore short-term reliability in control and mildly ill patient groups. All HIV+ subjects were medically asymptomatic, and unlikely to experience HIV-related changes over this interval. Two HIV+ subjects were neuropsychologically (NP) impaired.

Group 2 (n = 31), a different cohort, was retested an average of 19.8 (8.3) months after baseline. All subjects completed NP evaluations at baseline and follow-up, with NP status rated on a scale of 1 (above average) to 9 (severe impairment) by a clinician blinded to simulator performance. Twelve subjects (39%) were NP impaired. In order to examine reliability in a stable neurologic cohort, all subjects were selected because they remained at the same level of NP functioning at follow-up.

SDLP was assessed in both groups using an interactive PC-based driving simulator that consisted of a monitor, steering wheel, and brake/accelerator pedals. Participants were required to maintain lane position while holding a constant speed (55 mph) and responding to divided attention tasks in the corner of the monitor. Group 2 completed an existing, standardized scenario (TOPS), while Group 1 completed a newly developed driving scenario. Both simulations lasted approximately 7 minutes.

Results. Combined reliability for Group 1 was .74. Test-retest reliability was .68 for the HIV- and .83 for the HIV+ subjects. For Group 2, SDLP was significantly correlated with NP functioning at baseline ($r = .5, p = .005$) and follow-up ($r = .48, p = .006$), with impaired subjects

evidencing a higher SDLP than NP normal subjects at both baseline (mean of 1.9 vs 1.2; $p = .006$) and follow-up (1.7 vs 1.1, $p = .01$). Combined test-retest reliability for Group 2 was .86. The NP normal group had a test-retest reliability of .74; test-retest reliability for the NP impaired group was .87.

Conclusions. SDLP is a reliable measure for periods ranging from months to years when assessed in cognitively stable subjects. As such, this may serve as a useful tool in tracking the effects of neurologic disorders and pharmacologic treatments on driving abilities.