On the Road to Safety: Standardizing the RT-2S Brake Reaction Time Tester

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PURPOSE
The purpose of this study was to standardize the RT-2S Simple Reaction Time Tester as a reliable and valid instrument for use in driving evaluations. Although brake reaction time alone will not accurately predict whether an older driver is fit or unfit to drive, it is a valuable component for the driving evaluator when considering all the variables in a comprehensive driving evaluation. In the past, brake reaction time was measured by the false foot, a brake reaction time device manufactured by the American Automobile Association (AAA). The AAA brake reaction time test is no longer being manufactured, and therefore, there is a need for a new, reliable reaction time. This will be done by comparing the brake reaction time to the AAA norms established by the standardized AAA brake reaction times.

SAMPLE
Participants were recruited from the eastern United States during community health fairs. Demographic information of age, gender, and self-reported health status is depicted in Table 1. Examination of age and gender differences was performed using a Chi-Squared test with statistical significance. Raceethnicity was not found to be significant between the two groups (X^2 = 0.983, p > 0.05). Similarly, age differences were examined by gender using an independent samples t-test and were found to be non-significant (t = 0.945, p > 0.05). Prior to the study, the researchers obtained Institutional Review Board approval.

Table 1: Demographic Comparison by Gender

<table>
<thead>
<tr>
<th>Participants</th>
<th>Male (N=120)</th>
<th>Female (N=128)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-55 years</td>
<td>27 (22.5%)</td>
<td>31 (24.3%)</td>
</tr>
<tr>
<td>60-65 years</td>
<td>42 (35.0%)</td>
<td>55 (43.4%)</td>
</tr>
<tr>
<td>66-70 years</td>
<td>31 (25.8%)</td>
<td>29 (22.6%)</td>
</tr>
<tr>
<td>70 years and</td>
<td>19 (15.8%)</td>
<td>19 (15.0%)</td>
</tr>
<tr>
<td>Raceethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>112 (93.3%)</td>
<td>113 (88.8%)</td>
</tr>
<tr>
<td>Black</td>
<td>8 (6.7%)</td>
<td>5 (4.0%)</td>
</tr>
</tbody>
</table>

CONCLUSIONS
The brake reaction times of the different age groups tested increased with age with the exception of the 36 to 55 year olds. There was also a significant difference between younger and older drivers when compared between the two groups. This increase in brake reaction time with aging was expected. The average brake reaction time for the males was faster than the average time for females when tested using the AAA instrument. Although there were significant differences found between the two groups, the overall number of drivers was too small to justify the use of a post-hoc test. Overall, the average of the brake reaction times collected using the RT-2S Simple Reaction Time Tester was slower than the average of the brake reaction times collected using the AAA program. In general, the brake reaction times performed better for the younger group than the older group, which was consistent with the findings of the difference in the testing environment, a smaller sample size, or fewer numbers of trials.

An alternative interpretation is that the RT-2S is a more accurate reflection of an individual's sample brake reaction time. This is supported by the Gottin et al. (2000) study. They noted that their results 'challenge' the AAA norms. The study group, females who had right arm chronic ligament reconstruction, improved over six weeks to equal the control group in brake reaction times. However, even after 6 weeks, neither the control or the reached the 50th percentile of the AAA norms. Since participants reported themselves as being ' recreationally active', they don't raise the question of the validity of the AAA norms specifically for females. Since the RT-2S times were overall slower than the AAA norms, the female subjects in Gottin's study would have been at least in the 95 percentile or more. Thus, it may be that the RT-2S more accurately reflects simple reaction times.

PROCEDURE

*All subjects sit in the same standard, immobile chair with the first pedal placed on the ground in front of them during testing.

The test light has illuminated red and green lights placed on a table directly in front of subjects within easy viewing distance.

Each subject was asked to adjust his or her chair in relation to the first pedal, ensuring the subject was able to easily and comfortably reach the first pedal module, if they were in chair or seated.

All subjects were given specific, consistent directions throughout all trials in the study. Subjects instructed to place their right knee on the accelerator pedal and keep it depressed enough to maintain the illumination of the green light.

Before testing began, all subjects were instructed to move their right foot from the accelerator pedal to the brake pedal and depress the brake pedal as rapidly as possible when the red light was on the test light box illuminated.

Timing between the illumination of the red and green lights was randomly controlled by the researchers for two, three, or four seconds.

During testing, each subject was given one practice test and three trials that were used for data analysis.

REFERENCES


SUMMARY
In reality, attempting to determine the absolute brake reaction time for an individual is probably not possible. In any given situation, the human factor is characterized by great variability and the situations in which they operate a motor vehicle are so large that it is impossible to assign a single number or even a range of numbers to the perception-response time in the context of driving.

Clearly, simple reaction time cannot be the only or even larger factor in the decision, when evaluating drivers, particularly older adult drivers, having a simple reaction time with valid simple reaction time norms, gives a better understanding of the driving evaluator's role for determining whether an individual is safe to drive. Using the RT-2S Simple Reaction Time tool is, then appropriate validity and reliability studies must be done.

Based on the findings of this study, the RT-2S Simple Reaction Time Tester is an appropriate replacement instrument for the AAA Brakes Reaction Reaction tool. In fact, it may be that the RT-2S more accurately reflects simple reaction times, which is supported by the availability of this instrument will allow driving evaluators to continue to begin to assess the ability of older drivers and drivers who have physical or mental impairments. However, additional studies with a larger sample and a greater variety of geographical areas would be useful to confirm the reliability and validity of the RT-2S Simple Reaction Time tester across all populations.