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Exploring the Concurrent Validity of the Indoor Mobility Pre-driving Screen (IMPS): A Comparison of the IMPS and EF-Car Motion Driving Simulator

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Abstract

The purpose of this study was to explore the concurrent validity of an in-clinic assessment of pre-driving skills, the IMPS, in comparison to five rehabilitative programs on the EF-Car Motion Driving Simulator. Assessment data was collected from 36 participants ages 18+ who possess a valid driver's license. Pearson's product-moment correlations revealed there is some correlation between scores on the IMPS and three of the five assessments on the driving simulator (DS).

Literature Review

Driving is an important occupation linked closely to feelings of independence (Crizzle et al., 2019). Many drivers with disabilities seek driving assessment and rehabilitative services to regain independence (Macdonald, Pellerito Jr., & Di Stefano, 2006).

No one in-clinic assessment, or group of assessments, is considered best able to accurately predict on the road outcomes (Dickerson, 2014). The IMPS has the potential to fulfill that gap if proven a valid and predictive assessment. The IMPS has been shown to be a valid tool for pre-driving assessment in initial studies (Pope & Tope, 2011; Miles, Svay, Madrid, & Crichton, 2014; Alhasmi, Hudson, Mendez-Schiaffino, & Williford, 2016).

Table 1

Participant Age Groups

Age Group	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Number of Participants	5	9	2	4	11	2	3

Methodology

Design: This design of this study was a nonexperimental assessment comparison study of concurrent validity.

Participants: A convenience sample of 36 community-dwelling adults ages 18+ who possess a valid driver's license were recruited for this study. Attempts were made to stratify the sample based on age, however age distribution was uneven (Table 1). Four participants experienced simulator sickness during testing and had to halt testing procedures.

Data Collection: Participants were scheduled for a one-hour session during which they completed the IMPS and the DS assessments. Order of assessment (IMPS or DS first) administration was randomized to eliminate carryover and testing effects.

Assessments administered through the DS were: Reaction Time, Cognitive Abilities, Field of View, Glare/Memorization, and Situational Awareness.

Data Analysis: In order to answer the primary research question, relationships between IMPS total score and scores on the DS assessments were explored through the use of Pearson product-moment correlations.

Results

Some correlations were present between total scores on the IMPS and constructs of the DS assessments (Table2). It should be noted that the IMPS generates a total score indicative of performance on the measure, dissimilar to the DS assessments which do not generate a grand total. Individual testing variables of the IMPS and DS assessments were compared to further explore correlations between the assessments. Results detailed below. On the left is the IMPS construct and on the right is the DS assessment construct.

Cognitive Abilities Assessment:

- IMPS scanning right – Stayed on course (r=.332, *p*=.048)
- IMPS scanning left – Times over speed limit (r=-.390, *p*=.019)
- IMPS accuracy right – Veering to the right (r=-.340, *p*=.043)

Field of view (FOV) Assessment:

- IMPS scanning right – Objects identified (r=.369, *p*=.029)
- IMPS scanning right – Correct location of objects (r=.428, *p*=.01)
- IMPS accuracy right – Objects identified (r=.366, *p*=.031)
- IMPS accuracy right – Correct location of objects (r=.368, *p*=.03)
- IMPS accuracy left – Objects identified (r=.518, *p*=.001)
- IMPS accuracy left – Correct location of objects (r=.393, *p*=.02)

Table 2

Pearson Correlations of IMPS Total Score with Driving Simulator Scores

	Correlation	*p*-value	Significant
Reaction Time Assessment			
Reaction Time Average	-.196	.251	No
Cognitive Abilities Assessment			
Number of Times Over Speed Limit	-.384*	.021	Yes
Number of Times Under Speed Limit	-.186	.278	No
Veering to the Right	-.359*	.032	Yes
Veering to the Left	.042	.808	No
Maintained Appropriate Speed (%)	.299	.076	No
Stayed on Course (%)	.041	.812	No
Glare/Memorization Assessment			
Glare/Memorization Trial 1	.047	.788	No
Glare/Memorization Trial 2	.199	.252	No
Glare/Memorization Trial 3	.180	.301	No
Field of View Assessment			
Objects Identified	.469**	.004	Yes
Correct Location of Objects	.429**	.010	Yes
Situational Awareness Assessment			
Insufficient Separation Gap	-.139	.426	No
Turn Signal Errors	-.302	.078	No
White Line Errors	.051	.773	No
Inappropriate actions at Junctions	-.349*	.040	Yes
Number of Times Over the Speed Limit	.274	.111	No
Lane Discipline	-.144	.408	No
Wrong Direction	-.007	.969	No
Number of Collisions	-.061	.726	No
Hazards Negotiated	.046	.792	No

*p<.05
**p<.01

Discussion

The results of data analysis show some correlations between IMPS total score and testing items on the five DS assessments utilized. The greatest number of correlations were found when comparing the IMPS to the DS FOV assessment. The DS situational awareness assessment was the assessment most similar to a real world, on the road drive. Yet, only one of its constructs was found to be correlated with the IMPS total score.

While only a few correlations were found between the IMPS and the chosen DS assessments, it should not be discredited as a pre-driving assessment. The IMPS needs to be compared, concurrently, to an on the road driving assessment to truly explore its predictability.
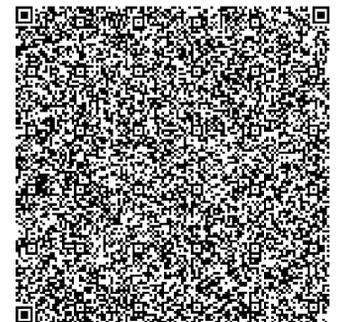
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