Night driving and the situation awareness of learners and parents: Are they seeing the same road?

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Abstract

Young drivers remain overrepresented in road crashes, particularly in darkness. In Queensland minimum graduated driver licensing practice requirements sees parents providing the most supervision to meet the required 100 logbook hours, including a minimum of 10 night-time hours. This study compared the situation awareness of parents and learners as they provided a verbal commentary regarding 'what they were looking at' during a 15-minute segement of real-world driving footage projected in a cave-simulation environment. Despite some similarities, analyses revealed considerable differences in situation awareness, with implications for the safety and nature of driving during supervised (learner) and restricted (provisional) driving.

Background

In Australia novice drivers must progress through a graduated driver licensing (GDL) program, with Queensland requiring a minimum of 100 logbook hours, a minimum of 10 which must be driven at night. Unsurprisingly parents are typically the most common supervisor (Scott-Parker et al., 2011). Rather than being professional instructors, parents tend to be experienced drivers who impart driving skills and knowledge based on their own driving experience, with driving practice the ideal opportunity to develop the situation awareness skills (SAS) of the young driver. Importantly, SAS emerges from a complex dynamic of perceiving, comprehending, and projecting risks, and as such SAS are vital for safe road use, including driving at nighttime. However the SAS of parents and learner drivers remains relatively unknown, therefore the similarities and differences in SAS for learners and parents, during nighttime driving, was explored.

Method

Twelve learner-parent dyads provided verbal commentary regarding 'what they were looking at' (insight into SAS) during separate viewing of a 15-minute segment of real-world nighttime driving footage, captured via three GoPro cameras and projected in a cave-simulation environment. Commentaries were recorded and transcribed verbatim. Word counts and frequencies (using NVivo version 10) were examined for learners, for parents, and for learner/parent comparisons. Verbal transcripts were analysed using Leximancer^{TM} version 4 to identify themes, concepts, and relationships between them to create the learner concept map which was overlaid manually with the parent concept map to identify similarities and differences in situation awareness during the nighttime driving task.

Results

Words and Concepts

Learners on average uttered 1,249 (*SD*=454) words (total=14,991 words). Parents uttered a non-significantly larger average of 1,642 (*SD*=557) words (total=19,700 words) in the nighttime driving condition, $t(22) = 2.15$, $p=.072$. Learners had 30 concepts and parents had 29 concepts; learners had 10 (e.g., direction, people, street) and parents had 9 (e.g., intersection, zone, clear) unique concepts, with 20 (e.g., car, left, lane) shared concepts overall. Concept frequencies can also suggest

importance within and contribution to the SAS network, and as can be seen in Table 1, the majority of concepts (as indicated by shading) were fairly consistent across learners and parents. Notable differences remain, however, with learners commenting regarding other road users (e.g., cars) and infrequent driving manuevres (e.g., merging) more commonly than parents, and parents commenting regarding the surrounding driving environment (e.g., traffic) more commonly than learners.

Table 1. Concept counts for shared and unique concepts, by learner and parent

Shared concepts	**Count**		**Shared concepts**	**Count**	
	Learner	**Parent**		**Learner**	**Parent**
Car	277 (22.2)	187 (11.4)	Turning	63 (5.0)	47 (2.9)
Left	271 (21.7)	445 (27.1)	Down	55 (4.4)	73 (4.5)
Lane	236 (18.9)	319 (19.4)	Front	52 (4.2)	88 (5.4)
Lights	225 (18.0)	250 (15.2)	Truck	52 (4.2)	74 (4.5)
Ahead	135 (10.8)	155 (9.4)	Speed	50 (4.0)	53 (3.2)
Road	111 (8.9)	181 (11.0)	Straight	49 (3.9)	41 (2.5)
Sign	106 (8.5)	168 (10.2)	Red	46 (3.7)	46 (2.8)
Green	104 (8.3)	160 (9.7)	Stop	43 (3.4)	57 (3.5)
Coming	89 (7.1)	195 (11.9)	Traffic	40 (3.2)	174 (10.6)
Merging	72 (5.8)	52 (3.2)	Roundabout	27 (2.2)	37 (1.6)
Unique concepts	**Learner Count (%)**		**Unique concepts**	**Parent Count (%)**	
Continuing	54 (4.3)		Hand	160 (9.7)	
Bus	45 (3.6)		Vehicles	69 (4.2)	
Direction	44 (3.5)		Intersection	59 (3.6)	
People	43 (3.4)		Zone	59 (3.6)	
Bridge	42 (3.4)		Clear	46 (2.8)	
Roadworks	40 (3.2)		Exit	40 (2.4)	
Driving	37 (3.0)		Tunnel	27 (1.6)	
Street	33 (2.6)		Highway	26 (1.6)	
Hour	27 (2.2)		Hats	22 (1.3)	
Heading	19 (1.5)				

NOTE: The relative frequency count of the concepts was calculated by ([count/average] X 100). Using this formula the frequency concept count for car for learners can be calculated by 277/1,249 x 100 to arrive at a relative frequency of 22.2. Shading indicates relative frequencies for shared concepts < +/- 2%.

Concept map

To further understand the situation awareness of learners and parents, the concepts were mapped to reveal the connections between the concepts. Figure 1 shows the concept map of the situation awareness of the learners (the foundation for the mapping exercise) with the concept map of the situation awareness of the parents overlaid. As can be seen by the double-bars, only a handful of concepts map with the same concept connections for learners and for parents. Overwhelmingly it appears that – while the concepts themselves are quite similar overall during the nighttime driving context – the structure of the concept maps differs considerably.

Conclusions

The analysis of the verbal commentary captured during the presentation of real-world nighttime driving footage in a cave simulation environment revealed interesting similarities and differences in the SAS of learner drivers and parents. In addition to education regarding the apparent differences in what is attended to in the driving scene by the vehicle's front seat occupants, resources to support parents through the novice licence phases could emphasise the importance of SAS, encourage

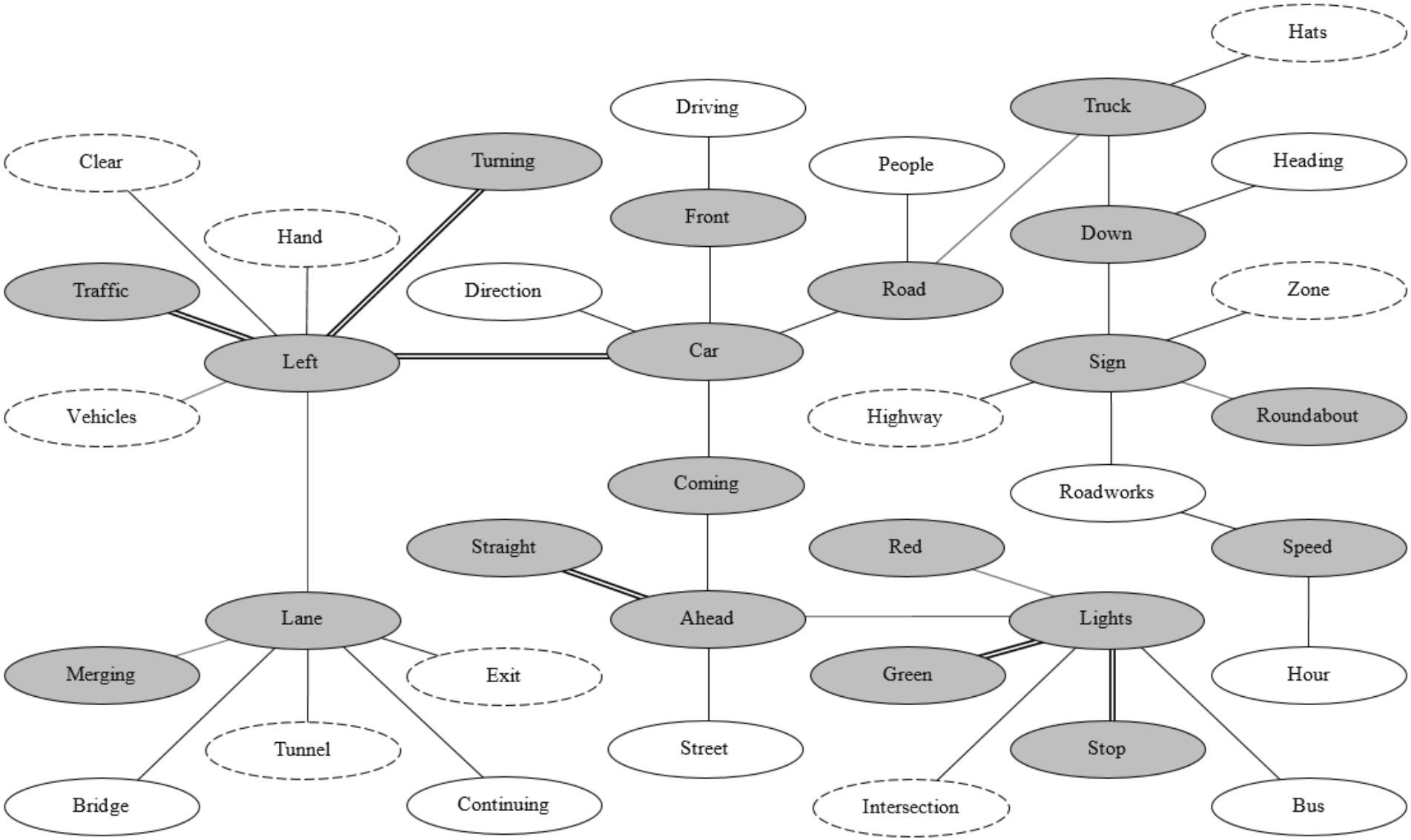
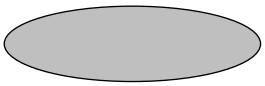
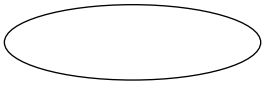


Figure 1. Learner/parent concepts, nighttime driving

Concept Shape	Concept Shape Meaning
	Shared Concept – Learner and Parent
	Unique Concept – Learner
	Unique Concept – Parent
	Shared Concept Connection – Learner and Parent

parents to identify their own SAS, and to focus on translating these skills – in verbal and practical guidance – to their novice child. Future research should investigate how to translate SAS skills from parents (as non-professional driving supervisors/instructors) and professional driving instructors to learners, as a novel way of minimising road crash risk for the independently-licensed young driver. In addition, future research should explore how to foster the young novice driver's SAS skills through driving practice, self-monitoring and insight training, consistent with best practice driver training models such as the Goals for Driver Education (GADGET) model.

References

Scott-Parker, B., Bates, L., Watson, B., King, M. J., & Hyde, M. K. (2011). The impact of changes to the graduated driver licensing program in Queensland, Australia on the experiences of Learner drivers. *Accident Analysis and Prevention, 43*(4), 1301-1308. doi: 10.1016/j.app.2011.01.012