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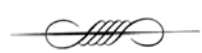
The Impact of Brand, Sex, Moment and Distance of Estimation on the Speed Perception of Vehicles



Abstract

Our research explores whether stereotypes influence estimations of the speed of a cheap vehicle and an expensive one viewed on film by participants. A second aim was to determine whether stereotyping could arise while completing a questionnaire. Davies (2009) demonstrated that no effect attributable to stereotyping could be detected among 18–21 year old participants' contemporaneous estimates of two vehicle speed (the cheap Volkswagen Polo and the expensive BMW).

In Experiment 1 we tested Davies' result among 14–18 year old school students. No interaction was found between any of the factors involved. The analysis also revealed that neither the main effects due to brand, nor the moment of estimation of the speed was significant. Furthermore, the main effect due to participants' sex was not significant.

In Experiment 2 we tested Davies' same results (2009) among university students (N = 351), but with a different experimental arrangement. Participants estimated the speed of cars from two different distances.

No interaction was detected between any of the factors – brand, distance, sex – involved. The analysis revealed that neither the main effects of the brand, nor the distance of the vehicle from the camcorder was significant. However, the effect of participants' sex *was* found to be significant: females' overall speed estimate achieved a higher grade of accuracy.

Keywords

estimating speed; impact of brand on speed estimation; moment of estimation; stereotypes; cars.

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The impact of vehicle brand on speed estimation can have important implications in eyewitness psychology. However, only a few researchers – Davies – Patel (2005), Davies (2009), Kósa et. al. (2011), and Kósa – Zsigmond (2013) – have addressed this issue. Davies and Patel (2005) demonstrated that stereotypes associated with particular types of car can influence judgments of culpability in a road accident report. Later, Davis (2009) conducted three experiments on speed estimation. In his experiments the impact of aggressiveness attributed to drivers through stereotyping on the estimated speed of the vehicles (a BMW 3 Series and VW Polo) was measured. The first two experiments concluded that no effect of stereotyping could be detected in the speed estimation of 18–21 year old participants who, having viewed a film of both cars, estimated the speed immediately after watching the film.

Experiment 1

Based on the findings above, our aim was to find out whether stereotyping due to brand could arise among students aged 14–18 not only after a day delay, but also during completing the questionnaire, within 4–5 minutes after watching the film. The question considering the first group's speed estimate – of the Matiz – was placed at the end of the questionnaire (1st condition), while the second group were asked for their estimation of the same car at the beginning of the questionnaire (2nd condition). The same procedure was followed for the third and fourth experimental groups but in this case using a film of the VW Polo. While testing Davies' result (2009) in another age group (14–18 years old) we also took into consideration the sex of the participants and the moment of speed estimation. In this experiment participants observed video sequences of either a cheap Daewoo Matiz or an expensive Volkswagen Polo, both of similar shape and size and of identical grey colour.

Method

Participants and Design

The 2 × 2 × 2 factorial design featured a quasi-experimental between-subject factor (sex) and two other between-subject factors (brand, and moment of estimation of the speed).

The experiment took place at two secondary schools, one in a small town, the other in a county town. Out of four groups of secondary school students (N = 214), aged between 14 and 18 years, the question requiring the first group's speed estimate – of the Matiz – was placed at the end of the questionnaire (1st condition), while the second group were asked for their estimation of the same car at the beginning of the questionnaire (2nd condition). The same procedure was followed for the third and fourth experimental groups but in this case using a film of the VW Polo.

Materials

A cheap Daewoo Matiz and an expensive Volkswagen Polo – of similar shape, size, colour and same year of manufacture – had been filmed from a car parked at an intersection outside each location. The two cars passed by the camera separately at a speed of 80 km/h (77 km/h or 48.84 mi/h calibrated speed). Local traffic was stopped during filming with the help of the County Police Inspectorate.

The same car registration plate was used for both cars and both were driven by the same person (the driver's sex, age etc. being unrecognizable). The film was then edited to produce two 4 second long sequences (one of the Matiz, the other the Polo) each passing directly in front of the camera and continuing at the same constant speed for about a further 20m, (when filming was stopped). The noise of the cars was kept unaltered during the presentations. In order to check the recognizability of the vehicle brands, the two short film sequences were first pretested to 33 secondary school students without mentioning the brand.

Participants in experiments completed a questionnaire (in Hungarian) firstly concerning the speed of the vehicles seen on the film. The questionnaire also asked for the participants'

driving history, frequency of car usage and the brand of car(s) they drive. Next, these participants were asked to name the brand and approximate price of the two cars from the sequences. Then based on their brand preferences they were asked to rank in descending order – from the most desirable to the least desirable – the following 10 vehicles of similar shape and size to those used in the research: Peugeot 206, Renault Clio, Volkswagen Polo, Dacia Logan, Opel Corsa, Daewoo Matiz, Mercedes Smart, Suzuki Swift, Chevrolet Spark and Skoda Fabia.

Using a 4-point rating scale (from '1' *very important* to '4' *not important at all*) they were also asked about the importance in their everyday life of certain brands of products, their price, quality, shape, trendiness, popularity among friends, equipment level, uniqueness and to what extent they are advertised. Finally, they answered questions concerning their age, sex and what information they had used to estimate the speeds of the vehicles.

Procedure

Students were tested in a classroom in their respective secondary schools. They were asked to participate voluntarily and anonymously in a five-minute research on cars organized by our university. They were randomly assigned by a researcher to one of the four experimental groups and then asked to sit in front of one of two notebooks, (Samsung NP300ESZ with earphones and '15,6' monitors). They were told that they would be shown a video clip of a passing car, and immediately afterwards would be required to fill in a questionnaire at an adjacent table. After completing the questionnaire the volunteers were thanked for taking part in our research, told they would be given an explanation of the aims of the research later that day and that the results of the research would follow a few months later.

Results

Of the participants who observed the Matiz, and whose estimate of the speed were given at the beginning of the questionnaire (2nd condition); 96,8% were able to recognize its brand and 3,2% did not provide an answer. Of those who observed the Polo sequence (again as the 2nd condition); 83,7% were able to identify it accurately and 7% as belonging to the same price category (9,3% did not provide an answer.) A similar pattern emerged for the groups who were required to give their estimates at the *end* of the questionnaire, (1st condition); 91,9% of participants who observed the Matiz were able to recognize its brand, 1,6% as belonging to the same price category and 6,5% not providing an answer. Of those who observed the Polo sequence, 69,6% were able to identify it accurately, 13% as belonging to the same price category, 2,2% identified the Matiz and 15,2% did not provide an answer. In the statistical analysis, only the data of those participants who could precisely identify the brand of the car in the film, or at least categorize it as belonging to the same price category, were taken into account. The differences between the means of the estimated prices of the two cars were analyzed by independent sample t-test, revealing a significant difference between them. The Polo was estimated to be more expensive than the Matiz, $t\,(160) = -3{,}884$, $p = 0{,}04$. Thus our assumption that the prices of the two cars involved in the experiment are perceived to differ significantly from each other was met.

Concerning the ranking of the mentioned 10 brands of vehicles, we were also able to identify an important difference: Marking with '1' the *most desirable* and with '10' the *least desirable* they expressed the same strong dissimilarity between the Matiz and Polo. The highest score was reached by the former, the least by the latter (Table 1).

We transformed each participant's judgments into scores representing the deviation from the true speed (77 kph) regardless of over or underestimate. After checking the assumptions of normal distribution and homogeneity of variances (extreme scores removed), the estimated speed scores were analysed using factorial analyses of variance of a quasi-experimental between-subject factor (sex), and two between-subject factors (brand and moment of estimation of vehicle speed).

No interaction could be detected between any of the factors involved. The analysis also revealed that neither the main effects due to brand; ($F(2, 201) = 0{,}243$, $p = 0{,}622$, $n^2 = 0{,}001$), nor the moment of speed estimation; ($F(3, 201) = 0{,}333$, $p = 0{,}717$, $n^2 = 0{,}003$) were significant (Figure 1). The main effect due to participants' sex was not significant either ($F(1, 336) = 6{,}304$, $p = 0{,}322$, $n^2 = 0{,}021$, Figure 2).

We conducted one-way ANOVA tests to identify in participants' everyday life any potential relationships between the variables of brand importance, price, quality, shape, trendiness, popularity among friends, equipment level, uniqueness, advertising and the speed estimation: No statistical relationships were found.

Conclusion and discussion

Our results are consistent with those of other researchers who have demonstrated the relatively high accuracy of speed estimation, (Scialfa et. al. 1991; Evans 1970), and the work of Davies (2009), that demonstrates the lack of a stereotype-driven effect on contemporaneous speed estimation. We have shown that in case of secondary school students, stereotyping does not seem to arise in the case of contemporaneously made judgements, nor within the time-frame of a 4–5 minute questionnaire. This held true whether participants observed the expensive VW Polo or the Daewoo Matiz passing in front of the camera, or when film of the cars was cut 20 meters *before* the vehicles passed directly in front of the camera.

More research is required to find out whether stereotyping after a day's delay in speed estimations, based on brand (as described by Davies 2009, and by Kósa – Zsigmond 2013), can be detected within this age group. If such stereotyping were shown to exist, it would be highly beneficial to identify exactly when, within that first 24 hours, it arises.

Experiment 2

In his above mentioned paper Davies (2009) presented the third experiment that showed stereotyping when estimations were given the following day by phone or e-mail: the estimated speed of BMW was then significantly higher than that of the VW Polo.

Kósa and Zsigmond (2013) revealed a relationship between the passing order of the vehicles and their brand during speed estimation of an expensive (Volkswagen Polo) and a cheaper car (Daewoo Matiz). Every participant in four groups observed the two vehicles in two different

passing orders, half of the groups estimating the speed at the time of viewing the film, the other half being asked a day later by phone or e-mail. Results showed that a slower speed was attributed to the Matiz than to the Polo in each speed estimation / passing order. In addition, they found a significant relationship between passing order and brand, showing up a stereotype-driven judgment of speed-estimation even in estimates given at the time of viewing the film.

This current paper explores the impact of vehicle stereotypes on witness judgments of speed. According to the hypothesis, although traveling at the same speed, a significantly higher speed is attributed to the expensive car than to the cheap one regardless of experimental conditions.

Participants observed video sequences of either a cheap (Daewoo Matiz) or a more expensive (Volkswagen Polo), both of similar shape and size and of identical colour (grey). The cars were filmed travelling at a 77 kph calibrated speed and were filmed separately by a camera in a stationary car situated at a local intersection. After passing directly in front of the camera, the cars continued travelling for about 20 m at constant speed until filming was stopped.

These two films, called "passing in front of the camera" were seen by the participants belonging to the first two experimental groups.

By editing these two original films, two other sequences were produced for viewing by the third and the fourth experimental groups. In these new sequences, filming was cut when the two vehicles were approximately 15 m from the camera. (These new sequences were named "15 m before reaching the camera"). Therefore, participants observed either the Polo (third experimental group) or the Matiz (fourth group) also travelling at 77 kph, but not passing directly in front of the camera. According to the hypothesis, a significantly lower speed is attributed to the cars on these short films than those films in which the cars passed in front of the camera.

Regarding the role of sex in speed estimation, it was supposed that there would not be differences between men and women.

Method

Participants and Design

The 2 × 2 × 2 factorial design featured a quasi-experimental between-factor (sex) and two other between-factors (brand and distance of the vehicle seen from the camera; whether the car passed in front of the camera or not on the film).

A random sample of 351 persons (176 female and 175 male) aged between 18 and 26 years were approached on the University campus to take part in a short survey on cars. They were randomly allocated to one the four groups (3 groups of 88 and 1 of 87). All participants observed one film sequence, either the Polo or Matiz and completed a questionnaire immediately after it was shown.

Materials

Both vehicles were filmed travelling at 77 kph calibrated speed (80 kph on the milometer). Local traffic was stopped during filming with the help of the County Police Inspectorate.

The same car registration plate was used for both cars and both were driven by the same person (The driver's sex, age etc. being unrecognizable). The film was first edited to produce two 4 second

long sequences; (one of the Matiz, the other the Polo) each passing in front of the camera. These sequences were then re-edited to produce two more (4 second) sequences in which the two cars were seen *not* passing in front of the camcorder, (the recording being cut with the cars at about 15 m from the camera). The noise of the cars was kept unaltered during the presentations.

In order to check the recognizability of the vehicle brands, short film sequences were first presented to 30 secondary school teachers without mentioning the brand.

These participants completed a questionnaire (in Hungarian) firstly concerning the speed of the vehicles seen on the film. The questionnaire also asked for participants' driving history, frequency of car usage and the brand of car(s) they drive. Next, participants were asked to name the brand and the approximate price of the two cars from the sequences. Based on their preferences they were also asked to rank in descending order – from the most desirable to the least desirable – the following 10 vehicles of similar shape and size to those used in the research: Peugeot 206, Renault Clio, Volkswagen Polo, Dacia Logan, Opel Corsa, Daewoo Matiz, Mercedes Smart, Suzuki Swift, Chevrolet Spark and Skoda Fabia.

Using a 4-point rating scale (from "1" *very important* to "4" *not important at all*) they were also asked about the importance in their everyday life of certain brands of products, their price, quality, shape, trendiness, popularity among friends, equipment level, uniqueness and to what extent they are advertised. Finally, they answered questions concerning their age, sex and what information they had used to estimate the speeds of the vehicles.

Procedure

Students were tested in the hall of the University. Three students and one of the researchers walked around asking people to participate voluntarily and anonymously in a five minute research on cars organized by our university. They were accompanied to the big round table in the Hall, randomly assigned by a researcher to one of the four experimental groups and then asked to sit in front of one of four laptops (Dell Inspiron 6400 with earphones and a "15.4" monitor.) They were told that they would be shown a video clip of a passing car, and that immediately afterwards, they would be required to fill in a questionnaire. After completing the questionnaire the volunteers were thanked for taking part in our research. They were also told they would be given an explanation of the aims of the research later that day and the results of the research a few months later.

Results

92% of participants who observed the Matiz on the "in front of the camera" film were able to recognize its brand and 2% of them identified it as belonging to the same price category. Of those who observed the Polo sequence 73% were able to identify it accurately and 16% as belonging to the same price category. A similar pattern emerged for those who observed the "far from camera" sequences (for both the Polo or the Matiz.) 85% of those who viewed the Matiz were able to recognize its brand and 6% identified it as belonging to the same price category; 47% of those who observed the Polo recognized it precisely and 31% categorized the vehicle

as having a similar price. In the statistical analysis, only the data of those participants' who could precisely identify the brand of the car in the film (Table 2), or at least categorize it as belonging to the same price category (Table 3) were taken into account.

The differences between the means of the prices of the two cars were analyzed by independent sample t-test, revealing a significant difference between them. The Polo was estimated as more expensive than the Matiz, $t\,(349) = –5{,}173$, $p = .006$. Thus our assumption, that the prices of the two cars involved in the experiment are perceived to differ significantly from each other, was met.

Concerning the ranking of the mentioned 10 brands of vehicles we were also able to identify an important difference. Marking with "1" the *most desirable* and with "10" the *least desirable* they expressed the same strong dissimilarity between the Matiz and Polo. The highest score was reached by the former, the least by the latter (Table 4).

We transformed each participant's judgements into scores representing the deviation from the true speed (77 kph) regardless of over or underestimate. After checking the assumptions of normal distribution and homogeneity of variances (extreme scores removed), the estimated speed scores were analyzed using a factorial analyses of variance of a quasi-experimental between-factor (sex) and two between-factors (brand and distance of the vehicle from the camcorder at the moment of estimation: whether the car passed in front of the camera or not on the film). No interaction could be detected between any of the factors involved. The analysis also revealed that neither the main effects due to brand; ($F(2, 336) = 0.237$, $p = 0.627$, $n^2 = 0.001$), nor the distance of the vehicle from the camcorder at the moment of the estimation, were significant; ($F(3, 336) = 1.025$, $p = 0.381$, $n^2 = 0.009$). However, the main effect due to participants' sex was significant ($F(1, 336) = 6.304$, $p = 0.013$, $n^2 = 0.021$). Thus, approximately 2% of the variation in the scores for speed estimation is accounted for by this factor.

Females' overall speed estimate achieved a higher grade of accuracy ($M = 13.10$, 95% $CI = 11.32 – 14.88$) than males' ($M = 16.25$, 95% $CI = 14.54 – 17.96$). (See Figure 3 and 4).

Conclusion and discussion

Based on two different speed estimation distances, a new experiment arrangement was tested in the current study. Two groups of participants – one group observed the Matiz, the other the Polo – observed a nearing car from 15 m. The hypothesis that significantly lower speed would be attributed to the cars in these short films than to those which passed in front of the camera, were not supported. Consistent with the conclusions in the field (Evans 1970, Scialfa et. al. 1991, Davies 2009, Kósa et. al. 2011) estimates of vehicle speed are considerably accurate. Results of Experiment 1 show a relatively high accuracy of speed estimation regardless of the distance from where estimates were done.

Taking into consideration Scialfa et. al. result (1987) that compare to younger men and women only older women overestimated cars' speed, we hypothesized no difference between university students by sex. It is surprising, however, that females achieved a higher accuracy of speed estimation in every condition compared to men. More research is required to find out whether stereotyping due to sex is also characteristic to other speed estimation contexts.

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Brand	Average of classification (1–10)	Ranking order
Peugeot 206	4.43	3
Renault Clio	5.29	6
Volkswagen Polo	4.34	2
Dacia Logan	7.30	9
Opel Corsa	5.38	7
Daewoo Matiz	8.06	10
Mercedes Smart	4.73	4
Suzuki Swift	5.52	8
Chevrolet Spark	5.06	5
Skoda Fabia	4.32	1

Table 1 *Desirability of brand*

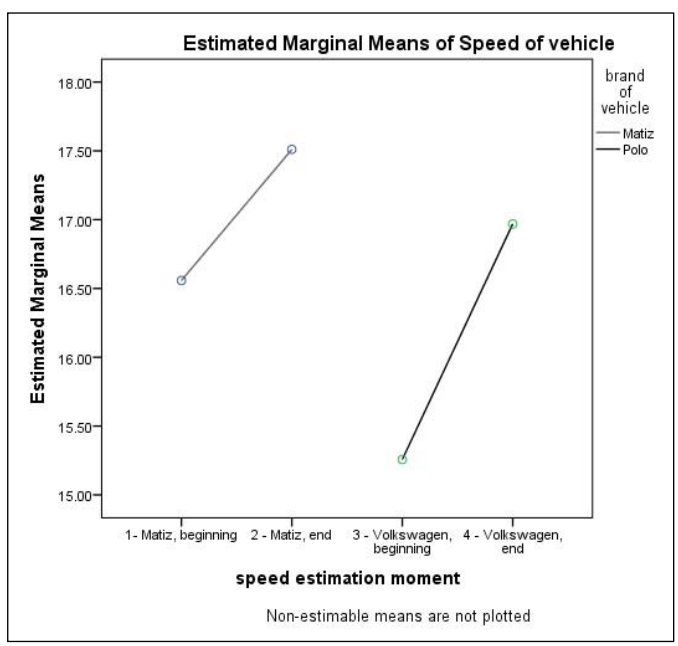

Figure 1 *Estimated marginal means of speed of vehicle – brand of vehicle*

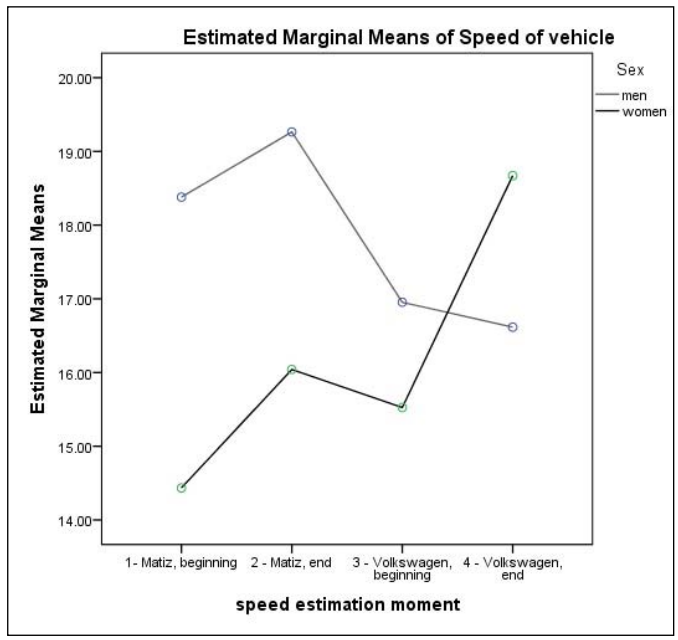

Figure 2 *Estimated marginal means of speed of vehicle – sex*

Experimental group	Brand	%
Matiz, 'passing in front of the camera' film	Recognized the Matiz	92
	Recognized the Matiz as belonging to a similar price category	2
	Recognized it as belonging to a higher price category	7
	Total grup – Matiz	*100*
Polo, 'passing in front of the camera' film	Recognized the VW Polo	73
	Recognized the Polo as belonging to a similar price category	16
	Recognized it as belonging to a cheaper price category	11
	Total grup – VW	*100*
Matiz, '15 m before reaching the camera' film	Recognized the Matiz	85
	Recognized the Matiz as belonging to a similar price category	6
	Recognized it as belonging to a higher price category	9
	Total grup – Matiz	*100*
Polo, '15 m before reaching the camera' film	Recognized the VW Polo	47
	Recognized the Polo as belonging to a similar price category	31
	Recognized it as belonging to a cheaper price category	22
	Total grup – VW	*100*

Table 2 *Recognizability of brand*

Experimental group	Mean	Median	Mode	Std. dev.	Min.	Max.	N
Matiz, ‘passing in front of the camera’	2 060,63	2 000	1 000	1167,49	300	6 000	88
VW, ‘passing in front of the camera’	3 969,38	4 000	5 000	1847,20	1 500	13 000	88
Matiz, ‘15 m before reaching the camera’	2 615,95	2 000	2 000	1909,13	600	12 000	88
VW, ‘15 m before reaching the camera’	4 216,66	3 500	5 000	2 750,28	500	15 000	87

Table 3 *Estimated price in Euros of the vehicles by experimental groups*

Brand	Average of classification (1–10)	Ranking order
Peugeot 206	4	2
Renault Clio	5,17	6
Volkswagen Polo	3,45	1
Dacia Logan	7,70	9
Opel Corsa	4,70	4
Daewoo Matiz	7,98	10
Mercedes Smart	4,86	5
Suzuki Swift	5,88	*8*
Chevrolet Spark	5,70	7
Skoda Fabia	4,57	3

Table 4 *Desirability of brand*

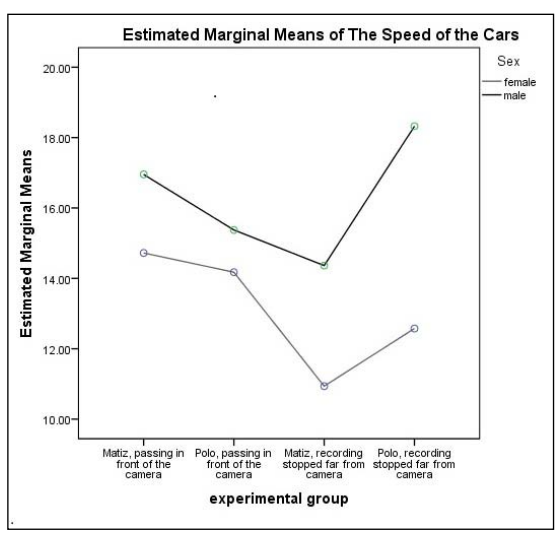

Figure 3 *Estimated marginal means of the speed of the cars – experimental group*

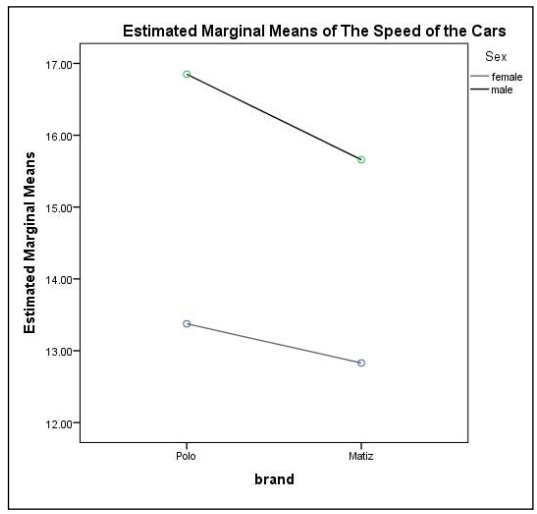

FIGURE 4 *Estimated marginal means of the speed of the cars – brand*

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