# DIGITAL BILLBOARDS 'DOWN UNDER'. ARE THEY DISTRACTING TO DRIVERS AND CAN INDUSTRY AND REGULATORS WORK TOGETHER FOR A SUCCESSFUL ROAD SAFETY OUTCOME?

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## ABSTRACT

In Australia, digital billboards are beginning to be permitted at the roadside. There are concerns from a road safety perspective that these signs may have more potential to distract drivers than static billboards. Since the existing international research on digital billboards and driver distraction is inconclusive, an on-road study was conducted to compare drivers' eye fixations and driving performance when advertising signs (static billboards, digital billboards and on-premise signs) were present. A total of 29 participants aged 25-54 years were fitted with eye tracking glasses and drove an instrumented vehicle along a 14.6 km route in Brisbane, Queensland passing a number of advertising signs, including digital and static billboards and on-premise signage. Number of fixations and dwell times towards advertising signs were measured, along with lateral deviation and vehicle headway. The study found the average fixation durations for all signage types were well below 0.75 s, considered to be the minimum perception-reaction time to an unexpected event. There were no significant differences in average vehicle headway between the three signage types. There was a statistically significant difference in lateral deviation when billboards were present. Joint research between regulators and industry is needed to further explore the significance of these findings.


## INTRODUCTION

In Australia, Out-of-Home (OOH) advertising is a legitimate and powerful means of advertising products and services. OOH advertising signs that appear on the side of the road such as billboards and bus shelters not only offer an effective means for advertising but also provide a potential revenue stream for State and local governments. As roadside billboards are designed to attract attention, an extensive body of research has explored whether roadside billboards have the potential to distract drivers or cause them to become inattentive to the driving task, which may ultimately lead to a crash (e.g. Decker, et al. 2015). In Regan, Hallet & Gordon's (2011) taxonomy, driver inattention has been defined as "insufficient, or no attention, to activities critical for safe driving" (p1775); while driver distraction (referred to as 'Driver Diverted Attention' in the taxonomy) is defined as the diversion of attention away from activities critical for safe driving toward a competing activity (either related or unrelated to the driving task), which may result in insufficient or no attention to activities critical for safe driving. As outlined in this taxonomy, billboards, because they are designed to attract attention, could compromise safe driving by diverting a driver's attention (either voluntarily or involuntarily) to a stimulus that is unrelated to the driving task.

Following substantial growth in the advertising industry over the last few years and advances in technology, digital billboards displaying a series of electronic advertisements are starting to be erected at the roadside. Subsequently, there are additional concerns that the size and brightness of the signs as well as the dwell time and changeover of each advertisement have the potential to divert attention away from the driving task for a longer period of time than a conventional billboard (Birdsall, 2008; Dukic, Ahlstrom, Patten, Kettwich & Kircher, 2013). In the interests of road safety, regulations and guidelines exist in most states of Australia for the installation of static billboards at the roadside. Operating standards for digital billboards are currently being drafted by regulators. The problem for regulators and the industry alike is that the existing scientific research cannot provide a definitive answer on whether billboards are sufficiently distracting to cause a crash, due to methodological limitations of the studies (e.g.

Molino, Wachtel, Farbry, Hermosillo & Granda, 2009; Decker, et al. 2015). The current operating standards internationally also differ widely between jurisdictions, possibly due to this absence of sound research-based evidence (Molino et al., 2009).

The measurement of eye glances is often used to assess the degree to which drivers are not attending to the information relevant to safe driving (Perez & Bertola, 2011). It is generally accepted in the research on driver inattention that glances away from the forward roadway totalling more than 2 s doubles the near-crash and crash risk compared to normal baseline driving (Klauer, Dingus, Neale, Sudweeks, & Ramsey 2006). A number of studies (e.g., Beijer, Smiley & Eizenman, 2004; Chattington, Reed, Basacik, Flint & Parkes, 2009; Dukic, et al., 2013; Lee, McElheny & Gibbons, 2007; Smiley, et al. 2005) have investigated drivers' visual behaviour towards billboards in metropolitan on-road and simulated environments. These studies have generally found that the presence of billboards did not significantly affect the percentage of time drivers devoted to glancing at the forward roadway (Decker, et al. 2015). Long glances were defined as anywhere between 0.75 s, the minimum perception-reaction time to an unexpected event, such as a vehicle slowing in front (Smiley, et al., 2005) and 2 s, based on Klauer et al.'s (2006) study.

Other research has explored the relationship between eye glance behaviour and driving performance variables such as lateral deviation and vehicle headway, as these variables are also considered to be indicators of distraction (e.g. Molino, et al., 2009) and can have a direct road safety impact. For example, high levels of visual and cognitive demand can result in a greater level of lane deviation and shorter headways (Östlund, Nilsson, Törnros & Forsman, 2006). However, studies that have explored the influences of digital billboards on driver performance variables such as lateral deviation and vehicle headway in a metropolitan on-road environment have reported mixed findings. For example, Lee et al. (2007) found only minor differences in speed and lane deviation between digital and static billboards which were located on straight interstate roads, while Dukic et al. (2013) did not find any significant changes in regards to speed, lateral placement of the vehicle or headway at any stage when drivers were passing digital billboards on a motorway.

There is no doubt that billboards add to the amount of external visual information presented to drivers; however drivers are exposed to a considerable amount of other visual information when driving, particularly along urban roads, some of which is relevant to the driving task (e.g., traffic signs), and some that is not. In some cases, roadside on-premise signs that advertise a product or service offered at that location are very similar to billboards in terms of their size, conspicuity, luminance, location and use of digital elements. It could be argued that these signs are designed to attract attention like billboards, yet they are often regulated differently. Only one research paper to date has reported comparisons of visual behaviour towards digital billboards with on-premise signs. Lee et al. (2007) found that there were no significant differences in glance durations between digital signs and on-premise comparison signs, some of which contained a digital element (average glance durations of 0.92 s compared to 0.87 s, respectively).

In meeting with representatives from the OOH industry and local and State government regulators to discuss the regulation of billboards in regards to road safety, a number of concerns with the existing research were raised and two of these were considered to be worth exploring in a new study. The main concern was whether the international on-road research exploring the impacts of both static and digital billboards on driver performance could be applied to Australian conditions, as a) no equivalent study had been conducted to date in Australia for comparison and b) regulations for billboards in Australia differ in some ways to those in other countries. The other concern was about the limited research on the influences of on-premise signage on driver performance, given there is a considerably higher number of on-premise signage than billboards in the Australian road environment. Given these concerns and that previous research (e.g. Molino et al., 2009) had recommended using an instrumented vehicle and eye tracking technology to study the effects of billboards on driving behaviour, the aim of the present study was to compare fixations and driving performance in the presence of static billboards, digital billboards and on-premise signs in an Australian on-road driving study, using the latest eye tracking technology. It was hoped that these research findings would assist in the development of future regulations and guidelines for both static and digital billboards as well as on-premise signage in Australia. The following research questions were proposed:

1. Do fixations and driving performance differ significantly in the presence of billboards (both static and digital) compared to on-premise signs?
2. Do fixations and driving performance differ significantly in the presence of digital billboards compared to static billboards?

# METHOD

## Design

The study utilised a within-subjects design to explore the relationship between drivers' viewing behaviours at OOH advertising signs and their subsequent driving performance. Signage type was the independent variable and viewing behaviour and driver performance were the dependent variables.

## Participants

A total of 29 participants (13 male, 16 female) were recruited via telephone by a specialist recruitment agency. A further four participants were recruited for an initial pilot study to test the equipment and driving time of the proposed route. This number of participants is commensurate with other similar international on-road studies (e.g., Beijer et al., 2004). Participants were aged between 25-54 years (M = 36.1 years, SD = 6.4 years) and all held a valid driver's licence, with a minimum of five years' driving experience. Drivers aged below 25 years and over 55 years were excluded from the study as limited driving experience and scanning patterns particular to these age groups were considered to be possible confounding factors in the results (e.g., Beijer et al., 2004). All participants had normal or corrected to normal eyesight. They were unfamiliar with the driving route, as familiarity with the route can influence viewing behaviour (Beijer, et al., 2004). In the present study, unfamiliarity with the route was defined as a) living outside the area by more than 10 kilometres, and either b) never driven the route, or c) not having driven the route in the last 6 months, similar to the definition in the Beijer et al. (2004) study. Participants were paid $100 for their involvement in the study. They were not informed about the specific nature of the study or the purpose of the instrumented vehicle until after the driving experiment was completed and were given the option to withdraw from the study at any time.

## Equipment

The Mobile Eye XG eye tracking system was used to capture participants' natural viewing behaviour while driving. The system consists of a set of head-mounted eye glasses that tracks all types of glances and records these in both video and data formats. A 2010 model Toyota Corolla sedan with automatic transmission was used as the test vehicle. The vehicle was fitted with the Mobileye collision warning technology to record lateral deviation and vehicle headway. This system was customised so that the raw data was synchronised with the eye tracking data. Cameras were attached to each side mirror to record lane position and behind the rear-view mirror to record vehicle headway. A roof-mounted sensor provided GPS location information. The data from all the different technologies was integrated and recorded within the RaceLogic VBOX performance measurement system which was installed within the passenger glove compartment.

## Route

The driving experiment took place along a 14.6 km section of road through Brisbane, Queensland, and its surrounding suburbs to Woolloongabba (see Appendix A for the route map). The route included multi-lane arterial roads, single lane local roads, city streets and a bridge crossing, with a predominant posted speed limit of 60 km/hr. This particular route was selected as it exposed drivers to the three signage types in both high and low density signage environments and at different points in the road environment (e.g., along a straight section of road, at an intersection, etc.); although the temporal spread of signage across all three signage categories was uneven along the route, The total driving time for each participant along the route and back to the starting point was approximately 90 minutes, depending on the amount of traffic. Data for each participant was only recorded from the start of the drive at Zillmere to the end of the route at Woolloongabba.

## Procedure

Participants were met at a supermarket car park in Zillmere, a suburb on the outskirts of Brisbane. They were fitted with the eye tracking glasses and an individual calibration procedure was conducted to ensure accurate POG recording. Participants then did a short 20 minute practice drive in the Zillmere area to familiarise themselves with both the vehicle and the eye tracking glasses.

Following the practice drive, participants drove the study route only once. A facilitator was present in the front passenger seat of the vehicle to provide instructions and route guidance where required. A technician was also present in the rear passenger seat to supervise the use of the eye tracking system. Participants drove the route in off-peak traffic conditions between the daylight hours of 11 am and 2 pm. On completion of the experiment, participants completed a 10 minute survey to record their demographic information.

## Data analysis

The three signage types were encoded in the present study as static billboards, digital billboards or on-premise advertising signs. Static billboards were defined as signs that display a static poster-type advertisement for a business that does not operate at the site of the billboard. Static billboards were either next to or visible from the roadway and generally measured greater than 25 square metres according to industry standards. Bus shelters and phone booths with advertising that measured less than 25 square metres were also included in this category. Digital billboards were defined as signs that display a series of electronic static advertisements for a business that does not operate at the site of the billboard. These signs measured 18 square metres according to industry standards and the advertisement changed every 10 seconds with a simple transition from one advertisement to the next. On-premise advertising signs were defined as signs that are used by businesses to advertise their product or service on the site of their business for example, a car sales yard using a portable Variable Message Sign (VMS) to advertise the sale of their cars. They varied in size and included digital elements in some cases. Advertising content of billboards and on-premise signs (including text size, graphics, etc.) was not recorded. Traffic signs were also encoded, although they were not included in any statistical comparisons to enhance statistical power.

Given the length of the route and the time it would have taken to analyse all of the video footage from each participant, the route was divided into eight segments of approximately one minute each in duration to compare participants' driving performance. Since digital billboards were of particular interest in this study and there were only four of these signs along the route compared to the large number of both static billboards and on-premise signage, four of the eight segments were designed to contain one digital billboard each. These digital segments also included a mix of static billboards and on-premise signs. The remaining four segments contained a mix of both static billboards and on-premise signs and were roughly comparable to the four digital segments in terms of their length and characteristics of the road. Segments were also originally categorised into high or low signage density environments; however in order to maximise statistical power of the subsequent analyses, the segments were collapsed and comparisons were made between the three signage categories only. A total of 21 static billboards were located across segments for comparison with the digital billboards. On-premise signs were not counted due to the time consuming nature of the encoding task, though the number of these signs would be substantially higher than the number of both digital and static billboards.

Participants' viewing behaviour was analysed in terms of number of fixations and the duration of these fixations. Fixations were defined as the maintenance of visual gaze on a specific region or object in the visual field. Generally, dwell times of 200 ms are classified as fixations; however more recently it has been suggested that fixations shorter than 200 ms are possible (Manor & Gordon, 2003). In this study, the threshold for fixations was therefore set at 100 ms. For analysis purposes, fixations were categorised as either on road (i.e., the participant was looking at the road surface or traffic signs) or off-road (i.e., the participant was looking at a digital billboard, a static billboard, an on-premise advertising sign or something else off-road).

Driving performance was analysed in terms of average and standard deviation of vehicle headway and average standard deviation of lateral position. These are commonly used as measures of distraction in other studies on billboards (e.g., Dukic, et al., 2013; Smiley et al., 2005). Vehicle headway was calculated by measuring the distance in time between the test vehicle and a vehicle directly in front. Standard deviation of lateral position was calculated by measuring the distance between the vehicle and the right lane marker.

To reduce any bias in the analysis, two highly trained encoders naive to the aims of the study analysed the footage frame-by-frame to determine where participants were directing their fixations. Each fixation was classified according to an agreed coding scheme. The observational encoding approach used was Mangold Interact, a specialist behavioural encoding software. Inter-rater reliability was calculated using both the kappa statistic and the intra-class correlation statistic, which has been used in other on-road studies (e.g., Hanowski, Olsen, Hickman & Dingus, 2006). The kappa coefficient was calculated using the fixation analysis, and found that the encoders were in substantial agreement with one another ($K=.689$, $p<.001$). The intra-class correlation statistic was calculated using the on-road dwell times and again found that encoders were consistent with each other ($r=.812$, $p<.001$).

Statistical analyses were carried out using the PSY statistical program (Bird, 2004) and a significance level of $\alpha = 0.05$ was applied. In some of the analyses, participants were excluded where there was insufficient data in every condition for comparison. Statistical comparisons were made between 1) digital billboards and static billboards to see if there were differences in fixations and driver performance when digital billboards in particular were present, and 2) billboards in general (by collapsing results between digital and static billboards) and on-premise signs to see if there were differences in fixation and driver performance when these forms of signage are present in the road environment.

# RESULTS

## Driver viewing behaviour

### Eyes on road

The study found that generally, participants tended to fixate most on the road ahead when driving. When comparing on-road viewing behaviour between digital and static billboards, there was no significant difference ($F(1,26) = .905$, $p = .760$). There was also no significant difference in on-road viewing behaviour when billboards (both static and digital) were present compared to when on-premise signs were present ($F(1,26) = .808$ , $p = .377$).

### Fixations

A total of 1,553 individual eye fixations were made towards billboards (both static and digital) across all segments. The characteristics of the fixations made towards each signage type in the eight segments are displayed in Table 1. Whilst there were far more fixations on static billboards than on digital billboards, there were five times as many static signs than digital signs along the route. When comparing average fixation durations between digital and static billboards, the result was not significant ($F(1,568) = 1.780$, $p = .183$. The result was significant when comparing billboards (both static and digital) with on-premise signs ($F(1,550) = 4.809$, $p = 0.29$).The average fixation durations however are well below 0.75 s which is considered to be the minimum perception-reaction time to an unexpected event.

**Table 1: Fixation characteristics by signage type**

| Sign type | Total fixations | Average fixation (ms) | *SD* (ms) | Median (ms) | Minimum fixation duration (ms) | Maximum fixation duration (ms) |
|---|---|---|---|---|---|---|
| **Static billboard** | 426 | 225 | 178 | 165 | 99 | 2310 |
| **Digital billboard** | 144 | 207 | 120 | 165 | 99 | 891 |
| **On-premise** | 983 | 199 | 107 | 165 | 99 | 1056 |

In terms of long fixations, only 12 fixations were above 0.75 s, considered to be the minimum perception-reaction time to an unexpected event. Two of these fixations were made towards digital billboards, eight were towards static billboards, and two were towards on-premise signs. Closer inspection of the video footage would be required to determine the exact signs that received these long fixations. There was only one fixation of over 2 s recorded in the study, where the participant was looking at a static billboard; however on closer inspection of the footage, the vehicle was stationary at the time of the fixation.

## Driving performance

### Vehicle headway

Average vehicle headway for each signage type was calculated for across the segments. The average headway when billboards (both static and digital) were present was 1.80 s compared to 1.85 s when on-premise signs were present. This difference was not statistically significant ($F(1,20) = .335$, $p = .569$). Further comparisons on average vehicle headway were made between digital and static billboards to see if there were any significant changes when digital billboards were present. The average vehicle headway when static billboards were present was 1.82 s compared to 1.77s when digital billboards were present. This difference was also not statistically significant ($F(1,20) = .636$, $p = .435$).

### Lane deviation

The average standard deviation of lane position (SDLP) for each signage type was calculated across the segments. There is great variability in the literature in regards to what SDLP is considered normal when driving, however it is estimated to be 0.20 m on average (e.g. Green, Cullinane, Zylstra & Smith, 2004).When billboards (both static and digital) were present, the average SDLP was 0.38 m compared to 0.30 m when on-premise signs were present. This result was statistically significant ($F(1,27) = 23.846$, $p = < .001$). Further comparisons on average SDLP were made between digital and static billboards to see if the average SDLP increased in the presence of digital billboards. The average SDLP in the presence of digital billboards was 0.37 m, compared to 0.38 m when static billboards were present. This result was not significant ($F(1,27) = .333$, $p = .569$).

## DISCUSSION

This study compared drivers' fixations and driving performance when advertising signs were present in an on-road environment. Specifically, the study explored whether there were significant differences in the number and duration of fixations as well as any significant differences in vehicle headway and lateral deviation when 1) digital billboards were present compared to when static billboards were present, and 2) when billboards in general (both static and digital) were present compared to when on-premise signs were present.

The study found that generally, participants tended to fixate most on the road ahead when driving, which is a positive finding in terms of road safety. There were also no differences in this on-road viewing between the three signage types. These findings are similar to that of Lee et al. (2007). There could be several reasons for these results; however these are speculative due to the lack of self-report data. Firstly, participants' attention might not have been attracted to these signs, or they may have chosen not to look at them. Secondly, because participants were unfamiliar with the route, they may not have had the spare cognitive capacity to look at things outside of the driving task. It is unknown exactly where participants directed their fixations for the small percentage of time when their eyes were not on the road or why (e.g. their attention was attracted to a billboard; they were looking at a traffic sign, etc). Future research may wish to include a self-report questionnaire to gather this kind of information.

When participants looked at billboards and on-premise signs, the average fixation durations were all well below 0.75 s, which is considered to be the equivalent minimum-perception reaction time to the slowing of a vehicle ahead (Smiley et al., 2005), which is another positive finding in terms of road safety. Less than one percent of all fixations were above 0.75 s, and long fixations were found for all three signage types. There was only one fixation of over 2 s, which is considered to be the upper limit to which a driver can be distracted from the driving task (Klauer et al. 2006). The video footage was closely inspected for this long fixation only. In this instance, the participant was looking at a static billboard; however the car was stationary at the time of the fixation. While some participants did make a small number of long fixations between 0.75 s and 2 s, the results seem to suggest that participants were generally concentrating on the driving task. Participants may have also only made these longer glances when the driving conditions permitted; for example, when the car was stationary. Closer inspection of the video footage would shed more light on whether this was the case or not. It is also unclear as whether the features of the sign (e.g. size, advertising content) might have led participants to fixate longer on these signs. This would be very hard to measure in an on-road experiment as each sign along the route differs in terms of its size, advertising content and features of the surrounding environment (e.g. located at an intersection or along a straight stretch of road).

In regards to driver performance variables, the data showed no significant differences in average vehicle headway for any of the signage types. The average vehicle headways for the three signage types ranged from 1.77 s to 1.85 s, which falls amongst the preferred headway of most drivers (Ayres, Li, Schleuning & Young, 2001). Since the time of perception-reaction to an unexpected event can take up to 1.6 s (Smiley, Smahel & Eizenman, 2004), the headways found in the present study would have given drivers enough time to detect the slowing of a vehicle in front and respond accordingly.

The data did show a significant difference average SDLP when billboards (both static and digital) were present compared to when on-premise signs were present. This is similar to the trend shown in the studies conducted by Lee et al. (2007) and Chattington et al. (2009), suggesting that billboards may have an impact on lane keeping when they are present along a driving route. There was no significant difference in average SDLP when digital billboards were compared with static billboards. This might be because digital billboards were attended to in similar ways to static billboards, even though they operate differently in terms of the display and changeover of the advertisement. Clearly, large SDLP values are of concern from a road safety perspective as they can cause a driver to depart from the lane, therefore increasing the chances of a crash (Peng, et al., 2013). There were no lane departures in the present study, but what remains to be defined is how much lateral deviation is considered dangerous and could lead to potential lane departures. Research has found that lateral deviation can differ greatly between drivers (Verster & Roth, 2011); however under normal baseline driving conditions, it is estimated to be around 0.20 m (Green et al., 2004; Verster and Roth, 2011; Zhou et al., 2008), with values ranging from 0.09 m up to 0.30 m and higher. It should also be noted that on-premise signs had a higher SDLP compared to the SDLP for normal baseline driving. Future research on the impacts of SDLP by signage in general (including on-premise and traffic signage) would be warranted.

 

There are a number of limitations to the present study in addition to the ones already highlighted in this discussion. Firstly, the study would have been more robust if there had of been a true control condition where no advertising signs were present; however because the route was chosen due to the number and location of digital billboards, no equivalent comparison segment could be found along the route to use as a control. Also, because the segments were of approximately one minute in duration each, it is possible that true driving behaviours may not have been reflected in such short periods of time. SDLP in particular has been found to be affected by trip duration (Zhou et al., 2008). Secondly, although it is clear from the video footage that the number of on-premise signs and traffic signs far exceeds that of billboards, an exact number of these signs could not be provided at the writing of this paper due to amount of time it would take to classify and categorise this signage. Thirdly, due to sample size and number of variables, comparisons were unable to be made in regards to signage density, which can have an influence on fixations. Comparisons were also unable to be made between traffic signage and advertising signage for the same reasons. This would have been interesting analyses as traffic signs are relevant to the driving task, whereas advertising signs are not. Fourthly, other than the operational characteristics of digital billboards, other signage characteristics such as size, advertising content, luminance, exposure and roadside position were not explored as they differ greatly and would have likely confounded the results. The digital billboards in this study displayed static electronic advertisements, so no conclusions can be made about digital billboards that display moving or animated advertisements. Also, signs that were located at traffic signals may have influenced results as the behaviour of participants who were stopped at a red light might have been different to those that had to keep driving through a green light. Lastly, the study only sampled middle-aged drivers, so the results may not be able to be generalised to younger and older drivers, who may show even greater variability in the driver performance variables.

# CONCLUSIONS

Despite some limitations, the results of the study show similar trends to those reported in other international studies. In regards to the two research questions, the findings firstly show that fixations and average vehicle headway were similar when on-premise signs were present compared to when billboards were present. Although there was a significant difference in average SDLP when billboards were present compared to when on-premise signs were present, the average SDLP for on-premise signs is still higher than what is considered normal for baseline driving. Whilst it is unclear if this is because on-premise signs function in similar ways to billboards or for some other reason, on-premise signs should be included in future research studies to further explore their impacts on road safety. Secondly, the findings show that digital billboards do not draw drivers' attention away from the road for dangerously long periods of time compared to the other signage types, and drivers maintained a safe average vehicle headway in the presence of these signs. Whilst average SDLP increased in the presence of billboards generally, digital billboards were not solely responsible for this result. Numerous suggestions are made for future research projects. Given that digital billboards are now a part of the urban landscape and that both the industry and regulators want these signs to exist without causing a serious road safety impact, it would make sense for these research projects to be conducted by regulators and the industry in partnership. By working together to establish the facts, it will reduce the likelihood of research bias, increase the likelihood of acceptance of research findings and will lead to safe and reasonable operating standards for these signs.

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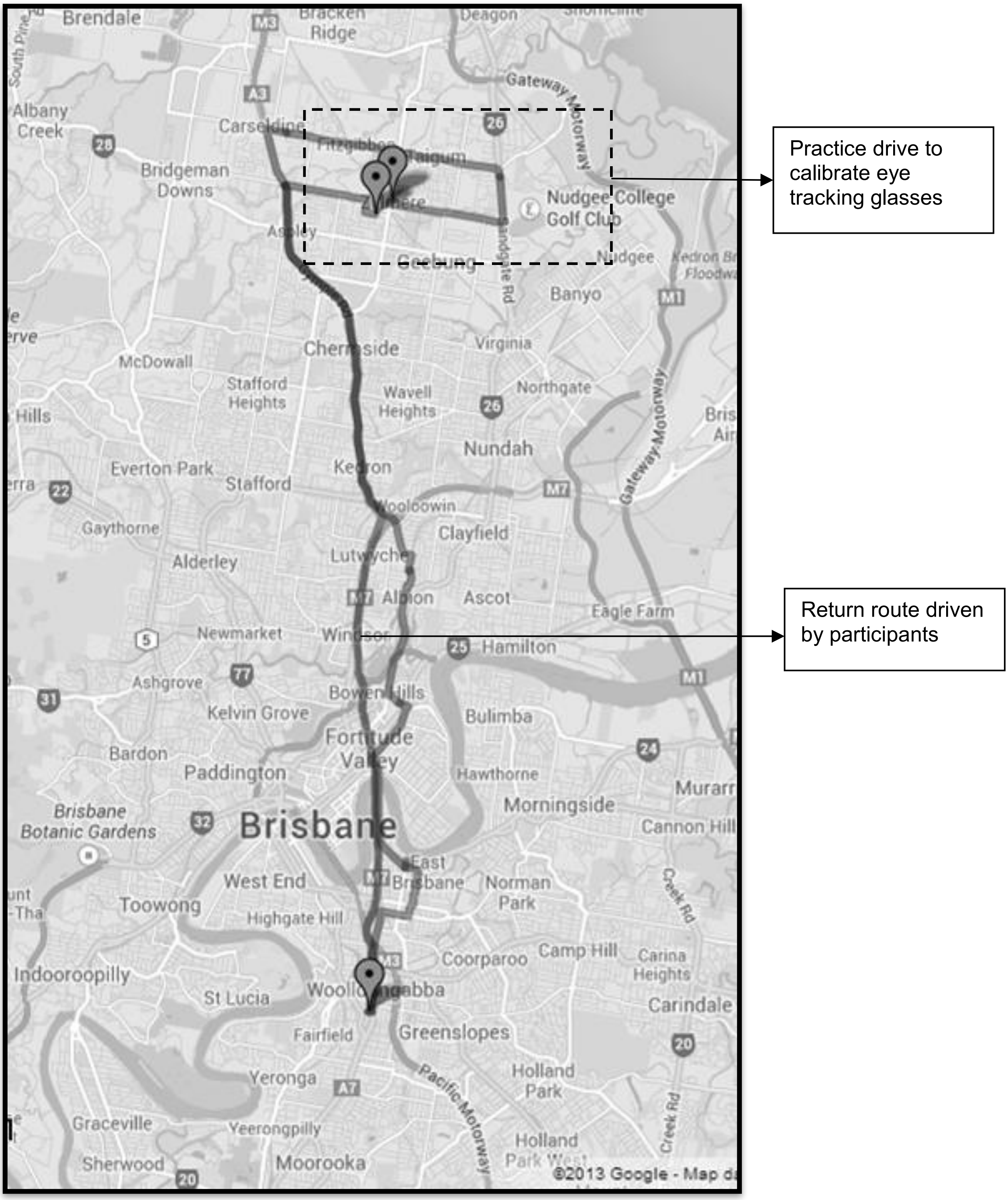
# Appendix A


Practice drive to calibrate eye tracking glasses
Return route driven by participants
Brendale
Bracken Ridge
Deagon
Gateway Motorway
Albany Creek
Carseldine
Fitzgibbon
Taigum
Bridgeman Downs
Nudgee College Golf Club
Aspley
Geebung
Nudgee
Banyo
Chermside
Virginia
McDowall
Stafford Heights
Wavell Heights
Northgate
Nundah
Everton Park
Stafford
Kedron
Gaythorne
Wooloowin
Clayfield
Alderley
Lutwyche
Albion
Ascot
Eagle Farm
Newmarket
Windsor
Hamilton
Ashgrove
Kelvin Grove
Bowen Hills
Bulimba
Bardon
Paddington
Fortitude Valley
Hawthorne
Morningside
Brisbane
Brisbane Botanic Gardens
Cannon Hill
West End
East Brisbane
Norman Park
Toowong
Highgate Hill
Coorparoo
Camp Hill
Carina Heights
Indooroopilly
St Lucia
Woolloongabba
Carindale
Fairfield
Greenslopes
Yeronga
Holland Park
Pacific Motorway
Graceville
Yeerongpilly
Holland Park West
Sherwood
Moorooka
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