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TAKING ELECTRIC BIKES FOR A SPIN WITH THE RAC WA EBIKE TRIAL

The RAC eBike Trial (trial), launched in August 2015, provided 40 participants from four workplaces in Perth (Western Australia) with an opportunity to try out an electric bike (eBike) for commuting and other purposes over 10 weeks. The aim was to gain insights into user experiences to better understand and promote the potential of eBikes to overcome some of the barriers to cycling.

Participants completed before and after surveys, and reported their eBike usage throughout the trial via travel diaries. The trial has provided encouraging evidence of an appetite for eBikes, as well as their potential to help make cycling a more attractive commuting option for more people. Commuting trips by car were found to have almost halved during the trial, and 55 per cent of all such trips were made solely by eBike. Usage of eBikes for commuting remained high throughout the 10-weeks and seventeen participants (plus one partner organisation) purchased their bikes.

1. Introduction

RAC WA partnered with the City of Perth, City of Wanneroo, North Metropolitan Area Health Service through Queen Elizabeth II Medical Centre Trust, and the University of Western Australia to run a trial of electric bikes (eBikes) in Perth, Western Australia (WA). The WA Departments of Transport and Sport and Recreation also supported the trial through the *Your Move* program[1].

The trial was launched on Friday 28 August 2015. Over 10 weeks, from Monday 31 August until Sunday 8 November, 40 employees of the four participating workplaces (10 employees from each) had exclusive use of a SmartMotion eCity eBike for their commute to and from work, as well as any other trips they wished to make.

1.1 Trial purpose

The aim of the trial was to gain insights into user experiences to better understand and promote the potential of eBikes to overcome some of the barriers to cycling, helping to make it a more convenient and realistic commuting option for more people.

More broadly, the trial intended to showcase the growing importance of personal mobility options, as well as the wider benefits of cycling.

1.2 Context

Perth has been growing at a rapid rate and it has been forecast that the City's population could increase by a further 1.5 million, to a total population of 3.5 million, by 2050 (Western Australia Planning Commission, 2015, p. 7). Strong population growth brings its own challenges. It is predicted by 2031

[1] *Your Move* is a WA State Government program that supports members of the community to enjoy a more active and healthy lifestyle by changing the way they travel. In 2015, the program was run in the City of Wanneroo.

seven of the nation's ten most congested road corridors, including the top four, will be in Perth and the cost of congestion will reach almost $16 billion (Infrastructure Australia, 2015, pp. 83 and 85).

While there is no single solution to Perth's congestion challenge, an increase in cycling can help to reduce the number of cars on the road, as well as provide health, wellbeing and financial benefits for individuals.

Cycling is undergoing resurgence in WA. The 2015 National Cycling Survey suggests as many as 591,800 WA residents ride in a typical week and over 1 million residents ride at least once in a typical year (Australian Bicycle Council and Austroads, 2015, p. 3). In a statement on cycleways by the WA Minister for Transport, Dean Nalder, recent bicycle count data was said to show a strong rise in the average number of cyclists using WA's principal shared path network, as well as entering and leaving the Perth Central Business District (CBD) (Parliament of Western Australia Assembly, Record of Proceedings, March 22 2016). According to the data, the number of cyclists entering and leaving the CDB in 2014/15 represented an increase of 6.8 per cent from the previous year and nearly 12 per cent on 2012/13 levels. The weekday average number of cyclists entering the CBD reached 12,052 cyclists in 2014/15.

With Perth's wonderful climate and relatively flat topography it is no surprise that many people enjoy cycling for a variety of reasons. However, due to actual or perceived barriers cycling may seem a less attractive option for some. RAC's 2015 Cycling Survey of over 5,500 Western Australians identified fear of sharing the road with motorists (43 per cent of respondents), lack of bike routes / infrastructure (31 per cent) and cycling being too time consuming (18 per cent) as frequently reported barriers. Respondents also often cited health issues (RAC, 2015).

It was considered and tested in this trial that certain barriers to cycling, such as distance, time and fitness or health constraints, may be overcome by eBikes.

1.3 About eBikes

An eBike is a bicycle with an electric motor and rechargeable battery that provides assistance to the rider. There are currently two categories of eBikes in WA, those with a maximum power output of 200 watts and 'Pedalecs' which comply with *European Standard EN 15194* and have a maximum power output of 250 watts. In 2012, the Australian Government adopted the EU design standard and 250 watt pedalecs (which are the eBikes used for the trial) became legal in WA in April 2015.

Pedalecs are pedal-assisted, rather than powered, bicycles; they help the rider to cycle further with less effort but cannot be ridden using a throttle without pedalling like a scooter. The motor works up to a speed of 25km/hr before automatically disengaging, any increase in speed beyond that would be the result of pedal power.

Figure 1 Smart Motion eCity eBike

More generally, eBikes are increasing in popularity around the world, with many people now finding them a convenient form of personal mobility. The global eBike market has expanded dramatically

and, according to forecasts by Navigant Research, global annual sales are anticipated to increase from around 32 million in 2014 to over 40 million in 2023 (Navigant Research, 2014).

Uptake has been slower in WA but eBikes are becoming more popular and the recent legislative change is likely to create more choice for consumers and in turn potentially help to drive demand.

While there has been a lot of research exploring eBike usage in China and Europe for instance, research in the Australian context is still in its infancy. A recent study of eBike owners in Australia found usage is high, with almost half of owners using their bike daily (Johnson and Rose, 2014). Research by the Royal Automobile Club of Victoria has highlighted the infrastructure and education considerations associated with the increasing popularity of eBikes (RACV, 2015).

2. Trial design

2.1 Workplace "lease" system

RAC initially proposed a trial of eBikes to the WA Department of Transport (DoT) as part of its sponsorship of the *Your Move* program, to be delivered in the City of Wanneroo. A number of systems were considered by RAC and the DoT, with a workplace lease system being preferred. This was subsequently refined in consultation with the partner organisations.

Other systems considered included an eBike hire system, with docking station infrastructure, and a library lease scheme allowing short-term loans to members of the community. For both of these systems, users would have been required to provide identification and complete a registration form and the use of GPS trackers was considered for monitoring usage (although differentiating between users would have been difficult).

While these options had clear merits, and would have allowed the wider community to trial eBikes, they presented a number of challenges not excluding, transference of responsibility to other parties as well as issues relating to insurance, liability and warranty. They would also not allow sufficient time for new commuting behaviours to be established.

Under the workplace lease system, participants (who were employees of the partner organisations) had access to their own eBike for storage at their place of work and home. This system allowed easier monitoring of usage, as well as a simpler and more centralised way to manage administration, registration, training, insurance, liability and warranty. Consideration was given to allowing the eBikes to be shared with other members of the family but this was discounted, again due to insurance, liability, and warranty challenges.

The commencement date and trial period were both considered important factors for success and were discussed in consultation with RAC and the DoT. The trial ran for 10 weeks over the spring months (31 August to 8 November 2015), avoiding the winter period and Christmas holiday season.

2.2 Identification of partner organisations

Being a local government in the outer metropolitan area, the City of Wanneroo has a relatively high car driver mode share for journeys to work of 63.7 per cent, compared to 61.5 per cent for Greater Perth (Australian Bureau of Statistics, 2011). However, with the City actively participating in *Your Move* there was good synergy with the trial and its objectives.

There was also considered to be value in extending the trial to include inner Perth locations where congestion pressures are more evident and better access to cycling infrastructure and public transport, as well as parking constraints would support usage of eBikes for some commuting trips.

The City of Perth, Queen Elizabeth II Medical Centre Trust (QEII) and University of Western Australia (UWA) were approached by RAC because they are significant employers who were already actively promoting more sustainable travel options to their staff.

Each partner organisation nominated a Trial Coordinator to assist with the planning and operation of the trial.

2.3 Risk management

A risk assessment was conducted to identify and understand the health and safety risks associated with the trial. A number of mitigating controls were implemented to manage these risks, including:

- the requirement for all participants to take part in a mandatory cycle training session and to receive a practical demonstration of how to use the eBikes;
- developing crash and breakdown procedures, both for internal use and for communication to the participants;
- taking out a Voluntary Workers Policy to cover participants in the event of accidental injury whilst using an eBike in the trial;
- taking out insurance to cover the eBikes against theft, loss or damage;
- preparing a waiver stipulating the terms and conditions of participation, such as abiding by the road rules of relevance to cycling and notifying RAC immediately if they feel their eBike is no longer in sound mechanical condition to enable them to ride safely (minor issues could also be reported through their weekly travel diaries), as well as a declaration of personal and medical fitness to take part in the trial for instance; and
- preparing an induction booklet, setting out the various procedures, tips on using the bikes, relevant road rules, RAC / partner organisation / participant roles and responsibilities, etc. for participants to read and understand prior to signing the waiver.

The partner organisations were also encouraged to undertake their own risk assessments for the trial; this included managing access to on-site parking and charging arrangements.

As the eBikes were brand new and covered by a two-year warranty, mechanical servicing was not required during the trial. However, UWA required its participants' eBikes to have weekly safety checks to ensure they remained roadworthy for the duration of the trial.

2.4 eBike selection and procurement

There is a wide range of eBikes on the market, which vary considerably in price and quality. While a full market comparison was not undertaken, a number of models were considered when procuring the bikes for the trial. The SmartMotion eCity eBike was selected because it was considered to be a good option for commuting, being comfortable, easy to ride and reasonably affordable.

The procurement process involved not only purchasing an appropriate eBike to suit riders of varied experience, age, and gender but also finding a suitable supplier who would be able to undertake repairs and maintenance in accordance with service standards specified by RAC. RAC also required the supplier to provide a practical demonstration to all participants.

In order to encourage any newly established travel behaviours to be maintained following the trial, it was proposed to make a limited number of the eBikes available for participants to purchase at a discounted rate. With this in mind, the transference of warranty from RAC (as the original owner) to participants purchasing a bike was negotiated as part of the supplier agreement.

2.5 Participant recruitment

Participants were recruited through an expression of interest (EOI) process. An information sheet and EOI form were designed to:

- explain how the trial would work, who could take part, benefits of participation (including the opportunity to purchase an eBike at a discounted rate), and required contributions; and
- capture personal and employment details, cycling experience and frequency, and availability to take part in the mandatory cycle training session.

In regards to the recruitment parameters, to be eligible to participate, employees of the City of Wanneroo needed to be Wanneroo residents and participants of the *Your Move* Wanneroo program. Participants who were employees of the City of Perth, QEII and UWA needed to live within 20km of their usual place of work. In addition, all participants needed to be:

- fit and heathy to ride a bicycle;
- willing and able to ride to / from work at least two days a week; and
- happy for their experiences and stories to be used for publications, case studies and marketing.

The EOI materials were circulated to staff of each of the partner organisations through their internal communication channels, including all-staff emails, newsletters and intranet pages. Recruitment ran from Wednesday 15 July until Friday 24 July 2015.

Over 110 employees from the four organisations applied to take part. These EOIs were reviewed by RAC and the Trial Coordinator from each organisation, and participants were selected to ensure a good cross section based on gender, age and cycling experience (refer to Table 1). Consideration was given to having a waiting list should participants withdraw from the trial. However, this was impractical due to operational considerations such as the need for participants to complete mandatory cycle training.

Table 1 About the participants

Characteristic	Description	Number of participants
Gender	Male	16
	Female	24 (-1*)
Age bracket	18-29	5
	30-39	12 (-1*)
	40-49	12
	50-59	8
	60-69	3
Vehicle ownership and driver's licence	Regular bicycle	33
	Licence holder	40
	Private vehicle	39 (-1*)

Characteristic	Description	Number of participants
Cycling experience**	Infrequent	16
	Frequent	16
	Experienced	20
	Inexperienced	5
Motivations for joining the trial**	Looking for a new option for commuting to / from work	29 (-1*)
	Wanted to see what eBikes are like	29 (-1*)
	Enjoy cycling and want to cycle more often	24
	For exercise / fitness	22
	For environmental reasons	20 (-1*)
	Offer of discounted purchase of an eBike was attractive	17 (-1*)
	Wanted to be part of a trial to promote eBikes	14 (-1*)
	To save money on transport	13 (-1*)
	Other	4

* One participant departed the trial during Week 1.
** Participants could select all options that apply.

2.6 Induction process

Participants were inducted into the trial through a launch event on 28 August 2015[2], designed to:

- give participants an opportunity to meet each other and help create a buzz around the trial;
- provide a practical demonstration of how to use the eBikes (delivered by the eBike supplier);
- provide personalised journey planning information (delivered through the DoT's TravelSmart team), as well as information about on-site end of trip (EoT) facilities, and storage and charging arrangements (provided by the partner organisations);
- familiarise participants with the induction booklet and online travel diary; and
- help participants feel safer and more confident cycling through on-road cycle training.

Three cycle training sessions were held, making it more convenient for those unable to attend the launch event, as well as QEII participants unable to participate during typical working hours.

Figure 2 Launch event, eBike demonstration and cycle training

[2] A "mini launch" was also held in the afternoon on Friday 28 August in Wanneroo.

2.7 Data collection and evaluation

2.7.1 Surveys

Pre and post-trial (or "before" and "after") surveys were developed to capture information about the participants' travel behaviours and perceptions to allow the impacts of the trial to be understood. These were online surveys, developed using Qualtrics survey software, capturing information such as:

- mode of travel and duration of trips to and from work for each day of the week;
- reasons for mode of travel to and from work;
- cycling experience, frequency and reasons for cycling for commuting and other trip purposes;
- reasons for participating in the trial and goals;
- impacts on cycling and driving frequency;
- financial, time and health benefits from participating; and
- satisfaction with the eBike and willingness to recommend.

Participants were asked to complete the before survey for the week of Monday 10 to Sunday 16 August 2015 and the after survey for the week of Monday 23 to Sunday 29 November 2015. To ensure a good response rate to the after survey, participants submitting before the specified deadline were entered into a prize draw for the chance to win a $100, or one of three $50 gift vouchers.

2.7.2 Travel diary

Participants were also required to keep a travel diary to record their eBike usage and experiences throughout the 10-weeks. A daily travel diary was originally considered however, to make it less onerous for the participants and increase the likelihood of timely completions, it was decided to design a weekly travel diary that still captured daily information for trips to and from work.

The travel diary captured information such as mode of travel and duration of daily trips to and from work, reasons for using the eBike or other modes, number of eBike trips for other purposes, any issues encountered (with the eBike or during their journeys) and what they liked / disliked about the eBike.

The ten weekly diary records were set up in the Qualtrics software as a single survey; this meant that participants could not proceed to the next week without having completed their entry for the prior week. However, they had the flexibility to complete their weekly entries daily, a couple of times a week or at the end of the week. Completions were reviewed by RAC the following week, each week, and those who had not completed their entries received a reminder email and then a follow up call.

Timely completion of the travel diaries was incentivised through offering those who regularly completed their entries on time priority when allocating bikes for purchase at the discounted price. In the weekly travel diary notifications, participants were also encouraged to share photos and captions through a "Where has your eBike taken you?" competition for the chance to win one of two $50 gift vouchers. However, usage of the eBikes was not incentivised at any point.

3. Trial results

In total over the 10 weeks, 1,741 eBike trips were made – 1,398 for commuting purposes and 343 for other purposes. The most frequently stated "other" purposes were for leisure / fun (47 per cent of all responses given over the 10 weeks), for fitness / exercise (33 per cent) and to go to the shops (32 per cent).

3.1 Commuting behaviours

Figure 3 shows the methods of travel for trips to and from work before, during and after the trial. As can be seen, before the trial a majority of participants' commuting trips were made by car (61 per cent in total – 56 per cent with them as the driver and 5 per cent as the passenger). However, 11 per cent were also made by regular bicycle and an additional 1 per cent by bicycle and public transport.

On average over the 10-weeks, 55 per cent of all commuting trips were solely made by eBike, with an additional 1 per cent by eBike and public transport, and 1 per cent by bicycle. This equates to a total of 57 per cent of commuting trips involving an eBike or bicycle for some portion of the journey (compared to 12 per cent before). Usage of eBikes remained high throughout, peaking at 65 per cent in Week 5 (28 September to 4 October) and dropping to 48 per cent in Week 10 (2 to 8 November).

While public transport usage decreased during the trial, the most significant shift was from private car. On average during the trial, commuting trips made by car almost halved to 32 per cent of all such trips. While car trips peaked at 40 per cent in Week 9 (26 October to 1 November), this is still significantly lower than the 61 per cent prior to the trial commencing.

The proportion of commuting trips by car did increased to 46 per cent following the trial however, this still represents a 15 percentage point reduction compared to before the trial. In addition, just over a quarter of commuting trips continued to be made by eBike (26 per cent) and a further 15 per cent by regular bicycle, maintaining a high cycling mode share of 41 per cent.

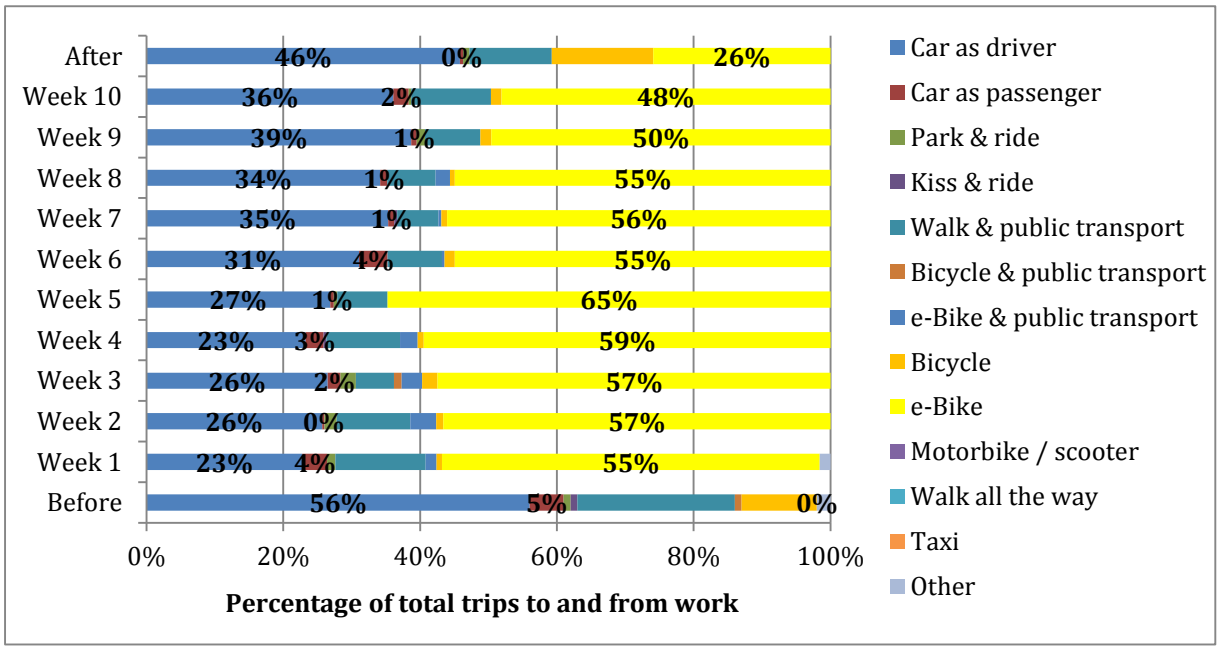

Figure 3 Mode of travel for trips to and from work[3]

When considering only those participants (seventeen) who purchased their eBike[4], 50 per cent of their trips to and from work were still being made by eBike after the trial and a further 13 per cent by regular bicycle. These participants therefore maintained a similar frequency of eBike usage compared to during the trial. The remainder of trips (37 per cent) were by car as a driver. This is compared to 8

[3] Question: *"Over the past week, how did you travel to and from work each day and how long did these journeys take [Mode_Day]".*

[4] The data for those participants who purchased their eBike but did not complete the after survey has also been discounted from this analysis to allow direct comparison between the before and after survey data.

per cent of trips being made by regular bicycle before the trial and 73 per cent by car (68 per cent as the driver and 5 per cent as the passenger).

Over the 10-weeks, the most frequently given reasons for using the eBikes for commuting during the trial were for the fitness / exercise benefits (77 per cent of all responses), enjoyment / comfort (66 per cent) and because their destinations were within a reasonable cycling distance (59 per cent).

3.2 Impacts on cycling frequency, enjoyment and safety

When considering participants' cycling frequency for any purpose not just commuting, as reported in the before and after surveys, it is apparent frequency increased following the trial. Considering only those participants who completed both the before and after surveys (32 in total), half cycled at least once a week before the trial and following the trial this increased to over two thirds.

Table 2 Cycling frequency for any purpose[5]

Cycling frequency	Before[6]	Before (adjusted)[7]	After
Never	5 (12.8%)	4 (12.5%)	2 (6.3%)
Less than once a month	8 (20.5%)	7 (21.9%)	0
Once a month	1 (2.5%)	1 (3.1%)	6 (18.8%)
Once a fortnight or less but more than once a month	1 (2.5%)	1 (3.1%)	0
Less than once a week but more than once a fortnight	6 (15.4%)	3 (9.4%)	2 (6.3%)
1-3 days per week	13 (33.3%)	13 (40.6%)	13 (40.6%)
4-5 days per week	4 (10.3%)	3 (9.4%)	7 (21.9%)
6-7 days per week	1 (2.5%)	0	2 (6.2%)
Total number of respondents	**39**	**32**	**32**

Of these participants, a majority said that they expected to continue cycling more often than they did before the trial (11 of which said they were extremely likely to) and only one said this was unlikely. Furthermore, 19 of the 32 participants stated they believed trialling an eBike had a significant and positive impact on their enjoyment of cycling (those selecting "A great deal" or "A lot"), 15 on the amount they cycle and 11 on their confidence while cycling. When it came to confidence, a comparable number did however say it had no impact at all.

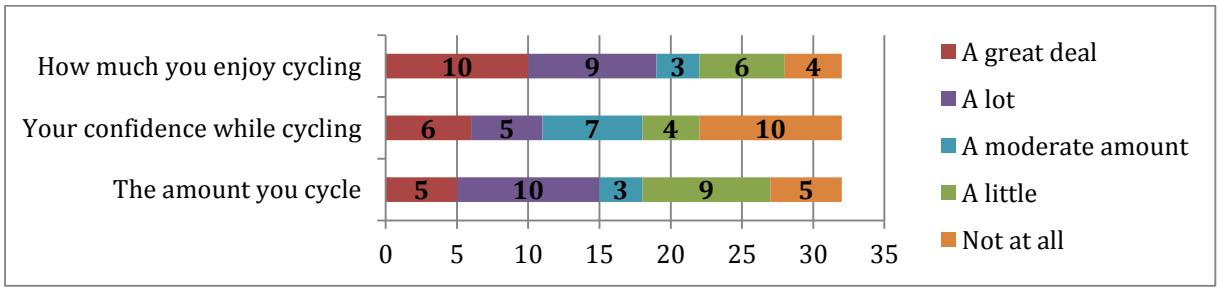

Figure 4 Influences of eBikes on riding[8]

[5] Question: *"On average, how often would you say you cycle for any purpose (including trips to and from work?"*
[6] All before data excludes the data provided by the participant that departed the trial during Week One.
[7] To allow a direct comparison, the data from those participants that did not complete the after survey has been discounted.

3.3 Anticipated impact on driving frequency

It is apparent from Figure 3 the number of trips to and from work by car reduced significantly during the trial and a substantial reduction was maintained after the trial. When asked what impact they anticipated their experiences from the trial would have on the amount they would drive in future for commuting purposes (relative to the amount they drove before the trial), 18 of the 32 participants thought they would drive less often.

Table 3 Anticipated impact on driving frequency for commuting purposes[9]

Anticipated impact	Number of respondents
I will likely drive a lot less often	8
I will likely drive less often	10
I will likely drive the same amount	14
I will likely drive more often	0

3.4 Financial, time and health benefits

One in three participants that completed the after survey said they made financial savings as a result of using the eBikes during the trial. Collectively, these participants reported a substantial saving of over $1,600 per week, or approximately $16,000 over the 10 weeks. The amounts reported varied considerably, from $6 to $300 per week.

While not as many participants reported time savings associated with their commute to and from work, the seven that did saved over seven hours on average per week collectively, or over 70 hours during the trial.

When it came to changes in health / wellbeing and / or fitness, 23 participants reported experiencing a range of benefits.

Table 4 Self-reported benefits of using the eBikes during the trial

Type of benefit	Number of respondents	Description
Financial savings[10]	24	Collective savings of $1,672.30 per week: • 13 respondents saved up to $30 per week • 5 saved between $31and $60 per week • 2 saved between $61 and $100 per week • 4 saved between $200 and $300 per week
Time savings associated with commuting[11]	7	Collective saving of 445 minutes per week: • 3 respondents saved 15 to 20 minutes per week • 2 saved between 30 and 40 minutes per week

[8] Question*: "To what extent, if at all, has trialling an eBike increased: [statement]?"*
[9] Question: *"Compared to how much you drove for commuting purposes before the trial, what impact if any, do you think your experiences from participating in the trial will have on the amount you drive in the future?)"*
[10] Questions: "*Did you save any money using the eBike over the 10-weeks of the Trial?" and "How much money (in dollars) would you estimate you saved per week, on average, over the 10-weeks?"*
[11] Questions: *"Did you save any time on your daily commute to/from work using the e-Bike over the 10-week Trial?" and "How much time (in minutes) did you save per week, on average, over the 10-weeks?"*

Type of benefit	Number of respondents	Description
		• 1 saved 2 hours • 1 saved over three hours per week
Health / wellbeing and / or fitness benefits[12]	23	• Improved cardio fitness, strength, endurance, and stamina • Generally feeling fitter and more healthy • Weight loss • Feeling happier, less stressed and more relaxed • Improved sleep quality

3.5 Level of satisfaction with the eBike

When asked to rate their degree of satisfaction with their eBike experiences over the 10-weeks, all participants were satisfied, with just over half being extremely satisfied (17 out of 32), 12 being satisfied and three somewhat satisfied.

In responding to the question "*All things considered, throughout the 10-week trial, what did you like most about the eBike?*", the freedom and enjoyment it provided was a common theme that emerged. Likewise, many said they liked the fact it offered a quick and easy way to get to work.

In terms of what they liked least, the weight of this particular model was cited most frequently and several commented on difficulties replacing the rear tube due to the presence of the motor.

When it came to willingness to recommend an eBike to family, friends and / or colleagues as an alternative means of commuting to and from work, 31 out of the 32 respondents said they would do so.

3.6 Other priorities to encourage more people to cycle

Irrespective of their views on the role of eBikes in making cycling more attractive, participants were asked *"Which of the following areas do you believe the Western Australian Government should place priority on to encourage more people to cycle?"*. The top three areas were investment in off-road infrastructure (23 participants ranked this as a top three priority), on-road infrastructure (21 participants) and incentives / grants to encourage employers to retrofit workplace end of trip (EoT) facilities (16 participants).

4. Discussion and conclusion

4.1 Trial outcomes

The purpose of this trial was to gain insights into user experiences to better understand and promote the potential of eBikes to make cycling a more attractive option for more people.

The results have shown significant behaviour change was experienced during the trial, with usage of the eBikes for commuting purposes remaining high throughout the 10-weeks. While there was a decline in eBike usage immediately following the trial, a substantial decrease in the proportion of

[12] Question: *"Did you experience any health, wellbeing and/or fitness benefits by the end of the 10 weeks?"*

commuting trips made by car was still maintained. Furthermore, those who purchased their bikes continued to have a high level of eBike usage.

It is also important to note that while timely completion of the travel diaries and after survey was incentivised, as was the sharing of photos and captions, eBike usage was not. In addition, participants reporting low or no usage for any week(s) were not discouraged from continued participation.

With a majority of participants already owning a regular bicycle before the trial, but less than half cycling for any purpose at least once a week, the increase in cycling maintained during and after the trial is considered to demonstrate that eBikes can increase the attractiveness of cycling.

In addition, seventeen participants (and one partner organisation) made a financial commitment to purchase an eBike after only seven weeks of trialling one and the vast majority of participants said they would recommend eBikes to others as a commuting option. This goes some way in demonstrating an appetite for eBikes and could also be taken to suggest a willingness amongst these participants to sustain their new commuting behaviours. The appeal of eBikes has been further demonstrated by an RAC poll in late 2015. Of the 944 poll respondents, 88 per cent suggested they would consider using an eBike to replace some journeys they currently make in their car.

> *"I'm most definitely interested in purchasing my e-bike. I love it and can't imagine life without it" – a City of Perth participant.*

When considering the demographic makeup of the participants that purchased their eBikes, 11 (or 65 per cent) were females. This is higher than would perhaps be expected based on cycling participation rates in Perth, which suggest females comprise approximately 44 per cent of those who participate in cycling (Australian Bicycle Council and Austroads, 2015, p. 7). Interestingly, a survey of eBike riders in Australia found nearly three quarters were male (Johnson and Rose, 2013, p. 7). While two participants who purchased bikes were under 39 years of age, seven were aged between 40 and 49 (41 per cent), and eight were between 50 and 69 (47 per cent). This aligns to some degree with research suggesting eBike riders are more likely to be older than regular cyclists (RACV 2015, Johnson and Rose 2015).

The feedback received from participants throughout and after the trial was very positive and from this it is apparent that many now have a newfound, or re-ignited, passion for cycling that will live on.

> *"It has renewed my love of cycling, and now it is the only way I will commute to work" – a City of Perth participant.*

> *"I have thoroughly enjoyed the 10 week bike trial and have found that even now the trial is finished, I am still getting up early in the morning to go for a scenic bike ride along the coast. I am a lot fitter and really enjoying the freedom you get on the eBike, not being limited by where you can travel by fitness" – a UWA participant.*

4.2 Considerations for promoting eBikes

With eBikes proving to be a real alternative to the private car for some commuting trips, consideration needs to be given to facilitating and encouraging usage, as well as managing the implications of increasing uptake. Safety, both for eBike riders and other road users, is a critical consideration.

As required by law in Australia, the motor of an eBike should automatically disengage at a speed of 25km/h. However, the user is able to manually adjust the maximum speed to receive assistance to around 32km/h on some eBikes. Likewise, some conversion kits result in eBikes with a higher power output / having a motor that can remain engaged at speeds in excess of 25km/hr. While many cyclists are capable of travelling at higher speeds without assistance, recent research suggests eBikes may be

ridden faster than regular bicycles (Dozza, Piccinini and Werneke, 2015). An increased prevalence of fast moving cyclists, whether on eBikes or regular bicycles, could therefore potentially increase the risk of conflict with other road users, particularly on shared paths.

Riding an eBike is also quite different to riding a regular bicycle and can take a bit of getting used to. Despite participating in the cycle training session and receiving a practical demonstration of how to use their eBikes, some of the trial participants still reported minor issues with learning how to use the bikes during the early part of the trial. Pulling off, slowing and managing speed when negotiating corners were the main difficulties reported. An increase in the volume of inexperienced eBike riders may present some risks, which could to some degree be managed through educational and awareness programs to encourage safe and responsible cycling behaviours.

The availability and quality of infrastructure has a significant influence on how safe, convenient and comfortable it is to cycle. Trial participants have highlighted the importance of investing in infrastructure to encourage more people to cycle, with a slight preference towards off-road infrastructure. This aligns with the findings of recent research on the safety implications of eBikes in Australia (RACV, 2015). Investment in infrastructure was also identified as a top priority by respondents to RAC's Cycling Survey but for this cohort, 71 per cent wanted to see more investment in on-road infrastructure and 64 per cent off-road (RAC, 2015).

With the potential for higher speeds and reported user difficulties in negotiating corners, there may be implications for the design of infrastructure to better cater for eBike users. These have not however been explored in this paper. Nevertheless, it is apparent that investment in infrastructure is essential to support an increase in cycling participation, whether users are on eBikes or regular bicycles.

While eBike riders may have less need for showering and changing facilities at their destination, ensuring adequate EoT facilities at workplaces was still viewed as a high priority by trial participants to encourage more people to cycle. In fact, this ranked third in their list of priorities whereas, in response to the same question, respondents to RAC's Cycling Survey ranked it ninth. It will be essential for the needs of eBike riders to be considered in developing and / or reviewing the guidelines and policy relating to EoT facilities, for example encouraging the provision of appropriate charging infrastructure.

4.3 Lessons learned

Some of the noteworthy lessons from this trial include the importance of:

- early engagement with potential partners / stakeholders to clearly define and agree the roles and responsibilities for all parties to create a shared sense of ownership;
- understanding and appropriately managing the risks and liabilities of participation for each organisation through robust risk assessments and appropriate mitigating controls – risks and responsibilities also need to be effectively communicated to participants;
- creating interest around the trial, and developing a sense of "community", to engage and inspire participants (e.g. through a launch event, media exposure, competitions, social media and blog posts – the cycle training was also an effective way to help participants feel more confident to manage their personal risks and embrace a new way of commuting);
- addressing operational considerations such:
  - procurement of bikes – consider the needs of likely users and ensure repairs, servicing and warranty arrangements are incorporated in a supplier agreement;

  - on-site parking and charging arrangements – parking needs to be secure but easy to access with eBikes which can be more cumbersome, and thought needs to be given to appropriate charging arrangements;
  - breakdown, crash and repairs procedures – consideration needs to be given to how such incidents will be managed, and how the procedures are communicated to participants; and
- making the surveys and travel diaries as easy and quick to complete as possible and incentivising timely completion to ensure a good response rate.

4.4 Conclusion

During the 10-week RAC eBike Trial, commuting trips by car were found to have almost halved and 55 per cent of all such trips were made solely by eBike. Usage of eBikes for commuting remained high week to week and seventeen participants (plus one partner organisation) purchased their bikes in Week 7. Following the trial, a high cycling mode share of 41 per cent (by eBike and regular bicycle) was maintained for trips to work.

The RAC eBike Trial has therefore provided encouraging evidence of the potential of eBikes to enhance the attractiveness and convenience of cycling as a mode of transport for commuting to work.

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