The Return Trip Effect:

A Car Simulator Study Examining Anticipation

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ABSTRACT

The Return Trip Effect is the sense that travelling back from a location feels shorter than the initial outgoing trip. This phenomenon directly involves our subjective perception of time, which turns out to be imprecise and easily misguided. Previous research has shown that numerous factors influence our time perception, and subsequently the Return Trip Effect; these factors include familiarity, violation of expectations, novelty, anticipation, workload and ambiguity. This study aimed to further investigate the influence of anticipation on the Return Trip Effect using a driving simulator. The study used a quantitative experimental research design to achieve this objective, questionnaires were used to obtain the estimated times and the various cognitive states of the drivers. Seventy-four people participated in a one-hour structured experiment. The participants were randomly assigned into one of three conditions: an outgoing, return, or non-anticipation group. Participants drove on a simulated road for about twelve minutes to a midway point, and then returned on that same road back to the starting point. The participants answered questions at the halfway point and at the end point, these questions included estimated driving times and included different measures of participants' cognitive load, such as boredom, mind-wandering, and excitement levels. The manipulated variable was the positioning of the anticipation during the experiment, which was either after the first trip or the second trip, the control group had no anticipation. The findings showed a strong Return Trip Effect overall, however no significant difference in trip magnitude was found between the three conditions. The results revealed that several other factors that may affect the Return Trip Effect.

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CHAPTER ONE | LITERATURE REVIEW

1.1 Introduction

The sense that travelling back from a location feels subjectively shorter than the initial outgoing trip is called the Return Trip Effect (Van de Ven, Rijswijk, & Roy, 2011). This phenomenon directly involves our subjective perception of time, which turns out to be imprecise and easily misguided. After all, according to Einstein's theory of special relativity, “the rate at which time passes depends on your frame of reference, because everything in the cosmos in moving in relation to everything else”, therefore time is relative (Lorentz et al., 1952). This makes the Return Trip Effect difficult to research, as so many factors have an influence on our time perception. Add the extra variable of driving into the equation and the complexity increases.

This study aimed to investigate the influence of anticipation on the Return Trip Effect using a driving simulator. The study used a quantitative experimental research design to achieve this objective. Seventy-four people participated in a one-hour structured experiment. The participants were randomly assigned into one of three conditions: the outgoing anticipation group, the return anticipation group, or the non-anticipation group. The independent variable was the positioning of the anticipation during the experiment, which was either after the first trip, after the second trip, or without anticipation. The main dependent variables were the estimated times for the outbound trip and the return trip. Additional measures relating to cognitive load were included to control for variables that may affect time

perception, these included: excitement, motivation, demandingness, boredom, comfort, mind-wandering, and driving performance.

This study contains four chapters. Chapter one introduces the study followed by the literature review, which includes background information and relevant literature. Chapter two presents the methodology for the research. Chapter three gives an overview of the results. Chapter four will discuss the results, limitations, recommendations, and will consider future research possibilities.

1.2 Time Perception

A fundamental aspect of time perception is entrainment, which is the manner biological, physical, and psychological processes are interconnected to time patterns and the external environment (McAuley & Fromboluti, 2014). Starting with most the basic form of entrainment which we are affected by year-round are circannual rhythms; these are directly related to the rotation of the earth around the sun. For example, circannual rhythms are present in suicides, mood, sleep and reproduction (Swaab et al., 1996). The next degree of time that we are entrained to are circadian time cycles, which are 24-hour time rhythms. Across the 24-hour day cycle the cells in our hypothalamus release chemicals into our brain and body on a very regular rhythm or cycle, which allows us to be aware of the time of the day (Morin, 2013; Rosenwasser & Turek, 2015). Still smaller time judgments come from an internal clock, which operates as a pacemaker and accumulator combined, and can be influenced by external stimuli or internal states of the mind (Wearden et al., 2017). The pacemaker produces pulses, and the accumulator stores these pulses, this combined process tracks the passage of time (Wittmann, & Paulus, 2008).

In 1990, Treisman et al. manipulated this inner clock by adding external auditory clicks while participants were presented with stimuli, in this way disturbing the internal clock. Their research demonstrated that enhanced clicking caused participants to have an increase in their time estimations. This increase in ticking on the pacemaker simulated a state of arousal according to their study. Several studies have repeated this method while focusing on moving stimuli or visual stimuli and likewise concluded that perceived duration increases with intensified external stimuli, such as visual flashes or auditory ticking (Makin et al., 2014; Droit-Volet, 2010). Several theories have proposed that internal processing of time is influenced by different states of arousal and can alter the way we perceive the passage of time (Schirmer, 2016; Mella et al., 2011; Angrilli et al., 1997).

Apart from our internal clock, perceived time duration also depends on whether we estimate time in the present, past, or future. Past and future judgments of time duration involve different cognitive processes, in particular prospective time judgments are less variable and are generally estimated as being longer than retrospective judgments (Block & Zakay, 1997). For example, a comparative study by Ozawa et al. (2015) assessed two different methods of time estimations. They measured ongoing prospective time estimations during a task and compared these with retrospective judgments of time. They reported that the Return Trip Effect only occurred retrospectively and involved our subjective feelings of time, rather than using a more rational internal timing mechanism. They emphasized that the prospective group had an awareness of timing, which caused participants to strategize their time judgments more carefully and they could focus their attention on temporal processing. Consequently, this group was better able to determine the

task duration postdictively. This aligns with prior research that demonstrated these two methods of time apprehension have competing cognitive processes that affect time processing (Zakay & Block, 2004). The study reported that retrospective time judgments utilise incidental memory, whereas prospective time judgments have a premeditated time awareness. Because of this conscious awareness a person can rely on elevated temporal information processing and can better evaluate the experienced length of time during the task (Zakay & Block, 2004).

In short, the Return Trip Effect seems to be affected by the awareness of time before or during a task. Once this awareness is absent, the Return Trip Effect essentially transpires because people rely on incidental recollection and prior feelings to estimate time, rather than depending on intentional time estimations.

1.3 Anticipation

Generally, people start their outbound trip from their main residence, the area where most time is spent, a place of comfort and certainty. Destinations that are associated with higher attachment are perceived to be nearer (Alter & Balcetis, 2011). This idea was further investigated by Raghubir et al. (2011), who reported that journeys towards home and home-like locations had shorter estimated travel times than journeys to unfamiliar destinations, because of the association with familiarity. Home is a place where people expect little anomalies, hence they will not be anticipating any significant challenges or ambiguity (Maglio & Kwok, 2015). The difference in time estimations between the outgoing journey and the return journey seems to be affected by the destination. Outbound trips only end once the actual destination has been reached, whereas return trips are perceived to be finished once

you have arrived in the general vicinity of the area, therefore it feels the return destination is reached sooner in time (Raghubir et al., 2011). In a follow-up study, participants were asked to estimate the walking time between two points wherein the familiarity aspect of the destination was manipulated. The findings showed that outgoing trips to a familiar end point had lower time estimations than trips to unfamiliar destinations (Raghubir et al., 2011). These findings further imply that the destination has a distinct effect on time perception. However, a return journey was not included in this study and therefore it remains uncertain if the Return Trip Effect would be affected by this account of familiarity.

Additional research has shown that expectancy plays a role in how people perceive time and how it can influence the Return Trip Effect. For example, a study by Van de Ven et al. (2011) manipulated the temporal expectancy for the outgoing trip, creating a false impression that the outgoing trip would be taking longer than anticipated. Participants were shown a faux written statement from a previous participant that said: “pwew, that took a lot longer than I expected”. As a result of this misleading statement, participants adjusted their estimated times downwards for the outgoing trip in comparison to the control group, thus eliminating the Return Trip Effect. Besides the expectancy manipulation, Van de Ven et al. (2011) also had added a condition where the return trip was manipulated. They had altered the return route (different route, same length) to examine route familiarity, with the assumption it would influence time perception. Contrary to expectations, the Return Trip Effect was not affected by the return route modification. These findings seem to suggest that anticipating a lengthier outgoing journey has an influence on the time

estimations, however familiarity with the route itself has no impact on the Return Trip Effect.

This anticipation effect on time estimations was further researched by Chen, Hamilton, and Rucker (2021) by means of estimated loading times before and after short videos. The Return Trip Effect was measured as the ratio of the estimated loading time before the video started and the estimated loading time following the video. In this study, they created a low anticipation group and a high anticipation group and coupled emotional valence to the anticipation. Their findings indicated that loading time ratios were larger when videos were labelled as being “funny” (high anticipation group), and comparatively lower when videos were labelled as being “boring” (low anticipation group). To distinguish anticipation from emotional valence they created a follow-up study in which they assessed highly anticipated events (positive vs. negative) with less anticipated events (positive vs. negative). The results showed a significant main effect for anticipation, which indicated that highly anticipated events had a larger Return Trip Effect than less anticipated events. How negative or positive the anticipated event was had no influence on their time perception. These findings suggest that the significance of the anticipated destination or event has a strong influence on time perception, regardless of the event being perceived as desirable or not. This implies that certain emotional states have differing degrees of influence on time perception.

Anticipation was also explored by Maglio and Kwok (2016), who specifically investigated ambiguity regarding the destination. To distinguish ambiguous destinations from unambiguous destinations participants were either told precisely what was expected of them or they were told that the task ahead would remain a

surprise. The findings in their study showed that travelling to an ambiguous outbound location increased people's time estimations, whereas travelling to an unambiguous destination did not. They noted that anticipated ambiguity regarding the destination increased the Return Trip Effect, still it did not appear necessary for a Return Trip Effect to occur. These findings suggest that it was the specific manipulation of the destination that affected time perception and not the path of the journey itself. It remains unclear from this study if it is the uncertainty or the feelings of arousal that caused the increase in time perception. Does a destination need context to elicit emotion to influence our perception of time, or can the anticipation be more neutral?

This uncertainty factor was also examined by Van de Ven et al. (2011), although their study did not specifically look at ambiguity regarding the destination, but rather took away the ambiguity concerning the projected duration of the trip. After alluding to participants that the outbound journey would be taking long, they removed the aspect of duration ambiguity, and as a consequence the outgoing trip was experienced as being shorter in comparison to the control group, therefore removing the Return Trip Effect.

In the previous mentioned studies it was believed that a combination of ambiguity, familiarity, anticipation, and violation of expectations can affect people's perception of time. These studies all used accounts of specific emotions imbued with anticipation regarding an outgoing or singular destination and explained the influence on the Return Trip Effect to varying degrees, however anticipation following a return trip still remains unexplored.

1.4 Cognitive load

In 1978, Block and Reed published a paper in which they described that time durations were remembered as taking longer when activities during intermissions had multiple types of tasks instead of regular single tasks. They noted that an increased cognitive load during these intervals caused participants to perceive time as passing slower. A subsequent study reached the same conclusions and found that temporal memory tends to intensify when there is an increase in cognitive processing tasks (Block & Zakay, 1997). Likewise, familiar and more predictable tasks are remembered as taking shorter, since there are fewer variables interfering with duration judgment (Yang et al., 2021). When tasks are novel or involve more complexity the conscious attention towards these tasks increases, which subtracts cognitive resources from temporal processing and as a result people overestimate the perceived passage of time (Block et al., 2010). As described in the previous section, several studies identified anticipation to have an influence on the Return Trip Effect in various forms. However, it appears that workload and its associated arousal during the journey also impacts our time perception (Hsu et al., 2005).

Previous research by Yamada and Kawabe (2011) demonstrated that time perception is influenced by emotions, by researching short interval time frames. They examined participants who were exposed to negative stimuli and compared these to a neutral stimuli control group. The results presented an increase in time estimations for participants in the negative stimuli group. It was reported that emotional processing appeared to have enhanced the pulsing rate, which led to a temporal overestimation while arousal levels were high. These findings suggest that certain emotions lead to increased arousal and subconsciously increase the pulses

that are being sent to the internal clock and consequently change our time perception. These findings are consistent with the Return Trip Effect literature previously mentioned, which noted that intensified cognitive states bring about increased time judgments (Maglio & Kwok, 2016; Chen et al., 2021). Further research has shown that increased cognitive loads cause overestimations for retrospective time judgments (Block & Gellersen, 2010; Nieuwoudt, 2015). It is thought that non-temporal information processing overrides temporal memory processing when tasks grow in complexity (Zakay & Block, 2004).

A comprehensive study by Yang et al. (2021) explored the internal causes of the Return Trip Effect, utilizing a car simulator and a real car driving experiment. Their study made use of eye trackers, EEG data and questionnaires to research internal workload, comparing groups who were unfamiliar and familiar to the experimental roads. The eye tracking data recorded comparatively increased saccade durations and increased pupil dilations when participants were on unfamiliar roads during the outgoing journey. This indicated that participants had to pay more attention to the road environment when they were unfamiliar with the surrounding scenery, causing an increase in their cognitive load. There seems to be a relationship between saccade duration, pupil dilation, and eye blinking rate. Blinking rates relate directly to attention and focus, and are regulated by dopaminergic systems (Terhune, Sullivan & Simola, 2016). Dopamine regulates the rate of blinking and constantly updates and modulates perception of time. For example, when dopamine levels are higher, the blinking rate increases and consequently time duration is overestimated (Terhune et al., 2016).

This is exemplified by Yang et al. (2021), who found increased EEG signals reflected a more concentrated attention during unfamiliar outgoing trips. These increased EEG waves were not present for familiar routes or return trips. This is consistent with Charlton and Starkey (2013), who found that participants drove faster during trips where the surrounding environment had changed, possibly causing a distraction or an increase in processing demands. Besides increased speeds, participants also had significant increases in self-report ratings regarding driving difficulty during these modified trips (Charlton & Starkey, 2013). It seems that an unknown environment can interfere with driving competency and leads to an enhanced cognitive load. Although these studies examined internal states, no study to date has focused on subjective states of arousal or emotion, which remains an unexplored area of research. There is a likelihood that internal states between outgoing and return trips will vary and could possibly link the eye tracking data and brain wave measures to tangible emotional and cognitive states.

As the previous research has shown, the Return Trip Effect is a multidetermined phenomenon, therefore this research will include additional measures to control for internal variables that may have an effect on cognitive load and time perception.

1.5 Aim of the present study and research questions

In light of the above review concerning the Return Trip Effect, time perception, anticipation, and cognitive load, it seems suitable to further explore the influence of anticipation for outgoing as well as return trips on time perception, and investigate various internal states that may have an effect on the Return Trip Effect. It is hoped

that studying the anticipation account more thoroughly, a better understanding of the processes that are involved in time estimations can be achieved. The main aim of this research is to explore the influence of anticipation and its potential influence on time perception, and subsequently the Return Trip Effect. This research additionally seeks to explore the relationship between different internal states and their potential impact on the perceived passage of time. To explore these objectives, the following research questions will be addressed:

1. Will there be a difference in perceived time estimates between the outgoing trip and the return trip?
2. Is there a difference between ordinal and numeric time estimations between trips?
3. Does anticipation have an influence on the Return Trip Effect?
4. Do subjective mental loads change between trips and do they have an influence on the perceived passage of time?

To answer these four questions this study used a combination of surveys, experimental and correlational research. Participants answered a questionnaire after each trip regarding time estimations and their subjective mental states. An experimental design was used to measure the influence of anticipation on the Return Trip Effect. A correlational analysis was used to investigate any relationships between the different dependent variables.

CHAPTER TWO | METHODOLOGY

This chapter will describe the how the study was conducted and which methods were used to carry out this research. It starts by describing the participants, apparatus, and questionnaires before discussing the procedure. Lastly, the data collection and data analysis are covered.

2.1 Participants

Participants were recruited using the university student research participation database 'Introduction to Psychology Research Program' (IPRP), word of mouth, advertisements on noticeboards (Appendix H), and the TRG database of previous participants. The participants of interest were aged between 18 and 65 years. Based on previous research in the TRG driving simulator, people aged 65 and over frequently report difficulties driving the simulator, therefore the chosen cut-off age was 65 years. Before taking part in the study, participants were sent an information sheet (Appendix B) detailing the study. Participants were required to hold a valid driver's licence which included: learners, restricted, full, and international licences. A total of 74 participants were recruited for the study, however one participant was excluded from the final analysis due to the participant using a digital clock for their time estimations. The exclusion of this participant left the final sample with 73 participants whose data was counted in the concluding analysis. Of these 73 participants, 47 were female and 26 were male. The participant's ages ranged between 17 and 58 years, with the average being 23.6 years old. The majority (n = 37) of the participants held a full driving license, 21 had their restricted license and 15 had their learner's license, the average driving experience being 7.7 years. New

Zealand Europeans made up 48% of the sample, 27% was New Zealand Māori, and the remaining 25% were a combination of Asian, European, and African participants.

All participants were asked to take part in two simulated drives, the roads being identical in length for each condition. The participants were randomly assigned into one of three groups: Group A (outgoing anticipation) contained 24 drivers (7 male, 17 female) aged between 18 and 45 years with a mean age of 24 years (SD = 7.9, N = 24); Group B (return anticipation) contained 24 drivers (6 male, 18 female) aged between 17 and 58 years with a mean age of 24 (SD = 12.0, N = 24); and Group C (control, non-anticipation) had 25 drivers (13 male, 12 female) aged between 18 and 58 years with a mean age of 23 (SD = 8.5, N = 25). In recognition of their participation, members of the general public were compensated with $30 vouchers, and participating IPRP students were rewarded with course credit.

The questionnaires and data collection protocols were reviewed and approved by the School of Psychology Research and Ethics Committee.

2.2 Apparatus

The research was conducted in the Applied Cognitive Psychology laboratory at the University of Waikato. The laboratory contains a driving simulator, consisting of an automobile (Toyota Prius) positioned in front of three projection surfaces. The middle projection is positioned 2.42m away from the driver's seat which is straight in front of the car. The two bordering projections are connected to the middle display and have a 62° angle. Each of the surfaces are tilted away from the driver at 14°, so that the line of sight is basically perpendicular to the surface of the screen. The three surfaces each have an individual projection, which creates a corresponding

projection of the simulated road ahead. The central image is 2.64m wide and 2.10m high and the bordering images are both approximately 2.65m wide and 2.00m high. The screens are positioned in this manner to create a horizontal and vertical visual angle that mimics a more realistic driving experience. The driver's side mirror and rear-view mirror have corresponding LCD screens attached to simulate a 360° driving experience, which is designed to display the rearward view. The speedometer is positioned on the dashboard in front of the driver and was programmed to replicate real-world speed accuracy in reflection to the simulated road and the surrounding objects. The vehicle's front wheels are positioned on top of a rotating disc to allow for the steering to be smoother and more accurate. Additionally, engine sound effects are added through an in-vehicle sound system located in the back of the vehicle. The speed, acceleration, lane position and travel duration were continuously being collected by the software system connected to the vehicle. An external point of view of the driving simulator is shown in Figure 1.

Figure 1. An external view of the driving simulator.

2.3 The simulated road

The simulated driving scenario that was used for this experiment was a digitised version of New Zealand's State Highway 2, initially designed for Charlton's (2009) driving experiment. To ensure a more realistic virtual experience, surroundings such as road lay-out, trees, houses, and speed signs were added to the virtual world. The current experiment used a 16.7km section of the original design. The surroundings were similar to a typical New Zealand rural road. Two different routes had to be created for this experiment: a road design for the outgoing trip (northbound) and a separate road design for the return trip (southbound). The outgoing trip started with an 80 km/h speed zone, indicated by a speed limit sign on the left-hand side of the road. The speeds limits throughout the drive varied between 60, 80 and 100 km/h, and were made salient by means of speed limit signs. Oncoming traffic was present during the entire drive, activated at different intervals. To avoid any misunderstandings or differences in reactions between participants there were no significant hazards, traffic lights, or other obstacles placed on the road. When the participants were nearing the end of the outgoing trip, they were alerted with a warning sign telling them to stop in 200 meters. The end of the road was marked with three stop signs spaced 5 meters apart. The outgoing trip ended with a 60 km/h speed limit. The return trip started with a 60 km/h speed zone and corresponded with the outgoing trip speed limits varying between 60, 80 and 100 km/h. When the participants neared the end of the return trip, they were alerted with a warning sign telling them to stop in 200 meters, similarly to the outgoing route. The end of the road was marked with three stop signs spaced 5 meters apart. The outgoing trip

ended with an 80 km/h speed limit. Both the outgoing road and the return road had the same placement of houses, trees, and speed signs alongside the route.

2.4 The Questionnaires

The three conditions were all required to complete two sets of self-reported questionnaires, one questionnaire after the first drive (Appendix C) and another questionnaire after the second drive (Appendix D). The questionnaires used in this study were administered via a computer using Qualtrics software. Both questionnaires included questions aimed at different factors that could affect the perception of time during the drives. All questions that were asked after the first drive were also asked after the second drive. The second questionnaire had additional questions regarding the entirety of the experiment.

The first set of questions contained nine questions and varied between rating scales and quantitative measures. The rating scales measured different aspects of factors that could potentially have an influence on the perceived time. Six rating scales had an ordinal scale of 1-7 and the questions were as follows: 1) “During the first trip I felt…” Very Comfortable 1 – 7 Very Uncomfortable; 2) “My driving performance during the first trip was…” Very Bad 1 – 7 Very Good; 3) “How did you feel driving the simulator during the first trip?” Very Excited 1 – 7 Very Unexcited; 4) “How motivated were you during the first trip?” Very Motivated 1 – 7 Very Unmotivated; 5) “Driving the simulator was cognitively...” Very Demanding 1 – 7 Very Undemanding; and 6) “The driving simulator experience was boring.” Strongly Agree 1 – 7 Strongly Disagree. The quantitative measures included: 7) “What proportion of the time (in %) did your mind wander during the first trip?” Scale 1-

100; 8) “How many times did you exceed the speed limit by more than 10 km/h during the first trip?” Scale 0-20; and 9) “How long (in minutes) did the first drive take you?” Scale 5-25. The first seven questions were aimed at measuring different possible contributors to perception of time. Question 8 was added to ensure that participants would watch their speed during the return drive. Question 9 required a numerical estimation for the perceived time of the trip, to measure the subjective duration estimate of the outgoing trip.

The second questionnaire after the return drive included the same nine questions as the first questionnaire for comparison purposes. In addition to these questions, the second questionnaire also included a 7-point rating scale question regarding their overall experience: 10) “The experiment met my expectations.” Strongly Agree 1 – 7 Strongly Disagree. And a 3-point rating scale to measure which trip was experienced as taking longer: 11) “Which trip was faster (in time)?” First trip – Second trip – Same. This question was followed up with the question: 12) “How much faster?” Much faster – Moderately Faster – Slightly Faster – Same. The rating scale for question 12 was dependent on the previous question. Therefore, in the results it shows a 7-point rating scale for this question from -3 (the first trip was much faster) to +3 (the second trip was much faster). The reason for adding a subjective ordinal question in addition to the numerical question regarding trip duration was to ensure that the validity of the participants answers regarding estimated trip time were upheld. The demographics questionnaire (Appendix E) followed the second questionnaire and recorded gender, age, ethnicity, driving experience and driver’s licence held. The procedure for the experiment is detailed in the next section.

2.5 Procedure

The experiment consisted of three conditions: an outgoing anticipation group (Group A), a return anticipation group (Group B) and a non-anticipation group (Group C; control). The participants were randomly assigned to a condition at the time of recruitment. Upon arrival, participants were given a brief explanation of what to expect, dependent on their condition. Before starting the experiment, participants were given time to ask any questions regarding the experiment and were asked to fill out the consent form (Appendix A). Once the consent form was signed and the questions were answered the experimenter explained to the participants how to operate the car simulator. The participants were told that they were able to stop the experiment at any time if they felt unwell. Generally, a small portion of participants experience motion sickness in the simulator. The participants were asked to sit in the car and have a practice session to get comfortable with driving the simulator and getting used to the braking and steering system. Following the practice drive, participants were asked if they felt comfortable driving the simulator and if they wished to continue the experiment. After receiving a confirming response, the experimenter exited out of the practise road and started the experimental outgoing road.

Following the practise drive, all three experimental groups were told they were going to be driving two separate trips, they were not informed that the second trip would be the return trip of the same road, to eliminate the possibility of participants realising the two trips were equal in distance and therefore adjusting their estimated times to a more logical answer, rather than a perceptual answer. Ozawa et al. (2015) mentioned that the awareness of 'return' can influence the

Return Trip Effect. The participants were told to stop the car when they arrived at the end point (Point E) signified by 3 stop signs on the left side of the road. They were further told that they would pass many side roads during the drive however, not to access these roads, but instead to follow the main road until the stop signs. They were asked to comply with the speed limits and to drive as natural as were possible. If at any point during the drive they felt unwell they could stop the experiment.

The outgoing anticipation group (Group A) were told before starting their outgoing trip that they were expected to answer a questionnaire and a set of riddles (Appendix F) upon arrival at the end point (Point E), and in addition they would be offered some chocolate. The riddles were chosen to stimulate curiosity, and to create an expectation regarding the destination; the confectionary was chosen to increase the desirability of arriving at the location. The riddles and confectionary combined would then potentially increase anticipation. Participants were then asked to start the drive from the starting point (Point S) to the end point (Point E). Upon arrival at Point E the experimenter came out of the laboratory room and invited the participant into the lab room next door to answer the riddles, they had 5 minutes to answer these. After completion they answered the first questionnaire. The chocolate was placed next to the computer, and the participants were free to enjoy this. After completing the riddles and questionnaire, the participants were asked to return to the driving simulator and complete the second drive. Before the return trip to Point S, the participants were told that they only needed to complete a questionnaire at arrival and that no other task was required, to minimise anticipation for their return trip. After the participants completed the second drive the experimenter invited

them back into the laboratory room to answer the second set of questions regarding the return trip and the experiment overall. After completing the second questionnaire, participants answered the demographic questions and were finished with the experiment hereafter.

The return anticipation group (Group B) were not given information regarding the questionnaire, riddles, or confectionary before their drive to the halfway point (point E), to avoid feelings of anticipation during their outgoing trip. Participants were asked to start the drive to point E. Upon arrival at Point E the experimenter came out of the laboratory room and invited the participant to the laboratory room to answer a set of questions regarding the first drive. After completing the questionnaire, the participants were asked to return to the driving simulator and complete a second drive. Before starting their return trip, participants were told that they were expected to answer a set of riddles and a second questionnaire upon arrival at the starting point (Point S), and in addition they would be offered some chocolate. Again, the riddles were chosen to stimulate curiosity, and to create an expectation regarding the destination; the chocolate was chosen to increase the desirability of arriving at the location. The riddles and confectionary combined would then potentially increase anticipation. Upon arrival at Point S the experimenter came out of the laboratory room and invited the participant to answer the riddles, they had 5 minutes to answer. After completion they answered the second questionnaire. The chocolate was placed next to the computer, and the participants were free to enjoy some confectionary. After completing the riddles and questionnaire, the participants answered the demographics questionnaire and were finished with the experiment hereafter.

The non-anticipation group (Group C) were told that they would be completing two trips and that they were expected to answer a questionnaire after each trip. Participants were then asked to start the drive to point E. Upon arrival at Point E the experimenter came out of the laboratory room and invited the participants to answer a questionnaire regarding the first drive. After completing the questionnaire, the participants were asked to return to the driving simulator and complete a second drive. Participants were told they were answering a second questionnaire upon arrival. The participants completed the second drive, and hereafter the experimenter invited them back into the laboratory room to answer the set of questions regarding the return trip and the experiment overall. Hereafter, they finished the demographic questionnaire to complete the experiment. An overview of the three experimental conditions is shown in Figure 2.

After completion, regardless of condition, the experimenter debriefed the participants and offered the debrief sheet (Appendix G). Any remaining questions were answered by the experimenter. Participants recruited via the IPRP system received research participation credit and participants recruited from the general public received a $30 gift voucher as compensation for their time.

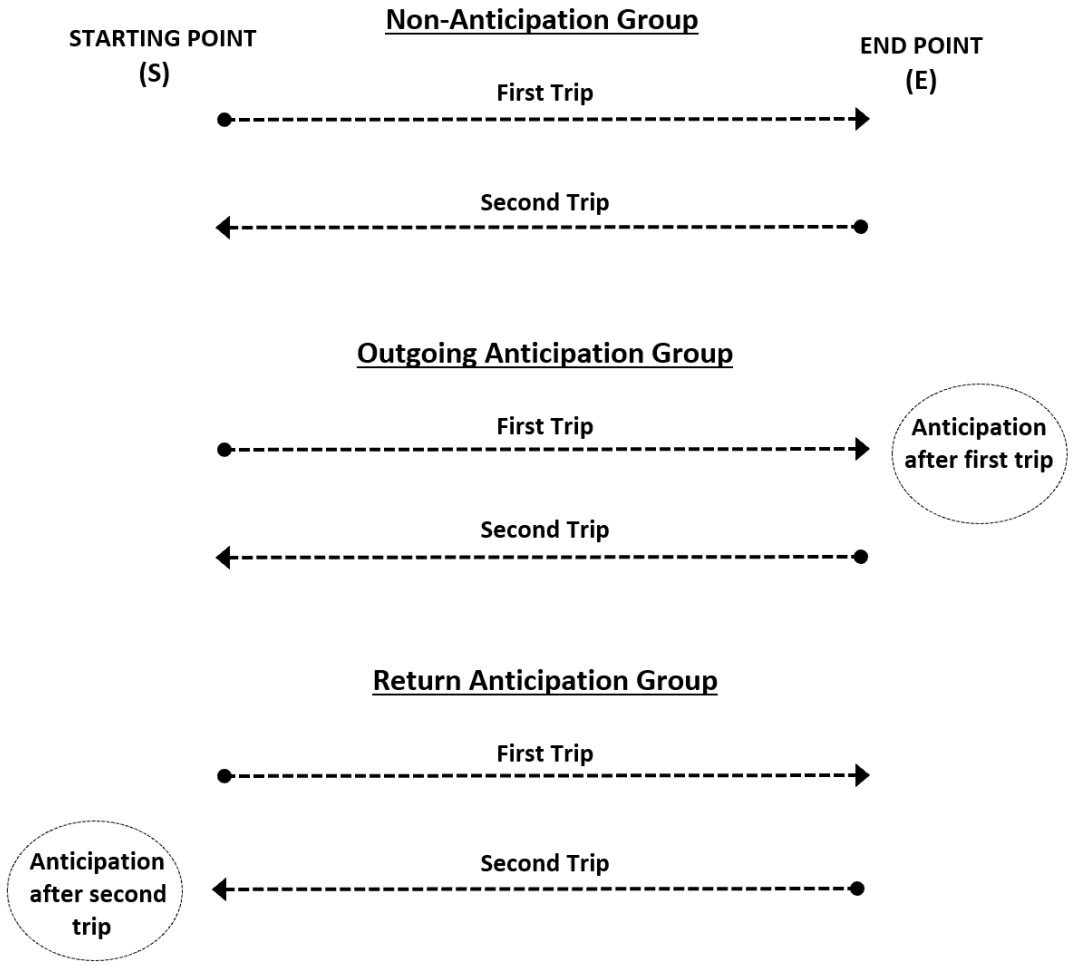

Figure 2. Overview of the three experimental conditions

2.6 Data collection and analysis

This study aimed to explore the influence of anticipation on time perception during outgoing trips and return trips. Three groups were created that had different parameters between conditions relating to anticipation; Group A had an anticipation after the outgoing trip, Group B had an anticipation after the return trip, and Group C had no anticipation. The manipulated variable was the positioning of the anticipation. The main measured variables were the estimated driving times for both trips. The variables to measure mental states and cognitive load were: excitement, boredom, mind-wandering, motivation, driving performance, comfort, and mental

demand. To examine the independent and combined effects of the time estimations a two-way mixed-model analysis of variance (ANOVA) was conducted with the outgoing trip and return trip as a within-subjects factor (Trip) and the three groups as a between-subjects factor (Group). A Wilcoxon signed-rank test was used to compare the within-subjects' differences for the 7-point scale measures and the numeric and ordinal time estimates. A Kruskal-Wallis nonparametric test was performed to examine the distribution between the three groups for ordinal time measures. Effect size was estimated by using partial eta-squared (η_p^2) and Cohen's d. A Spearman's rank-order correlation was used to measure nonparametric correlations between the time variables (numeric, ordinal, and actual), and the dependent 7-point scale variables. For all statistical calculations, $p < .05$ was accepted as significant. The study used an existing New Zealand road setting representing an outgoing trip and a return trip and gathered time estimates and cognitive load measures from each participant after each trip. All participants, irrespective of group, completed the self-report questionnaires in an identical manner. The actual driving time for both the outgoing trip and the return trip were recorded separately using the driving simulator computer system.

CHAPTER THREE | RESULTS

The results will be presented in four main parts: actual time taken, perceived trip durations, subjective estimated trip comparison, and subjective cognitive load measures. The first section on actual time taken, presents the true travel times for both the outgoing and the return trip, to ensure a comparison measure for actual time and estimated time. The section on perceived trip durations will look at the time estimations for both the outgoing and return trip, and the difference between the two measures. An analysis of variance will be conducted to measure the differences between groups and test the research question: "does anticipation have an influence on the Return Trip Effect?" The third section will present the subjective comparison of trip duration and will compare the ordinal estimations with estimated numerical trip durations to assess possible variances between the two separate measures. Lastly, the fourth section will evaluate the group means for the measured variables relating to cognitive load and will assess their potential influence on time perception.

3.1 Actual trip durations

This study created two identical trips in distance, an outgoing trip, and a return trip, both 16.7 km in length. The travel times for both the outgoing and the return trip were measured to ensure that there was a comparison measure for the actual time of travel and the estimated time of travel. The within-subjects results showed nearly identical times for the outgoing trip (M = 12.50, SD = 0.51) and the return trip (M = 12.77, SD = 0.46). The return trip took 16.2 seconds longer, indicating the average speed for the return trip was 2.35 km/h lower. We conducted a two-way 2 (actual

trip time: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the actual trip time variable. There was a significant main effect of actual trip time, $F(1, 70) = 23.42$, $p < .001$, $\eta_p^2 = .251$. This effect tells us that if we ignore the group effect, the actual outgoing trip times were significantly different than the actual return trip times. The results for the actual trip time showed no difference between the three independent groups, therefore the group effect was not significant, $F(2,70) = .49$, $p = .62$, $\eta_p^2 = .014$. There was no interaction effect between the actual trip times and the different groups, $F(2,70) = .20$, $p = .82$, $\eta_p^2 = .006$ (see Figure 3).

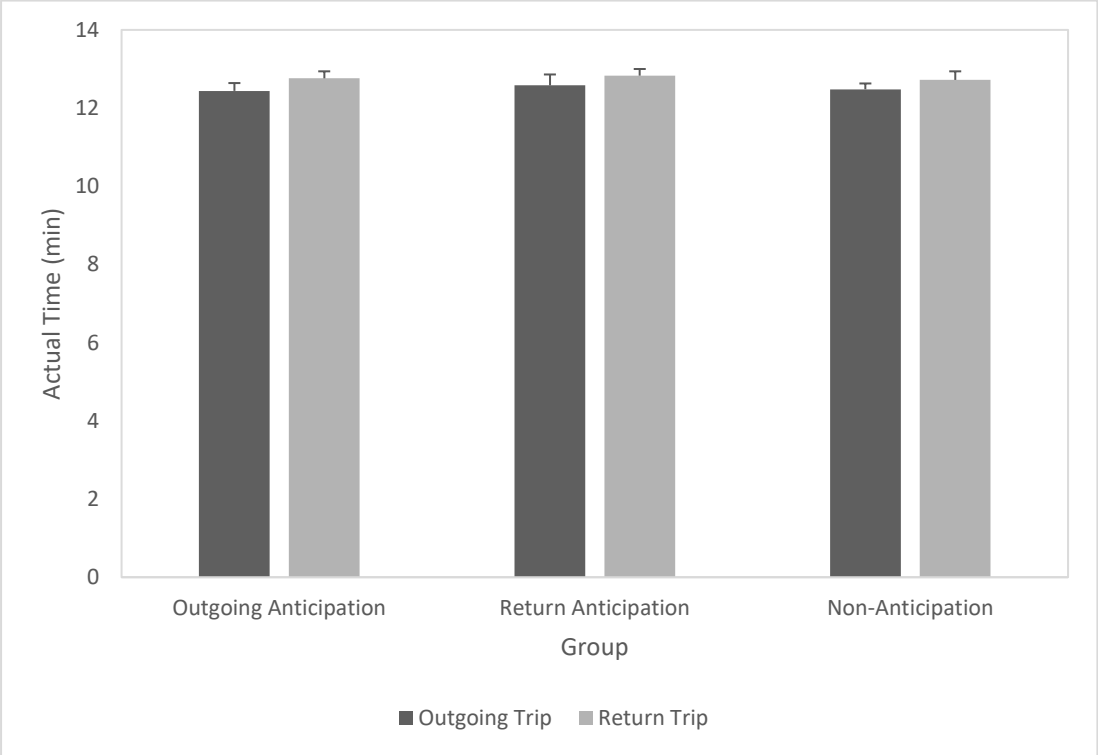

Figure 3. Mean actual trip times outgoing trip vs. return trip between group conditions. Error bars show 95% confidence intervals.

3.2 Estimated trip durations

The estimated times showed a difference of 1 min 13 sec between the outgoing trip (12 min 26 sec) and the return trip (11 min 13 sec), representing estimations for the return trip as being lower on average. A total of 47/73 participants experienced a return trip effect (64.4%), 14/73 participants had no trip effect (19.2%), and 12/73 participants experienced a reversed trip effect whereby the second trip felt longer (16.4%). The within-subjects estimated time for the outgoing trip indicated a significant higher estimation (M = 12.44, SD = 3.74) than did the return trip estimation (M = 11.21, SD = 3.82), $F(1, 72) = 8.69$, $p = .004$, $\eta_p^2 = .108$, and also after controlling for actual travel times, $F(1, 72) = 13.12$, $p = <.001$, $\eta_p^2 = .158$. To control for the actual travel times, we subtracted the estimated trip times from the actual trip times for each participant independently. We conducted a two-way 2 (estimated trip time: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the estimated trip time variable. There was a significant main effect of estimated trip time, $F(1, 70) = 8.56$, $p = .005$, $\eta_p^2 = .109$. This effect tells us that if we ignore the group effect, the estimated outgoing trip times were significantly different than the estimated return trip times. The results showed a significant main effect for group, $F(2, 70) = 3.18$, $p = .048$, $\eta_p^2 = .08$. This effect tells us that the group time estimations were significantly different from each other. However, post hoc pairwise comparisons using the Bonferroni test indicated that the mean estimated time differences between the group conditions did not statistically differ. This indicated that the manipulation did not have an effect on the estimated trip times. There was no interaction effect between the estimated trip times and the different groups, $F(2, 70) = .18$, $p = .84$, $\eta_p^2 = .005$ (see Figure 4).

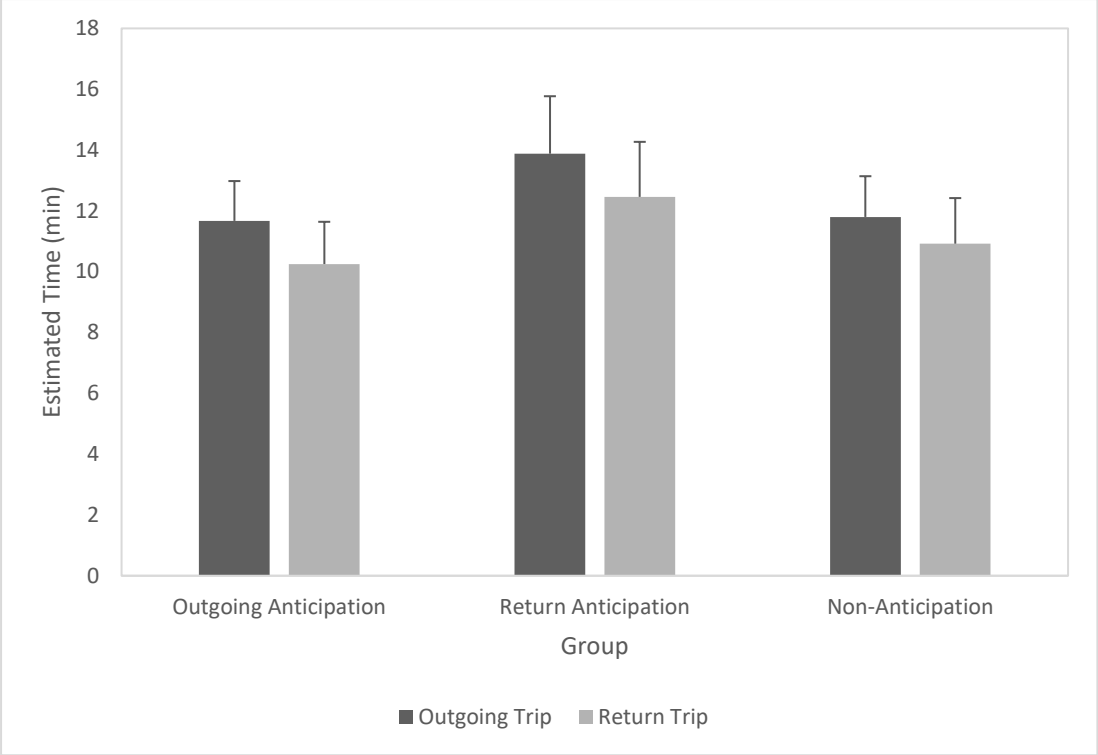

Figure 4. Mean estimated trip duration outgoing trip vs. return trip between groups. Error bars show 95% confidence intervals.

3.3 Ordinal trip estimations

Besides specific time estimations, participants also indicated which trip they thought took longer in time on a 7-point scale from -3 (the outgoing trip was faster) to 3 (the return trip was faster). A total of 52/73 participants experienced a return trip effect (71.2%), 13/73 participants had no trip effect (17.8%), and 8/73 participants experienced a reversed trip effect whereby the second trip felt longer (11.0%). On average, participants perceived the outgoing trip taking longer (M = 0.97, SD = 1.20), which indicated a significant trip effect, $t(72) = 6.92$, $p < .001$, d = 0.81, representing a large effect size. Figure 5 shows the mean ordinal trip estimations for the outgoing anticipation group (M = 1.04, SD = 1.50), the return anticipation group (M = 0.88, SD

= 0.99), and the non-anticipation group (*M* = 1.00, *SD* = 1.12). A Kruskal-Wallis nonparametric test was performed to examine the distribution across the three groups, *H* (2) = .778, *p* = .678. This indicated there was no significant difference between the three groups for ordinal trip estimations.

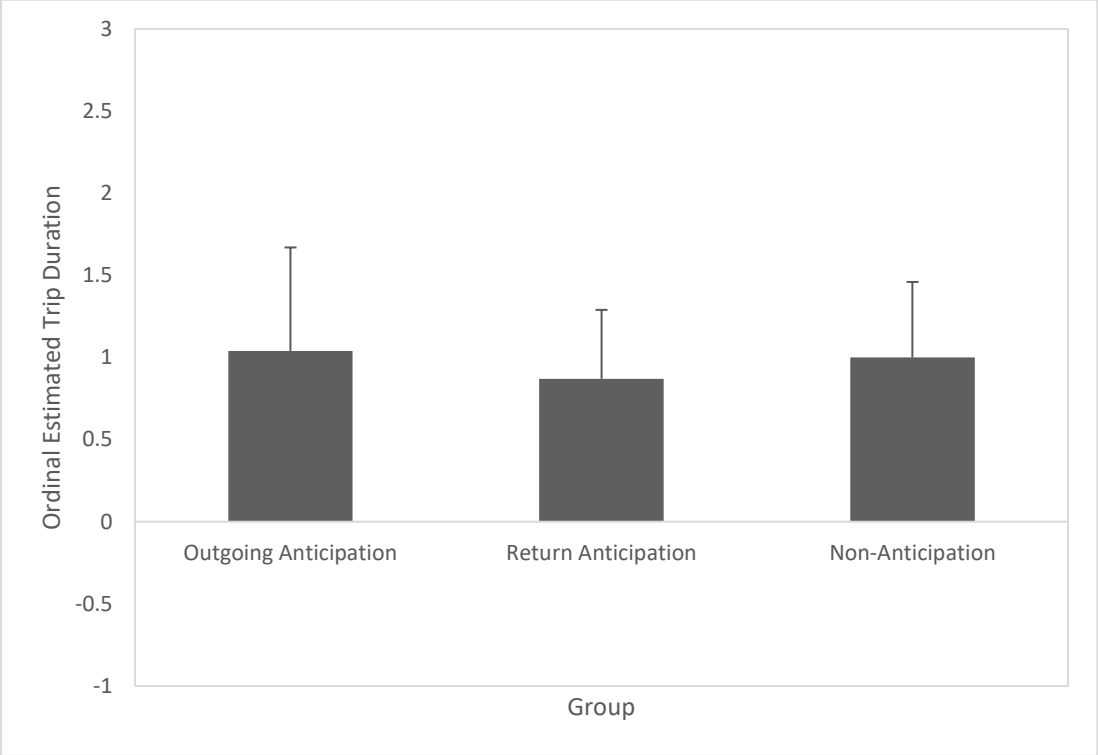

Figure 5. Between groups ordinal trip estimations. Error bars show 95% confidence intervals.

The results showed a significant positive correlation between the ordinal (*M* = 0.97, *SD* = 1.20) and numeric time estimations (*M* = 1.23, *SD* = 3.57), $r(73) = .48$, $p < .001$. Because we were comparing an ordinal measure with a numeric measure we added Spearman's Rho. The results for the Spearman's Rho nonparametric correlation between the ordinal and numeric time estimations also showed a positive correlation, $r_s = .51$, $p < .001$ $N = 73$. We added the Wilcoxon signed-rank test to compare the numeric and ordinal time estimates, the result was non-

significant, T = 770, z = -.742, p = .458, which indicated the two measures did not significantly differ. Figure 6 shows the two separate measures in the same chart.

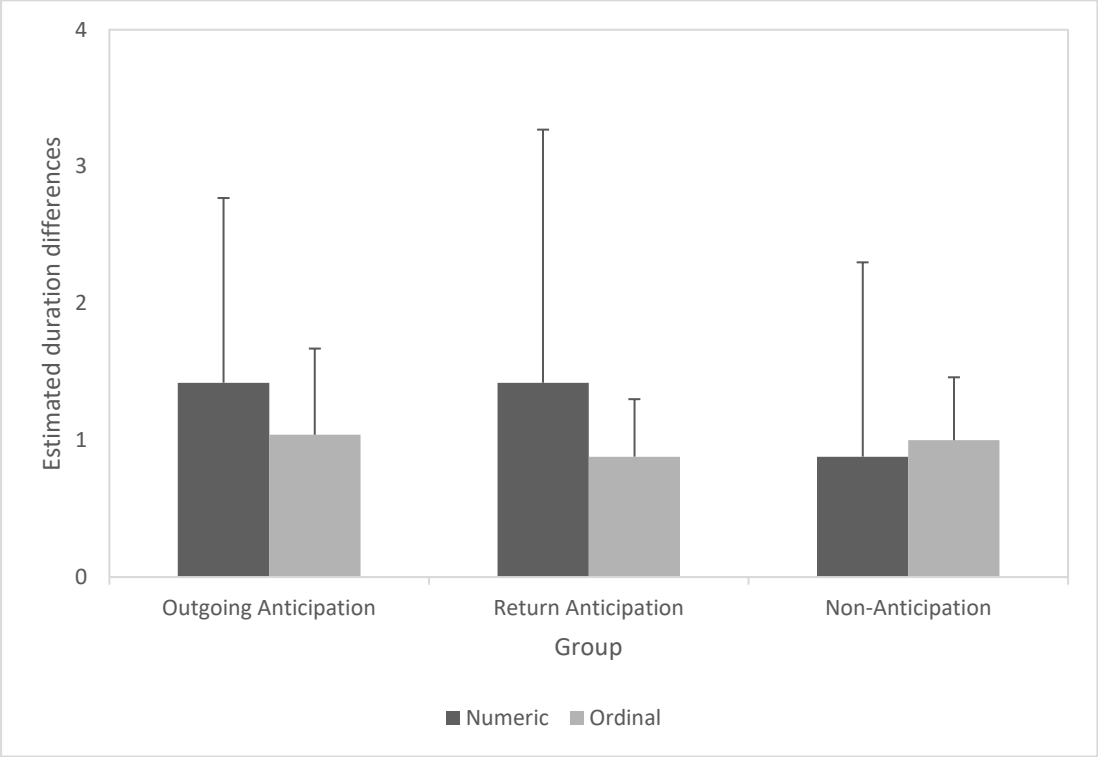

Figure 6. Mean numeric and ordinal trip estimations between subjects. Error bars show 95% confidence intervals.

3.4 Subjective cognitive loads

The following section will examine the subjective cognitive loads for the outgoing trip and the return trip. The measured variables are: excitement, motivation, demandingness, boredom, comfort, mind-wandering, and driving performance.

Firstly excitement, Figure 7 shows the mean excitement levels on a 7-point scale ranging from 1 (very unexcited) to 7 (very excited) for both the outgoing (M = 5.21, SD = 1.03) and the return trip (M = 4.41, SD = 1.15). The level of excitement for the outgoing trip was compared to the return trip as a within-subjects comparison

and on average the outgoing trip had a higher count than the return trip, indicating the return trip was less exciting. A Wilcoxon signed-rank test indicated that this difference was statistically significant, $T = 157$, $z = -4.80$, $p < .001$. Spearman's rank-order nonparametric correlations were run to examine the relationships between level of excitement and the subjective numeric, subjective ordinal, and actual time durations. The level of excitement had no correlation with the numeric time estimations, $r_s = -.12$, $p = .32$, $N = 73$, no correlation with the ordinal time estimations, $r_s = -.07$, $p = .55$, $N = 73$ and no correlation with the actual time, $r_s = -.19$, $p = .10$, $N = 73$. We further conducted a two-way 2 (excitement: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the excitement variable to examine a potential difference between groups. There was a significant main effect of excitement, $F(1, 70) = 30.13$, $p < .001$, $\eta_p^2 = .301$. This effect tells us that if we ignore the group effect, the levels of excitement were significantly different between trips. The results for the excitement levels showed no difference between the three independent groups, therefore the group effect was not significant, $F(2,70) = .23$, $p = .792$, $\eta_p^2 = .007$. There was no interaction effect between the excitement and group, $F(2,70) = 2.02$, $p = .14$, $\eta_p^2 = .055$.

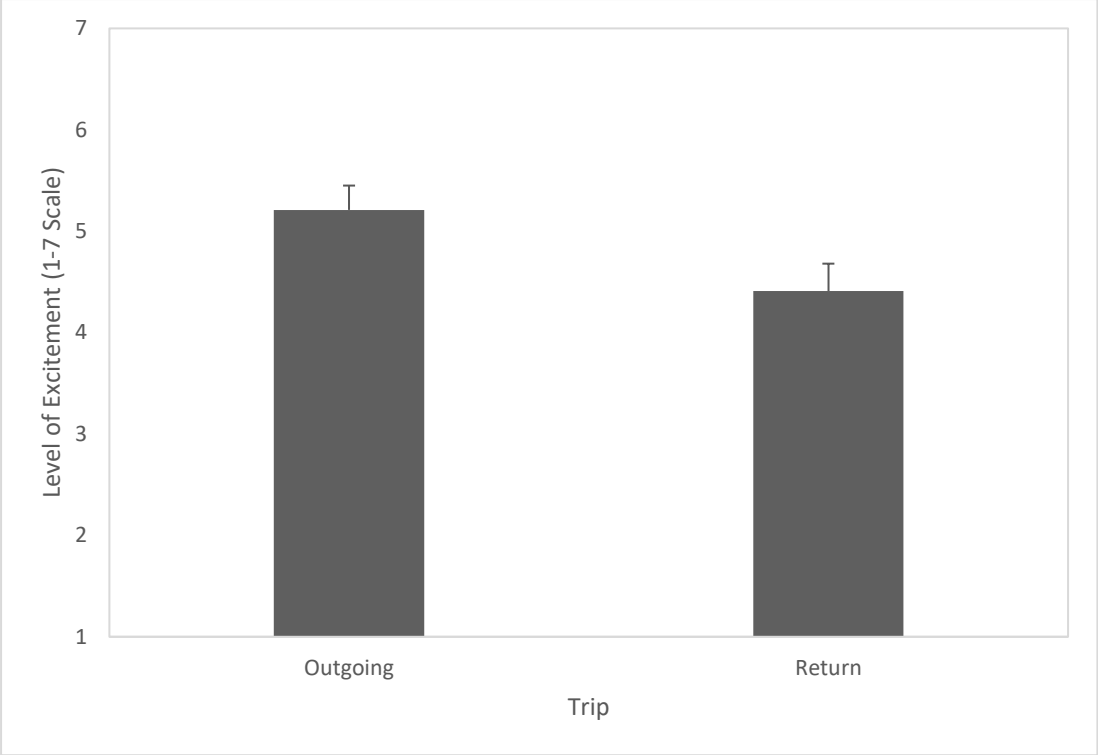

Figure 7. Within-subjects mean level of excitement outgoing trip vs return trip. Error bars show 95% confidence intervals.

The data in Figure 8 shows the mean motivation levels on a 7-point scale ranging from 1 (very unmotivated) to 7 (very motivated) for both the outgoing (M = 5.36, SD = 1.10) and the return trip (M = 4.71, SD = 1.40). The level of motivation for the outgoing trip was compared to the return trip as a within-subjects comparison and on average the outgoing trip had a higher count than the return trip, indicating the participants were less motivated during the return trip. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 203, z = -3.93, p < .001. Spearman's rank-order nonparametric correlations were run to examine the relationships between level of motivation and the subjective numeric, subjective ordinal, and actual time durations. The level of motivation had no correlation with their numeric time estimations, r_s = .05, p = .69, N = 73, no correlation with the

ordinal time estimations, r_s = -.10, p = .39, N = 73, and no correlation with the actual time, r_s = -.03, p = .83, N = 73. We further conducted a two-way 2 (motivation: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the motivation variable to examine a potential difference between groups. There was a significant main effect of motivation, F(1, 70) = 21.07, p < .001, η_p^2 = .231. This effect tells us that if we ignore the group effect, the levels of motivation were significantly different between trips. The results for the motivation levels showed no difference between the three independent groups, therefore the group effect was not significant, F(2,70) = .04, p = .957, η_p^2 = .001. There was no interaction effect between motivation and group, F(2,70) = 2.92, p = .06, η_p^2 = .077.

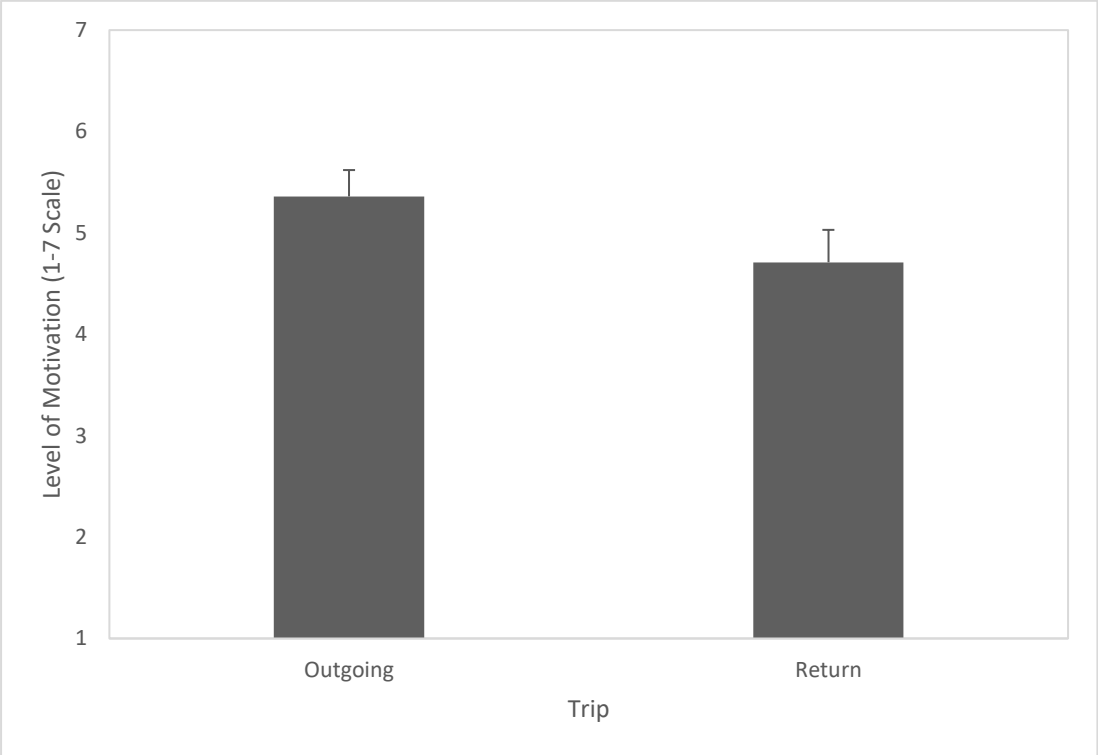

Figure 8. Within-subjects mean level of motivation outgoing trip vs return trip. Error bars show 95% confidence intervals.

The mean level of how cognitively demanding the drive was on a 7-point scale ranging from 1 (very undemanding) to 7 (very demanding) for both the outgoing (M = 5.23, SD = 0.98) and the return trip (M = 4.59, SD = 1.20) is seen in Figure 9. The level of how cognitively demanding the drive was for the outgoing trip was compared to the return trip as a within-subjects comparison and on average outgoing trip had a higher count than the return trip, indicating the return trip was less demanding. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 242.5, z = -3.91, p < .001. Spearman's rank-order nonparametric correlations were run to examine the relationships between level of demandingness and the subjective numeric, subjective ordinal, and actual time durations. The level of how cognitively demanding the drive was had no correlation with their numeric time estimations, r_s = -.05, p = .65, N = 73, no correlation with the ordinal time estimations, r_s = -.13, p = .28, N = 73, and no correlation with the actual time, r_s = -.07, p = .55, N = 73. We further conducted a two-way 2 (demandingness: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the demandingness variable to examine a potential difference between groups. There was a significant main effect of demandingness, $F(1, 70) = 17.63$, $p < .001$, $\eta_p^2 = .201$. This effect tells us that if we ignore the group effect, the levels of demandingness were significantly different between trips. The results for the demandingness levels showed no difference between the three independent groups, therefore the group effect was not significant, $F(2,70) = .18$, $p = .833$, $\eta_p^2 = .005$. There was no interaction effect between demandingness and group, $F(2,70) = .43$, $p = .656$, $\eta_p^2 = .012$.

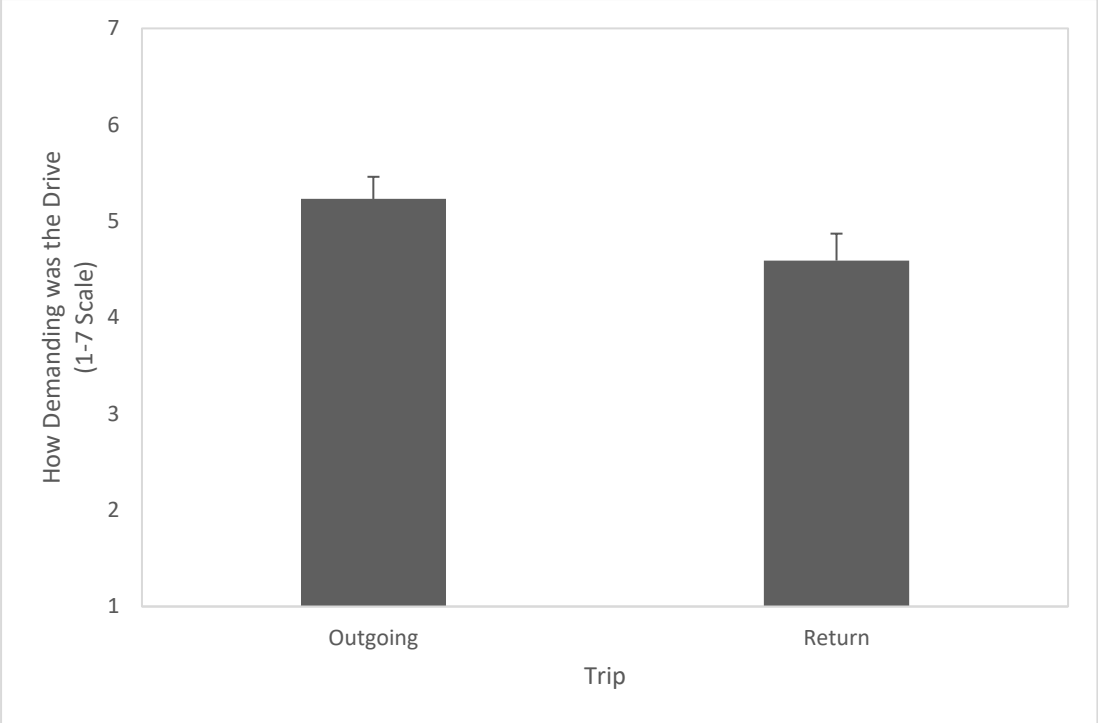

Figure 9. Within-subjects mean level of how demanding the drive was cognitively outgoing vs return trip. Error bars show 95% confidence intervals.

Figure 10 shows the mean level of how boring the drive was on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree) for both the outgoing (M = 3.15, SD = 1.49) and the return trip (M = 4.07, SD = 1.53). The level of boredom for the outgoing trip was compared to the return trip as a within-subjects comparison and on average the return trip had a higher count than the outgoing trip, indicating the return trip was more boring. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 1098.5, z = -5.41, p < .001. Spearman's rank-order nonparametric correlations were run to examine the relationships between level of boredom and the subjective numeric, subjective ordinal, and actual time durations. The level of boredom had no correlation with their numeric time estimations, r_s = -.04, p = .73, N = 73, no correlation with the ordinal time estimations, r_s = .01, p = .96, N = 73, and no correlation with the actual

time, r_s = -.05, p = .70, N = 73. We further conducted a two-way 2 (boredom: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the boredom variable to examine a potential difference between groups. There was a significant main effect of boredom, $F(1, 70) = 40.77$, $p < .001$, $\eta_p^2 = .368$. This effect tells us that if we ignore the group effect, the levels of boredom were significantly different between trips. The results for the boredom levels showed no difference between the three independent groups, therefore the group effect was not significant, $F(2,70) = .18$, $p = .833$, $\eta_p^2 = .005$. There was no interaction effect between boredom and group, $F(2,70) = .03$, $p = .971$, $\eta_p^2 = .001$.

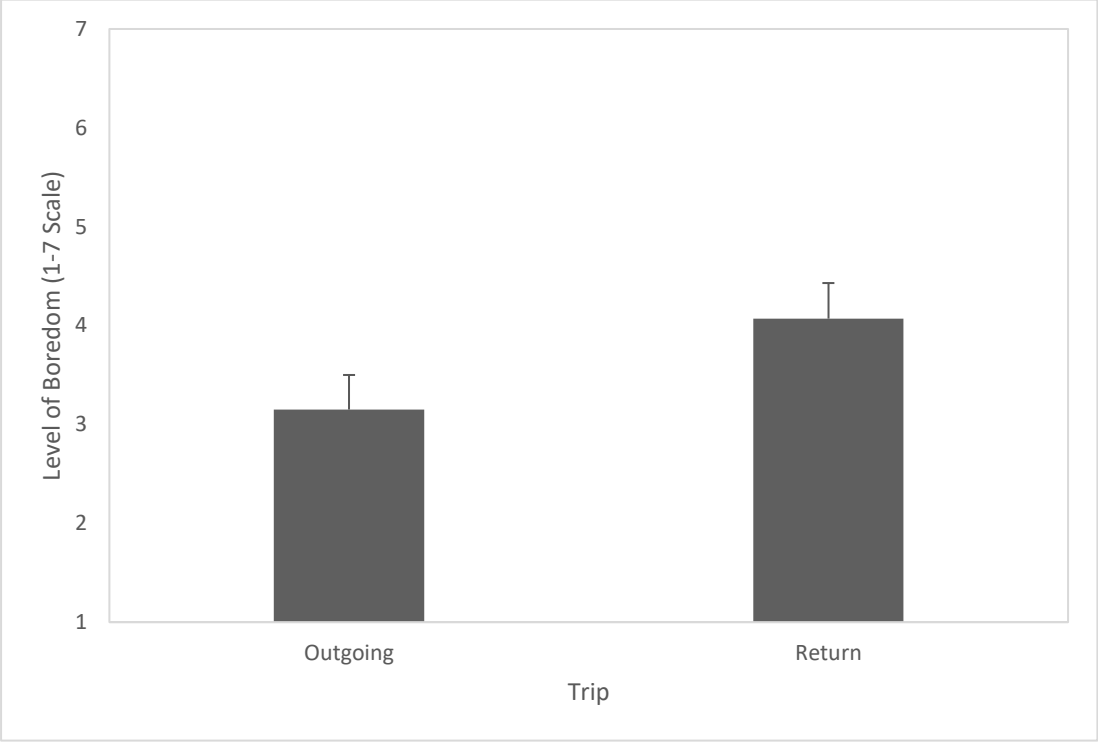

Figure 10. Within-subjects mean level of boredom outgoing vs return trip. Error bars show 95% confidence intervals.

The results for how comfortable participants were during their drive as seen in Figure 11, show the mean level of comfort on a 7-point scale ranging from 1 (very uncomfortable) to 7 (very comfortable) for both the outgoing (M = 4.29, SD = 1.60) and the return trip (M = 5.34, SD = 1.57). The level of comfort for the outgoing trip was compared to the return trip as a within-subjects comparison and on average the return trip had a higher count than the outgoing trip, indicating participants were more comfortable during the return trip. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 1245.5, z = -5.15, p < .001. Spearman's rank-order nonparametric correlations were run to examine the relationships between level of comfort and the subjective numeric, subjective ordinal, and actual time durations. The level of comfort had no correlation with their numeric time estimations, r_s = -.04, p = .73, N = 73, no correlation with the ordinal time estimations, r_s = -.07, p = .56, N = 73, and no correlation with the actual time, r_s = -.03, p = .82, N = 73. We further conducted a two-way 2 (comfort: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the comfort variable to examine a potential difference between groups. There was a significant main effect of comfort, F(1, 70) = 40.80, p < .001, η_p^2 = .368. This effect tells us that if we ignore the group effect, the levels of comfort were significantly different between trips. The results for the comfort levels showed a significant difference between the three independent groups, F(2, 70) = 3.57, p = .034, η_p^2 = .092. Post hoc comparisons using the Bonferroni test indicated that the mean score for the non-anticipation group (M = 5.34, SD = 0.28) was significantly different than the return anticipation group (M = 4.29, SD = 0.28), p = .028. However, the outgoing anticipation group (M = 4.79, SD = 0.28) did not

significantly differ from the non-anticipation group, p = .502, and the return anticipation group, p = .636. There was no interaction effect between comfort and group, $F(2,70) = .84$, p = .434, η_p^2 = .024.

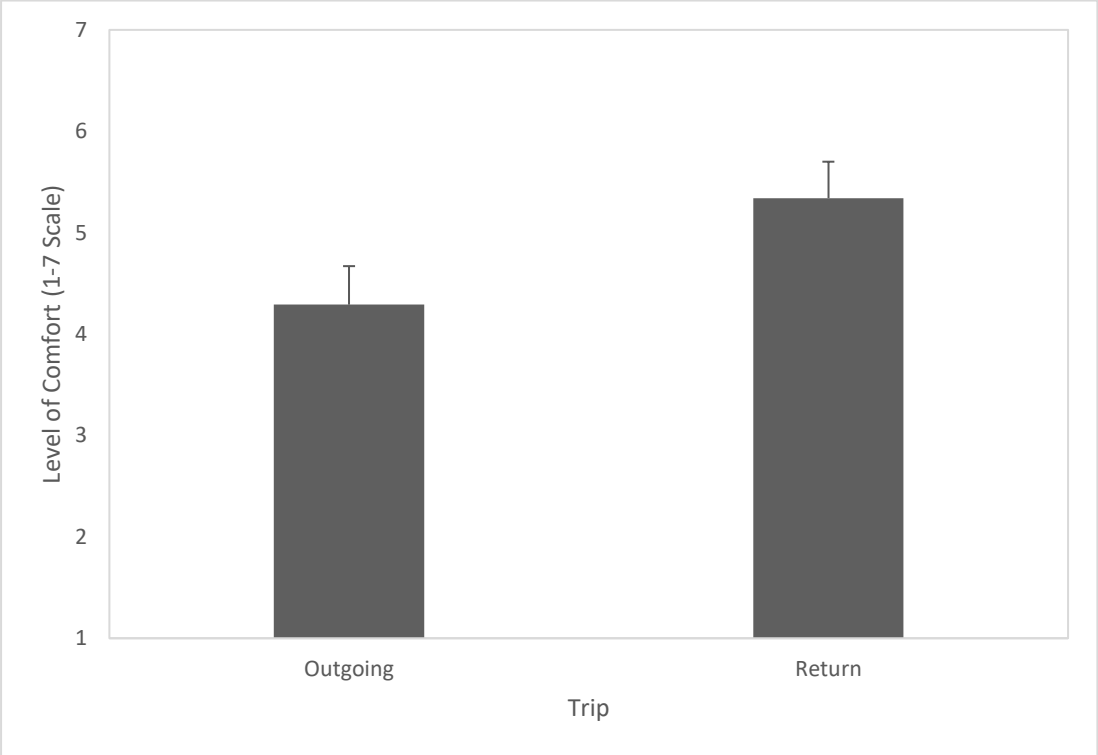

Figure 11. Within-subjects mean comfort levels outgoing vs return trip. Error bars show 95% confidence intervals.

The data in Figure 12 shows the mean percentage (scale 1-100) of mind-wandering for both the outgoing (M = 32.1, SD = 23.0) and the return trip (M = 40.5, SD = 27.4). The mean percentage of mind-wandering for the outgoing trip was compared to the return trip as a within-subjects comparison and on average the return trip had a higher percentage than the outgoing trip, indicating a higher proportion of mind-wandering during the return trip. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 1891.5, z = -4.10, p < .001. Spearman's rank-order nonparametric correlations were run to examine the

relationships between proportion of mind-wandering and the subjective numeric, subjective ordinal, and actual time durations. The proportion of mind-wandering had no correlation with their numeric time estimations, r_s = .03, p = .79, N = 73, no correlation with the ordinal time estimations, r_s = .21, p = .07, N = 73, and no correlation with the actual time, r_s = .22, p = .06, N = 73. We further conducted a two-way 2 (mind-wandering: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the mind-wandering variable to examine a potential difference between groups. There was a significant main effect of mind-wandering, $F(1, 70) = 18.81$, $p < .001$, $\eta_p^2 = .212$. This effect tells us that if we ignore the group effect, mind-wandering was significantly different between trips. The results for mind-wandering showed a significant difference between the three independent groups, $F(2, 70) = 5.15$, $p = .008$, $\eta_p^2 = .128$. Post hoc comparisons using the Bonferroni test indicated that the mean score for the non-anticipation group (M = 25.32, SD = 4.52) was significantly different than the outgoing anticipation group (M = 45.77, SD = 4.62), p = .007. However, the return anticipation group (M = 38.33, SD = 4.62) did not significantly differ from the non-anticipation group, p = .144, and the outgoing anticipation group, p = .775. There was no interaction effect between mind-wandering and group, $F(2,70) = 1.42$, p = .248, $\eta_p^2 = .039$.

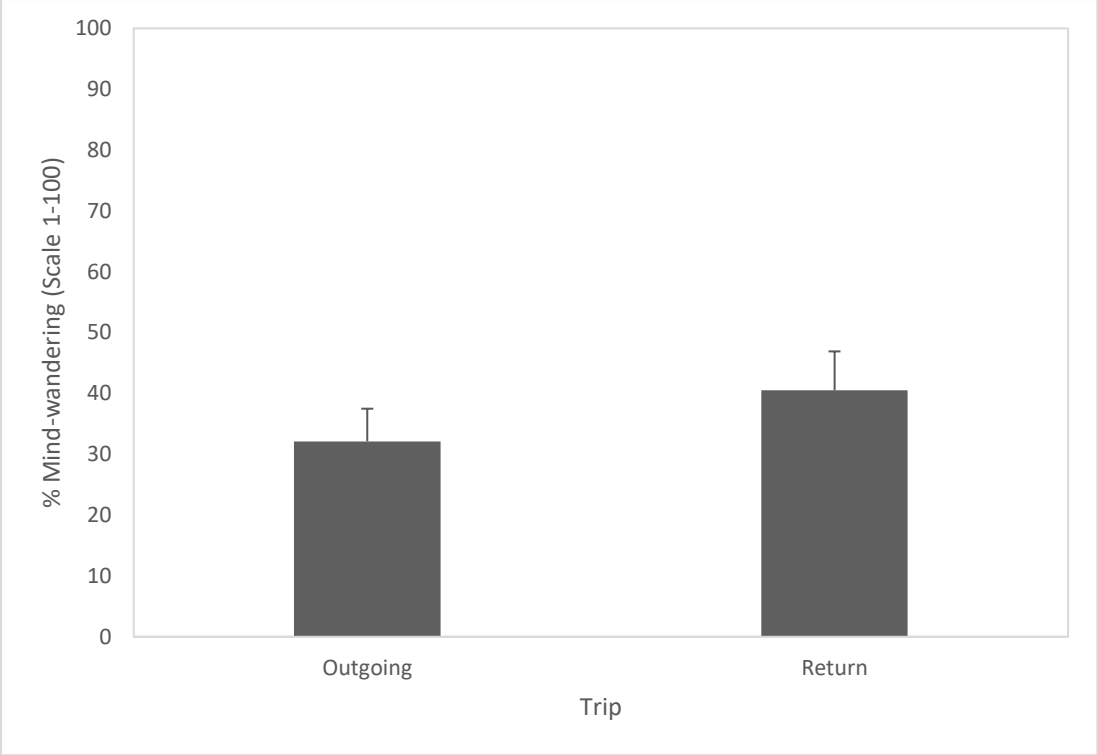

Figure 12. Within-subjects mean percentage estimated mind-wandering outgoing vs return trip. Error bars show 95% confidence intervals.

Lastly, Figure 13 shows the mean level of driving performance was on a 7-point scale ranging from 1 (very bad) to 7 (very good) for both the outgoing (M = 4.15, SD = 1.52) and the return trip (M = 4.71, SD = 1.40). The driving performance for the outgoing trip was compared to the return trip as a within-subjects comparison and on average the return trip had a higher count than the outgoing trip, indicating participants had a better driving performance during the return trip. A Wilcoxon signed-rank test indicated that this difference was statistically significant, T = 839.5, z = -3.38, p < .001. Spearman's rank-order nonparametric correlations were run to examine the relationships between driving performance and the subjective numeric, subjective ordinal, and actual time durations. Driving performance had no correlation with their numeric time estimations, r_s = -.13, p = .29, N = 73, no

correlation with the ordinal time estimations, r_s = -.10, p = .42, N = 73, and no correlation with the actual time, r_s = -.07, p = .54, N = 73. We further conducted a two-way 2 (driving performance: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the driving performance variable to examine a potential difference between groups. There was a significant main effect of driving performance, $F(1, 70) = 13.03$, $p < .001$, $\eta_p^2 = .157$. This effect tells us that if we ignore the group effect, driving performance was significantly different between trips. The results for the driving performance showed no difference between the three independent groups, therefore the group effect was not significant, $F(2, 70) = 1.31$, $p = .28$, $\eta_p^2 = .036$. There was no interaction effect between driving performance and group, $F(2,70) = 2.19$, $p = .119$, $\eta_p^2 = .059$.

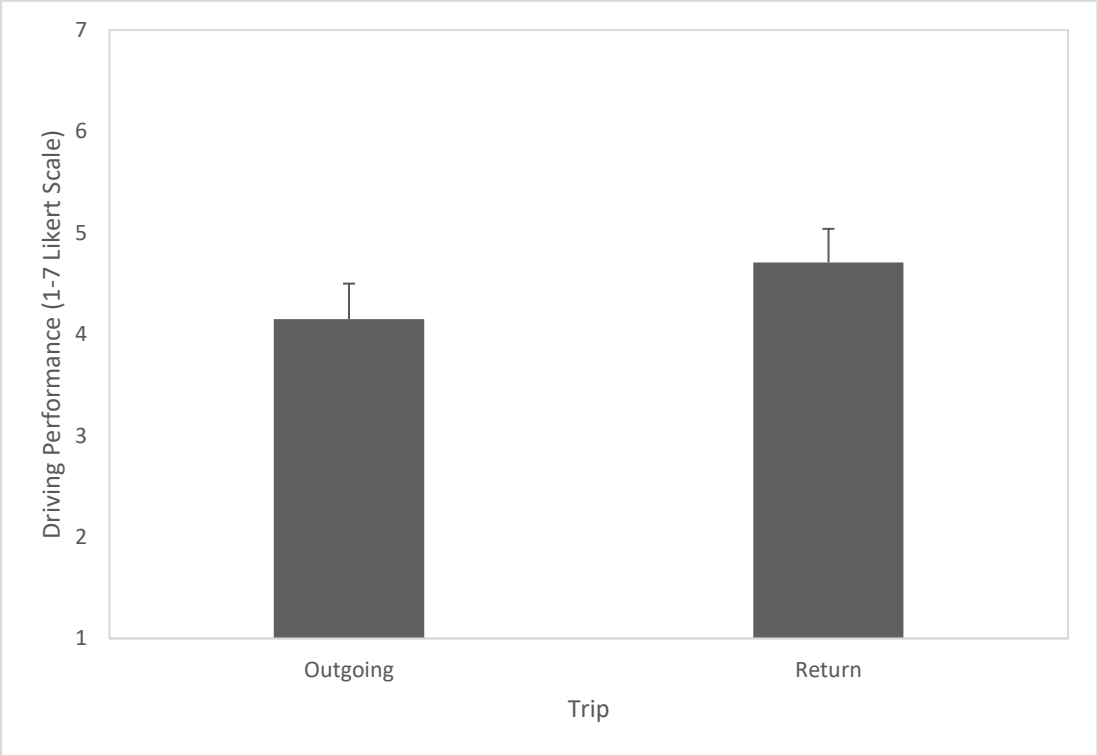

Figure 13. Within-subjects mean driving performance outgoing vs return trip. Error bars show 95% confidence intervals.

In summary, Figure 14 shows the clustering of the group means for the outgoing trip and the return trip for the seven measured variables as within-subjects comparisons.

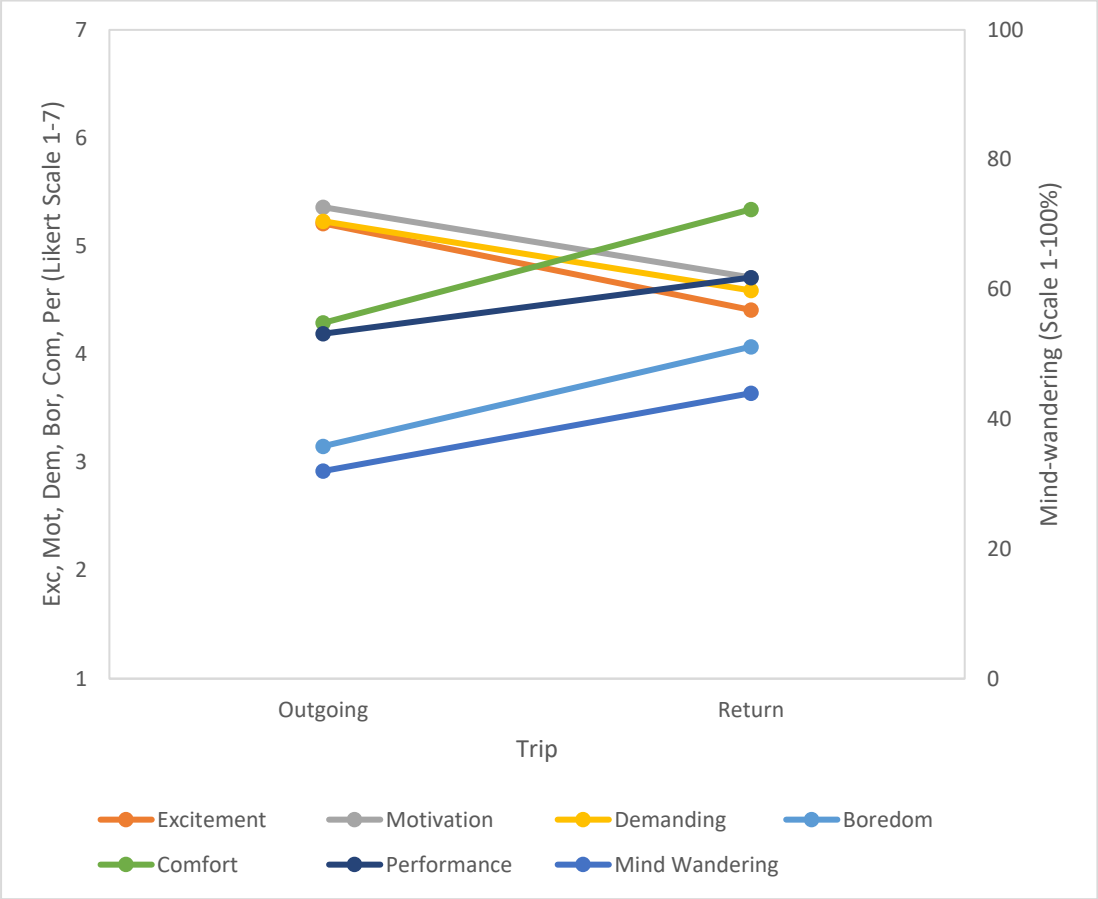

Figure 14. Within-subjects mean outcomes for the seven dependent variables (Excitement, Motivation, Demandingness, Boredom, Comfort, Performance, Mind-wandering) outgoing vs return trip.

3.5 Exceeding the speed limit

The data in Figure 15 shows the mean estimates of how many times the speed limit was exceeded with more than 10 km/h (scale 0-20) for both the outgoing (M = 3.40, SD = 2.87) and the return trip (M = 3.05, SD = 3.64). How many times the speed limit was exceeded with more than 10 km/h was compared to the return trip as a within-

subjects comparison and on average the return trip had a lower count than the outgoing trip. A Wilcoxon signed-rank test indicated that this difference was not statistically significant, $T = 480.5$, $z = -1.92$, $p = .055$. Spearman's rank-order nonparametric correlations were run to examine the relationships between the mean estimates of how many times the speed limit was exceeded and the actual time durations of both the return trip and the outgoing trip. The mean estimates of how many times the speed limit was exceeded with more than 10 km/h for the *outgoing trip* had a negative correlation with the actual time taken, $r_s = -.24$, $p = .044$, $N = 73$, and the mean estimates of how many times the speed limit was exceeded with more than 10 km/h for the *return trip* also had a negative correlation with the actual time taken, $r_s = -.30$, $p = .011$, $N = 73$. We further conducted a two-way 2 (exceeding speed limit: outgoing and return) x 3 (type of anticipation: outgoing, return or non) mixed ANOVA with repeated measures on the speed limit variable to examine a potential difference between groups. There was no main effect of exceeding the speed limit, $F(1, 70) = .682$, $p < .412$, $\eta_p^2 = .010$. This effect tells us that if we ignore the group effect, exceeding the speed limit did not differ between trips. The results for exceeding the speed limit showed no difference between the three independent groups, therefore the group effect was not significant, $F(2, 70) = .709$, $p = .496$, $\eta_p^2 = .020$. There was no interaction effect between exceeding the speed limit and group, $F(2,70) = 2.21$, $p = .117$, $\eta_p^2 = .059$. To finish, a negative correlation between how many times the speed limit was exceeded and driving performance was found, $r_s = -.43$, $p < .001$, $N = 73$.

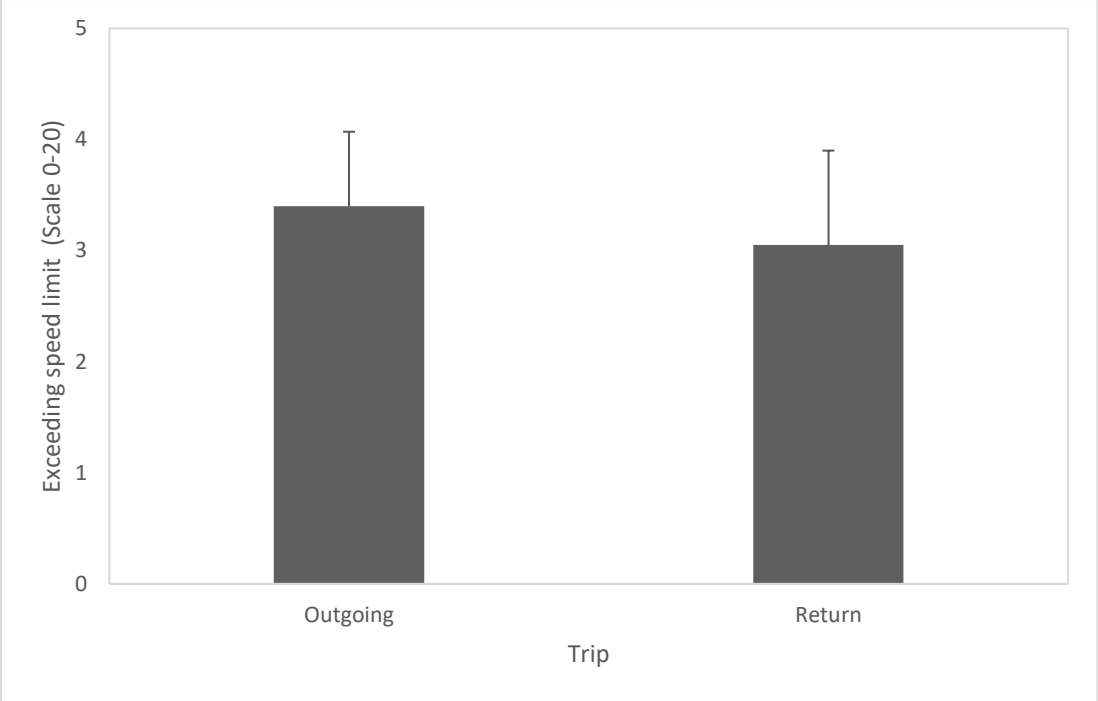

Figure 15. Mean estimates of how many times the speed limit was exceeded with more than 10 km/h outgoing trip vs return trip. Error bars show 95% confidence intervals.

CHAPTER FOUR | DISCUSSION

4.1 Summary of the Main Research Findings

First, the Return Trip Effect came through strong for all three groups independently, even when controlling for the actual time taken, which turned out to be significantly longer for the return trips. The main dependent variables were the estimated trip times for both the outgoing and return trip and the results showed a significant difference between the trip estimates. In response to the research question: Is there a difference between ordinal and numeric time estimates? A positive correlation was found between the two distinct time estimations and additionally a Wilcoxon paired difference test showed there was no difference between the two separate measures, validating both measures for the Return Trip Effect.

As for the research question: Does anticipation have an influence on the return trip effect? Contrary to expectations, the results in this study indicated that the parameters did not cause a difference in the magnitude of the Return Trip Effect between the three groups. However, there was a difference in the mean averages, possibly caused by ambiguity of the task ahead. The findings suggest that regular task anticipation does not have a strong influence on the Return Trip Effect, or it is possible that the chosen parameters of the independent variable were not robust enough to have an influence.

To answer the final research question: Do subjective mental loads change between trips and have an influence on the perception of time? All seven measures changed significantly between trips: excitement, motivation and demandingness all

decreased; boredom, mind wandering, driving performance and comfort all increased. However, the results did not find any evidence of a relationship between the individual variables and the estimated times.

4.2 Actual trip duration

The actual time it took participants to complete both trips varied significantly in this study. This difference must be seen in the context of the total average of 12 min 38 sec for both trips combined, the average difference being 16 seconds between trips. It took participants slightly longer to drive the return trip, meaning their average speed was lower during the return trip. This difference actually enhanced the Return Trip Effect as shown in the results. Participants essentially took longer to drive back, but still perceived it to be faster. The possible reason for participants taking longer was the purposeful question included in the questionnaire: “how many times did you exceed the speed limit with more than 10 km/h?”. This question was added to make participants aware of their speed during the return trip and to avoid participants speeding to possibly complete the experiment faster, which would have caused a genuine return trip effect. A negative correlation was found between the mean estimates of how many times the speed limit was exceeded with more than 10 km/h and the actual time taken for both the outgoing trip and the return trip. This indicated that the actual trip time increased (the average driving speed decreased), while the mean estimates of exceeding the speed limit decreased. This seems to imply that participants were indeed encouraged to watch their speed, and therefore drove slower during their return trip.

Charlton and Starkey (2013) found that a changed environment caused participants to divert their attention away from driving, and consequently not adhere to the speed limit. In other words, participants paid more attention to their surroundings than operating their car. These findings are similar to those reported by Östlund et al. (2006), who found that participants had reduced speed control when their visual cognitive load increased. In precaution, drivers compensated for their increased visual load by reducing their speed and had increased steering movements. Since the environment did not change for the current study, the return trip surroundings were identical to the outgoing trip, participants could focus more on maintaining their speed and were less distracted by external stimuli outside the car. In addition, drivers had been made consciously aware that the speed limit was potentially a marker of their driving skill, and hence had more accountability for speeding. The results indicated that self-reported driving performance had a negative correlation with how many times participants thought they had exceeded the speed limit; the higher participants rated their driving performance, the less they surpassed the speed limit. This suggests that their self-perceived driving performance was directly related to how well they managed to adhere to the speed limits.

4.3 Estimated trip duration and Anticipation

Returning to the purpose of this study, and the third research question: Does anticipation have an influence on perception of time and consequently on the Return Trip Effect? The results demonstrated that the three independent groups all had a significant Return Trip Effect, resulting from both the numeric and ordinal

duration estimations. Still the numeric data showed a significant difference in altitude between time estimations, however this difference did not affect the magnitude of the trip effect. Because the magnitude of the trip effect was not significantly different between the three groups it seemed that the manipulation of the anticipation parameters did not change people's perception of time, and consequently did not have an influence on the Return Trip Effect. This contrasts with previous research by Chen et al. (2021) who did find evidence for an influence of anticipation on the Return Trip Effect. There is a possible explanation for these different findings, for example their research method was different. Their study framed the destination with strong emotional wording such as: the anticipation is "disliked" or "liked by most", and the anticipation is "boring" or "funny". Moreover, they asked participants in a subsequent study to remember events they travelled to that were negative and trips to events that were perceived to be positive. They found evidence that for highly anticipated events the perceived travel time increased, in comparison to lowly anticipated destinations. It seems that attaching emotional language and meaning to the destination or the task ahead is a necessary precondition to alter the perception of time.

This attached meaning was also employed in Maglio and Kwok's (2016) study; they used sentences like: "in order to make the task surprising, we will not tell you what task you will be performing". And in a succeeding experiment they presented the participants with an emotion-loaded story (ambiguous or unambiguous) regarding the destination. They found a stronger Return Trip Effect when tasks were deemed more uncertain and ambiguous. Again, this anticipated ambiguity was made salient in conjunction with specific wording or narrative before the task. The current

study did not manipulate the anticipation by attaching suggestions or ideas to the task ahead. This could explain why the current study had no anticipation effect unlike the studies by Chen et al. (2021) and Maglio and Kwok (2016). There appears to be an effect of emotion on temporal perception.

Similarly, Raghubir et al. (2011) assessed the distinction between positive and negative anticipation towards a destination. They used “meeting a friend for lunch” as a positive reason for the trip and “meeting a friend to study for an exam tomorrow” as a negative reason for the trip. Participants then either travelled to a familiar or unfamiliar destination for this hypothetical meeting. The findings indicated there was no difference in perceived duration between negative and positive trips but there was a significant effect of familiarity. There are two explanations for this result: the positive and negative destinations both elicited a similar anticipation and therefore the estimated times did not differ; or the chosen reasoning was not emotionally efficacious enough and therefore the familiarity aspect of the destination superseded the influence of the positive or negative aspect of the meetings.

This last factor (one effect overriding another) may be an explanation of why the current research did not observe a difference in magnitude between the three anticipation groups. Possibly the anticipation parameters were not robust enough and the driving simulator experience overshadowed the anticipation; driving the simulator was a novelty for 97% of the participants. The non-anticipation group, who did not have the treats or riddles were just as excited as the two experimental groups, suggesting that the driving simulator experience itself was the anticipating factor, not so much the riddles and treats. Since the three conditions all had a similar

magnitude of the trip effect, it can be assumed that the parameters did not affect the Return Trip Effect. The level of excitement or motivation for the return trip between groups did not differ, providing some evidence that participants in the return anticipation group were not more excited or motivated during their second trip than the outgoing anticipation group or the non-anticipation group. To reiterate, Maglio and Kwok (2015) found that attached ambiguity regarding the task caused an increase in time estimations, not the task itself.

Coming back to the unexpected variance between the three conditions; it shows that the return anticipation group made longer objective time estimations for both their outgoing and return trip, than did the participants of the non-anticipation group and the outgoing anticipation group. The difference between these estimations seems to lie in the methodology**.** Both the outgoing anticipation group and the non-anticipation group were told prior to their first trip what was expected of them following their first drive, contrary to the return anticipation group, who were unaware of what was expected of them after their first drive. This uncertainty may have caused ambiguity regarding the destination ahead and therefore the return anticipation group had higher perceived time estimations. Tasks that are deemed unpredictable are more often recalled as taking longer than tasks that have clarity and predictability (Boltz, 1995; Bar-Anan, Wilson, & Gilbert, 2009). This is supported by Maglio and Kwok (2016), who found that anticipated ambiguity caused journeys to feel longer. Therefore, it seems the ambiguity of not knowing what was going to happen may have caused this difference in the perceived travel times for the return anticipation group. This ambiguity however did not change the magnitude

of the Return Trip Effect, it simply increased the perceived time of travel for both trips.

This study included ordinal scales to measure the perceived duration alongside numeric estimations. Ordinal time scales had been used in several studies to assess the Return Trip Effect. Chen et al. (2021), Maglio and Kwok (2016), and Van de Ven et al. (2011) all successfully found a Return Trip Effect using this method, in which in a larger ordinal score corresponded with a more significant trip effect. Thus far, no studies have measured both a numeric and ordinal scale simultaneously within the same sample to measure the Return Trip Effect. This study did include both time measures to examine a possible relationship between ordinal and numeric time variables. The results revealed a positive correlation between the two measures and no difference between the mean estimations, validating both measures. This demonstrates that both measures can effectively serve as an accurate comparison measure for time durations.

4.4 Cognitive load

The varied measured variables relating to cognitive load all showed a significant difference between both trips. However, the results did not find any evidence of a relationship between the individual variables and the estimated times. There does appear to be a pattern when looking at all measures in the same table. Excitement, motivation and demandingness all decreased, and boredom, mind-wandering, driving performance and comfort all increased. What does this tell us about the mental state of the participants when we compare the outgoing trip with the return trip? During return trips they reported to be less engaged (decreased motivation),

more at ease (better driving performance and less demanding), not so anxious (more comfortable), more unfocused (increased mind-wandering) and less interested (excitement decreased and boredom increased) by their own self-reporting. If time flies when you're having fun, then you would expect the initial trip to feel shorter. However, fun with increased cognitive load means that a lot of different processes need to be attended to, perhaps operating a driving simulator for the first time. Block and Zakay (1997) confirm that people generally overestimate the passage of time when processing demands increase. This is further supported by Droit-Volet and Wearden (2002), who found that the pulsing rate increases when people are occupied with a stimulus, diverting their cognitive attention away from temporal processing. An increased pulsing rate means the subjective time duration is overestimated, causing the task to feel longer. It seems that during the outgoing trip participants were more engaged with their new surroundings and the novelty of the driving simulator. This pre-occupation with the unfamiliar surrounding stimuli could potentially have increased their pulsing rate, which would have caused the trip to feel longer. In addition, the findings show enhanced mind-wandering and increased comfort during the return trip and these findings, although preliminary, suggest that participants were more in a flow state, which potentially caused time to fly by (Csikszentmihalyi, 1997).

As described in the literature review, Yang et al. (2021) researched the internal causes of the Return Trip Effect looking at EEG indicators and eye movement. Their research found that during the outgoing trips drivers had an increased pupil dilation, prolonged saccade duration, and the examined brain waves were more active for groups unfamiliar with the route. These findings implied that

the driver's cognitive load was increased during the outgoing trip, and the attention was more concentrated when they were unfamiliar with the route. The group that was familiar with the route did not have these differences in estimated times between both trips. There are similarities between the present study and those described by Yang et al. (2021) regarding familiarity; participants in the current study were also unfamiliar with the route and driving simulator before the experiment started. During the return trip (second drive) participants became familiar and more comfortable, causing a reduction in their workload and a less intensified cognitive state. Similar results were found by Block and Reed (1978); when they increased the workload for participants during their intervals, they found that the passage of time was remembered to be longer. This is consistent with the current study, where cognitive workload seemed higher during the outgoing trips and consequently the time estimates were perceived as being higher as well.

4.5 Limitations

Unforeseen, the novelty of the driving simulator experience (97% of participants were new to the experience) seemed to have reduced the effect of the anticipation manipulation for this research. Novelty causes tasks to be remembered as taking more time, whereas familiarity shortens the perceived time taken (Roy & Christenfeld, 2007; Boltz, Kupperman & Dunne 1998). There were only two participants that had driven in the simulator prior to this experiment and they both did not record a Return Trip Effect. Because only two participants had this previous experience it was not a sufficient number for an appropriate analysis. Furthermore, the study did not test for subjective internal states before the experiment started.

This could have revealed the level of excitement and motivation before they started with the driving experiment and could have given insight into their anticipation levels beforehand.

After investigating the numeric time estimations more closely it showed that the mode for the outgoing time estimations was 10 minutes (26/73) and second were the 15-minute time estimations (16/73), together accounting for more than half of the variance. The return trip also had 10 minutes (16/73) as its mode and 15 minutes (11/73) was the third most chosen time. It seems therefore that round numbers were preferred when making time estimates. In retrospection, a study by Ross and Engen (1959) found that participants preferred numbers ending in 0 and 5. Possibly the sliding bar, which had a range from 5-25, primed participants to choose more rounded numbers, which could have generated less accurate results (Kersten et al., 2018, Kettle & Häubl, 2010). Choosing a certain number is sensitive to its context, for example a number ending in 5 appears more 'round' when the surrounding numbers appear more systematically, and numbers ending in zero are considered 'round' regardless of context (Ross & Engen, 1959). Another basis for obtaining less accurate results was the placement of the first questionnaire. Because the participants were asked to give a time estimate after the first trip, they were mindful that in all probability a time estimation was required after the second trip also, which could have changed their time perception for the second trip (Block & Zakay, 1997). However, Van de Ven et al. (2011) found that giving a time estimation once both trips were completed did not significantly differ from time estimations given between both trips independently.

4.6 Future Research and Recommendations

It seems that temporal processing is in a serious way affected by workload, either anticipated or current. Future research could aim to manipulate the Return Trip Effect by modifying the workload during both trips. For example, increasing the cognitive load during the return trip may lead to a reversal of the effect.

Furthermore, while driving to a destination, particular stimuli can take precedence over others, it would therefore be useful to find out what type of factors have more influence than others while driving. For example, what cognitive processes become more active and take hold of our attention and memory capabilities. This objective can be accomplished by adding additional trips to the study, keeping the distances and times as equal as possible and manipulating the tasks with varying types of emotions.

4.7 Conclusion

This research focused on retrospective time perception based on subjective measures using a driving simulator. The purpose of this study was to explore the effect of anticipation on the Return Trip Effect, as well as controlling for different subjective cognitive states. The results showed a Return Trip Effect for all three conditions for both numeric and ordinal time measures, and a positive correlation was found between time measures. The anticipation parameters between the conditions did not affect the magnitude of the Return Trip Effect, arguably removed by the novelty of the simulator experience overturning the efficacy of the anticipation, or because of the lack of emotional phrasing attached to the task. Nonetheless, it seemed that the estimated trip times for the return trip (for all three

conditions) were lower because of the familiarity with the driving simulator, causing participants to be more at ease. Ambiguity and cognitive workload possibly did have an influence on people's perception of the passage of time and consequently the Return Trip Effect. The cognitive load appeared larger during the outgoing trip than the return trip, indicated by the self-reported answers, however a causal relationship with time estimations was not established. Ambiguity relating to the destination appeared to have increased time perception, hence the higher average time estimations for the return anticipation group. Was the influence of anticipation in the Return Trip Effect successfully investigated in this study? Partially, the driving simulator experience itself seemed to have discarded the eagerness for the task anticipation parameters, however it did reveal the potential importance of wording and meaning attached to the destination. In light of these findings, there seems to be a tipping point where specific cognitive processes intervene with temporal processing, hereby affecting the judgment of time.

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APPENDICES

Appendix A

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

TRG
Transport Research Group

CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant.

Research Project: Driver Behaviour Research

Please complete the following checklist. Tick (✓) the appropriate box for each point.	**YES**	**NO**
1. I have read the Participant Information Sheet (or it has been read to me) and I understand it.		
2. I have been given sufficient time to consider whether or not to participate in this study		
3. I am satisfied with the answers I have been given regarding the study		
4. I understand that taking part in this study is voluntary and that I may withdraw from the study at any time without penalty		
5. I have the right to decline to participate in any part of the research activity		
6. I know who to contact if I have any questions about the study in general.		
7. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study		
8. I wish to receive a copy of the findings		
9. I would like to receive information about future studies conducted by TRG		

Declaration by participant:
I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the Secretary of the Committee, email alpss-ethics@waikato.ac.nz , postal address, Division of Arts, Law, Psychology and Social Sciences , University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240

Participant's name (Please print): _____

Signature: _____ Date: _____

If you would like to receive a copy of the research findings, or are interested in taking part in future studies conducted by TRG please provide your email or other contact address below:

_____

_____

Declaration by member of research team:
I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it. I believe that the participant understands the study and has given informed consent to participate.

Researcher's name (Please print): _____

Signature: _____ Date: _____

Appendix B

Driver Behaviour Research – Driving Simulator

Information Sheet

The purpose of this study is to examine driver behaviour and perception. The research project has been designed to learn more about driver's decision making and consequently to design safer roads and road conditions. The findings will be written up as a master's thesis and potentially they will be used for a peer-reviewed journal or conference presentation. We are looking for licenced drivers to assist us with this research (a learners, restricted or full NZ driver's licence).

Participants will be asked to

1) Take two short drives in our driving simulator at the university campus. (We will give you a 5 min practice drive first).
2) During the drive we want you to drive the same way as you would in your daily life, following the road rules.
3) At certain points during the drive, you will be asked to answer a series of questions regarding the drive.
4) As a thank you for participating we will offer you **$30 in gift vouchers (or a course credit).**

We are asking you to drive alone (no passengers). All the information we record during the drive will be kept confidential and will only be accessible by the research team. You can withdraw from the study at any time simply by stopping the simulated vehicle.

For this experiment we are recruiting drivers between 18 and 65 years of age.

If you have any questions about the study, you can contact a member of the research team
Rick Visser (rickcvisser@gmail.com) or
Prof Samuel Charlton (samuel.charlton@waikato.ac.nz)

This research project has been approved by the Human Research Ethics Committee of the Division of Arts, Law, Psychology and Social Sciences. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee, email alpss-ethics@waikato.ac.nz , postal address, Division of Arts, Law, Psychology and Social Sciences , University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240

Appendix C

Thank you for participating in this research! Please answer the questions to the best of your ability.

Q1. During the first trip I felt...

Very comfortable	Moderately comfortable	Slightly comfortable	Neither comfortable nor uncomfortable	Slightly uncomfortable	Moderately uncomfortable	Very uncomfortable
○	○	○	○	○	○	○

Q2. My driving performance during the first trip was...

Very good	Moderately good	Slightly good	Neither good nor bad	Slightly bad	Moderately bad	Very bad
○	○	○	○	○	○	○

Q3. How did you feel driving the simulator during the first trip?

Very excited	Quite excited	Somewhat excited	Neither excited nor unexcited	Somewhat unexcited	Quite unexcited	Very unexcited
○	○	○	○	○	○	○

Q4. How motivated were you during the first trip?

Very motivated	Quite motivated	Slightly motivated	Neither motivated nor unmotivated	Slightly unmotivated	Quite unmotivated	Very unmotivated
○	○	○	○	○	○	○

Q5. Driving the simulator was cognitively...

Very demanding	Quite demanding	Slightly demanding	Neither demanding nor undemanding	Slightly undemanding	Quite undemanding	Very undemanding
○	○	○	○	○	○	○

Q6. The driving simulator experience was boring.

Strongly Agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
○	○	○	○	○	○	○

Q7. What proportion of the time (in %) did your mind wander during the first trip?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

% mind wandering

Q8. How many times did you exceed the speed limit by more than 10 km/h during the first trip?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

exceeding speed limit <10km/h

Q9. How long (in minutes) did the first drive take you?

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Travel time (in minutes)

Please stop here. You have now completed the this part of the questionnaire.
Please inform your research assistant, and you will continue to the next part of the drive.

Please enter the participant code *(research assistant to complete)*

Researcher to select group

- ○ A
- ○ B
- ○ C

Appendix D

Q1. During the second trip I felt...

Very comfortable	Moderately comfortable	Slightly comfortable	Neither comfortable nor uncomfortable	Slightly uncomfortable	Moderately uncomfortable	Very uncomfortable
○	○	○	○	○	○	○

Q2. My driving performance during the second trip was...

Very good	Moderately good	Slightly good	Neither good nor bad	Slightly bad	Moderately bad	Very bad
○	○	○	○	○	○	○

Q3. How did you feel driving the simulator during the second trip?

Very excited	Quite excited	Somewhat excited	Neither excited nor unexcited	Somewhat unexcited	Quite unexcited	Very unexcited
○	○	○	○	○	○	○

Q4. How motivated were you during the second trip?

Very motivated	Quite motivated	Slightly motivated	Neither motivated nor unmotivated	Slightly unmotivated	Quite unmotivated	Very unmotivated
○	○	○	○	○	○	○

Q5. Driving the simulator during the second trip was cognitively...

Very demanding	Quite demanding	Slightly demanding	Neither demanding nor undemanding	Slightly undemanding	Quite undemanding	Very undemanding
○	○	○	○	○	○	○

Q6. The driving simulator experience was boring during the second trip.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
○	○	○	○	○	○	○

Q7. The experiment met my expectations.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
○	○	○	○	○	○	○

Q8. My skills at solving riddles compared to the average person is...

Much better	Moderately better	Slightly better	About the same	Slightly worse	Moderately worse	Much worse
○	○	○	○	○	○	○

Q9. The riddles and treats met my expectations.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
○	○	○	○	○	○	○

Q10. What proportion of the time (in %) did your mind wander during the second trip?

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

% mind wandering

Q11. How many times did you exceed the speed limit by more than 10 km/h during the second trip?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

exceeding speed limit <10km/h

Q12. How long (in minutes) did the second drive take you?

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Travel time (in minutes)

Q13. Which trip was faster (in time)?

- ○ First trip
- ○ Second trip
- ○ Same

Q14. How much faster?

Much faster	Moderately faster	Slightly faster	Same
○	○	○	○

Q15. Was your average speed higher during the first trip or second trip?

- ○ First trip
- ○ Second trip
- ○ Same

Appendix E

Now we want to know a little bit about you

What is your age (in years)?

What gender do you most identify as?

- ○ Male
- ○ Female
- ○ Non-binary/third gender
- ○ Prefer to self-describe
- ○ Prefer not to answer

Which ethnic groups do you belong to? Identify any that apply.

☐ New Zealand European	☐ Tongan	☐ Indian
☐ Other European	☐ Cook Islands Māori	☐ Other (please state)
☐ Māori	☐ Niuean	☐ Prefer not to answer
☐ Samoan	☐ Chinese	

Do you have a current driving license?

- ○ Yes
- ○ No
- ○ Prefer not to respond

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How many years of driving experience do you have? (e.g., years since you passed your learners' test)

How did you hear about this study?

- ○ Recruitment e-mail
- ○ Poster
- ○ Word of mouth (from a friend, collegue, family member etc.)
- ○ Neighbourly
- ○ Other
- ○ Waikato DHB intranet

Appendix F

Thank you for participating. Good luck solving some riddles. You have 5 minutes to answer the questions.

1. What can you hold in your right hand, but not in your left?

2. The more you take, the more you leave behind. What am I?

3. What belongs to you, but other people use it more than you?

4. I'm tall when I'm young, and I'm short when I'm old. What am I?

5. What question can you never answer yes to?

6. What is always in front of you but can't be seen?

7. What goes up but never comes down?

8. A man who was outside in the rain without an umbrella or hat didn't get a single hair on his head wet. Why?

9. What can you keep after giving to someone?

10. What gets wet while drying?

Appendix G

Debriefing Statement

Dear student,

You just took part in a one session study in which you were asked to drive a car simulator from point A to point B and return to point A hereafter. You answered a series of questions and dependent on the group you were assigned to, you may have also enjoyed some confectionary and answered some riddles. Beforehand, you were told that the purpose of the study was to investigate driver behaviour. In fact, we were interested in your time estimations of the outbound trip in comparison to the return trip. We also controlled for mind wandering, workload and anticipation in the questionnaire. Our hypothesis is that anticipation will increase the perceived time taken to get from location to location. Scientific research shows that return trips are perceived as shorter, and most often anticipation is lower during a return trip, therefore we tried to manipulate this variable for the study.

In other words, in this project, we are trying to get a better understanding of the Return Trip Effect, where return trips are perceived as taking shorter. We are specifically basing our research on the anticipation component. Driving is an excellent medium to study cognitive processes such as perception, workload, and rational functioning. Previous research into this field have studied these processes using retrograde memories, which are often not remembered accurately and can lead to inaccuracies during recall. Additionally, the results of this study will add to the knowledge of our perceptual understanding during driving and will further add to a body of research to be applied to the design of roads that are safer and easier to use.

What did we find?

At the moment we are still in the process of collecting data, and so we don't have any results to share with you. But if you would like to know what we find in this study, please contact us using the details below, and we will email you a copy of the results.

Recall that at the start of the study, you were told that the study was about driver behaviour when really, the study was designed to research anticipation as a component of the Return Trip Effect. As a result, we expected that many of you would perceive the return trip as being shorter (a completely normal aspect of mental processing), but not when there was anticipation.

Sometimes people change how they answer these kinds of questions if they know the aim of the study, and so we could not tell you the purpose of this study until you had completed it. We regret having somewhat misled you about the genuine purpose of this study, and we wish we could have adopted a non-deceptive procedure instead.

Research of this kind is extremely valuable in helping us understand theoretical issues — such as how perceptions of truth work — but it also has tremendous practical value. This research will provide insight into the influence of goal orientation and the anticipation hereof on the return trip effect in the everyday task of driving.

Should you have any further questions about the study, please feel welcome to contact us. Thank you once again for your help.

Sincerely,

Professor Samuel Charlton and Rick Visser.

Appendix H

Driver Behaviour Research – University Driving Simulator

We are looking for participants to take part in a study to investigate drivers' perceptions and behaviour on NZ roads during a simulated drive

What does the study involve?

We will meet you at the university and you will be asked to take a short drive in the driving simulator. At several points you will be asked some brief questions about the section of simulated road you drove.

You will need to hold a NZ driver's licence (learner, restricted or full licence)

You will receive up to $30 in gift vouchers voucher to thank you for participating in the research

For this study we are recruiting drivers between 18-65 years of age

Who can I contact to volunteer or to find out more?

Email us at RickcVisser@gmail.com to find out more and we will provide you with further information and answer any questions you may have.

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This study is being conducted by Prof Charlton of the Transport Research Group at the University of Waikato. This research project has been approved by the Human Research Ethics Committee of the Division of Arts, Law, Psychology and Social Sciences. All information collected will remain confidential.

TRG
Transport Research Group