THE INFLUENCE OF VISUAL PERCEPTION ON VEHICLE RATES OF CLOSURE

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THE INFLUENCE OF VISUAL PERCEPTION ON VEHICLE RATES OF CLOSURE

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SUMMARY

Given the high prevalence of automobile collisions in the United States, the need for collision prevention research is evident. To understand the complete cause of these incidents, it is critical to examine the driver's perception of these situations. This study involved simulations of multiple driving situations variant on luminance, rate of closure, and vehicle motions. Findings suggest changes in brake onset times of younger drivers based on roles of a lead vehicle. Multiple perceptually different rear end collisions caused participants to alter their brake onset times. The brake onset times were used to analyze braking models, including constant distance and constant tau. Additional analysis included correlations of the effects Useful Field of View and Test Anxiety on brake onset times. Effects identified not only aid in the general understanding of driving behavior, but also facilitate the application of driver assistive systems, which are currently being integrated into production vehicles.

CHAPTER 1

INTRODUCTION

Over 43% of the 4.3 million multiple car accidents in 2003 can be attributed to rear end collisions (Traffic Safety Facts, 2003). Traffic accidents in the year 2003 resulted in over 1.3 million injuries and fatalities. Since rear end collisions are the most common types of vehicle accidents, attempts should be made to not only curtail such events but also to understand processes that may be involved. If identified, these processes may lead to better vehicle designs, driver training, and assistive technologies. The difficulty in completely understanding traffic accidents is not the physics involved nor the lack of physical data, instead it is the lack of complete knowledge of the human components involved. The driver is arguably the most complex component in the analysis of driving related crashes. Perception, cognition, and movement control can all affect a driver's effectiveness. Research on cognitive loads, decision making, and effects during driving have been studied extensively (e.g. Engtrom, Johansson, and Ostlund, 2005; Lee, 1996; Walker, Fain, Fisk, and McGuire, 1997). The effects of motor control, such as stimulus reaction time and the effects of substances such as alcohol, have also been exhaustively studied over the years (e.g. Kelly, Darke, and Ross, 2004). However, the combination of this knowledge does not necessarily encompass all the driving related components.

Perceptual research involving driving was conducted as early as 1928 (Forster, 1928), but because of the large number of variables that may influence driving, we lack a complete understanding of the perceptual effects that may influence driving. The driving environment is highly variant in factors such as weather, road layout, and time of day. Changes in weather can alter both visibility and road conditions, such as seen in icy or foggy environments. Road layout may allow the driver to see miles down a straight road or remove predictability on a curved mountain path. Time of day can deny the driver information because of low light conditions or high glare. The driver's attention may also limit the amount of data received, especially in conditions when the driver is not monitoring the road, perhaps focusing instead on changing the radio station or using a cell phone.

The informational field of the driver can include other vehicles. Attributes such as vehicle size, lights, and speed must have been perceived accurately to enable the driver to obtain the maximal amount of information essential to driving decisions. In terms of accidents involving two vehicles, one of the most important attributes is the rate of closure or relative speed of the vehicles in question. The drivers must know at what speed they are approaching the vehicle ahead to avoid a rear end collision. A calculation must then be made involving this perceived closure speed and the distance to the vehicle. This calculation conveys to the driver the amount of time remaining until both vehicles collide. Based on this time, the driver must make a determination as to whether or not the situation requires slowing the vehicle. The decision could result in the rate of closure decreasing or reversing; hopefully reducing the risk of a collision.

Changes in Perception

Luminance Effects

The shift from driving in daylight to night conditions has a very powerful effect on the driver's perception. Low light causes change in both perceived and actual environments. These changes include the introduction of head and tail lights as well as less distance visibility. Castro, Martinez, Tornay, Fernandez, and Martos (2005) examined the effect of vehicle headlights on night driving. More accurate distances were reported with wider separation in the headlights as opposed to headlights that are closer together. Castro, et al. (2005) attributed the perceptual difference to the use of depth-to-relative size cues. Studies completed on brake lights produce a similar effect with larger separations between vehicle brake lights having a more pronounced effect on the perceptual system than those of smaller distances (Janssen, Michon, and Harvey, 1976).

The luminance of the head or tail-lights does not appear to have any effect on distance estimation (Castro, et al. 2005). Brighter head or tail-lights seem to provide no additional information to the driver regarding distance or speed estimations. Therefore, the determination may be made that the majority of information on the speed of a lead vehicle must be calculated via the brake lights of the lead vehicle. Any additional perceptual changes during night driving probably are caused by an error in the judgment of the speed of the lead vehicle using the brake lights or to the perceptual effect of driving at night as opposed to a more comfortable and information rich situation of daytime driving.

Simulation vs. Real Driving Scenarios

A large concern for any study involving simulations of real situations is how well the simulated event represents the real event. Simulation is often the preferred method when looking at some situations involving vehicles, especially for those involving collisions. The risk of human life is too great for the facilitation of reenacting these dangerous events. Simulation allows us to offset these risks, but questions arise about the external validity of results when using an artificial environment. Even though this possibility exists, driving simulators can lead to a greater understanding of human effects on driving, especially when dealing with speeds faster than natural locomotion (Kemeny and Panerai, 2003). Speed estimations appear to be only moderately affected when created from simulations versus real motion. The correlation of speed estimations increasing in both real and simulated environments as speed increases has been previously shown (Castro, et al., 2005). McGehee, Mazzae, and Bladwin (2000) determined a direct relation regarding the brake reaction times between simulated and real events. This brake reaction time differential was 0.3 seconds faster for simulations, but should not affect any correlated effects found when using a simulator as opposed to trying to control real situations because of the consistency of such an effect.

The inclusion of peripheral vision cues is of some concern, especially in low fidelity simulators where little or no peripheral information is presented. Hoffman and Mortimer (1996) proposed that in situations where both the driver's vehicle and the lead vehicle are in motion, information gathered involving the relative motion of the two is not affected by the lack of peripheral information. However, the removal of peripheral information does hinder the driver from making accurate estimations of the absolute speed of their own vehicle (Hoffman and Mortimer, 1996).

Speed Perception

Self Motion

In order for the human body to determine what objects in its field of vision are moving, the person must determine if any self motion is occurring. The human perceptual system must integrate data from the visual, vestibular, and proprioception systems (Kemeny and Panerai, 2003). Although all of these systems are important for the analysis of self motion, the visual system provides the most information about the environment (Kemeny and Panerai, 2003). The exact function that the human uses to accomplish this task is under debate. Optic flow and active gaze strategies have both been shown to supply data toward self motion assessments (Kemeny and Panerai, 2003; Lappe, Bremmer, and Van Den Berg, 1999). The larger question is how faster speeds, such as those seen while driving, might affect the perception of self motion. The perception of one's speed while moving is generally underestimated by the visual system (Durgin, Gigone, and Scott, 2005; Recarte and Nunes, 1996). Estimations do seem to improve as speed increases (Recarte and Nunes, 1996).

Perception of Lead Vehicle Movement

One of the major perceptual considerations involved in collisions is the perception of direction of an object's motion in depth and the time to collision/contact/catch, also known as *tau* or TTC (Regan and Gray, 2000). TTC is the metric by which the perceptual system calculates the time, distance, and placement of any form of contact. The time to contact could be between a lead vehicle and a driver or between a pitched baseball and a batter's swing of a bat.

The determination of how this calculation is made is under some debate. The two major processes that could be involved in this calculation involve the use of monocular and binocular cues. Regan and Gray (2000) concluded that although TTC estimates were more accurate when binocular and monocular information were both available, binocular cues provide the greater amount of information to the system. In Regan and Gray's model, monocular cues only affect the perceived distance between objects. Equation 1, derived by Regan and Gray (2000), allows the calculation of TTC using a majority of binocular cues.

$$TTC = \frac{I}{D(d\delta / dt)}$$

when (1)
D >> I
where
I is the interpupillary distance
D is the current distance between moving objects
$d\delta/dt$ is the rate of change of relative disparity

Bootsma's (1991) view on the calculation of *tau* differs. Bootsma (1991) suggests binocular information does not aid performance when attempting to catch balls of various sizes. Regan and Gray (2000) account for the discrepancy in that binocular involvement in TTC is more dominant for small objects for which little to no monocular cues are available. The dominant aspect of binocular cues would be more relevant to driving considering the speeds and distances of the objects involved especially when highway speeds are achieved (Hancock and Manser, 1997; Regan and Gray, 2000). However, the determination of TTC may not be this simplistic. Hancock and Manser (1997) suggest that other factors may affect the estimation of *tau*. Greater accuracy was reported when approaching vehicles were occluded versus disappearing vehicles. Age affects estimation, with younger participants producing more accurate and less biased estimations of *tau* as compared to older participants. Sex differences have also been observed, but are correlated to the perceived *tau* and durations must be greater than three seconds to have any significant effects.

The second perceptual aspect of collisions is the ability to detect and compute the direction of an object's motion. The directional component can be determined using two phenomena, changes in binocular depth cues and the change in apparent size of the tracked object (Herstein and Walker, 1993). Directionality of motion can be established by the change in disparity on the retina in a binocular setting (Regan and Gray, 2000), but this phenomenon creates errors by inducing the illusion that an approaching vehicle is perceived to be farther away than its actual distance. An additional input is needed to resolve this estimation error (Herstein and Walker, 1993). The principal of looming, or the increase or decrease in apparent size of a lead object, provides an additional cue. Apparent size does invoke its own limitations because of its nonlinear aspects at closer distances. Objects tend to increase in apparent size very rapidly at closer distances, whereas at farther distances such a change is not as pronounced. The change in apparent size also provides no assistance in determining the speed of an approaching vehicle. Li and Milgram (2005) correlated optical looming manipulations to changes in the control of braking. Interestingly, participants who could not accurately calculate TTC could determine if one could safely cross an intersection (Herstein and Walker, 1993).

Hoffman and Mortimer (1996) infer that the change in the lead objects motion, or change in headway, can be determined using the perceptual changes of the spacing between the two vehicles and changes in the angular velocity. This change is limited in that the just noticeable difference must be exceeded. The introduction of perceptual spacing prompts “dead zones” in which the visual system is unable to determine if spacing changes exist. This phenomenon is most evident at greater distances where a change in vehicle spacing may be perceptually small, but may have actually resulted in a larger distance traveled.

Brake Reaction Time

Brake reaction times for investigating driver's behaviors have been used extensively over the years (see Green, 2000). This attempt has resulted in information ranging from direct reaction of stimuli to foot speed and dynamics when moving from accelerator to brake. Over the years a great effort has been made to determine a canonical or generic acceptable brake RT. Because of these efforts, brake reaction standards have been created in both the United States, 2.5 sec, and in Europe, 2.0 sec (Green, 2000), and investigations still continue supporting the use of such methods. The difficulty in pursuing this methodology is in the variance of the driving and personal environment. Canonical brake reaction times can vary by as much as a factor of four over different experimental methods (Green, 2000). Averaging reaction times over many varieties of driver samples and conditions may not be the most beneficial approach. A more developed and detailed model must be created that accounts for individual as well as situational variance (Summala, 2000). Although Green (2000) attempted to create variable reaction times based on situations, Summala (2000) rejected this method by stating that Green is merely repackaging canonical reaction times.

To understand how brake reaction time can vary dependant on the situation, it is crucial to understand the factors that are involved. Green (2000) divided the factors into device response time, movement time, and mental processing time. Device response time is an attribute of the vehicle and unaffected by any perceptual changes, but may be affected by physical conditions of the environment. Movement time is related to the physical movement the driver produces, such as initiating the muscles of the leg to depress the brake. Again, this component is not directly affected by any changes in the perceptual environment. The final component, mental processing time, can be divided into three types of timed processes, detection, processing, and response selection. Detection relates to the time required to physically sense an object. Changes in the driving situation could affect this component. Night versus day conditions could create a disparity in the detection of the lead vehicle. Processing is the duration of time that is necessary to interpret the information from the senses. Response selection is the choice of action by the driver. This choice is not limited to braking, but may also include steering to avoid a potential collision. In this study, mental processing time provides the most explanation of any changes in brake reaction times. Detection may be affected by the ability to sense the lead vehicle. Processing is the sub-component responsible for any calculations related to the absolute speeds and rates of closure, and thus may be greatly affected by any manipulations.

Schweitzer, Apter, Den-David, Liebermann, and Parush (1995) examined the effects of vehicle speeds on minimum braking times. Sixty and eighty kilometers per hour were used, but there was no effect on total braking time. However, a problem is apparent in the situation Schweitzer, et al. used. The relative speeds of the two vehicles remained zero until the lead vehicle braked at either 6 meters or 12 meters. At these distances, the response becomes more of an emergency reaction than a perception of the speed difference. Liebermann, Ben-David, Schweitzer, Apter, and Parush (1995) later stated that the effect of closure distances may be related to the time available for perception.

The effect of gender on brake reaction times continues to be under some debate (Green, 2000). Some research portrays men as having a faster response than women, as supported in research relating to *tau* effects (see Green, 2000). Other research, such as Schweitzer, et al. (1995), finds no differences in the genders. Interestingly, no studies have found faster reaction times of women over men (Green, 2000).

Useful Field of View

A crucial portion of braking behavior is the visual ability of the driver. If the driver has difficulties focusing, processing, or attending to the lead vehicle, any calculations required to assist the driver in braking can become severely hindered and may influence the time to brake. The UFOV® Visual Attention Analyzer has three sub tests, which include the measuring of the speed of visual processing, divided attention, and selective attention. An individual's range in reduction of the Useful Field of View can be between 0 and 90% where more than a 40% reduction classifies an individual as a high risk driver (Myers, Ball, Kalina, Roth, and Goode, 2000). Empirical research has shown that Useful Field of View directly correlates to higher incidents of crash incidents of older adults (Ball, Roenker, Bruni, Owsley, Sloane, Ball, and O'Connor, 1991; Myers, et al., 2000; Ball and Rebok, 1994). This relationship becomes even more salient when difficult scenarios arise, such as seen in driving during the rain, interstate driving, rush hour driving, or left hand turns (McGwin, Chapman, and Owsley, 2000). Based on findings like these, the use of Useful Field of View tests have been suggested as a method to screen for at-risk drivers (Myers, et al., 2000).

Effects of Personality

Human behavior reflects more than reaction times and visual processing. In driving an additional factor may be integrated into the final braking actions, this factor is the driver's own personality. Scales, such as the Zuckerman-Kulman Sensation Seeking

Scale, attempt to quantify the risk taking behavior of an individual (Zuckerman and Kuhlman, 2000). High sensation seekers view risk with a decreased assessment over those with lower sensation seeking values (Zuckerman and Kuhlman, 2000) and tend to identify their environment as less threatening when compared to low sensation seekers (Rosenbloom, 2003). Correlates have included gambling, sexual activity, and financial risks (Jonah, 1997). Sensation seeking behavior, ranked by this scale, has also been applied successfully to risky driving across drivers in multiple countries (Jonah, 1997). High sensation seeking drivers become comfortable violating road laws without previous unwanted costs (Rosenbloom, 2003), while gaining a higher proficiency in driving skill (Jonah, 1997). The increase in proficiency can be explained by greater efficiency in processing of road information and driving stress (Rosenbloom, 2003). Although connections have been accomplished, Whissell and Bigelow (2003) stated that, "Driving literature currently lacks contextual clarity in the identification of connections between negative driving attitudes and unsafe driving" (pg. 812). Direct applications involving scores on the sensation seeking scale and specific driving circumstances could create a better understanding of the contextual affect of risk seeking in driving. Heino, van der Molen, and Wilde (1992) studied the distances sensation seekers choose in car following situations. They found that those with higher sensation seeking attitudes preferred shorter distances than those participants who scored lower on the sensation seeking scale. Expressions of these behaviors should be evident in the data gathered throughout this experiment. Those participants with higher sensation seeking scores should prefer smaller brake initiated distances as demonstrated in experiments by Heino, et al (1992).

Another technique entails the use of an inverse approach. Fairclough, Tattersall, and Houston (2006) successfully examined the use of measures of anxiety towards driving tests finding increased anxiety in participants of driving tests over the same participants in known mock tests. "A person who perceives a situation as dangerous or threatening will experience an increase in anxiety" (Spielberger, Gonzalez, Taylor, Algaze, and Anton, 1978, pg. 171). Such anxiety could alter one's behavior. The study examined the use of the Sarason's (1978) 23 item Test Anxiety Scale as a method of examining how one's anxiety of fear of failure may affect braking behavior. The Test Anxiety Scale has been viewed as a standard for ascertaining Fear of Failure (James, 1998). High Fear of Failure individuals reason decisions that create self protective behaviors (James, 1998). Such self protective behaviors could include braking effects, and therefore, necessitating the need to assess Fear of Failure in this study.

Applications for Knowledge

Many major car manufacturers are currently, or planning on, installing driver assist systems. Such systems include adaptive cruise control systems and automatic braking systems. Combinations of technologies exist to aid manufacturers in their design. The technologies include radar, infrared, laser, and optic systems. All of these technologies allow the sensor suite to accurately measure the distance between the driver's vehicle and the lead vehicle. Once onboard computer systems analyze all the available data, two different modes are available to the automated system. The system may be designed to alert the drive, hoping to illicit an action, actually perform the needed action, including the reduction of speed or application of brakes, or a combination of both. The difficulty arises when attempting to decide when the driver should be alerted or informed of the action required. A great deal of research has been completed involving such alarm and notification issues. The use of auditory alerts (Graham, 1999; Wiese, and Lee, 2004; Green, 2000) has been evaluated and generic warning times have been proposed (Lee, McGehee, Brown, and Reyes, 2002). In addition, the effects of trust have been appraised (Parasuraman, Hancock, and Olofinboba, 1997; Ben-Yaacov, Maltz, and Shinar, 2002; Bliss and Acton, 2003).

The key to enabling great success in these types of systems is an understanding of the perception of situations, such as time to contact (Kemeny, et al., 2003). Much debate exists about how vehicles enabled with these assistive systems should maintain control by either using a distance or a time based algorithm. The issues involved with such a decision include time or distance available for the driver to react, overall traffic flow, and user acceptance (Wang and Rajamani, 2004). User acceptance not only determines the overall success of such a marketing adventure but also whether the system is used by the driver. If spacing between vehicles is too large, vehicles may be able to cut into the available space. If too small, drivers may be uncomfortable with the short time to collision related to the distance. Although companies are hesitant to detail any workings of their systems, several European manufacturers seem to be using time based algorithms (Touran, Brackstone, and McDonald, 1999). Touran, et al. (1999) details a prototype system that used a 1.4 s target headway, which exerted a mild control of acceleration and a limited ability to brake. If the braking rate needed is over -3 m/s^2, an alarm will warn the driver to apply additional braking power. The time based system is not the only system with advocates. Research, such as work performed by Wang and Rajamani (2004), does exist to support distance based systems.

Statement of the Problem

The proposed research seeks to answer the question: how are brake onset times altered by modifying the perceptual qualities of the motion of a lead vehicle in a rear end collision situation? As previously stated, the driving environment is quite variable. Time or distance modifications could exist for changes in the perception of motion, day/night changes, and driver speed. Comprehending these effects would increase our knowledge of how drivers monitor the vehicle situations. This knowledge may aid in the design of driver assistive systems by understanding the monitoring task the driver has in determining when such a system fails (Stanton, Young, and McCaulder, 1997). If the system reacts just before the driver would normally react, the driver's determination of the functioning of the system could become less difficult. In order to design systems using such information, the determination of how drivers judge the necessity and timing of vehicle braking must be investigated. This information could also provide insight in accident reconstruction attempts. Through a better understanding of the driver, a more accurate representation of the actual events can be made.

CHAPTER 2

METHODS

Participants

Fifty-five Georgia Institute of Technology undergraduate students participated in this experiment. Participants were males and females between the ages of 18 to 25. All participants were licensed drivers with at least two years driving experience. Vision conditions were accepted if corrected by glasses or contacts. The participants were treated in accordance to the procedures and guidelines established by the ICH/GCP. Five participants were removed from later analysis. Two early participants were removed because of a modification of the number of trials presented. An additional two were excluded for failure to follow instructions. The final excluded participant displayed unusual behavior, failure to recall own birthday.

Apparatus

Participants were placed in one of ten individual testing stations. Each station consisted of a desktop computer with a 17 inch CRT monitor. Available to the participant was a brake pedal. Each testing station was separated on both sides by cubicle walls. Because no sound was used in the simulation, a group testing environment was used. All animations used were created using the Carrara™ 4 software package (Eovia™, 2005). The experimental program was created and executed using Inquisit 2.0™ desktop software (Millisecond™, 2005).

Procedure

After consenting to this study, the participant was seated at the testing computer and given a brief introduction to the study and the system. The goal for the participants was to depress the brake pedal whenever they believe it was necessary to begin to stop safely and prevent the vehicles from colliding. From this point forward, the participant was given the ability to halt the displayed vehicle's motion by depressing the brake pedal. Any other inputs from the apparatus were disregarded.

Eighteen trial types were produced by the combination of luminance (2) and vehicle rates of closure (3) and vehicle motion conditions (3). Six additional catch trial types were included consisting of the rates of closure (3) and luminance (2) combinations but with a vehicle that prevented a collision by altering speeds to match that of the driver's car. This condition was used to prevent the participants from braking as soon as the target was present. Luminance conditions consisted of either day or night driving. The lighting condition of the testing area mirrored the relevant luminance condition. Vehicle motion conditions were: a) driver advancing toward stopped vehicle, b) driver advancing toward a slower vehicle, and c) lead vehicle reversing toward stopped driver. Three constant closure speeds were used throughout the experiment; 20 (32.2), 40 (64.4), and 60 (96.6) miles per hour (km/h). Each trial type was presented ten times in a random order within the day and night conditions. The order of the day/night conditions was counter-balanced between subjects. For each trial the total duration remained constant at ten seconds, while the start distances varied dependent on rate of closure and vehicle motion condition. The distance between the driver and the lead vehicle when the participant depresses the brake pedal was recorded for later analysis.

After the participant completed the 240 trials, the participants were shown six no-car animations, consisting of night and day conditions at 20, 40, and 60 mph, and asked to estimate the speed. Participants then completed Sarason's (1978) Test Anxiety Scale Survey. Once completed, the participants were given the Useful Field of View[1] (UFOV) Task (Visual Resources, 1998). Finally, upon completion of the procedure, a full explanation of the study was presented to the participants and any questions were answered.

[1] Used with Author's Permission

CHAPTER 3

RESULTS AND ANALYSIS

Collected brake onset times for each participant were transformed to *tau* times based on the known collision time. Times were aggregated based on participant means and medians for each condition type, but with no significant differences found between the two, means were used throughout the rest of this analysis. A mixed-model ANOVA

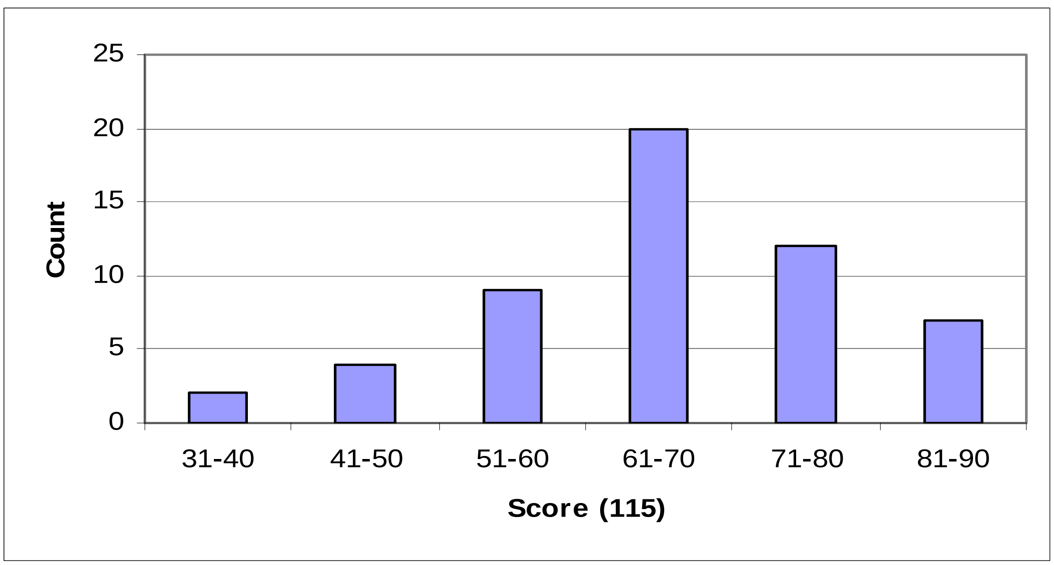

Figure 1. Distribution of Test Anxiety Scores

was used to analyze the *tau* means. This analysis resulted from a 3 (Fear of Failure) by 2 (Luminance) by 3 (Driving Condition) by 3 (Rate of Closure). Fear of Failure was a grouping factor where the raw scores were categorized into three groupings based on the mean, (X = 66), and standard deviation, (std dev = 15). The mean was near the neutral response of the survey, 69. The full distribution of scores appear close to a normal distribution, see Figure 1, as well as the three groupings, see Figure 2. Because there was a lack of variance in the category scores of the participants, the Useful Field of View

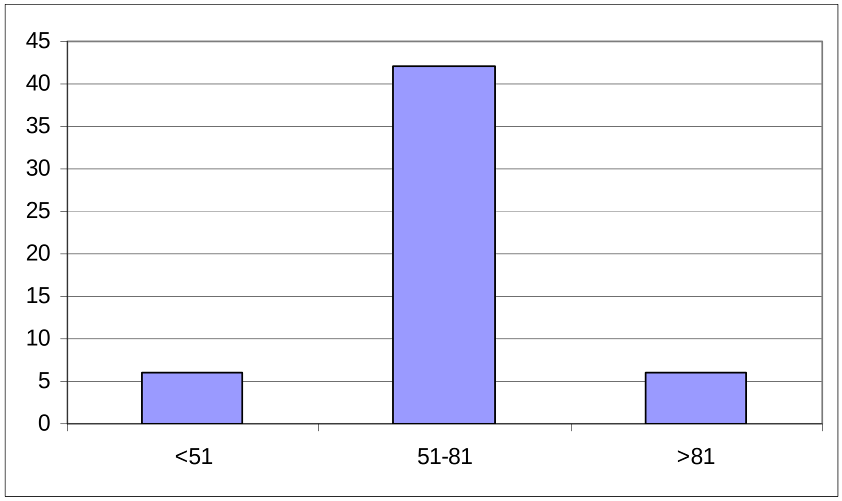

Figure 2. Groupings of Test Anxiety Scores

Score was not used in the omnibus ANOVA analysis. This analysis resulted in three statistically significant findings, two main effects and a single interaction. Rate of Closure ($F(1.098, 51.625) = 97.694$, $p < .01$) and Condition ($F(1.441, 67.716) = 10.333$, $p < .01$) were found to be significant as was the interaction of Rate of Closure by Condition ($F(3.607, 169.545) = 4.327$, $p < .01$).

Additional analysis included the examination of these three effects. Results between the three rates of closure were determined through the use of paired T-tests using a Bonferroni correction. The analysis determined that all points when collapsed on the

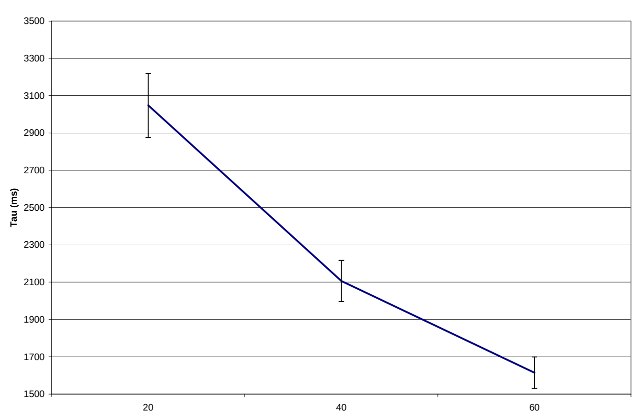

Figure 3. *Tau* Times Collapsed on Rate of Closure

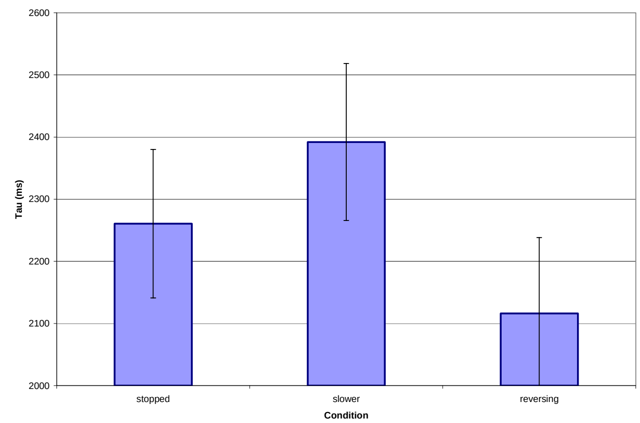

Figure 4. ***Tau* Times Collapsed on Vehicle Motion Condition**

three rates of closure, see Figure 3, are statistically significant from each other; 20 mph – 40 mph ($t(49) = 13.841$, $p < .01$), 20 mph - 60 mph ($t(49) = 14.829$, $p < .01$), 40 mph – 60 mph ($t(49) = 14.873$, $p < .01$). A negative slope was also apparent. When *tau* means are collapsed on Condition, see Figure 4, similar results were found using the same procedure; stopped – slower vehicles ($t(49) = -5.942$, $p < .01$), stopped – reversing vehicles ($t(49) = 3.672$, $p < .01$), slower – reversing vehicles ($t(49) = 5.977$, $p < .01$). A closer examination of the interaction between Rate of Closure and Condition can be seen in Figure 5. Similar patterns can be seen for the 40 mph and 60 mph rates of closure, while the 20 mph was unique. Table 1 depicts the statistical significance, using the same procedure outlined previously, of each comparison. Only three comparisons did not

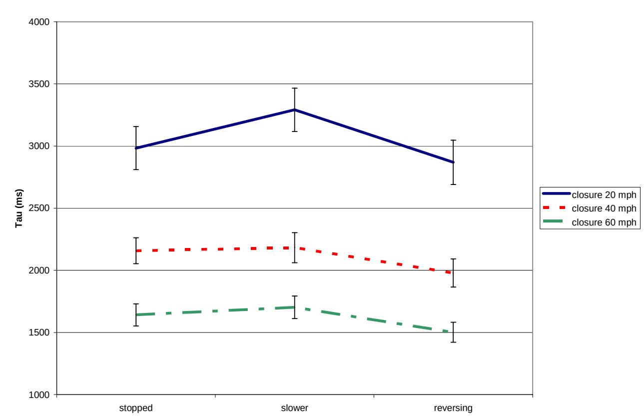

Figure 5. Interaction between Rate of Closure and Vehicle Motion Condition

result in statistically significant findings; stopped – reversing vehicle at 20 mph rate of closure, and stopped – slower vehicle at 40 mph and 60 mph rates of closure. The results

Table 1. Paired T-test scores for the Interaction of Rate of Closure and Vehicle Motion

Pair	t score	Sig (2-tailed)
Parked 20 - Slower 20	-6.927	.000*
Parked 20 - Reversing 20	1.720	.092
Slower 20 - Reversing 20	5.669	.000*
Parked 40 - Slower 40	-0.775	.442
Parked 40 - Reversing 40	4.201	.000*
Slower 40 - Reversing 40	4.079	.000*
Parked 60 - Slower 60	-2.397	.02
Parked 60 - Reversing 60	4.154	.000*
Slower 60 - Reversing 60	5.134	.000*

* denotes significant findings

of the speed estimations are shown in Figure 6. No statistical differences were found between day and night estimations. Accuracy was found to be worse with increased speeds.

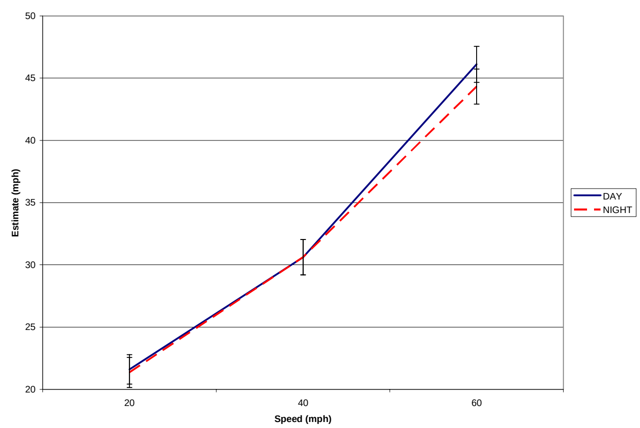

Figure 6. Speed Estimations for Day and Night

CHAPTER 4

DISCUSSION

Based on the results found in this study, the use of a canonical brake time may be unsuitable. Even the creation of a brake time algorithm based solely on speed or rate of closure, such as a constant distance or constant tau, also seems unable to explain the results found in this study. The only effective method of explaining braking behavior is the cataloging of all the different braking conditions. At first examination, this goal seems akin to an infinite task, but with the examination of studies similar to this one, the number of conditions could be finite. The three vehicle conditions denoted in this study could be argued to encompass all direct rear end collision scenarios.

The significance of the rate of closure is not surprising. Braking times are expected to directly vary with the speed at which the collision might occur. The exact relationship is of interest. When collapsed onto rate of closure, the braking model of constant *tau* does not become evident, see Figure 7. Figure 8 depicts the same data with *tau* transformed to distance based on the rate of closure. A braking model of constant

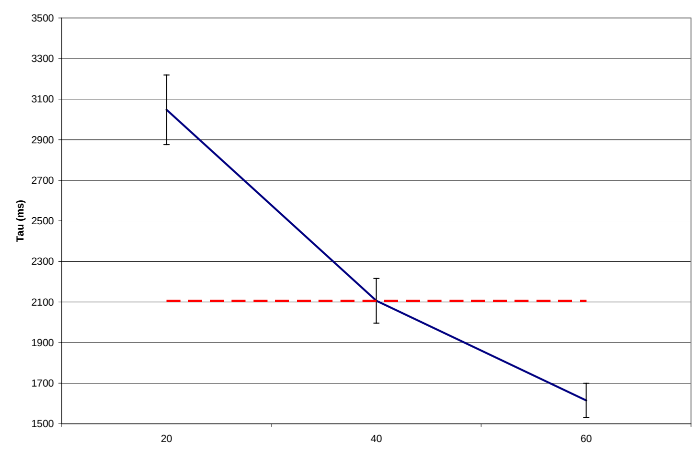

Figure 7. Constant *Tau* Braking Method

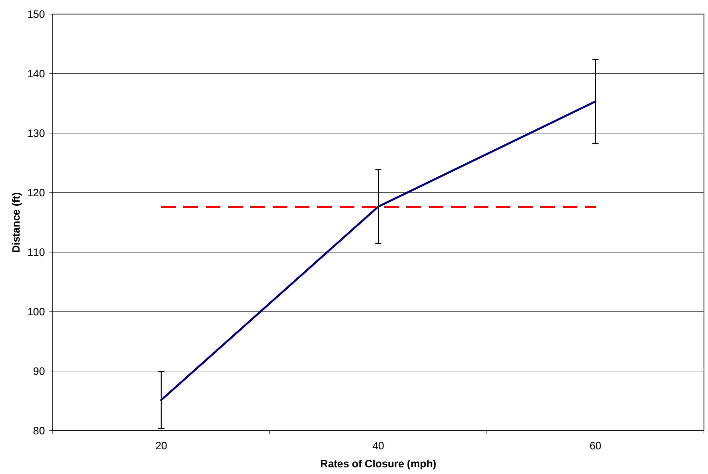

Figure 8. Constant Distance Braking Method

distance does not emerge. Neither method seems to explain the data collected in this study.

The focal point of this study is the determination that lead vehicle condition has a direct effect on braking behavior. When exploring the partial eta squares of the rate of closure, .675, and condition effects, .180, it is interesting to note that more than a quarter as much variance is explained with condition as rate of closure. This result makes it impossible to create a canonical brake reaction nor a simple algorithm based on speeds. This finding is not a surprising result, but the logic behind the resulting data is interesting. The parked vehicle *tau* is statistically smaller than that found for the slower vehicle condition. This result depicts participants braking farther away for a vehicle that will move away from the driver. If the driver were to slam on the brake, the total distance to the slower vehicle would be larger than the parked vehicle because the slower vehicle continued to move away. This result may be better explained through the interaction of the rates of closure and vehicle motion condition. Another interesting result can be seen in the comparisons between the parked or slower vehicle conditions versus the reversing vehicle. In this situation, the concept of locus of control infers that brake times should be larger for reversing vehicles than for conditions where the driver's vehicle is moving (e.g. Hammond and Horswill, 2002). When the driver is not in direct control of the other vehicle, one could expect that the driver would want the reversing vehicle to stop farther away as compared to when the driver has direct control and is advancing toward the vehicle. On the contrary, it seems that the opposite is more likely. Participants acted as if the driver of the lead vehicle would stop on their own volition and only depressed the brake as a last resort. Although this may be true, additional research is needed to determine whether the true threat of injury, as one would expect in a real collision, has an effect on this result.

Although these main effects exist, a greater understanding may be gained be examining the logic of the interaction between rate of closure and condition. Figure 8 depicts the same information as Figure 5 but the *tau* times have been transformed to distances. It seems that the braking behavior observed changed as rates of closure increased. At the 20 mph rate of closure, the parked and reversing conditions are

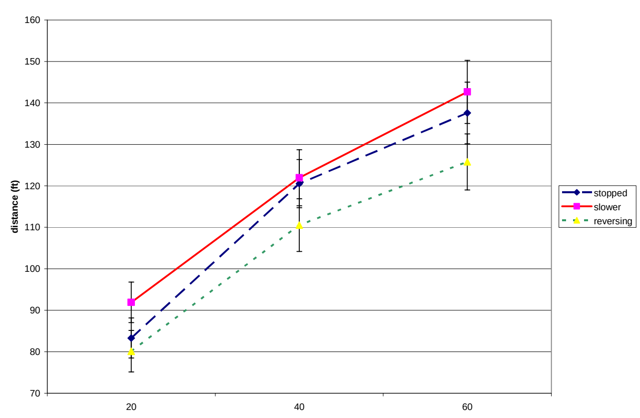

Figure 9. Interaction with *Tau* Times Transformed to Distance

separate from the slower moving vehicle but not from each other. In this situation, the drivers are viewing the slower moving vehicle as the larger collision threat. During the 40 mph and 60 mph condition, a change occurs. The slower and parked conditions are statistically different from the reversing condition, but not themselves. The similarity of the parked and slower vehicle conditions denotes that participant drivers were unable to distinguish between these conditions or at the very least treated each condition as equivalent. This result does become concerning. The driving environment leads us to believe that the vehicle in front of us is normally moving. This scenario is the situation we encounter every day when driving. This flaw can become very dangerous for the driver in question. If the driver believes that the lead vehicle is moving, the adaptation used in their braking behavior would be very incorrect. This error would result in a larger braking pressure being required to prevent a collision. As denoted earlier, this effect is a change from the 20 mph rate of closure condition where the distinction between the parked and slower moving seems to be perceptually salient. Across the speeds, a noticeable differential exists with the braking distances of the reversing vehicle condition. These distances suggest that a different technique is being used during these scenarios. Interestingly, one might expect that the distances of the reversing conditions to be larger as the issue of locus of control arises. Although this logic may be solid, the result found during this study is not surprising based on a possible belief by the participant that the driver of the lead vehicle will initiate their brake.

The participants' speed estimations can be seen in Figure 6. The findings of the underestimations of speeds from Durgin, et. al. (2005) and Recarte and Nunes (1996) are reiterated here. The additional findings of Recarte and Nunes (1996) that estimations become more accurate as speeds are increase are not supported by the findings of this study. The overestimation of the 20 mph speed can be attributed to the generalization of the overestimations. At slower speeds, it is possible that the estimation range may fall above and below the actual speed. This would allow the same approximate error seen at higher speeds, to encompass both over- and underestimations for 20 mph.

The Useful Field of View data were not used in the omnibus ANOVA analysis. The removal of this variable was because almost no variance was found on the categorical scores each participant received. This result is congruent with studies suggesting limited application to young drivers. An additional analysis was performed using the raw scores of the divided and selective attention tasks contained in the UFOV. The speed of visual processing task was not used because scores had little or no variance across the younger subjects. A correlation matrix (see Table 2) was created using the mean *tau* times collapsed on brake conditions, an additional set or times collapsed on rates of closure, selective and divided attention scores, and Text Anxiety Scores. No correlations relevant to Useful Field of View were found to be statistically significant.

Table 2. Correlations for UFOV and Test Anxiety

		stopped	slower	reversing	20 mph	40 mpg	60 mph	Div At	Sel At	FoF
Divided Attention	Pearson Correlation	-0.033	-0.008	-0.01	-0.04	0.007	-0.002	1	0.039	0.121
	Sig (2-tailed)	0.819	0.955	0.946	0.785	0.961	0.988		0.788	0.403
	N	50	50	50	50	50	50	50	50	50
Selective Attention	Pearson Correlation	-0.128	-0.13	-0.06	-0.108	-0.08	-0.138	0.039	1	0.042
	Sig (2-tailed)	0.377	0.368	0.679	0.454	0.583	0.34	0.788		0.772
	N	50	50	50	50	50	50	50	50	50
Fear of Failure Score	Pearson Correlation	0.073	0.087	-0.049	0.045	0.04	0.018	0.121	0.042	1
	Sig (2-tailed)	0.613	0.548	0.734	0.754	0.783	0.903	0.403	0.772	
	N	50	50	50	50	50	50	50	50	50

These data should not be viewed as an attack on the validity regarding Useful Field of View relation to driving, but simply that its usefulness in this study was restricted because of the limited population used. More extensive research should be conducted using Useful Field of View to aid in the determination of how effects determined in this study might unfold over a more unrestricted population including older adults.

The variable relating to Test Anxiety did not seem to be statistically relevant in either the omnibus ANOVA or the correlation matrix. This result is not to imply that such a survey does not provide usefulness in predicting driving behavior. More likely, the effect of Fear of Failure or Sensation Seeking may better correlate with active driving behavior and other collision avoidance behaviors, such as steering to evade a collision. Additional research is needed to differentiate which behaviors fear of failure may aid in predicting.

Human behavior in any form is highly complex even when limited to a small area as vehicle braking. Even so, significant discoveries have been made over the years including those involving braking behavior. Such research attempts to explain behavior parsimoniously resulting in constant distance or constant *tau* theories. Although the findings of this study provide evidence against such theories, the expectation of a parsimonious or algorithm based explanation is not unattainable. Future research would allow comparisons of what driving scenarios might correlate. It is possible that scenarios where the lead vehicle is rotated 90 degrees, creating a side view, may or may not alter brake times in the same fashion as found here. By creating studies that include such a wide range of scenarios, the possibility of limiting the braking environment into a manageable collection of scenarios. These scenarios could then be used actively in prediction of braking behaviors.

The issue of understanding driver's behavior has expanded beyond psychological interest. Currently, some production vehicles already include automatic braking systems, adaptive cruise control systems, or driver assist systems. This research method is critical for the engineering groups designing such systems. Although life-saving technologies are always useful when the technology is created, careful consideration must be made when integrating such technologies before an acceptable knowledge of braking behavior exists. Any incorrect assumptions, such as an unacceptable braking model, made at the design stage of these systems could cause injury to a driver who trusts in such a system. In such a case, the system has the potential to cause more harm than good.

This study, in conjunction with current research, continues to bridge engineering design with psychology's desire to explain human behavior. Strengthening this interaction will supply trustworthy, more effective, and safer driving technologies. These technologies can then be ubiquitously integrated into our society with confidence that the designs integrate crucial knowledge of human behavior.

APPENDIX A

ANALYSIS RESULTS

General Linear Model

Within-Subjects Factors

Measure: tau

day	speed	cond	Dependent Variable
1	1	1	Dcar20_MEAN
		2	Dcatch20_MEAN
		3	Drev20_MEAN
	2	1	Dcar40_MEAN
		2	Dcatch40_MEAN
		3	Drev40_MEAN
	3	1	Dcar60_MEAN
		2	Dcatch60_MEAN
		3	Drev60_MEAN
2	1	1	Ncar20_MEAN
		2	Ncatch20_MEAN
		3	Nrev20_MEAN
	2	1	Ncar40_MEAN
		2	Ncatch40_MEAN
		3	Nrev40_MEAN
	3	1	Ncar60_MEAN
		2	Ncatch60_MEAN
		3	Nrev60_MEAN

Between-Subjects Factors

		N
FF	1.00	6
	2.00	39
	3.00	5

Descriptive Statistics

	FF	Mean	Std. Deviation	N
Dcar20_MEAN	1.00	2897.8458	1624.29157	6
	2.00	3058.0724	1348.85084	39
	3.00	2880.4400	836.50424	5

Descriptive Statistics

	FF	Mean	Std. Deviation	N
Dcar20_MEAN	Total	3021.0820	1319.94980	50
Dcatch20_MEAN	1.00	3229.5167	1606.54685	6
	2.00	3396.9453	1289.86744	39
	3.00	3174.0800	883.36793	5
	Total	3354.5673	1274.36153	50
Drev20_MEAN	1.00	3019.0500	1691.64398	6
	2.00	2865.3963	1201.97573	39
	3.00	2630.8200	976.25698	5
	Total	2860.3771	1224.21545	50
Dcar40_MEAN	1.00	2162.0500	795.06822	6
	2.00	2205.3164	743.93335	39
	3.00	2086.3000	565.54281	5
	Total	2188.2228	721.93149	50
Dcatch40_MEAN	1.00	2024.9148	1005.63747	6
	2.00	2230.2916	832.60894	39
	3.00	2060.9400	698.60007	5
	Total	2188.7113	828.83941	50
Drev40_MEAN	1.00	1965.4509	957.07067	6
	2.00	2021.0429	778.19770	39
	3.00	1920.9800	788.38133	5
	Total	2004.3655	784.19702	50
Dcar60_MEAN	1.00	1611.3704	669.73022	6
	2.00	1624.0533	606.36889	39
	3.00	1606.5000	427.97578	5
	Total	1620.7760	588.13572	50
Dcatch60_MEAN	1.00	1554.6444	620.22018	6
	2.00	1667.6248	605.53134	39
	3.00	1619.3400	496.11888	5
	Total	1649.2387	587.49963	50
Drev60_MEAN	1.00	1601.7500	630.57357	6
	2.00	1498.8098	523.53794	39
	3.00	1433.8822	514.02733	5
	Total	1504.6699	525.73462	50
Ncar20_MEAN	1.00	2987.3889	1738.90234	6
	2.00	2854.4618	1114.96342	39
	3.00	3593.7125	2479.46043	5
	Total	2944.3381	1350.61469	50
Ncatch20_MEAN	1.00	3229.5222	1771.81995	6
	2.00	3161.7195	1125.00060	39
	3.00	3742.2900	2204.90600	5
	Total	3227.9129	1314.99041	50
Nrev20_MEAN	1.00	2996.0000	1666.23467	6
	2.00	2798.0587	1254.19742	39
	3.00	3355.1891	2573.42379	5
	Total	2877.5247	1440.07843	50
Ncar40_MEAN	1.00	2192.5556	1058.81264	6
	2.00	2067.7125	703.05007	39
	3.00	2507.9967	1642.02888	5
	Total	2126.7220	857.87745	50

Descriptive Statistics

	FF	Mean	Std. Deviation	N
Ncatch40_MEAN	1.00	2261.4333	1191.07253	6
	2.00	2117.8944	841.56209	39
	3.00	2530.0215	1559.77681	5
	Total	2176.3318	953.40013	50
Nrev40_MEAN	1.00	2058.1444	855.28674	6
	2.00	1911.6291	801.18438	39
	3.00	2143.8600	1644.48247	5
	Total	1952.4341	894.22336	50
Ncar60_MEAN	1.00	1672.5500	699.75416	6
	2.00	1625.2373	651.46712	39
	3.00	1941.1509	1407.56524	5
	Total	1662.5062	741.53435	50
Ncatch60_MEAN	1.00	1594.0056	680.00963	6
	2.00	1746.0325	710.30578	39
	3.00	2020.4382	1334.00107	5
	Total	1755.2298	770.81378	50
Nrev60_MEAN	1.00	1657.8352	832.84586	6
	2.00	1466.5797	590.76698	39
	3.00	1545.0800	1007.68578	5
	Total	1497.3804	654.57490	50

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.
day	Pillai's Trace	.031	1.519[b]	1.000	47.000	.224
	Wilks' Lambda	.969	1.519[b]	1.000	47.000	.224
	Hotelling's Trace	.032	1.519[b]	1.000	47.000	.224
	Roy's Largest Root	.032	1.519[b]	1.000	47.000	.224
day * FF	Pillai's Trace	.088	2.254[b]	2.000	47.000	.116
	Wilks' Lambda	912	2.254[b]	2.000	47.000	.116
	Hotelling's Trace	.096	2.254[b]	2.000	47.000	.116
	Roy's Largest Root	.096	2.254[b]	2.000	47.000	.116
speed	Pillai's Trace	.693	51.839[b]	2.000	46.000	.000
	Wilks' Lambda	.307	51.839[b]	2.000	46.000	.000
	Hotelling's Trace	2.254	51.839[b]	2.000	46.000	.000
	Roy's Largest Root	2.254	51.839[b]	2.000	46.000	.000
speed * FF	Pillai's Trace	.004	.043	4.000	94.000	.996
	Wilks' Lambda	.996	.042[b]	4.000	92.000	.997
	Hotelling's Trace	.004	.042	4.000	90.000	.997
	Roy's Largest Root	.004	.086[c]	2.000	47.000	.918
cond	Pillai's Trace	.243	7.403[b]	2.000	46.000	.002
	Wilks' Lambda	.757	7.403[b]	2.000	46.000	.002
	Hotelling's Trace	.322	7.403[b]	2.000	46.000	.002
	Roy's Largest Root	.322	7.403[b]	2.000	46.000	.002
cond * FF	Pillai's Trace	.077	.939	4.000	94.000	.445
	Wilks' Lambda	.925	.920[b]	4.000	92.000	.456
	Hotelling's Trace	.080	.900	4.000	90.000	.467
	Roy's Largest Root	.048	1.128[c]	2.000	47.000	.332
day * speed	Pillai's Trace	.006	.141[b]	2.000	46.000	.869
	Wilks' Lambda	.994	.141[b]	2.000	46.000	.869
	Hotelling's Trace	.006	.141[b]	2.000	46.000	.869
	Roy's Largest Root	.006	.141[b]	2.000	46.000	.869
day * speed * FF	Pillai's Trace	.177	2.280	4.000	94.000	.066
	Wilks' Lambda	829	2.267[b]	4.000	92.000	.068
	Hotelling's Trace	200	2.253	4.000	90.000	.070
	Roy's Largest Root	.159	3.726[c]	2.000	47.000	.031
day * cond	Pillai's Trace	.022	.514[b]	2.000	46.000	.601
	Wilks' Lambda	.978	.514[b]	2.000	46.000	.601
	Hotelling's Trace	.022	.514[b]	2.000	46.000	.601
	Roy's Largest Root	.022	.514[b]	2.000	46.000	.601
day * cond * FF	Pillai's Trace	.040	.481	4.000	94.000	.750
	Wilks' Lambda	.960	.475[b]	4.000	92.000	.754
	Hotelling's Trace	.042	.469	4.000	90.000	.758
	Roy's Largest Root	.041	.963[c]	2.000	47.000	.389
speed * cond	Pillai's Trace	.261	3.893[b]	4.000	44.000	.009
	Wilks' Lambda	.739	3.893[b]	4.000	44.000	.009
	Hotelling's Trace	.354	3.893[b]	4.000	44.000	.009
	Roy's Largest Root	.354	3.893[b]	4.000	44.000	.009
speed * cond * FF	Pillai's Trace	.076	.444	8.000	90.000	.892
	Wilks' Lambda	.924	.441[b]	8.000	88.000	.893
	Hotelling's Trace	.082	.438	8.000	86.000	.895
	Roy's Largest Root	.078	.878[c]	4.000	45.000	.485

Multivariate Tests[d]

Effect		Value	F	Hypothesis df	Error df	Sig.
day * speed * cond	Pillai's Trace	.068	.799[b]	4.000	44.000	.532
	Wilks' Lambda	.932	.799[b]	4.000	44.000	.532
	Hotelling's Trace	.073	.799[b]	4.000	44.000	.532
	Roy's Largest Root	.073	.799[b]	4.000	44.000	.532
day * speed * cond * FF	Pillai's Trace	.054	.312	8.000	90.000	.960
	Wilks' Lambda	.947	.307[b]	8.000	88.000	.962
	Hotelling's Trace	.056	.301	8.000	86.000	.964
	Roy's Largest Root	.042	.472[c]	4.000	45.000	.756

Multivariate Tests[d]

Effect		Partial Eta Squared	Noncent. Parameter	Observed Power[a]
day	Pillai's Trace	.031	1.519	.227
	Wilks' Lambda	.031	1.519	.227
	Hotelling's Trace	.031	1.519	.227
	Roy's Largest Root	.031	1.519	.227
day * FF	Pillai's Trace	.088	4.508	.436
	Wilks' Lambda	.088	4.508	.436
	Hotelling's Trace	.088	4.508	.436
	Roy's Largest Root	.088	4.508	.436
speed	Pillai's Trace	.693	103.677	1.000
	Wilks' Lambda	.693	103.677	1.000
	Hotelling's Trace	.693	103.677	1.000
	Roy's Largest Root	.693	103.677	1.000
speed * FF	Pillai's Trace	.002	.173	.058
	Wilks' Lambda	.002	.170	.058
	Hotelling's Trace	.002	.166	.058
	Roy's Largest Root	.004	.172	.062
cond	Pillai's Trace	.243	14.806	.925
	Wilks' Lambda	.243	14.806	.925
	Hotelling's Trace	.243	14.806	.925
	Roy's Largest Root	.243	14.806	.925
cond * FF	Pillai's Trace	.038	3.755	.287
	Wilks' Lambda	.038	3.678	.282
	Hotelling's Trace	.038	3.601	.276
	Roy's Largest Root	.046	2.255	.237
day * speed	Pillai's Trace	.006	.282	.070
	Wilks' Lambda	.006	.282	.070
	Hotelling's Trace	.006	.282	.070
	Roy's Largest Root	.006	.282	.070
day * speed * FF	Pillai's Trace	.088	9.121	.645
	Wilks' Lambda	.090	9.069	.642
	Hotelling's Trace	.091	9.012	.638
	Roy's Largest Root	.137	7.451	.655
day * cond	Pillai's Trace	.022	1.028	.129
	Wilks' Lambda	.022	1.028	.129
	Hotelling's Trace	.022	1.028	.129
	Roy's Largest Root	.022	1.028	.129
day * cond * FF	Pillai's Trace	.020	1.922	.160
	Wilks' Lambda	.020	1.899	.158
	Hotelling's Trace	.020	1.876	.156
	Roy's Largest Root	.039	1.926	.207
speed * cond	Pillai's Trace	.261	15.571	.866
	Wilks' Lambda	.261	15.571	.866
	Hotelling's Trace	.261	15.571	.866
	Roy's Largest Root	.261	15.571	.866
speed * cond * FF	Pillai's Trace	.038	3.548	.196
	Wilks' Lambda	.039	3.528	.195
	Hotelling's Trace	.039	3.506	.193
	Roy's Largest Root	.072	3.513	.257

Multivariate Tests[d]

Effect		Partial Eta Squared	Noncent. Parameter	Observed Power[a]
day * speed * cond	Pillai's Trace	.068	3.196	.235
	Wilks' Lambda	.068	3.196	.235
	Hotelling's Trace	.068	3.196	.235
	Roy's Largest Root	.068	3.196	.235
day * speed * cond * FF	Pillai's Trace	.027	2.499	.146
	Wilks' Lambda	.027	2.452	.143
	Hotelling's Trace	.027	2.405	.141
	Roy's Largest Root	.040	1.888	.151

a. Computed using alpha = .05

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

d.
Design: Intercept+FF
Within Subjects Design: day+speed+cond+day*speed+day*cond+speed*cond+day*speed*cond

Mauchly's Test of Sphericity[b]

Measure: tau

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.
day	1.000	.000	0	.
speed	.094	108.658	2	.000
cond	.524	29.704	2	.000
day * speed	.418	40.171	2	.000
day * cond	.811	9.655	2	.008
speed * cond	.563	26.064	9	.002
day * speed * cond	.526	29.140	9	.001

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

Mauchly's Test of Sphericity[b]

Measure: tau

Within Subjects Effect	Epsilon[a]		
	Greenhouse -Geisser	Huynh-Feldt	Lower-bound
day	1.000	1.000	1.000
speed	.525	.549	.500
cond	.678	.720	.500
day * speed	.632	.669	.500
day * cond	.841	.906	.500
speed * cond	.800	.902	.250
day * speed * cond	.823	.930	.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.
Design: Intercept+FF
Within Subjects Design: day+speed+cond+day*speed+day*cond+speed*cond+day*speed*cond

Tests of Within-Subjects Effects

Measure: tau

Source		Type III Sum of Squares	df	Mean Square	F
day	Sphericity Assumed	1971368.528	1	1971368.528	1.519
	Greenhouse-Geisser	1971368.528	1.000	1971368.528	1.519
	Huynh-Feldt	1971368.528	1.000	1971368.528	1.519
	Lower-bound	1971368.528	1.000	1971368.528	1.519
day * FF	Sphericity Assumed	5852200.617	2	2926100.308	2.254
	Greenhouse-Geisser	5852200.617	2.000	2926100.308	2.254
	Huynh-Feldt	5852200.617	2.000	2926100.308	2.254
	Lower-bound	5852200.617	2.000	2926100.308	2.254
Error(day)	Sphericity Assumed	61010187.485	47	1298089.095	
	Greenhouse-Geisser	61010187.485	47.000	1298089.095	
	Huynh-Feldt	61010187.485	47.000	1298089.095	
	Lower-bound	61010187.485	47.000	1298089.095	
speed	Sphericity Assumed	152883743.4	2	76441871.704	97.694
	Greenhouse-Geisser	152883743.4	1.049	145681373.92	97.694
	Huynh-Feldt	152883743.4	1.098	139188052.14	97.694
	Lower-bound	152883743.4	1.000	152883743.41	97.694
speed * FF	Sphericity Assumed	204390.498	4	51097.625	.065
	Greenhouse-Geisser	204390.498	2.099	97380.820	.065
	Huynh-Feldt	204390.498	2.197	93040.354	.065
	Lower-bound	204390.498	2.000	102195.249	.065
Error(speed)	Sphericity Assumed	73551235.716	94	782459.954	
	Greenhouse-Geisser	73551235.716	49.324	1491196.365	
	Huynh-Feldt	73551235.716	51.625	1424730.642	
	Lower-bound	73551235.716	47.000	1564919.909	
cond	Sphericity Assumed	4305416.773	2	2152708.387	10.333
	Greenhouse-Geisser	4305416.773	1.355	3176814.275	10.333
	Huynh-Feldt	4305416.773	1.441	2988295.368	10.333
	Lower-bound	4305416.773	1.000	4305416.773	10.333
cond * FF	Sphericity Assumed	834896.617	4	208724.154	1.002
	Greenhouse-Geisser	834896.617	2.711	308020.295	1.002
	Huynh-Feldt	834896.617	2.882	289741.717	1.002
	Lower-bound	834896.617	2.000	417448.309	1.002
Error(cond)	Sphericity Assumed	19582996.523	94	208329.750	
	Greenhouse-Geisser	19582996.523	63.697	307438.262	
	Huynh-Feldt	19582996.523	67.716	289194.222	
	Lower-bound	19582996.523	47.000	416659.500	
day * speed	Sphericity Assumed	67116.423	2	33558.212	.243
	Greenhouse-Geisser	67116.423	1.264	53103.167	.243
	Huynh-Feldt	67116.423	1.338	50162.201	.243
	Lower-bound	67116.423	1.000	67116.423	.243
day * speed * FF	Sphericity Assumed	1224609.627	4	306152.407	2.219
	Greenhouse-Geisser	1224609.627	2.528	484461.523	2.219
	Huynh-Feldt	1224609.627	2.676	457631.019	2.219
	Lower-bound	1224609.627	2.000	612304.814	2.219
Error(day*speed)	Sphericity Assumed	12971891.146	94	137998.842	
	Greenhouse-Geisser	12971891.146	59.403	218372.051	
	Huynh-Feldt	12971891.146	62.885	206278.146	
	Lower-bound	12971891.146	47.000	275997.684	

Tests of Within-Subjects Effects

Measure: tau

Source		Type III Sum of Squares	df	Mean Square	F
day * cond	Sphericity Assumed	49767.868	2	24883.934	.382
	Greenhouse-Geisser	49767.868	1.682	29594.943	.382
	Huynh-Feldt	49767.868	1.811	27477.479	.382
	Lower-bound	49767.868	1.000	49767.868	.382
day * cond * FF	Sphericity Assumed	135147.347	4	33786.837	.519
	Greenhouse-Geisser	135147.347	3.363	40183.338	.519
	Huynh-Feldt	135147.347	3.622	37308.293	.519
	Lower-bound	135147.347	2.000	67573.674	.519
Error(day*cond)	Sphericity Assumed	6121934.472	94	65126.962	
	Greenhouse-Geisser	6121934.472	79.037	77456.755	
	Huynh-Feldt	6121934.472	85.128	71914.866	
	Lower-bound	6121934.472	47.000	130253.925	
speed * cond	Sphericity Assumed	1198396.135	4	299599.034	4.327
	Greenhouse-Geisser	1198396.135	3.200	374495.549	4.327
	Huynh-Feldt	1198396.135	3.607	332210.488	4.327
	Lower-bound	1198396.135	1.000	1198396.135	4.327
speed * cond * FF	Sphericity Assumed	195664.174	8	24458.022	.353
	Greenhouse-Geisser	195664.174	6.400	30572.262	.353
	Huynh-Feldt	195664.174	7.215	27120.286	.353
	Lower-bound	195664.174	2.000	97832.087	.353
Error(speed*cond)	Sphericity Assumed	13018195.833	188	69245.723	
	Greenhouse-Geisser	13018195.833	150.401	86556.403	
	Huynh-Feldt	13018195.833	169.545	76783.142	
	Lower-bound	13018195.833	47.000	276982.890	
day * speed * cond	Sphericity Assumed	219002.037	4	54750.509	1.037
	Greenhouse-Geisser	219002.037	3.292	66531.917	1.037
	Huynh-Feldt	219002.037	3.720	58875.405	1.037
	Lower-bound	219002.037	1.000	219002.037	1.037
day * speed * cond * FF	Sphericity Assumed	175987.512	8	21998.439	.417
	Greenhouse-Geisser	175987.512	6.583	26732.141	.417
	Huynh-Feldt	175987.512	7.440	23655.798	.417
	Lower-bound	175987.512	2.000	87993.756	.417
Error(day*speed*cond)	Sphericity Assumed	9923531.612	188	52784.743	
	Greenhouse-Geisser	9923531.612	154.709	64143.149	
	Huynh-Feldt	9923531.612	174.828	56761.538	
	Lower-bound	9923531.612	47.000	211138.970	

Tests of Within-Subjects Effects

Measure: tau

Source		Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
day	Sphericity Assumed	.224	.031	1.519	.227
	Greenhouse-Geisser	.224	.031	1.519	.227
	Huynh-Feldt	.224	.031	1.519	.227
	Lower-bound	.224	.031	1.519	.227
day * FF	Sphericity Assumed	.116	.088	4.508	.436
	Greenhouse-Geisser	.116	.088	4.508	.436
	Huynh-Feldt	.116	.088	4.508	.436
	Lower-bound	.116	.088	4.508	.436
Error(day)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				
speed	Sphericity Assumed	.000	.675	195.389	1.000
	Greenhouse-Geisser	.000	.675	102.524	1.000
	Huynh-Feldt	.000	.675	107.307	1.000
	Lower-bound	.000	.675	97.694	1.000
speed * FF	Sphericity Assumed	.992	.003	.261	.063
	Greenhouse-Geisser	.943	.003	.137	.060
	Huynh-Feldt	.949	.003	.143	.060
	Lower-bound	.937	.003	.131	.059
Error(speed)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				
cond	Sphericity Assumed	.000	.180	20.666	.985
	Greenhouse-Geisser	.001	.180	14.004	.943
	Huynh-Feldt	.001	.180	14.888	.952
	Lower-bound	.002	.180	10.333	.883
cond * FF	Sphericity Assumed	.411	.041	4.008	.306
	Greenhouse-Geisser	.392	.041	2.716	.248
	Huynh-Feldt	.395	.041	2.887	.256
	Lower-bound	.375	.041	2.004	.214
Error(cond)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				
day * speed	Sphericity Assumed	.785	.005	.486	.087
	Greenhouse-Geisser	.680	.005	.307	.080
	Huynh-Feldt	.693	.005	.325	.081
	Lower-bound	.624	.005	.243	.077
day * speed * FF	Sphericity Assumed	.073	.086	8.874	.631
	Greenhouse-Geisser	.105	.086	5.608	.491
	Huynh-Feldt	.101	.086	5.937	.507
	Lower-bound	.120	.086	4.437	.430
Error(day*speed)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				

Tests of Within-Subjects Effects

Measure: tau

Source		Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
day * cond	Sphericity Assumed	.683	.008	.764	.110
	Greenhouse-Geisser	.647	.008	.643	.105
	Huynh-Feldt	.663	.008	.692	.107
	Lower-bound	.539	.008	.382	.093
day * cond * FF	Sphericity Assumed	.722	.022	2.075	.170
	Greenhouse-Geisser	.691	.022	1.745	.158
	Huynh-Feldt	.704	.022	1.879	.163
	Lower-bound	.599	.022	1.038	.130
Error(day*cond)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				
speed * cond	Sphericity Assumed	.002	.084	17.306	.927
	Greenhouse-Geisser	.005	.084	13.845	.877
	Huynh-Feldt	.003	.084	15.608	.905
	Lower-bound	.043	.084	4.327	.531
speed * cond * FF	Sphericity Assumed	.943	.015	2.826	.167
	Greenhouse-Geisser	.916	.015	2.261	.152
	Huynh-Feldt	.932	.015	2.548	.159
	Lower-bound	.704	.015	.706	.103
Error(speed*cond)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				
day * speed * cond	Sphericity Assumed	.389	.022	4.149	.324
	Greenhouse-Geisser	.382	.022	3.414	.291
	Huynh-Feldt	.387	.022	3.858	.311
	Lower-bound	.314	.022	1.037	.170
day * speed * cond * FF	Sphericity Assumed	.910	.017	3.334	.193
	Greenhouse-Geisser	.882	.017	2.744	.176
	Huynh-Feldt	.900	.017	3.100	.186
	Lower-bound	.662	.017	.834	.114
Error(day*speed*cond)	Sphericity Assumed				
	Greenhouse-Geisser				
	Huynh-Feldt				
	Lower-bound				

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	Type III Sum of Squares	df	Mean Square
day	Linear			1971368.528	1	1971368.528
day * FF	Linear			5852200.617	2	2926100.308
Error(day)	Linear			61010187.485	47	1298089.095
speed		Linear		147863458.3	1	147863458.31
		Quadratic		5020285.103	1	5020285.103
speed * FF		Linear		185826.032	2	92913.016
		Quadratic		18564.467	2	9282.233
Error(speed)		Linear		68423481.769	47	1455818.761
		Quadratic		5127753.948	47	109101.148
cond			Linear	1531549.247	1	1531549.247
			Quadratic	2773867.526	1	2773867.526
cond * FF			Linear	421445.775	2	210722.887
			Quadratic	413450.842	2	206725.421
Error(cond)			Linear	10955111.923	47	233087.488
			Quadratic	8627884.600	47	183572.013
day * speed	Linear	Linear		56391.571	1	56391.571
		Quadratic		10724.852	1	10724.852
day * speed * FF	Linear	Linear		1114802.329	2	557401.165
		Quadratic		109807.298	2	54903.649
Error(day*speed)	Linear	Linear		10416007.486	47	221617.181
		Quadratic		2555883.661	47	54380.503
day * cond	Linear		Linear	23927.481	1	23927.481
			Quadratic	25840.387	1	25840.387
day * cond * FF	Linear		Linear	115449.009	2	57724.504
			Quadratic	19698.338	2	9849.169
Error(day*cond)	Linear		Linear	4358505.576	47	92734.161
			Quadratic	1763428.896	47	37519.764
speed * cond		Linear	Linear	23145.016	1	23145.016
			Quadratic	840035.073	1	840035.073
		Quadratic	Linear	89371.511	1	89371.511
			Quadratic	245844.535	1	245844.535
speed * cond * FF		Linear	Linear	9755.504	2	4877.752
			Quadratic	47825.015	2	23912.508
		Quadratic	Linear	92995.697	2	46497.848
			Quadratic	45087.958	2	22543.979
Error(speed*cond)		Linear	Linear	4609510.875	47	98074.699
			Quadratic	3380355.819	47	71922.464
		Quadratic	Linear	1883232.654	47	40068.780
			Quadratic	3145096.485	47	66916.946
day * speed * cond	Linear	Linear	Linear	28056.296	1	28056.296
			Quadratic	122252.870	1	122252.870
		Quadratic	Linear	11.286	1	11.286
			Quadratic	68681.586	1	68681.586
day * speed * cond * FF	Linear	Linear	Linear	55772.464	2	27886.232
			Quadratic	46966.454	2	23483.227
		Quadratic	Linear	23931.050	2	11965.525
			Quadratic	49317.545	2	24658.772

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	Type III Sum of Squares	df	Mean Square
Error(day*speed*cond)	Linear	Linear	Linear	2551316.614	47	54283.332
			Quadratic	3141147.789	47	66832.932
		Quadratic	Linear	1924278.746	47	40942.101
			Quadratic	2306788.463	47	49080.606

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	F	Sig.	Partial Eta Squared
day	Linear			1.519	.224	.031
day * FF	Linear			2.254	.116	.088
Error(day)	Linear					
speed		Linear		101.567	.000	.684
		Quadratic		46.015	.000	.495
speed * FF		Linear		.064	.938	.003
		Quadratic		.085	.919	.004
Error(speed)		Linear				
		Quadratic				
cond			Linear	6.571	.014	.123
			Quadratic	15.111	.000	.243
cond * FF			Linear	.904	.412	.037
			Quadratic	1.126	.333	.046
Error(cond)			Linear			
			Quadratic			
day * speed	Linear	Linear		.254	.616	.005
		Quadratic		.197	.659	.004
day * speed * FF	Linear	Linear		2.515	.092	.097
		Quadratic		1.010	.372	.041
Error(day*speed)	Linear	Linear				
		Quadratic				
day * cond	Linear		Linear	.258	.614	.005
			Quadratic	.689	.411	.014
day * cond * FF	Linear		Linear	.622	.541	.026
			Quadratic	.263	.770	.011
Error(day*cond)	Linear		Linear			
			Quadratic			
speed * cond		Linear	Linear	.236	.629	.005
			Quadratic	11.680	.001	.199
		Quadratic	Linear	2.230	.142	.045
			Quadratic	3.674	.061	.073
speed * cond * FF		Linear	Linear	.050	.952	.002
			Quadratic	.332	.719	.014
		Quadratic	Linear	1.160	.322	.047
			Quadratic	.337	.716	.014
Error(speed*cond)		Linear	Linear			
			Quadratic			
		Quadratic	Linear			
			Quadratic			
day * speed * cond	Linear	Linear	Linear	.517	.476	.011
			Quadratic	1.829	.183	.037
		Quadratic	Linear	.000	.987	.000
			Quadratic	1.399	.243	.029
day * speed * cond * FF	Linear	Linear	Linear	.514	.602	.021
			Quadratic	.351	.706	.015
		Quadratic	Linear	.292	.748	.012
			Quadratic	.502	.608	.021

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	F	Sig.	Partial Eta Squared
Error(day*speed*cond)	Linear	Linear	Linear			
			Quadratic			
		Quadratic	Linear			
			Quadratic			

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	Noncent. Parameter	Observed Power[a]
day	Linear			1.519	.227
day * FF	Linear			4.508	.436
Error(day)	Linear				
speed		Linear		101.567	1.000
		Quadratic		46.015	1.000
speed * FF		Linear		.128	.059
		Quadratic		.170	.062
Error(speed)		Linear			
		Quadratic			
cond			Linear	6.571	.709
			Quadratic	15.111	.968
cond * FF			Linear	1.808	.197
			Quadratic	2.252	.236
Error(cond)			Linear		
			Quadratic		
day * speed	Linear	Linear		.254	.078
		Quadratic		.197	.072
day * speed * FF	Linear	Linear		5.030	.480
		Quadratic		2.019	.216
Error(day*speed)	Linear	Linear			
		Quadratic			
day * cond	Linear		Linear	.258	.079
			Quadratic	.689	.128
day * cond * FF	Linear		Linear	1.245	.148
			Quadratic	.525	.089
Error(day*cond)	Linear		Linear		
			Quadratic		
speed * cond		Linear	Linear	.236	.076
			Quadratic	11.680	.917
		Quadratic	Linear	2.230	.310
			Quadratic	3.674	.467
speed * cond * FF		Linear	Linear	.099	.057
			Quadratic	.665	.100
		Quadratic	Linear	2.321	.243
			Quadratic	.674	.101
Error(speed*cond)		Linear	Linear		
			Quadratic		
		Quadratic	Linear		
			Quadratic		
day * speed * cond	Linear	Linear	Linear	.517	.108
			Quadratic	1.829	.263
		Quadratic	Linear	.000	.050
			Quadratic	1.399	.212
day * speed * cond * FF	Linear	Linear	Linear	1.027	.130
			Quadratic	.703	.103
		Quadratic	Linear	.585	.094
			Quadratic	1.005	.128

Tests of Within-Subjects Contrasts

Measure: tau

Source	day	speed	cond	Noncent. Parameter	Observed Power[a]
Error(day*speed*cond)	Linear	Linear	Linear		
			Quadratic		
		Quadratic	Linear		
			Quadratic		

a. Computed using alpha = .05

Tests of Between-Subjects Effects

Measure: tau
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2171320091	1	2171320091.0	159.115	.000	.772
FF	1513664.902	2	756832.451	.055	.946	.002
Error	641373242.8	47	13646239.208			

Tests of Between-Subjects Effects

Measure: tau
Transformed Variable: Average

Source	Noncent. Parameter	Observed Power[a]
Intercept	159.115	1.000
FF	.111	.058
Error		

a. Computed using alpha = .05

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	average20	3047.6337	50	1212.63672	171.49273
	average40	2106.1313	50	780.26906	110.34671
Pair 2	average20	3047.6337	50	1212.63672	171.49273
	average60	1614.9668	50	598.54158	84.64656
Pair 3	average40	2106.1313	50	780.26906	110.34671
	average60	1614.9668	50	598.54158	84.64656
Pair 4	caraverage	2260.6078	50	844.16056	119.38233
	catchaverage	2391.9986	50	893.42617	126.34954
Pair 5	caraverage	2260.6078	50	844.16056	119.38233
	revaverage	2116.1253	50	863.31998	122.09188
Pair 6	catchaverage	2391.9986	50	893.42617	126.34954
	revaverage	2116.1253	50	863.31998	122.09188

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	average20 & average40	50	.977	.000
Pair 2	average20 & average60	50	.938	.000
Pair 3	average40 & average60	50	.977	.000
Pair 4	caraverage & catchaverage	50	.985	.000
Pair 5	caraverage & revaverage	50	.947	.000
Pair 6	catchaverage & revaverage	50	.932	.000

Paired Samples Test

		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t
Pair 1	average20 - average40	941.50243	480.98432	68.02146	804.80819	1078.1967	13.841
Pair 2	average20 - average60	1432.6669	683.17639	96.61573	1238.5103	1626.8234	14.829
Pair 3	average40 - average60	491.16443	233.52200	33.02500	424.79821	557.53065	14.873
Pair 4	caraverage - catchaverage	-131.39078	156.36634	22.11354	-175.82960	-86.95195	-5.942
Pair 5	caraverage - revaverage	144.48257	278.19337	39.34248	65.42089	223.54425	3.672
Pair 6	catchaverage - revaverage	275.87335	326.34930	46.15276	183.12590	368.62079	5.977

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	average20 - average40	49	.000
Pair 2	average20 - average60	49	.000
Pair 3	average40 - average60	49	.000
Pair 4	caraverage - catchaverage	49	.000
Pair 5	caraverage - revaverage	49	.001
Pair 6	catchaverage - revaverage	49	.000

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	car20av	2982.7100	50	1222.29018	172.85793
	catch20av	3291.2401	50	1233.55247	174.45066
Pair 2	car20av	2982.7100	50	1222.29018	172.85793
	rev20av	2868.9509	50	1262.63176	178.56310
Pair 3	catch20av	3291.2401	50	1233.55247	174.45066
	rev20av	2868.9509	50	1262.63176	178.56310
Pair 4	car40av	2157.4724	50	735.49142	104.01419
	catch40av	2182.5215	50	854.89672	120.90065
Pair 5	catch40av	2182.5215	50	854.89672	120.90065
	rev40av	1978.3998	50	802.54588	113.49713
Pair 6	car40av	2157.4724	50	735.49142	104.01419
	rev40av	1978.3998	50	802.54588	113.49713
Pair 7	car60av	1641.6411	50	627.03750	88.67649
	catch60av	1702.2343	50	641.71999	90.75291
Pair 8	catch60av	1702.2343	50	641.71999	90.75291
	rev60av	1501.0251	50	570.19264	80.63742
Pair 9	car60av	1641.6411	50	627.03750	88.67649
	rev60av	1501.0251	50	570.19264	80.63742

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	car20av & catch20av	50	.967	.000
Pair 2	car20av & rev20av	50	.930	.000
Pair 3	catch20av & rev20av	50	.911	.000
Pair 4	car40av & catch40av	50	.970	.000
Pair 5	catch40av & rev40av	50	.911	.000
Pair 6	car40av & rev40av	50	.927	.000
Pair 7	car60av & catch60av	50	.961	.000
Pair 8	catch60av & rev60av	50	.902	.000
Pair 9	car60av & rev60av	50	.924	.000

Paired Samples Test

		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t
Pair 1	car20av - catch20av	-308.53004	314.93980	44.53921	-398.03494	-219.02514	-6.927
Pair 2	car20av - rev20av	113.75913	467.59750	66.12827	-19.13061	246.64887	1.720
Pair 3	catch20av - rev20av	422.28917	526.71336	74.48852	272.59889	571.97945	5.669
Pair 4	car40av - catch40av	-25.04911	228.43535	32.30564	-89.96971	39.87150	-.775
Pair 5	catch40av - rev40av	204.12173	353.86659	50.04429	103.55396	304.68950	4.079
Pair 6	car40av - rev40av	179.07262	301.40541	42.62516	93.41415	264.73109	4.201
Pair 7	car60av - catch60av	-60.59318	178.76052	25.28056	-111.39635	-9.79000	-2.397
Pair 8	catch60av - rev60av	201.20914	277.11594	39.19011	122.45366	279.96462	5.134
Pair 9	car60av - rev60av	140.61596	239.34062	33.84788	72.59611	208.63581	4.154

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	car20av - catch20av	49	.000
Pair 2	car20av - rev20av	49	.092
Pair 3	catch20av - rev20av	49	.000
Pair 4	car40av - catch40av	49	.442
Pair 5	catch40av - rev40av	49	.000
Pair 6	car40av - rev40av	49	.000
Pair 7	car60av - catch60av	49	.020
Pair 8	catch60av - rev60av	49	.000
Pair 9	car60av - rev60av	49	.000

Correlations

Correlations

		caraverage	catchaverage	revaverage	average20	average40
caraverage	Pearson Correlation	1	.985**	.947**	.986**	.987**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	50	50	50	50	50
catchaverage	Pearson Correlation	.985**	1	.932**	.978**	.984**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	50	50	50	50	50
revaverage	Pearson Correlation	.947**	.932**	1	.962**	.970**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	50	50	50	50	50
average20	Pearson Correlation	.986**	.978**	.962**	1	.977**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	50	50	50	50	50
average40	Pearson Correlation	.987**	.984**	.970**	.977**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	50	50	50	50	50
average60	Pearson Correlation	.963**	.963**	.956**	.938**	.977**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
	N	50	50	50	50	50
FF	Pearson Correlation	.047	.054	-.016	.030	.027
	Sig. (2-tailed)	.747	.709	.911	.838	.854
	N	50	50	50	50	50
DivAt	Pearson Correlation	-.033	-.008	-.010	-.040	.007
	Sig. (2-tailed)	.819	.955	.946	.785	.961
	N	50	50	50	50	50
SelAt	Pearson Correlation	-.128	-.130	-.060	-.108	-.080
	Sig. (2-tailed)	.377	.368	.679	.454	.583
	N	50	50	50	50	50

Correlations

		average60	FF	DivAt	SelAt
caraverage	Pearson Correlation	.963**	.047	-.033	-.128
	Sig. (2-tailed)	.000	.747	.819	.377
	N	50	50	50	50
catchaverage	Pearson Correlation	.963**	.054	-.008	-.130
	Sig. (2-tailed)	.000	.709	.955	.368
	N	50	50	50	50
revaverage	Pearson Correlation	.956**	-.016	-.010	-.060
	Sig. (2-tailed)	.000	.911	.946	.679
	N	50	50	50	50
average20	Pearson Correlation	.938**	.030	-.040	-.108
	Sig. (2-tailed)	.000	.838	.785	.454
	N	50	50	50	50
average40	Pearson Correlation	.977**	.027	.007	-.080
	Sig. (2-tailed)	.000	.854	.961	.583
	N	50	50	50	50
average60	Pearson Correlation	1	.028	-.002	-.138
	Sig. (2-tailed)		.845	.988	.340
	N	50	50	50	50
FF	Pearson Correlation	.028	1	.159	.036
	Sig. (2-tailed)	.845		.269	.804
	N	50	50	50	50
DivAt	Pearson Correlation	-.002	.159	1	.039
	Sig. (2-tailed)	.988	.269		.788
	N	50	50	50	50
SelAt	Pearson Correlation	-.138	.036	.039	1
	Sig. (2-tailed)	.340	.804	.788	
	N	50	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

APPENDIX B

COLLECTED DATA

	Dcar20_MEAN	Dcar40_MEAN	Dcar60_MEAN	Ncar20_MEAN	Ncar40_MEAN	Ncar60_MEAN	Dcatch20_MEAN	Dcatch40_MEAN	Dcatch60_MEAN	Ncatch20_MEAN	Ncatch40_MEAN
1	3,258.60	2,253.20	1,613.80	3,762.73	2,508.33	1,609.80	3,874.00	2,367.33	1,912.60	4,411.13	2,358.80
2	1,974.67	1,134.75	692.10	705.80	594.50	405.70	1,679.90	1,045.30	792.30	1,322.50	421.00
3	3,722.30	3,111.60	2,191.90	3,033.90	1,720.10	1,807.10	4,814.00	2,744.40	2,305.50	3,173.10	2,206.90
4	1,865.00	2,299.70	2,068.50	2,576.30	1,876.40	1,833.90	3,158.70	2,002.00	2,268.40	2,600.00	1,900.80
5	2,350.80	1,764.80	1,116.70	1,539.90	1,293.20	1,043.30	2,590.20	1,330.90	1,180.80	2,178.50	1,376.20
6	4,514.80	3,178.70	2,246.20	3,731.80	2,644.50	2,237.80	5,070.90	3,287.20	2,471.80	4,034.10	3,431.60
7	5,772.60	3,341.80	2,437.30	5,618.70	3,646.50	2,378.70	5,823.20	3,570.90	2,316.90	5,760.10	3,533.90
8	5,652.10	3,899.60	2,972.50	4,984.30	3,554.00	3,141.50	6,360.70	3,904.40	3,036.90	5,239.70	3,579.80
9	3,161.86	2,369.55	1,477.00	3,266.33	2,165.79	1,984.93	3,376.58	2,257.82	1,555.00	3,413.38	2,240.57
10	2,498.60	2,431.80	1,383.50	1,585.91	1,570.90	1,117.30	3,256.60	2,307.30	1,665.33	2,281.20	1,377.10
11	2,544.90	2,036.20	1,476.80	2,790.70	2,031.70	1,562.20	3,299.00	2,354.10	1,757.70	3,216.40	2,291.80
12	2,468.90	2,030.80	1,329.10	3,161.30	2,612.60	2,113.50	3,478.80	2,330.40	1,737.90	3,736.70	3,054.60
13	1,667.50	1,378.44	850.50	1,525.00	1,268.60	843.50	1,788.70	1,574.80	934.50	1,996.90	934.00
14	3,902.70	2,629.70	2,003.70	4,154.60	2,778.90	2,230.10	4,558.20	3,072.40	1,943.40	4,209.40	2,384.50
15	1,290.90	1,052.10	703.80	1,113.80	827.80	587.70	1,260.60	928.00	713.90	1,175.80	640.50
16	2,897.60	2,694.90	2,290.10	2,778.10	2,550.30	2,186.70	3,542.20	2,436.30	1,990.40	3,539.70	3,048.70
17	3,014.80	2,251.80	1,368.40	2,230.70	1,750.70	1,206.00	3,117.40	1,857.40	1,572.90	2,505.50	1,611.20
18	2,881.90	2,811.30	2,062.50	7,865.10	5,283.80	4,301.00	4,057.80	3,029.60	1,921.20	7,414.00	5,125.70
19	2,750.50	1,770.70	1,531.22	3,583.20	2,556.30	2,137.10	2,956.60	1,899.56	1,372.67	3,152.10	3,011.60
20	1,399.10	920.70	937.70	1,794.80	1,478.30	964.70	1,547.90	993.60	681.90	1,919.20	1,241.20
21	4,113.40	2,349.90	1,750.80	4,436.20	3,036.40	1,944.40	4,461.10	3,224.30	1,593.90	4,323.30	2,956.20
22	4,598.30	2,990.30	2,076.80	3,793.80	2,860.50	2,050.80	4,178.80	3,154.00	2,266.10	3,872.00	3,028.70
23	3,262.10	2,682.10	1,977.00	4,017.40	3,386.40	2,483.50	3,817.80	2,577.60	1,834.50	4,224.80	2,940.50
24	2,064.50	1,390.20	1,122.22	2,972.70	2,531.90	1,222.63	2,277.18	1,741.56	992.20	2,484.88	1,653.44
25	1,816.60	1,374.20	1,030.00	1,509.10	1,221.40	752.90	1,990.10	1,174.20	960.90	1,746.50	1,222.10
26	2,661.20	2,102.60	1,487.80	3,021.40	2,107.10	2,107.50	3,077.30	2,061.20	1,613.60	3,120.00	2,219.10
27	3,570.80	2,422.20	1,890.30	3,372.90	2,283.80	1,844.40	4,314.30	2,426.60	1,813.90	3,613.10	2,592.20
28	1,918.20	1,310.00	813.56	1,027.50	887.40	486.30	2,203.80	1,197.10	739.33	1,527.50	662.90
29	2,383.50	1,955.80	1,212.20	3,013.30	2,026.00	1,256.00	3,515.80	2,119.70	1,535.20	3,487.70	2,049.90
30	1,307.80	1,322.10	925.70	1,223.67	1,140.40	811.50	1,524.80	920.90	914.20	1,435.10	925.67
31	2,220.90	1,995.10	1,510.50	4,139.10	2,103.80	2,280.40	3,253.70	2,182.40	1,767.10	4,744.30	2,953.50
32	3,410.40	2,477.00	2,043.40	3,647.44	2,741.10	2,180.70	4,112.70	2,417.00	2,330.90	4,152.70	2,825.70
33	3,804.80	2,415.60	2,146.60	3,555.50	2,503.60	1,970.30	4,263.60	2,590.60	1,933.00	3,737.80	2,501.40
34	7,688.10	4,110.30	3,323.00	4,929.20	3,273.40	2,468.50	6,453.90	4,047.90	3,378.90	5,580.60	3,687.90
35	2,602.10	1,890.50	1,157.70	3,665.00	2,251.30	1,768.00	3,160.00	1,769.20	1,475.30	4,954.30	2,444.60
36	3,299.80	2,027.80	1,540.30	2,960.00	2,223.70	1,572.60	3,350.30	1,919.80	1,415.50	3,283.90	1,998.80
37	3,500.90	2,383.10	2,132.40	2,641.10	2,017.60	1,427.00	3,639.90	2,902.50	2,058.20	3,406.00	2,290.00
38	1,999.90	1,908.30	1,249.00	2,008.70	1,675.60	1,280.20	2,816.70	1,905.70	1,257.90	2,191.70	1,457.10
39	2,975.00	2,554.40	2,071.10	2,541.80	2,098.50	1,671.90	3,157.00	2,291.50	1,947.50	2,953.30	1,927.80
40	1,416.88	1,859.60	1,092.00	1,067.80	1,066.10	1,135.30	1,920.50	947.40	1,021.40	1,338.30	975.10
41	2,513.30	1,560.90	1,081.10	2,197.00	1,416.80	990.70	2,805.30	1,528.70	1,114.80	2,478.30	1,483.90
42	2,184.90	1,633.10	1,429.70	2,145.82	1,447.08	1,155.45	2,450.30	1,414.70	1,290.40	2,672.75	1,592.31
43	3,967.70	2,051.90	1,400.40	1,923.10	1,497.00	899.00	3,032.30	2,067.60	1,426.50	1,996.40	1,309.30
44	3,764.50	2,763.20	2,053.80	3,123.60	2,267.30	1,614.90	3,749.40	2,617.20	2,132.30	3,220.80	2,250.80
45	2,343.40	1,747.60	1,213.00	2,209.90	1,442.10	1,051.10	2,385.70	1,582.20	1,281.70	2,157.40	1,565.90
46	6,304.20	3,898.90	2,851.70	5,133.80	3,302.90	3,282.90	6,851.40	4,419.80	2,491.50	5,478.80	4,015.80
47	1,957.30	1,458.20	1,096.50	2,387.10	1,571.00	1,169.60	2,217.30	1,375.80	1,127.70	2,475.60	1,797.10
48	3,858.20	1,868.10	1,802.50	2,864.80	1,934.20	1,690.00	2,817.40	2,288.40	1,932.70	2,813.30	2,221.20
49	1,892.90	1,980.40	1,496.70	1,962.90	1,766.50	1,506.10	2,109.20	1,565.00	1,517.60	2,356.90	1,901.50
50	2,062.40	1,565.60	1,307.70	1,922.30	1,542.00	1,358.20	2,208.80	1,711.30	1,165.20	2,288.20	1,595.70

	Ncatch60_MEAN	Drev20_MEAN	Drev40_MEAN	Drev60_MEAN	Nrev20_MEAN	Nrev40_MEAN	Nrev60_MEAN	FFscore	FF	caraverage	catchaverage	revaverage	average20
1	1,987.93	2,723.60	2,091.47	1,648.40	3,481.20	2,079.07	1,606.53	38.00	1.00	2,501.08	2,818.63	2,271.71	3,585.21
2	448.10	1,225.00	1,136.70	695.90	559.22	405.90	248.60	62.00	2.00	917.92	951.52	711.89	1,244.51
3	1,919.60	4,496.30	2,765.00	1,968.30	2,896.90	2,389.10	1,576.80	68.00	2.00	2,597.82	2,860.58	2,682.07	3,689.42
4	2,031.60	1,486.10	1,564.60	1,636.40	2,029.50	1,647.40	1,482.10	65.00	2.00	2,086.63	2,326.92	1,641.02	2,285.93
5	958.60	2,427.70	1,603.50	1,237.56	1,790.20	1,195.10	955.80	71.00	2.00	1,518.12	1,602.53	1,534.98	2,146.22
6	2,811.50	5,409.00	3,768.00	2,417.70	4,784.00	3,005.70	2,304.60	67.00	2.00	3,092.30	3,517.85	3,614.83	4,590.77
7	2,301.10	5,992.30	3,384.70	2,309.80	5,057.50	3,180.10	2,412.70	46.00	1.00	3,865.93	3,884.35	3,722.85	5,670.73
8	3,464.40	4,450.40	3,661.00	2,543.40	4,657.30	3,751.10	2,627.20	59.00	2.00	4,034.00	4,264.32	3,615.07	5,224.08
9	2,512.83	3,115.56	1,967.07	1,466.73	3,604.55	2,523.23	2,027.36	62.00	2.00	2,404.24	2,559.37	2,450.75	3,323.04
10	1,286.90	3,680.70	2,388.90	1,561.90	1,511.40	1,309.90	1,051.10	58.00	2.00	1,764.67	2,029.07	1,917.32	2,469.07
11	1,864.60	2,593.70	2,136.90	1,663.30	2,952.10	1,846.50	1,561.80	65.00	2.00	2,073.75	2,463.93	2,125.72	2,899.47
12	2,214.00	1,911.10	1,372.50	911.40	2,430.90	1,585.33	1,181.40	68.00	2.00	2,286.03	2,758.73	1,565.44	2,864.62
13	942.11	1,297.30	893.00	894.00	901.56	584.75	629.75	78.00	2.00	1,255.59	1,361.84	866.73	1,529.49
14	1,762.80	3,351.40	2,325.00	1,995.80	3,981.30	2,381.00	1,672.00	76.00	2.00	2,949.95	2,988.45	2,617.75	4,026.27
15	663.00	1,121.00	671.90	616.90	974.30	983.70	376.90	48.00	1.00	929.35	896.97	790.78	1,156.07
16	2,208.30	3,077.50	2,566.89	2,124.80	4,004.10	2,756.50	2,262.78	49.00	1.00	2,566.28	2,794.27	2,798.76	3,306.53
17	1,366.44	3,069.60	2,183.70	1,465.70	2,999.10	1,707.60	1,530.50	69.00	2.00	1,970.40	2,005.14	2,159.37	2,822.85
18	4,149.40	3,881.30	3,046.40	2,189.00	7,708.80	4,875.20	3,131.60	83.00	3.00	4,200.93	4,282.95	4,138.72	5,634.82
19	1,431.20	3,443.60	1,813.50	1,770.10	3,478.00	2,155.50	2,310.60	47.00	1.00	2,388.17	2,303.95	2,495.22	3,227.33
20	818.20	1,279.80	1,014.56	602.50	1,700.60	1,039.00	785.70	67.00	2.00	1,249.22	1,200.33	1,070.36	1,606.90
21	1,927.80	3,051.80	1,944.30	1,643.40	3,368.40	1,951.90	1,486.70	74.00	2.00	2,938.52	3,081.10	2,241.08	3,959.03
22	2,161.00	3,763.70	2,617.60	1,863.70	4,126.50	2,372.00	1,780.30	64.00	2.00	3,061.75	3,110.10	2,753.97	4,055.52
23	2,309.70	3,644.70	2,580.50	1,557.60	4,541.90	2,581.80	1,951.70	71.00	2.00	2,968.08	2,950.82	2,809.70	3,918.12
24	2,098.89	1,663.40	1,371.44	1,049.00	2,022.67	2,905.30	1,217.50	75.00	2.00	1,884.02	1,874.69	1,704.89	2,247.55
25	913.80	2,392.80	1,785.70	1,116.70	1,904.10	1,467.30	1,011.90	61.00	2.00	1,284.03	1,334.60	1,613.08	1,893.20
26	2,159.70	2,852.00	2,467.10	1,729.80	2,656.60	2,202.10	2,044.00	80.00	2.00	2,247.93	2,375.15	2,325.27	2,898.08
27	1,854.70	3,409.60	2,018.60	1,433.90	3,042.30	2,043.80	1,524.10	62.00	2.00	2,564.07	2,769.13	2,245.38	3,553.83
28	571.86	1,750.20	948.00	791.50	1,072.20	696.40	411.10	64.00	2.00	1,073.83	1,150.42	944.90	1,583.23
29	1,396.90	2,582.30	1,519.90	984.10	2,204.50	1,220.00	887.70	79.00	2.00	1,974.47	2,350.87	1,566.42	2,864.52
30	1,034.33	1,694.70	953.30	1,045.30	1,560.20	1,057.90	679.20	61.00	2.00	1,121.86	1,125.83	1,165.10	1,457.71
31	2,070.60	1,914.70	1,561.90	1,006.80	3,120.40	2,034.10	1,777.70	74.00	2.00	2,374.97	2,828.60	1,902.60	3,232.18
32	2,525.30	3,479.10	2,402.60	1,572.40	3,645.60	2,508.30	1,943.30	85.00	3.00	2,750.01	3,060.72	2,591.88	3,741.32
33	1,723.90	3,704.70	2,809.70	2,233.20	2,996.80	2,256.00	1,896.30	68.00	2.00	2,732.73	2,791.72	2,649.45	3,677.20
34	2,672.70	6,253.30	3,569.50	2,467.80	4,786.70	2,904.80	2,480.70	79.00	2.00	4,298.75	4,303.65	3,743.80	5,948.63
35	1,906.00	2,725.70	1,993.30	1,414.00	3,770.10	2,592.70	1,757.40	63.00	2.00	2,222.43	2,618.23	2,375.53	3,479.53
36	1,495.20	2,711.40	2,131.50	1,472.40	3,169.70	1,970.22	1,523.20	67.00	2.00	2,270.70	2,243.92	2,163.07	3,129.18
37	1,963.40	2,032.20	2,058.50	1,621.60	1,830.80	1,574.70	1,335.80	76.00	2.00	2,350.35	2,710.00	1,742.27	2,841.82
38	1,052.50	1,856.00	1,339.60	968.30	1,723.60	1,133.50	957.20	81.00	2.00	1,686.95	1,780.27	1,329.70	2,099.43
39	1,728.00	3,021.70	2,057.40	1,632.50	2,884.20	1,545.10	1,272.50	64.00	2.00	2,318.78	2,334.18	2,068.90	2,922.17
40	972.50	1,756.30	1,264.25	1,140.50	980.90	1,194.00	977.50	39.00	1.00	1,272.95	1,195.87	1,218.91	1,413.45
41	1,070.70	2,233.70	1,378.60	909.70	2,190.20	1,361.80	972.20	60.00	2.00	1,626.63	1,746.95	1,507.70	2,402.97
42	1,103.09	1,815.40	1,128.10	855.10	1,607.55	1,214.00	828.00	85.00	3.00	1,666.01	1,753.92	1,241.36	2,146.12
43	1,072.20	2,131.70	1,631.30	1,480.11	1,588.40	977.20	726.30	87.00	3.00	1,956.52	1,817.38	1,422.50	2,439.93
44	1,698.40	3,319.20	2,438.50	1,995.20	3,049.80	2,235.70	1,774.90	52.00	2.00	2,597.88	2,611.48	2,468.88	3,371.22
45	1,166.10	2,060.00	1,594.60	1,437.60	1,788.70	1,280.50	1,108.10	54.00	2.00	1,667.85	1,689.83	1,544.92	2,157.52
46	3,694.90	5,409.10	3,779.70	2,428.10	6,625.80	3,990.70	2,811.70	63.00	2.00	4,129.07	4,492.03	4,174.18	5,967.18
47	1,252.20	1,846.60	1,396.50	1,072.80	2,225.60	1,144.60	1,096.20	82.00	3.00	1,606.62	1,707.62	1,463.72	2,184.92
48	2,088.00	3,966.60	2,443.00	2,207.40	3,812.40	2,704.00	2,257.50	52.00	2.00	2,336.30	2,360.17	2,898.48	3,355.45
49	1,529.40	1,943.00	1,369.70	1,142.30	2,050.80	1,478.10	1,284.70	58.00	2.00	1,767.58	1,829.93	1,544.77	2,052.62
50	1,405.10	2,000.30	1,308.30	1,241.10	2,026.30	1,621.50	1,357.80	75.00	2.00	1,626.37	1,729.05	1,592.55	2,084.72

	average40	average60	car20av	car40av	car60av	catch20av	catch40av	catch60av	rev20av	rev40av	rev60av	DivAt	SelAt
1	2,276.37	1,729.84	3,510.67	2,380.77	1,611.80	4,142.57	2,363.07	1,950.27	3,102.40	2,085.27	1,627.47	17.00	83.00
2	789.69	547.12	1,340.23	864.63	548.90	1,501.20	733.15	620.20	892.11	771.30	472.25	17.00	57.00
3	2,489.52	1,961.53	3,378.10	2,415.85	1,999.50	3,993.55	2,475.65	2,112.55	3,696.60	2,577.05	1,772.55	87.00	180.00
4	1,881.82	1,886.82	2,220.65	2,088.05	1,951.20	2,879.35	1,951.40	2,150.00	1,757.80	1,606.00	1,559.25	17.00	67.00
5	1,427.28	1,082.13	1,945.35	1,529.00	1,080.00	2,384.35	1,353.55	1,069.70	2,108.95	1,399.30	1,096.68	17.00	40.00
6	3,219.28	2,414.93	4,123.30	2,911.60	2,242.00	4,552.50	3,359.40	2,641.65	5,096.50	3,386.85	2,361.15	17.00	93.00
7	3,442.98	2,359.42	5,695.65	3,494.15	2,408.00	5,791.65	3,552.40	2,309.00	5,524.90	3,282.40	2,361.25	17.00	73.00
8	3,724.98	2,964.32	5,318.20	3,726.80	3,057.00	5,800.20	3,742.10	3,250.65	4,553.85	3,706.05	2,585.30	17.00	17.00
9	2,254.00	1,837.31	3,214.10	2,267.67	1,730.96	3,394.98	2,249.19	2,033.92	3,360.05	2,245.15	1,747.04	23.00	150.00
10	1,897.65	1,344.34	2,042.25	2,001.35	1,250.40	2,768.90	1,842.20	1,476.12	2,596.05	1,849.40	1,306.50	60.00	73.00
11	2,116.20	1,647.73	2,667.80	2,033.95	1,519.50	3,257.70	2,322.95	1,811.15	2,772.90	1,991.70	1,612.55	83.00	114.00
12	2,164.37	1,581.22	2,815.10	2,321.70	1,721.30	3,607.75	2,692.50	1,975.95	2,171.00	1,478.92	1,046.40	20.00	103.00
13	1,105.60	849.06	1,596.25	1,323.52	847.00	1,892.80	1,254.40	938.31	1,099.43	738.88	761.88	17.00	53.00
14	2,595.25	1,934.63	4,028.65	2,704.30	2,116.90	4,383.80	2,728.45	1,853.10	3,666.35	2,353.00	1,833.90	17.00	60.00
15	850.67	610.37	1,202.35	939.95	645.75	1,218.20	784.25	688.45	1,047.65	827.80	496.90	17.00	64.00
16	2,675.60	2,177.18	2,837.85	2,622.60	2,238.40	3,540.95	2,742.50	2,099.35	3,540.80	2,661.69	2,193.79	17.00	23.00
17	1,893.73	1,418.32	2,622.75	2,001.25	1,287.20	2,811.45	1,734.30	1,469.67	3,034.35	1,945.65	1,498.10	17.00	97.00
18	4,028.67	2,959.12	5,373.50	4,047.55	3,181.75	5,735.90	4,077.65	3,035.30	5,795.05	3,960.80	2,660.30	70.00	70.00
19	2,201.19	1,758.81	3,166.85	2,163.50	1,834.16	3,054.35	2,455.58	1,401.93	3,460.80	1,984.50	2,040.35	17.00	50.00
20	1,114.56	798.45	1,596.95	1,199.50	951.20	1,733.55	1,117.40	750.05	1,490.20	1,026.78	694.10	23.00	73.00
21	2,577.17	1,724.50	4,274.80	2,693.15	1,847.60	4,392.20	3,090.25	1,760.85	3,210.10	1,948.10	1,565.05	23.00	37.00
22	2,837.18	2,033.12	4,196.05	2,925.40	2,063.80	4,025.40	3,091.35	2,213.55	3,945.10	2,494.80	1,822.00	17.00	114.00
23	2,791.48	2,019.00	3,639.75	3,034.25	2,230.25	4,021.30	2,759.05	2,072.10	4,093.30	2,581.15	1,754.65	17.00	110.00
24	1,932.31	1,283.74	2,518.60	1,961.05	1,172.42	2,381.03	1,697.50	1,545.54	1,843.03	2,138.37	1,133.25	17.00	423.60
25	1,374.15	964.37	1,662.85	1,297.80	891.45	1,868.30	1,198.15	937.35	2,148.45	1,626.50	1,064.30	17.00	424.00
26	2,193.20	1,857.07	2,841.30	2,104.85	1,797.65	3,098.65	2,140.15	1,886.65	2,754.30	2,334.60	1,886.90	17.00	40.00
27	2,297.87	1,726.88	3,471.85	2,353.00	1,867.35	3,963.70	2,509.40	1,834.30	3,225.95	2,031.20	1,479.00	17.00	47.00
28	950.30	635.61	1,472.85	1,098.70	649.93	1,865.65	930.00	655.60	1,411.20	822.20	601.30	33.00	110.00
29	1,815.22	1,212.02	2,698.40	1,990.90	1,234.10	3,501.75	2,084.80	1,466.05	2,393.40	1,369.95	935.90	17.00	70.00
30	1,053.38	901.71	1,265.73	1,231.25	868.60	1,479.95	923.28	974.27	1,627.45	1,005.60	862.25	27.00	57.00
31	2,138.47	1,735.52	3,180.00	2,049.45	1,895.45	3,999.00	2,567.95	1,918.85	2,517.55	1,798.00	1,392.25	17.00	63.00
32	2,561.95	2,099.33	3,528.92	2,609.05	2,112.05	4,132.70	2,621.35	2,428.10	3,562.35	2,455.45	1,757.85	17.00	70.00
33	2,512.82	1,983.88	3,680.15	2,459.60	2,058.45	4,000.70	2,546.00	1,828.45	3,350.75	2,532.85	2,064.75	17.00	27.00
34	3,598.97	2,798.60	6,308.65	3,691.85	2,895.75	6,017.25	3,867.90	3,025.80	5,520.00	3,237.15	2,474.25	17.00	87.00
35	2,156.93	1,579.73	3,133.55	2,070.90	1,462.85	4,057.15	2,106.90	1,690.65	3,247.90	2,293.00	1,585.70	27.00	100.00
36	2,045.30	1,503.20	3,129.90	2,125.75	1,556.45	3,317.10	1,959.30	1,455.35	2,940.55	2,050.86	1,497.80	17.00	103.00
37	2,204.40	1,756.40	3,071.00	2,200.35	1,779.70	3,522.95	2,596.25	2,010.80	1,931.50	1,816.60	1,478.70	17.00	80.00
38	1,569.97	1,127.52	2,004.30	1,791.95	1,264.60	2,504.20	1,681.40	1,155.20	1,789.80	1,236.55	962.75	97.00	50.00
39	2,079.12	1,720.58	2,758.40	2,326.45	1,871.50	3,055.15	2,109.65	1,837.75	2,952.95	1,801.25	1,452.50	17.00	53.00
40	1,217.74	1,056.53	1,242.34	1,462.85	1,113.65	1,629.40	961.25	996.95	1,368.60	1,229.13	1,059.00	17.00	50.00
41	1,455.12	1,023.20	2,355.15	1,488.85	1,035.90	2,641.80	1,506.30	1,092.75	2,211.95	1,370.20	940.95	17.00	67.00
42	1,404.88	1,110.29	2,165.36	1,540.09	1,292.58	2,561.53	1,503.50	1,196.75	1,711.47	1,171.05	841.55	33.00	63.00
43	1,589.05	1,167.42	2,945.40	1,774.45	1,149.70	2,514.35	1,688.45	1,249.35	1,860.05	1,304.25	1,103.21	17.00	63.00
44	2,428.78	1,878.25	3,444.05	2,515.25	1,834.35	3,485.10	2,434.00	1,915.35	3,184.50	2,337.10	1,885.05	17.00	60.00
45	1,535.48	1,209.60	2,276.65	1,594.85	1,132.05	2,271.55	1,574.05	1,223.90	1,924.35	1,437.55	1,272.85	17.00	37.00
46	3,901.30	2,926.80	5,719.00	3,600.90	3,067.30	6,165.10	4,217.80	3,093.20	6,017.45	3,885.20	2,619.90	17.00	47.00
47	1,457.20	1,135.83	2,172.20	1,514.60	1,133.05	2,346.45	1,586.45	1,189.95	2,036.10	1,270.55	1,084.50	17.00	57.00
48	2,243.15	1,996.35	3,361.50	1,901.15	1,746.25	2,815.35	2,254.80	2,010.35	3,889.50	2,573.50	2,232.45	17.00	74.00
49	1,676.87	1,412.80	1,927.90	1,873.45	1,501.40	2,233.05	1,733.25	1,523.50	1,996.90	1,423.90	1,213.50	87.00	60.00
50	1,557.40	1,305.85	1,992.35	1,553.80	1,332.95	2,248.50	1,653.50	1,285.15	2,013.30	1,464.90	1,299.45	17.00	23.00

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