DEINDIVIDUATION OF DRIVERS: IS EVERYONE ELSE A BAD DRIVER?

by

KEITH R. MACARTHUR

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Psychology
in the College of Sciences
and in the Burnett Honors College
at the University of Central Florida
Orlando, Florida

Summer Term 2014

Thesis Chair: Dr. Peter A. Hancock

ABSTRACT

Deindividuation is a psychological phenomenon that occurs when a given environment reduces the "individuality" or identifiability of a person. These environments may cause a psychological reduction in self-consciousness, potentially leading to violations of sociocultural norms (Festinger, Pepitone, & Newcomb, 1952; Singer, Brush, & Lublin, 1965). The present research sought to empirically test deindividuation theory among automobile drivers utilizing the anonymizing factor of observation. Participants (N = 31) used a driving simulator and were either in the observed condition or an unobserved condition. Analysis of driving data did not reveal significant results, however self-report data had some interesting trends. Though limited in scope, this research begins to shed light on deindividuation of drivers and may provide a foundation for future research.

DEDICATION

For Mike L. Mershon, my source of strength, wisdom, and support. You always said I could.

For Gaby M. Hancock, you made this possible.

ACKNOWLEDGEMENTS

I wish to extend my sincerest gratitude to my committee Dr. Peter A. Hancock, Dr. James Szalma, Dr. Robert S. Kennedy, and Dr. Cathy Cico for their support and guidance. I would like to thank Dr. Peter A. Hancock for the use of his research laboratory and his driving simulator. I would like to extend my gratitude to Dr. Valerie Sims for her direction in finding the topic for my thesis. I would like to thank my mentors, Gabriella M. Hancock and Ben D. Sawyer for giving me direction, advice, and their time whenever needed. I would like to thank Jessica Siler being an unending inspiration and assisting me with formatting, and Petal Laborde for assisting me in finding a topic.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Deindividuation is a psychological phenomenon that occurs when a given environment reduces the "individuality" or identifiability of a person. These environments may cause a psychological reduction in self-consciousness, potentially leading to violations of sociocultural norms (Festinger, Pepitone, & Newcomb, 1952; Singer, Brush, & Lublin, 1965). Current literature addresses deindividuation in areas such as group dynamics (Festinger, Pepitone, & Newcomb, 1952), occlusion of identifying traits (anonymity), role adoption (Zimbardo, 1969), and computer-mediated communications (Lee, 2008). However, it does not address the effect of anonymity of the driving experience by virtue of the isolation afforded in their individual vehicles. Deindividuation could make individuals less courteous and less inclined to drive with regard for others due to a reduced fear of social sanction. Such conditions could lead to adverse driving outcomes such as citations, injuries, and/or fatalities (Lonczak, Neighbors, & Donovan, 2007). Our lack of empirical understanding in the area perpetuates the problem as certain drivers might see this disconnect from personal responsibility as the only way to achieve their driving goals. This study's objective therefore was to investigate this construct of deindividuation in automobile drivers and its effects on driving performance.

Festinger and colleagues (1952), coined the term 'deindividuation' and defined it as the reduction of internal psychological restraints due to a group effect, whereby people are not perceived (and do not perceive others) as individuals. Festinger and his associates devised experiments to test their theory with the hypothesis that groups who fostered a

reduction of psychological restraints (e.g. contributing to a negative reaction similar to other members in a group) among its members facilitates the likelihood of deindividuation; thus rendering group membership more attractive due to its relatively permissive nature. While their results did provide support for this hypothesis, our understanding of deindividuation is far from complete. While Festinger and colleagues coined the term deindividuation, knowledge of this construct has evolved through research conducted by others.

Singer and associates (1965) were the first to attempt replication of the phenomenon of deindividuation. These researchers proposed that if deindividuation is caused by the release of social restraints, then it is more likely to occur in conditions wherein more social restraints are present. The researchers modified a model previously developed by Asch (1951), to test their conformity to construct an experiment that tested if identifiability caused greater conformity in a group situation, and compare the low identifiability non-conforming participants to the high identifiability non-conforming participants.

Identifiability was manipulated by asking participants to arrive dressed either in business casual attire or old clothes. Groups were designed to include one participant and three confederates. The group was instructed to rate how well-dressed individuals in a series of photographs were by completing a Likert-scale ranging from 1-3. Identifiability, as an abstract concept, proved difficult to measure. Singer and collaborators (1965) derived an indirect measure of identifiability from the participant's ability to single out other members of the group and where they sat. Methodologically, this measure was quantified

using a photographic line-up of nine individuals after the confederates left the room. Three of the photographs were of the confederates with whom the participant had been grouped. Quality of dress was determined to be a manipulation of identification as the participants were better able to identify the confederates who were well dressed. A post hoc conclusion provided by Singer and associates identified a lack of a clear factor of identifiability in the conditions.

Singer and his collaborators conducted a second experiment that was designed to be comparable to the seminal Festinger (1952) study. Additionally, emphasis was given to providing a safer outlet for the participants' deindividuated expression. This experimental protocol had four conditions: (a) type of dress (business casual versus old clothes), and (b) discussion topic (taboo versus non-taboo). Each group was given explicit instructions regarding their type of dress and were comprised of three participants and one confederate. They were told the study involved concept formation and were then given a topic to discuss. The primary dependent variable measures included: (a) the participant's ability to recall and correctly identify what the confederate said during the discussion out of a list of 18 items (14 of which were dummy quotes), (b) the participant's ability to identify the confederate in a line-up of 5 photographs, (c) the participant's ability to identify the confederate's voice via an audio recording. Additional behavioral measures thought to be indicators of deindividuation were also evaluated, including: the frequency of pauses in speech exceeding five seconds in duration and the number of interruptions of another's speech. Singer and associates concluded that their experimental design was sufficient to measure deindividuation; however, they acknowledged that the measure is

indirect and may only be measuring certain aspects of deindividuation. Singer and compatriots also questioned their a priori theoretical stance, "that feelings of identification and/or actual identification may often be predisposing factors but not necessary factors for deindividuation" (p. 375). Both experiments used perhaps an overly-broad approach and, in the end, neither refuted nor supported Festinger and colleagues' theory of deindividuation. They lacked a well-defined, a priori measure for deindividuation and seemed to examine a multitude of factors without first considering the independent variable they selected. Though this is an understandable perspective when conducting exploratory research, the majority of their measures did not show significance; and those that did suffer from possible confounds. They may also have been working under a false assumption: that the manipulation in quality of dress was indeed a manipulation of identifiability.

Zimbardo (1969) offered a broader and more generalized definition for deindividuation, claiming that it "is a complex, hypothesized process in which a series of antecedent social conditions lead to changes in perception of self and others, and thereby to a lowered threshold of normally restrained behavior" (p. 251). Here, the focus shifted from a direct group in the definition of deindividuation, to the existence of environmental conditions that may change perceptions of individuation. Zimbardo made connections between deindividuation, anonymity and arousal; he also gave clear criteria for evaluation. Zimbardo additionally generated an important aspect to deindividuation: the stipulation that it may occur while an individual is anonymous, regardless of the presence of a group.

In Zimbardo's (1969) first experiment, anonymity was one of the primary variables tested. Half of the participants were dressed in large lab coats and hoods to obscure their identity. In groups of four, participants listened to a recorded statement from either a "nice" moralistic individual or an "obnoxious" conceited individual, and rated them on a scale of social factors (e.g., warmth, sincerity, genuineness, and honesty). After completing the scale, participants drew lots to determine which two of the four would administer a shock to the confederate. The lots were designed so that each participant thought that they were amongst the two to execute shocks, while the remaining two individuals were merely judges. Participants were then secluded in cubicles where they could see, via one-way glass, the confederate. Each participant was given a sample shock of the same magnitude they would be delivering to the confederate and instructed how to use the shock-administration interface. Results indicated that in an anonymous state of deindividuation, participants were likely to shock the confederate for a period of time twice as long as that of someone in a non-deindividuated condition. These results therefore lend support to the theory of deindividuation.

In his second experiment, Zimbardo's (1969) participants were soldiers from an army base. He used a design modified from his aforementioned protocol. The participants were required to shock another person as before (though it is unclear if this was a confederate or another soldier) while only half of the participants were hooded. All the participants knew that the others were also giving shocks, but were told that their independent evaluations about the shocked person would remain unidentifiable. Results run counter to those found in Zimbardo's first experiment, as those who were in the

deindividuation condition shocked others for less total time than those in the identifiable condition. Zimbardo discusses this discrepancy in the data and posits that they were already deindividuated given their arrival in uniform, and that the addition of the lab coat and hood therefore individuated them from the group. This individuation could cause heightened self-awareness and self-consciousness. Zimbardo concludes his research by proposing two interacting factors that can create deindividuation: "the locus of deindividuation (internally generated needs versus ones externally imposed by another person or group) is orthogonal to the degree of voluntary exposure to group situations where anonymity, shared responsibility, and other deindividuating operations are likely to be experience[d]" (p. 300).

METHODOLOGY

A Priori Power Analysis

An a priori power analysis utilizing G*Power (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007) and the average of effect sizes ($\bar{x}$ = .09) provided by a meta-analysis of previous deindividuation research (Postmes & Spears, 1998) indicated that to achieve 95% power, this experiment would require 503 participants in each condition. Due to understandable constraints, these criterion could not be met in the present case.

Participants

In the present procedure, thirty-two participants (13 male and 18 female) were recruited via the University of Central Florida's SONA research system. Participants were required to be 18 years or older, a licensed driver, and a college student at the University of Central Florida to be included in this study (mean age = 19.38 years). Informed consent was presented to the participant prior to their assent to the research, and a copy made available for them to take. The SONA research system conscripts participants through the use of extra credit for some college classes, which was the only incentive for participation. Approval was granted by the University of Central Florida's Institutional Review Board to conduct this research (see Appendix E).

Experimental Design

This study utilized a between-subjects design. Objective data from a driving simulator and software was collected and analyzed regarding conformity to traffic laws and

adherence to the traffic pattern outlined by a series of barricades. Measures will therefore include: (a) the number of crashes into barriers, (b) cumulative duration of time spent either exceeding the speed limit by 5 mph or dropping 5 mph under it, (c) the number of failures to use a directional when changing lanes, and (d) cumulative duration of time spent off the primary roadway. Subjective data was also collected via questionnaires administered by way of online software located on a computer in the experimentation room. Participants completed the NASA Task Load Index (TLX; Hart & Staveland, 1988), a modified Driver Stress Inventory (DSI; Matthews, Desmond, Joyner, Carcary, & Gilliland, 1996), Driver Coping Questionnaire (DCQ; Matthews et al., 1996), and selected subscales of the Dundee Stress State Questionnaire (DSSQ; Matthews, Joyner, Gilliland, Huggins, & Falconer, 1999).

The independent variable in this experiment was the participant's deindividuation, manipulated via their awareness (n = 16) or unawareness (n = 15) of their observation by another party. The experimental environment was automated with signs, recorded audiovisual instructions, and the questionnaires, so that there was a standardization of instruction delivery. This protocol was designed to obviate the need for participant-researcher interaction. In the observed condition, a researcher was in the room with a clip board and a lab coat to observe participants, but refrained from interacting with them. If a participant inquired about further instruction, the researcher presented a printed sign that directed them to follow the instructions to the best of their ability. In the unobserved condition, a researcher managed the experiment while obscured from the participant's view by a partition.

Materials and Procedure

EQUIPMENT

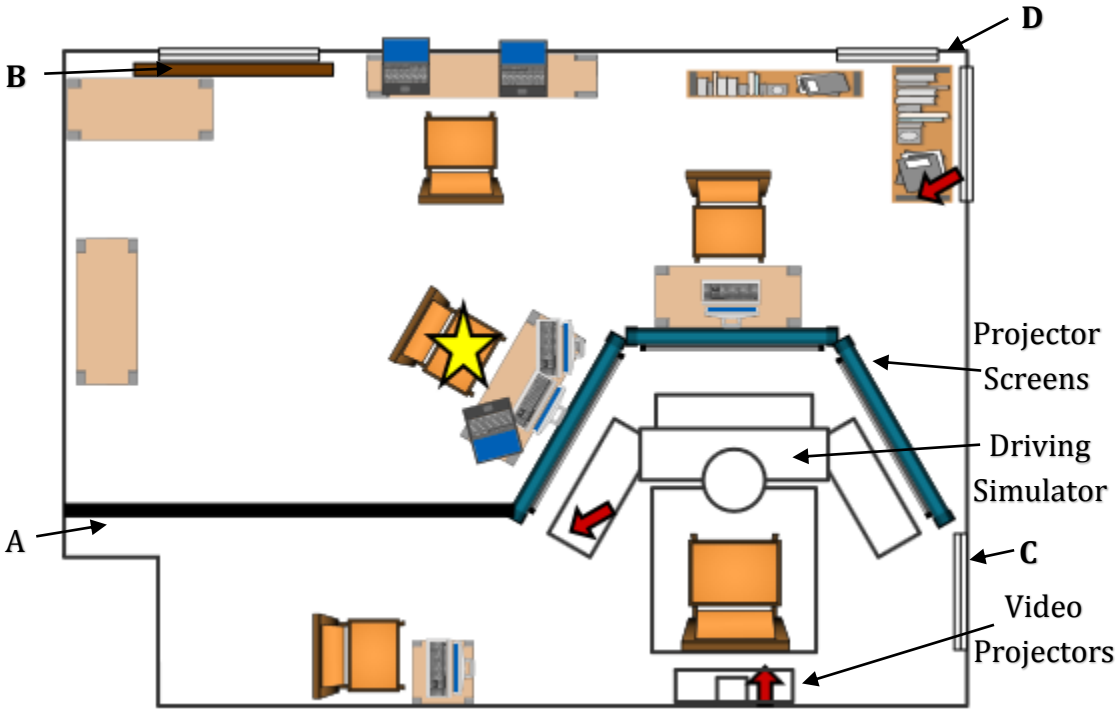


Figure 1: Experimental Setup (A – Room Divider, B – Window Cover, C – Foiled Window, D – Window Blocked by Bookshelves)

The experimental space was constructed to reduce any external influence on the participant by occluding any equipment, furniture, or light source that was not required for the experiment. A black curtain as illustrated in Figure 1, component A was erected to close the gap from the simulator projector screens and the exterior wall of the room, ensuring that the participant would be unaware of the experimenter in the room during the unaware condition. The windows were obstructed with blinds, but additional barriers were utilized including cardboard component B, foil component C, or furniture component D to prevent the participant from seeing the experimenter's shadow and to control for the ambient light. Three web cameras were concealed in the room (see Figure 1, represented by arrows) to

allow for multiple angles of observation of participants in the unaware condition (one camera hidden among the projectors, one atop a bookshelf, and one under the simulator). These cameras allowed for the observation of the participant entering the experimental space (the camera under the simulator) ensuring that the door was closed, to observe their interaction with the survey computer (the camera on the bookshelf) and to ensure the simulation that it was working properly (the camera in the projector mount). In the unaware condition, the experimenter was seated in front of the operations console marked with a star (see Figure 1), where a Dell desktop (Dell, Round Rock, TX)with Windows 7 and the ISim driving software package was used to control the operation of the driving simulator and monitor the web cameras. A Dell Ultrabook (Model XPS 13) running Windows 8 was used to remote access the operations console, by way of Splashtop remote desktop software, to utilize as a touch pad so as to prevent the sound of mouse clicks. In the aware condition, the experimenter utilized a Google/ASUS Nexus 7 2013 Android tablet to remote access the operations console, by way of Splashtop remote desktop software.

PROCEDURE

Prior to the participant's arrival, the researcher prepared the questionnaire so that the initial instructions for the participant are presented. Depending on condition, the researcher either remained in view or moved behind the curtain. Upon arrival, all participants were presented with a welcoming sign instructing them to have a seat in front of the computer and read what was displayed. Once the participant was seated, they were presented instructions via a video recording and a transcription of the audio dialogue.

Initial instructions included reading over the informed consent and completing the DSI questionnaire (assent to the informed consent was recorded in the questionnaire, and participants were allowed to keep the informed consent form if they chose). In this initial recording, participants were told that should they complete the study quickly, they would be able to leave early. This provision was intended to create a scenario wherein social norms apply, but expected desire to depart created a degree of urgency.

After completing the introduction segment, they were shown a video tutorial on how to properly interact with the driving simulator, after which they were given a limited amount of time to practice driving in the simulator. The training session familiarized the participants with the simulated environment as well as the skills necessary for the experiment. Once the training was over, they returned to the computer to complete the Driver Coping Questionnaire while the researcher prepared the experimental session. In the experimental session, participants were instructed to drive down a length of highway demarcated with barriers, and to take the exit marked 'Liberty'. Once both conditions were completed, the participant then completed the Dundee Stress State Questionnaire and NASA Task Load Index. Finally, their participation concluded with an audio recorded debriefing.

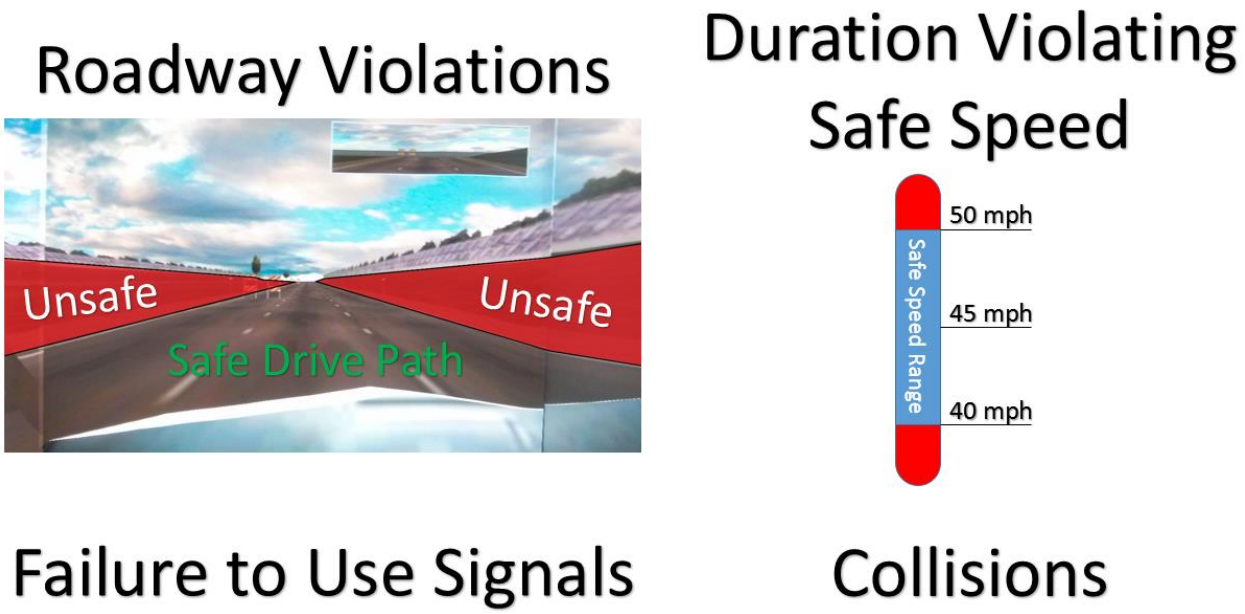
RESULTS

Data were analyzed multiple ways to assess their validity as a measure of deindividuation in a driving environment.

Driving Measures

The driving data were evaluated and the mean time spent traveling outside the proscribed speed limit by a range of five miles per hour was recorded. This time was calculated from when the participant reached 45 miles per hour for the first time and until they passed the last set of barricades. All driving data were assessed using a multivariate analysis of variance (ANOVA) F (1,3) = .420, p = .740, partial η^2 = .045. Each variable was assessed independently using an ANOVA to evaluate its ability to measure deindividuation. Again, there was no significant difference between conditions in speed violation duration (F (1,29) = .317, p = .578, η^2 = .011), failure to signal (F (1,29) = .114, p = .738, η^2 = .004), or roadway violation duration F (1,29) = .520, p = .476, η^2 = .018,). There were no collisions for any participants and therefore no statistical procedure was feasible. A subsequent analysis of speed was conducted on the mean speed (F (1,29) = 1.531, p = .226, η^2 = .223) and range of speed (F (1,29) = .337, p = .566, η^2 = .087).

Figure 2: Driving Measures



Self-Report Measures

DRIVER STRESS INVENTORY

The Driver Stress Inventory was used to garner demographic information (see Table 1) and previous driving history (see Table 2).

Table 1: Demographics

Demographics	
	$\bar{x}$ =
Age	19.380
Sex	
Male	n = 13
Female	n = 18
Occupation	
Fulltime Student	n = 25
Sales Associate	n = 4
Trade Skill	n = 1
Office Work	n = 1

Table 2: Driving History

Driving History						
Infractions in Last 3 Years	**Σ**	**x̄**	**Miles Driven Last Year**	**n**	**Roads Frequented**	**x̄**
Accidents	15	0.484	Less than 5k	8	Freeway	0.774
Speeding	4	0.129	5k - 10k	13	Other Main Raod	0.774
Careless/Reckless Driving	1	0.032	10k - 15k	7	Urban Road	0.516
DUI	0	0	15k - 20k	2	Country Road	0.194
Other*	1	0.032	More than 20k	1		

*Disregarding a stop sign

DRIVER COPING QUSTIONNAIRE

Table 3: DCQ ANOVA

DCQ ANOVA								
	Observed		**Hidden**					
Coping Style	**x̄**	**SE**	**x̄**	**SE**	**MD***	**F**	**Sig.**	**Partial η2**
Confrontive	33.357	6.880	31.619	7.106	3.738	0.143	0.708	0.005
Task-Focused	64.643	5.457	63.048	5.636	1.595	0.041	0.840	0.001
Emotion-Focused	30.179	3.944	22.857	4.073	7.321	1.668	0.207	0.054
Reappraisal	44.107	4.883	44.762	5.043	-0.655	0.009	0.926	0.000
Avoidance	32.857	4.086	36.381	4.220	-3.524	0.360	0.553	0.012

*MD = Observed - Hidden

A multivariate ANOVA was conducted on the Driver Coping Questionnaire results (F (1,29) = .740, p = .601, partial η^2 = .129). Thus revealed no significant effects or interactions. However, exploring the pairwise comparisons revealed an interesting trend which is illustrated in Table 3. Participants had a greater mean difference (7.321) in the Emotion-Focused Coping subscale (F (1,29) = 1.668, p = .207, partial η^2 =.054) making it two times greater than that of any other subscales as shown in Table 3.

DUNDEE STRESS STATE QUESTIONNAIRE

The Dundee Stress State Questionnaire was analyzed with a multivariate ANOVA (F (1,29) = .905, p = .476, partial η^2 = .122) and showed no significant main effect for condition on any of the identified subscales (see Table 4).

Table 4: DSSQ ANOVA

DSSQ ANOVA								
	Observed		Hidden					
Subscale	x̄	SE	x̄	SE	MD*	F	Sig.	Partial η²
Energetic Arousal	9.875	0.627	10.067	0.648	-0.192	0.045	0.833	0.002
Tense Arousal	7.563	0.769	5.800	0.794	1.763	2.542	0.122	0.081
Task Related Interference	18.938	1.329	16.267	1.373	2.671	1.953	0.173	0.063
Task Irrelevant Interference	12.063	1.218	11.467	1.258	0.596	0.116	0.736	0.004

*MD = Observed - Hidden

NASA TASK LOAD INDEX

The NASA Task Load Index was analyzed using a multivariate ANOVA (F (1,6) = 1.181, p = .349, partial η^2 = .228) indicating a lack of overall significance of effect from the conditions.

Table 5: NASA-TLX ANOVA

NASA-TLX ANOVA								
	Observed		Hidden					
Subscale	x̄	SE	x̄	SE	MD*	F	Sig.	Partial η2
Mental Demand	6.000	0.893	4.867	0.922	1.133	0.780	0.384	0.026
Physical Demand	2.875	0.627	2.800	0.647	0.075	0.007	0.934	0.000
Temporal Demand	3.375	1.053	2.733	1.088	0.642	0.180	0.675	0.006
Performance	14.938	1.008	17.733	1.042	-2.796	3.719	0.064	0.114
Effort	8.063	1.464	5.133	1.512	2.929	1.937	0.175	0.063
Frustration	3.750	0.992	1.333	1.024	2.417	2.873	0.101	0.090

*MD = Observed - Hidden

DISCUSSION

The present experiment was designed to explore the construct of deindividuation in a driving environment. A series of measures were selected with the intent of locating a valid, concept-specific measure for future research on deindividuation. Although the present data did not show significant differences, there are two interesting trends which may serve to facilitate future research. The first of these trends is couched within the performance subscale of the NASA-TLX, representing the participant's perception of their successful task completion. Although the simulation was not intended to be difficult, this may indicate that the simulation's complexity was unrealistic, or that self-report of performance on a task may be indicative of deindividuation. Further research on deindividuation and driving should therefore include the NASA-TLX performance subscale.

The second interesting trend was found in data for the Emotion-Focused Coping Subscale of the Driver Coping Questionnaire. This subscale is concerned with the driver's propensity to concentrate on their own emotional experience and is twice as significant as any other subscale in the DCQ (see Table 3). This magnitude may indicate that participants in the observed condition self-monitored their emotional state to a greater extent; whereas, the hidden condition showed a reduced level of emotion-focused coping and thereby a reduction in self-monitoring. The direction of this effect can be determined from the pairwise comparisons of the conditions in the DCQ (Observed – Hidden mean difference = 7.312).

Future Research

Deindividuation research has historically proven to have exhibited only small effect sizes and therefore requires large samples to build statistical power. The development of objective measures, rather than self-report or subjective measures, in conjunction with rigorously designed experimental protocols, and strong manipulation of independent variables could generate a greater effect reducing the sample size. This experiment, though not statistically significant does show some trends in areas that may be of use in future research in deindividuation primarily among drivers.

During the execution of the present research participants (primarily in the unaware condition) were observed acting outside the expected behavioral parameters for a driving or experimental situation. One participant drove through the simulation with the accelerator completely depressed for the entire protocol, exceeding speeds of 100mph. Having finished the tutorial, said participant could not get the car to start (as they failed to follow directions and return the gear shifter to Park) and shouted obscenities at the simulator insisting that it was not their fault that it would not work, and they did not break it. There was no foreknowledge to record or code such observations during the experiment and may have provided a better measure of deindividuation.

Limitations of the Present Research

The present experiment has a number of limitations including but not limited to; a lack of funding, time, researchers, and necessary number of participants. Due to a procedural issue a halt had to be called on the experiment until the Institutional Review

Board could re-examine the protocol. Experimentation was approved to resume later with the provision that an exclusion clause be added precluding the participation of anyone with a history of seizures. However, this left three days until the end of the semester and experimentation was thus unable to continue.

Conclusions

None of the expected direct measures proved to be a significant indicator of deindividuation. However, new potential indicators of deindividuation including the NASA Task Load Index (specifically the performance subscale) and the Driver Coping Questionnaire (specifically the Emotion-Focus Subscale) were identified. Together these findings and potential measures provoke new and interesting questions regarding deindividuation and driving.

APPENDIX A: MODIFIED DRIVER STRESS INVENTORY

DSI

Office use only ☐☐☐☐

Please check one box only unless otherwise indicated (do not write in boxes at right margin).

Section A

1. Please state your age in years: _____ ☐☐

2. Please state your gender: Male ☐ Female ☐ ☐

3. What is your highest educational qualification?_____ ☐

4. Please state your occupation:_____ ☐☐

5. Please state the year when you obtained your full driving license: 19____ ☐☐

6. About how often do you drive nowadays?
Everyday ☐ 2-3 days a week ☐ About once a week ☐ Less often ☐ ☐

7. Estimate roughly how many miles you personally have driven in the past year:
Less than 5000 miles ☐ 5000-10,000 miles ☐ 10,000-15,000 miles ☐
15,000-20,000 miles ☐ Over 20,000 miles ☐ ☐

8. Do you drive to and from your place of work?
Everyday ☐ Most days ☐ Occasionally ☐ Never ☐ ☐

9. Please state which of these types of road you use frequently (check one or more boxes as appropriate):
Freeways ☐ Other main roads ☐ Urban roads ☐ Country roads ☐ ☐☐☐☐

10. During the last three years, how many minor road accidents have you been involved in?
(A minor accident is one in which no-one required medical treatment, AND costs of damage to vehicles and property were less than $800).

Number of minor accidents ____ (if none, write 0) ☐☐

11. During the last three years, how many major road accidents have you been involved in?
(A major accident is one in which EITHER someone required medical treatment, OR costs of damage to vehicles and property were greater than $800, or both).

Number of major accidents ____ (if none, write 0) ☐☐

12. During the last three years, have you ever been convicted for:

(a) Speeding	Yes No	☐ ☐	☐
(b) Careless or dangerous driving	Yes No	☐ ☐	☐
(c) Driving under influence of alcohol or drugs	Yes No	☐ ☐	☐
(d) Other moving violation - please specify: _____	Yes No	☐ ☐	☐

APPENDIX B: DRIVER COPING QUESTIONNAIRE

Driver Coping Questionnaire

These questions are concerned with how you usually deal with driving when it is difficult, stressful or upsetting. Think of those occasions during the last year when driving was particularly stressful. Perhaps you nearly had an accident, or you were stuck in a traffic jam, or you had to drive for a long time in poor visibility and heavy traffic. Use your experiences of driving during the last year to indicate how much you usually engage in the following activities when driving is difficult, stressful or upsetting, by CIRCLING one of the numbers from 0 to 5 to the right of each question.

	Not at all					Very much
1. Relieved my feelings by taking risks or driving fast	0	1	2	3	4	5
2. Cheered myself up by thinking about things unrelated to the drive	0	1	2	3	4	5
3. Stayed detached or distanced from the situation	0	1	2	3	4	5
4. Tried to make other drivers more aware of me by driving close behind them	0	1	2	3	4	5
5. Wished that I was a more confident and forceful driver	0	1	2	3	4	5
6. Ignored my feelings about the drive	0	1	2	3	4	5
7. Made sure I avoided reckless or impulsive actions	0	1	2	3	4	5
8. Showed other drivers what I thought of them	0	1	2	3	4	5
9. Drove assertively or aggressively	0	1	2	3	4	5
10. Tried to gain something worthwhile from the drive	0	1	2	3	4	5
11. Showed other drivers I was in control of the situation	0	1	2	3	4	5
12. Made an extra effort to drive safely	0	1	2	3	4	5
13. Felt that I was becoming a more experienced driver	0	1	2	3	4	5
14. Made an effort to stay calm and relaxed	0	1	2	3	4	5
15. Swore at other drivers (aloud or silently)	0	1	2	3	4	5
16. Thought about good times I've had	0	1	2	3	4	5
17. Wished that I found driving more enjoyable	0	1	2	3	4	5
18. Made sure I kept a safe distance from the car in front	0	1	2	3	4	5
19. Went on as if nothing had happened	0	1	2	3	4	5
20. Refused to believe that anything unpleasant had happened	0	1	2	3	4	5
21. Told myself there wasn't really any problem	0	1	2	3	4	5
22. Let other drivers know they were at fault	0	1	2	3	4	5
23. Criticized myself for not driving better	0	1	2	3	4	5
24. Thought about the consequences of having an accident	0	1	2	3	4	5
25. Flashed the car lights or used the horn in anger	0	1	2	3	4	5
26. Felt I was learning how to cope with stress	0	1	2	3	4	5
27. Deliberately slowed down when I met a difficult traffic situation or bad weather	0	1	2	3	4	5
28. Made a special effort to look out for hazards	0	1	2	3	4	5
29. Blamed myself for getting too emotional or upset	0	1	2	3	4	5
30. Concentrated hard on what I had to do next	0	1	2	3	4	5
31. Worried about what I was going to do next	0	1	2	3	4	5
32. Looked on the drive as a useful experience	0	1	2	3	4	5
33. Worried about my shortcomings as a driver	0	1	2	3	4	5
34. Thought about the benefits I would get from making the journey	0	1	2	3	4	5
35. Learnt from my mistakes	0	1	2	3	4	5

APPENDIX C: DUNDEE STRESS STATE QUESTIONNAIRE

Dundee Stress State Questionnaire Subsections

DSSQ QUESTIONNAIRE

General Instructions. This questionnaire is concerned with your feelings and thoughts during the task. Please answer **every** question, even if you find it difficult. Answer, as honestly as you can, what is true of **you**. Your answers will be kept entirely confidential. You should try and work quite quickly. The first answer you think of is usually the best.

Please indicate how well each word describes how you felt **DURING THE TASK** (circle the answer from 1 to 5).

	Not at all = 1	A little bit = 2	Somewhat = 3	Very much = 4	Extremely = 5
1. Energetic	1	2	3	4	5
2. Relaxed	1	2	3	4	5
3. Alert	1	2	3	4	5
4. Nervous	1	2	3	4	5
5. Passive	1	2	3	4	5
6. Tense	1	2	3	4	5
7. Jittery	1	2	3	4	5
8. Sluggish	1	2	3	4	5
9. Composed	1	2	3	4	5
10. Restful	1	2	3	4	5
11. Vigorous	1	2	3	4	5
12. Anxious	1	2	3	4	5
13. Unenterprising	1	2	3	4	5
14. Calm	1	2	3	4	5
15. Active	1	2	3	4	5
16. Tired	1	2	3	4	5

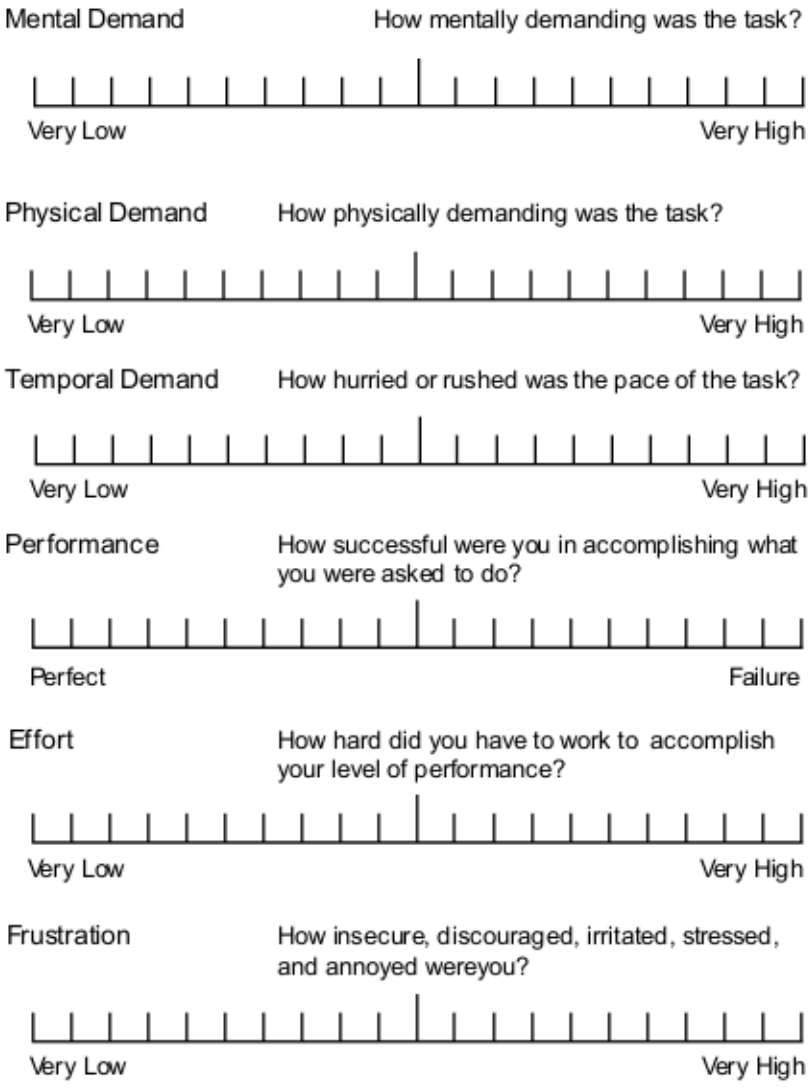
Please indicate roughly how often you had each thought **DURING THE TASK.**

	Never = 1	Once = 2	A few times = 3	Often = 4	Very often = 5

17.	I thought about how I should work more carefully.	1	2	3	4	5
18.	I thought about how much time I had left.	1	2	3	4	5
19.	I thought about how others have done on this task.	1	2	3	4	5
20.	I thought about the difficulty of the problems.	1	2	3	4	5
21.	I thought about my level of ability.	1	2	3	4	5
22.	I thought about the purpose of the experiment.	1	2	3	4	5
23.	I thought about how I would feel if I were told how I performed.	1	2	3	4	5
24.	I thought about how often I get confused.	1	2	3	4	5
25.	I thought about members of my family.	1	2	3	4	5
26.	I thought about something that made me feel guilty.	1	2	3	4	5
27.	I thought about personal worries.	1	2	3	4	5
28.	I thought about something that made me feel angry.	1	2	3	4	5
29.	I thought about something that happened earlier today.	1	2	3	4	5
30.	I thought about something that happened in the recent past (last few days, but not today).	1	2	3	4	5
31.	I thought about something that happened in the distant past	1	2	3	4	5
32.	I thought about something that might happen in the future.	1	2	3	4	5

APPENDIX D: NASA TASK LOAD INDEX

NASA Task Load Index



APPENDIX E: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Gabriella M. Hancock** and Co-PI: **Keith R. MacArthur**

Date: **February 27, 2014**

Dear Researcher:

On 2/27/2014, the IRB approved the following human participant research until 2/26/2015 inclusive:

Type of Review:	UCF Initial Review Submission Form
Project Title:	Timed Driving
Investigator:	Gabriella M Hancock
IRB Number:	SBE-14-10038
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 2/26/2015, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Joanne Muratori

IRB Coordinator

APPENDIX F: IRB APPROVAL LETTER #2

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Gabriella M. Hancock** and Co-PI: **Keith R. MacArthur**

Date: **April 16, 2014**

Dear Researcher:

On 4/16/2014, the IRB approved the following minor modification to human participant research until 02/26/2015 inclusive:

Type of Review:	IRB Addendum and Modification Request Form
Modification Type:	The protocol has been revised as follows: the Exclusion criteria now include individuals who have a history of seizures. In addition, the consent process will now include screening for individuals who have had seizures. Individuals who have a history of seizures will not be able to participate in the study. The revised protocol has been uploaded in iRIS.
Project Title:	Timed Driving
Investigator:	Gabriella M Hancock
IRB Number:	SBE-14-10038
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 02/26/2015, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Joanne Muratori

IRB Coordinator

APPENDIX F: INFORMED CONSENT

Timed Driving

Informed Consent

Principal Investigator:	Gabriella Hancock, M.Sc.
Co-Investigator:	Keith MacArthur
Sub-Investigator:	Ben Sawyer, B.Sc.
Faculty Supervisor:	Peter Hancock, Ph.D
Investigational Site(s):	University of Central Florida, Psychology Department, Room 303D

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being invited to take part in a research study which will include about 100 people at UCF. You have been asked to take part in this research study because you have a driver's license. You must be 18 years of age or older to be included in the research study.

Gabriella Hancock of the UCF Psychology departmentis overseeing this research project. All the researchers are being guided by Dr. Peter Hancock, a UCF faculty supervisor in psychology.

What you should know about a research study:

- This research study will be explained to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you.

Purpose of the research study: The purpose of this study is to evaluate the effects of time pressures on drivers.

What you will be asked to do in the study: This study may ask you to watch instructional videos, complete a series of questionnaires, and participate in a series of short driving simulations.

Location: This study will require you to come to the lab in the UCF Psychology Building, Room 303D.

Time required: We expect that you will be in this research study for approximately 30 to 60 minutes.

Audio or video recording: Your driving simulation will be digitally recorded during this study. If you do not want your trial to be recorded, you will not be able to participate in the study. If you consent to allowing your trial to be recorded, the data will be kept in a locked, safe place for up to 5 years.

Risks: There is a small risk that people who take part will develop what is ordinarily referred to as simulator sickness. It occurs once in a while to people who are exposed to prolonged continuous testing in simulated environments. Symptoms consist of nausea and feeling light-headed. The risk is minimized as a result of the short duration of each session in the simulator. If you experience any of the described symptoms, please tell the researcher or delay the next section and remain seated until the symptoms have abated. If the symptoms do not improve over time please contact UCF Health Services 1-800-613-8544 or 4098 Libra Drive .Orlando, FL 32816-3333

Compensation or payment: There is no payment offered for this study; however extra credit may be assigned by SONA Systems. Once you complete the study, we will send verification to SONA Systems, who is in charge of assigning points to your account.

Confidentiality: Only people who have a need to review your personal data collected in this study will have access to this information. Your identity will be kept confidential. Your information will be assigned a code. All of the information form the study will be kept in a locked filling cabinet or stored on a password protected computer. Your information will be combined with information from other people who took part in this study. When the researcher writes about this study to share what was learned with other researchers, he will write about this combined information. Your name will not be used in any report.

Study contact for questions about the study or to report a problem: If you have questions, or complaints, talk to Keith MacArthur, Undergraduate Student, Psychology Department, College of Sciences, (321) 480-7482 or Dr. Peter Hancock, Faculty Supervisor, Department of Psychology at (407) 823-2310 or by email at keith.macarthur@knights.ucf.edu

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901. You may also talk to them for any of the following:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You want to get information or provide input about this research.

REFERENCES

Asch, S. (1951). Effects of group pressure upon the modification and distortion of judgements. *Groups, Leadership, and Men*, 222-236.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. -G. (2009). Statistical power analysis using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Faul, F., Erdfelder, E., Lang, A. -G., & Buchner, A. (2007). G*Power 3: A flexable statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Festinger, L., Pepitone, A., & Newcomb, T. (1952). Some consequences of de-individuation in a group. *The Journal of Abnormal and Social Psychology, 47*(2S), 382.

Hart, S. G., & Staveland, L. E. (1988). Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research. *Advances in Psychology, 52*, 139-183.

Lee, E. J. (2008). When are strong arguments stronger than weak arguments? Deindividuation effects on message elaboration in computer-mediated communcation. *Communication Research, 35*(5), 646-665.

Lonczak, H. S., Neighbors, C., & Donovan, D. M. (2007). Predicting risky and angry driving as a fucntion of gender. *Accident Analysis & Prevention, 39*(3), 536-545.

Matthews, G., Desmond, P. A., Joyner, L., Carcary, B., & Gilliland, K. (1996, May). Validation of the driver stress inventory and driver coping questionnaire. *International Conference on Traffic and Transport Psychology*, (pp. 1-27). Valencia, Spain.

Matthews, G., Joyner, L., Gilliland, K., Campbell, S., Falconer, S., & Huggins, J. (1999). Validation of a comprehensive stress state questionnaire: Towards a state big three. *Personality Psychology in Europe, 7*, 335-350.

Postmes, T., & Spears, R. (1998). Deindividuation and antinormative behavior: A meta-analysis. *Psychological Bulletin, 123*(3), 238.

Singer, J. E., Brush, C. A., & Lublin, S. C. (1965). Some aspects of deindividuation: Identifaction and conformity. *Journal of Experimental Social Psychology, 1*(4), 356-378.

Zimbardo, P. G. (1969). The human choice: individuation, reason, and order versus deindividuation, impulse, and chaos. *Nebraska Symposium on Motivation, 17*, 237-307.