ABSTRACT

Title of Thesis:	PHYSIOLOGY AND COPS: THE EFFECTS OF PHYSIOLOGICAL IMPAIRMENT ON POLICE BEHAVIOR
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Questions surrounding police reform and police behavior are now a constant part of American policy discourse. Research has been conducted about effective policing, methods to connect communities and their police, and the problems within the police system. However, little research has been done on the physiology of police and the impact that impaired physiology has on police behavior. This research begins to fill that gap.

To investigate this relationship, I use data from the University of Maryland's Lab for Applied Social Sciences Police Research Study that tests police interactions with civilians using virtual reality. Using binary measures of physiological standards, I evaluate the impact of being hungry and fatigued on police disrespect towards civilians. Results are analyzed through cross tabulations and correlational analyses. The data show that officers presenting with both physiological impairments are also likely to be those displaying disrespectful behavior. The officers who showed fatigue

were also those likely to display disrespectful behavior. The results of the impact of hunger are inconclusive.

Knowing the impact of easily managed physiological traits on police behavior can inform policy reforms for police practice. Mandated sleep and eating requirements as well as changes in policy in order to shorten officer's work days can reduce irritable officers in the field and in turn reduce police behavior viewed as inappropriate and aggressive by the general public. Policy changes of this nature would likely be welcomed by police unions, something that is uncommon in most areas of potential reform.

PHYSIOLOGY AND COPS:
THE EFFECTS OF PHYSIOLOGICAL IMPAIRMENT ON POLICE BEHAVIOR

by

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Thesis submitted to the Department of Criminology and Criminal Justice at the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of

Bachelor of Arts
2021

Acknowledgements

First, I would like to thank my parents and brother for their constant support throughout this project and life. I would like to thank Dr. Bianca Bersani for her never-ending willingness to answer every question I had and be someone I knew I could go to for any assistance throughout the past two years of school. I would like to thank Kristin Reque for always being a relatable perspective on school and life. Additionally, I would like to thank Dr. Rashawn Ray for trusting an undergraduate to work in his lab and starting me on the path to success. Thank you to Dr. Long Doan and the rest of LASSR for allowing me to be a part of your work group and never thinking my questions were too stupid to answer. Finally, thank you to this honors cohort for always laughing at my terrible jokes and being the best group of people to learn from for the past two years.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Historically, but especially in the current political climate as the United States is still grappling with racial equity one year after the killing of George Floyd, the occupation of policing and the role of police in the United States has been debated. Questions are present about the necessity of the police, the role they should play in enforcing laws, and the rights officers have over civilians. Common criticisms shared about the police include issues such as over-policing, hyper-surveillance, police brutality, and perceived illegal search and seizure. Concerns about the role of police are found especially amongst minority communities to whom the police have a history of over patrolling and arresting (Reinka and Leach, 2017, P. 769).

Research is routinely conducted to determine areas of policing that need reform to ensure safety for civilians, as well as to improve police-community relations. Prior research on police citizen interactions has shown that trust in police can be easily dismantled and less easily built (Avdija, 2010). Other research has looked into overuse of force and actions of civilians that can lead to police use of force (Chaney and Robertson, 2013). Work has even been done on the effects of stress on police actions (Hope, 2016). However, little work has been done on the more easily regulated areas of physiology such as hunger and fatigue.

In this paper I approach this gap in research from a community policing perspective. Using the argument that positive interaction with police leads to more trust in police and their responsibilities in a community, I evaluate the effects of impaired physiology on police behavior. People joke that they get "hangry" when they have not eaten for a while. This self-defined mood combines hunger and anger to

describe the cranky behavior of those experiencing it. This informal reference and understanding helps explain the body of research examining the effects of physiology on people in other high stress jobs. For example, research has explored the effects of fatigue on the motor and personal skills of people in the occupations of "aviation, healthcare, and military" (Hope, 2016, p. 240). A noticeable gap in the research is the effects of fatigue and hunger on police officers. This is particularly surprising given that policing can involve high stress situations that often involve interactions with community members in addition to working long hours not conducive to sleep and eating. In an attempt to fill the gap left by the lack of prior research on this topic, this paper seeks to determine if impaired physiology is associated with an officer's use of disrespectful behavior on the job.

This study investigates the effects of fatigue and sleep disruption as well as hunger on police attitudes towards civilians. As police officers hold state sanctioned power in their interactions with civilians, understanding how the physiology of the officer impacts their mood can provide an understanding of what may make officers less respectful in their patrols. The goal of this research is to assess if hungry and fatigued police officers are less respectful than their counterparts who have recommended sleep and hunger levels. Findings from this research could inform policy reforms intended to improve the physiology of officers and potentially improve their behavior among civilians.

Chapter 2: Literature Review

The History of Community Oriented Policing

Criticism about police behavior and effectiveness has led to many questions surrounding police community trust and reforms. As new reforms have been floated and adopted over time, one has stuck around in a variety of forms. Community Oriented Policing (COP), also known as community policing, became prevalent in the mid 1990's as a way to increase community interaction and trust with the police (Bureau of Justice, 1994:1). The thought was that instead of the police having only a punitive presence, they would also have a presence in community actions that increase cooperation like community meetings and neighborhood watch types of programs (Peyton et al, 2019:19894). Theoretically, this increased interaction with the police would lead to enhanced police community relations and the community would be more likely to trust and assist the police. According to the official Department of Justice Community Oriented Policing Services website, community policing also works to address the non-criminal underlying issues in a community, such as lack of resources, and assists the community and local government in allocating resources (DOJ, N.D.).

The Effectiveness of Community Oriented Policing

There are varying reports about the effectiveness of Community Oriented Policing for many reasons. First, it is unclear if these approaches work in all sized departments. Smaller departments are known to have close ties with the communities they serve so implementation of specific COP benchmarks may not be effective as they are likely already being met (Paez and Dierenfeldt, 2020:143). Secondly, the forms of interaction that build the most trust among police and the civilians they serve

have yet to be determined. It has been shown that social media use by departments works to increase confidence and satisfaction from the public (Williams et al, 2018:212). Social media use is good in that it creates contact points with many civilians at once, but still lacks the direct personal interaction that is a goal of COP. Research into COP has also shown that although the broad effects of community policing are unknown, youth are the mostly likely to feel the positive impacts of COP changes and policies, an effect for which the implications are unknown but could perhaps lead to more community trust in police over time (Rukus et al, 2018:1873).

Another potential hindrance to the effectiveness of Community Oriented Policing is officer participation in changed strategies. It has been found that not all officers are supportive of COP strategies (Kearns, 2017:1215). Variance in views has been shown within department, within years of service and years of education, and within race of the officer (Kearns, 2017:1215). Views on COP based on the race of the officer are perhaps most telling as officers who view a large social gap between themselves and the minority communities they serve are often less supportive of COP strategies in minority neighborhoods (Kearns, 2017:1225). Officers are also granted more autonomy in dealing with minor violations or actions in COP districts (Kearns, 2017:1215). Autonomy which officers might not want as it could mean more opportunity to do something that is later on viewed as a mistake. Knowing this, it is evident that hesitation to attempt the potentially effective COP strategies is present in police forces. The implications of this reluctance are not yet known but could include resistance to increased community interaction.

Building Trust in Community Oriented Policing

No matter how officers feel about Community Oriented Policing, COP ideals cannot be met if the police do not have the trust of the population they serve. If civilians are unwilling to call for help, provide descriptions and witness statements, or respect police requests, the effectiveness of police is greatly diminished. Because of this, there is an increased body of literature focusing on police civilian trust and what can increase or decrease this connection. Research has found that the previous interactions people have had with police also have a lasting effect on their willingness to trust police (Goldsmith, 2005:447). It has also been shown that it is not just the individual experiences that a person has had with police but also the interactions of their family and friends that also impact a person's perception of police (Goldsmith, 2005:454). If a police officer does something perceived as not procedurally just, not only will the person who saw the action be affected by it but their entire network's perspective on police will likely be changed. Knowing that people's interactions with police have long term effect on their perception of police becomes more relevant when situated within the frame of negative experiences. Avdija (2010:77) showed that negative police experiences can lead to fear of police which subsequently decreases the trust someone has in police. Therefore, in order to increase trust of the police, there should be an enhanced focus on respectful and polite interactions with the greater public (Avdija, 2010:85). Based on these conclusions, it can be assumed that increased trust of police can lead to stronger police community relations, more assistance from communities and stronger community pride in their police force.

How Physiology Relates

As Community Oriented Policing is a framework built upon police interactions with the communities they serve, it is important to understand what can affect the interaction. As previously noted, when officers appear disrespectful or rude in their interactions with civilians, there can be a negative impact that leads to distrust of the police (Avdija, 2010:77). Therefore, it is important to determine what controllable outside forces can lead to negative interactions with police officers. This is where physiology comes in. Physiology, whether it be stress, fatigue or hunger, has been shown to affect officer mood and actions. Increased cardiovascular arousal, which can come as a result of increased fatigue or stress, has been linked to the unnecessary use of lethal force (Andersen et al, 2018:867). On the other hand, insufficient arousal can lead to missing cues in the field which have endangered police lives (Andersen et al, 2018:867). Fatigue has been shown to make officers sluggish, irritable, forgetful and more likely to act fast (Vila 2000; Hope, 2016). Hunger has been known to increase irritability and lower self-control (Danzinger et al, 2011; Gailliot and Baumeister, 2007). Both fatigue and hunger have been proven to affect stress levels which effects reaction speed and irritability (Andersen et al, 2010:872). These levels of increased stress found in police are higher than the civilian population and continue to increase (Planche et al, 2019:264). Overall, impaired physiology has been shown to lead to increased irritability and decreased effectiveness in police, both of which are effects that can harm Community Oriented Policing efforts.

In the end, healthy, productive cops are a key to creating positive police community relations. Upon that foundation sits a greater likelihood for positive interactions with civilians which is a backbone for community trust in police. Community trust in police is necessary for the partnership that community-oriented policing idealizes and works as a result of (figure 1). Should a physiologically impaired police officer be in a stressful situation they are more likely to act brashly and create situations of distrust. For this reason, it is important to understand the impact of hunger and fatigue on police officers and it's tipping point like ability to cause problems with COP from a single interaction.

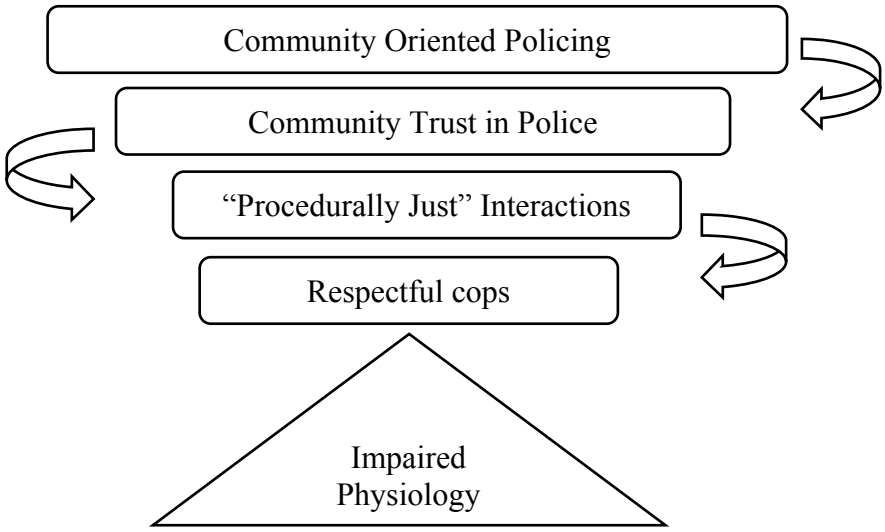

Figure 1: The Tipping Point Effect of Impaired Physiology

A Focus on Fatigue and Hunger

The majority of the research previously done in this field was conducted by Bryan Vila in his 2000 "Tired Cops" study. Though many things have changed about policing since 2000, such as public attention to police actions and increased federal oversight, this is the only previous research done on this specific intersection of

fatigue and police behavior and therefore is the most relevant existing research. Vila (2000) interviewed more than 350 officers from across the U.S. about the impacts of fatigue and sleep disruption on policing behavior. His findings indicated that tired officers are worse officers in a variety of ways. He cites decreased focus, increased potential for accidents, increased irritability and increased propensity to violence as effects of fatigue. Since then, more research has found that "fatigue is a well-known risk factor for injury, yet the scientific literature documenting the prevalence of fatigue among officers…is limited" (Fekedulegn et al, 2016:43). Understanding the prevalence of sources of fatigue from existing research provides foundational background for this current research. The prevalence, causes, and effects of fatigue and hunger are all important to understand in determining the implications of fatigue on behavior.

Prevalence and Sources of Fatigue

A fundamental human need is quality sleep. Common understanding suggests that most people need between seven and eight hours of sleep each night (Vila, 2006). However, Vila (2006:975) found over 50% of his sample averaged less than six and a half hours of sleep. For officers, the sleep quality in that representative study indicated overall poorer sleep quality and duration compared to the general public. In Fekedulegn et al (2016) 57% of the officers in their study population reported poor sleep quality as measured by the Pittsburgh Sleep Quality Index questionnaire, the tool used in a variety of fields to measure quality of sleep.

Physiological causes of fatigue come from a variety of sources. Fekedulegn et al (2016) provide the best explanation of fatigue for understanding its impact on

police behavior. “Fatigue is best viewed as a continuum” they state. On the lower end of the continuum, fatigue presents in acute situation where stress increases and the effects of fatigue are felt; however, on the high-end, fatigue can exist as a chronic condition impacting all aspects of one’s life (Fekedulegn et al, 2016:44). Fatigue’s impacts can also be measured using sleep disruption as an indicator. Vila (2006) also offers a body of evidence showing how human performance is diminished by sleep factors such as disruption of a person’s circadian rhythm and not getting enough sleep.

A variety of factors contribute to the prevalence of fatigue in policing, many of which are common police behaviors such as long and varying shifts, overtime, and commute length. Longer shift lengths, especially those over 13 hours, can lead to increased fatigue (Bell et al, 2015). Another external factor that increases fatigue is working overtime. For police this comes both from working overtime within their department and moonlighting as security for other jobs to increase income. Overtime increases fatigue “both by increasing the amount of work performed beyond normal levels, and by disrupting sleep patterns” (Vila, 2000:23). Finally, a large proportion of officers live far from the communities they serve. This leads to longer commute times which Vila (2000) linked with increased fatigue because of its impact on how much time officers are able to spend with families and recuperating from past shifts. It also leads to an increased likelihood that the community they serve has a different culture from the one they live in. This can mean that civilian actions are perceived differently than intended. For example, someone talking while gesticulating could be perceived as threatening motions by an officer used to more subdued conversation.

Impacts of Fatigue on Police

Most importantly for this paper, fatigue has been shown to directly affect the mood and mentality of an officer. On the most basic level "tired people are more irritable and prone to anger" (Vila, 2000:26). Police are also "more likely to make bad decisions, crash cars, and be cranky when tired" (Vila, 2006:973). Fatigue can lead to increased irritability in officers which can result in poor responses to community engagement in the field. In terms of officer mental health, anxiety and fear can also be increased by fatigue which can lower officers "ability to deal appropriately with complex situations" (Vila, 2000:26). This could lead to potentially fatal actions if an officer were to misidentify a held object as a weapon and act accordingly.

One of the well documented impacts of fatigue is the impairment of memory. Hope (2016:242) touches on this effect saying that "impairment in terms of response and memory performance" are the results of fatigue and fatigue-related stress. Bell et al (2015) also referenced fatigue's impact on memory stating that fatigue has consequences that lead to impairment in both short- and long-term memory, focus and other executive functions. Impaired memory in policing can lead to short term problems like being unable to recall a suspect description. Memory impairment can also have long term effects when police are asked to remember an interaction with a suspect at a later court date or for a formal report. Impaired memory can lead to officers filling the blanks with common perceptions or mis-remembered details. Implications of this include misremembering or misidentifying the race or height of a suspect which could lead to innocent civilians being pursued in investigations.

Fatigue has also been linked to job-related accidents and injury. The rate of injury in law enforcement is one of the highest when compared with other occupations (Fekedulegn et al, 2016). Vila (2000:88) found that "four of eight officers who had accidents or were injured on the job… were fatigue impaired on the day of the incident". Fatigue rates having been measured by the FIT eye scanner system that uses comparative eye-performance standards to measure fatigue in a person (Vila, 2000). Similarly, in Fekedulegn et al (2016) BCOPS study, officers who did not feel alert were more that 50% more likely to get injured than their coworkers who reported feeling alert. Understanding that most accidents are linked to fatigue is even more important after learning that officers die more often of accidents than from criminal assaults (Vila, 2006).

In addition to the physical impacts of fatigue, judgement in stressful situations has also been shown to be negatively affected. James (2018) found that implicit bias can also vary based on fatigue in that officers were more likely to associate Black men and weapons on implicit bias tests when tired than the same officers were after a night of good sleep. Implicit bias is known to be deeply ingrained into human psyche; therefore the understanding that fatigue has the power to change it shows how powerful short-term and long-term loss of sleep is. Additionally, research has been done about the effects of fatigue on soldiers. Conclusions from this research include that tired soldiers "can shoot and shoot accurately but no longer can distinguish friend from foe" (Vila, 2000:26). Applying this to police, who often do not know the civilians with whom they are interacting, this conclusion becomes even more impactful.

Fatigue's negative effects are often compared to the impact of drinking alcohol. Being awake for 17 hours can affect actions similarly to the impact of a blood alcohol content (BAC) of 0.05% while being awake for 24 hours provides the effect of a BAC of 0.1% (Vila, 2000). Bell et al (2015) report that sleep deprivation can have an impact greater than that of alcohol when it comes to tasks such as driving, hand-eye coordination, and cognitive performance. Duke et al (2011) have found a positive trend between increasing BAC and increased aggression similar to the trend of increased BAC and decreasing motor skills. It is possible that fatigued police officers also feel increased aggression when their performance begins to mimic that of someone with a high BAC.

Impacts of Fatigue on Policing

Fatigue also changes the way officers do their jobs, leading to different actions while they are on active patrol. Vila (2000:27) brings this to its extreme in writing that "excess fatigue seems especially likely to increase the probability of what is loosely called 'police brutality'". This link between fatigue and police brutality indicates that a reduction in fatigue could lead to less incidents of police brutality. Bell et al (2015) measure the effect of different shift lengths on fatigue and other variables. They find that those with longer shift lengths are normally more tired on the job and in turn conduct more field interrogations as ways to stay awake. Those officers on the longer shifts also booked significantly more adults, perhaps a direct response to the increased rate of field interrogations (Bell et al, 2015). A study on police behavior in San Diego showed that about 15% of arrests on patrol came from random field interrogations, which supports the idea that the increase in field

interrogations leads to an increase in arrests (Boydston, 1975). Additionally, when officers work varying shifts, they are unable to develop rapport with their patrol communities and therefore are less able to be effective from the mindset of community policing (Vila, 2000). The lack of rapport-building means the residents in these communities are less likely to know which officers they can rely on and feel safe with. Thus, the ideals of community policing, in which a connection between residents and officers reduces negative police civilian interaction, cannot be met.

Impacts of Hunger on Police and Policing

As fatigue has been shown to impact officers, there is also a question about other physiological determinants of police behavior such as hunger. Though there is not much background literature on this question, a similar study with relevant conclusions was done with judges. Danzinger et al (2011) showed that parole judges were more likely to provide a favorable ruling when then had eaten recently, either after breakfast, lunch or a snack break. This conclusion is supported by physiology research indicating that an empty stomach, which generates the feeling of hunger, means a person is low on glucose which directly affects aggression and self-control. Gailliot and Baumeister (2007) described this pathway saying that glucose levels rise after eating which impacts self-control as it is the presence of glucose in the body that provides energy to one's brain. They add that self-control is an unusual human action because of it requires more spent energy than other human processes. Because of these connections, low glucose can lead to aggressive behavior. Additionally, and especially important for policing, because "self- control allows people to suppress prejudice and stereotypes toward out-group members", lowered self-control brought

on by low glucose could be a factor in race related incidents in policing (Gailliot & Baumeister, 2007:321).

Chapter 3: Data and Method

The Current Study

As the background literature shows, physiological deficiencies can significantly impair memory and judgement. These deficiencies also make people more prone to anger. These detriments may be more pronounced among those working in high-risk occupations. Research has established that fatigue is common among police and, though limited, empirical research suggests that tired officers have a higher likelihood of impairment while doing their jobs. While there is an indication that physiological deficiencies may influence police and policing, available research has focused solely on the impacts of sleep deprivation. This research builds on this body of research in two keyways. First, I expand the physiology indicators to include hunger as well as fatigue. Second, I examine whether the accumulation of multiple deficiencies is associated with police behavior. Drawing on prior research, it is expected that physiological impairment for officers will be correlated with disrespect shown in their interactions with civilians. Specifically, I hypothesize:

Hypothesis 1: sleep deprivation is positively associated with disrespectful behavior.

Hypothesis 2: hunger is positively associated with disrespectful behavior.

Hypothesis 3: sleep deprivation combined with hunger is positively associated with disrespectful behavior.

Data

The data used in this paper comes from the University of Maryland Lab for Applied Social Science Research's policing study. For the main study, the team worked with departments across the country to recruit 79 officers to participate in the

research. The officers came from departments across the Mid-Atlantic, Southern and Mid-Western regions of the United States. Departments were of varying sizes and could send as many officers as were willing to participate. Not all contacted departments agreed to send officers due to time constraints exacerbated by the length of the experiment. Officers participated in four virtual reality scenarios. One which served to train officers on how to use the virtual reality equipment and three which represented realistic in the field policing interactions.

The experiment began with an onboarding session where officers learned how to use the virtual reality software and their virtual tools. Afterwards, each officer went through three realistic scenarios in random order. These scenarios were a domestic house call, a suspicious person call at a public bus stop and a convenience store robbery call. Throughout this paper these scenarios will be referred to as the house, the bus and the store scenes respectively. Upon being placed into a scene, the officer received call instructions from the system then was free to walk around the responding location and interact with the person of interest. The preprogrammed artificial intelligence led the person of interest through over 1,700 possible responses based on the officer's tone, words, distance from the person of interest, and previous questions during the interaction. Though the officers did not know it, the research assistants manipulated race (black or white) and gender (man or woman) based on predetermined, randomized study conditions.

Analytic Sample

Questions about physiology were added later in the experimental timeframe and is available for 37 officers (47% of the full sample). The analytic sample over-

represents the population of African American police officers in the country according to the Bureau of Justice Statistics (BJS) which cites that 11.4% of sworn officers in 2016 were African American. This sample is fairly representative for white officers as BJS reports as 71.5% of sworn officers as white in 2016. Hispanic/Latino officers are severely underrepresented in this sample with BJS documenting 12.5% of the police officers in the US as Hispanic/Latino. This sample also slightly overrepresented male officers subsequently under-representing female officers as BJS reports the rates at 87.7% and 12.3% respectively (Hyland, 2016). Officers also had varying levels of experience with 29.73% of officers having spent between 0-5 years on the job, 18.92% of officers having spent 6-10 years on the job, 27.03% of officers having spent 11-15 years on the job and 24.32% of officers had spent 20 or more years on the job

Table 1- Demographic Makeup of Sample, n=37

Demographic	Responses	Frequency	Percentage
Race	African American	11	29.73
	Hispanic/Latino	1	2.70
	White	25	67.57
Gender	Male	33	89.19
	Female	4	10.81
Age	18-24	5	13.51
	25-34	8	21.62
	35-44	12	32.43
	45-54	11	29.73
	55+	1	2.70
Education (Highest Completed)	High School	5	13.51
	Some Post-Secondary	15	40.54
	Associates	6	16.22
	Bachelors	11	29.73
Experience (Years on the Job)	0-5	11	29.73
	6-10	7	18.92
	11-15	10	27.03
	20+	9	24.32

Measures

For the purposes of this study, the AI program determined a score of differential treatment that indicated respect or disrespect from the officer to the person of interest. This score, referred to as a deference score, was determined based on officers using respectful and tone neutral language. The determination of disrespectful or respectful language is made by the programmed artificial intelligence (AI) based on conclusions on the intentions of words and phrases drawn by Voigt et al (2017) from analyzing body worn camera footage. Voigt et al's work was done in Oakland, CA and covered interactions between police and people of varying race, age and socio-economic status. Though objective respect is an imperfect measure, concerns about interpretations of respect based on race or age are met by the original study as it was conducted in a variety of locations with various regional speech patterns and vernacular changes based on race and age. Our team has also analyzed the efficacy of the AI's interpretation to determine how accurately the AI understood the words said by the officers participating. We found negligible differences between what the AI transcribed as officer responses and what research assistants transcribed as officer responses (Doan et al, in progress). This indicates that AI reactions were correctly determined based on what officers said and removes some hesitation as to the use of AI in this type of program. Also factored into the deference score is the distance from the person of interest the officer was standing during each spoken interaction and the volume at which they spoke to the person of interest. These parts of the interaction, for every sentence spoken, were then summed by the computer program and assigned a score from -1 to 1, with -1 representing the value where

everything said and done was disrespectful and 1 being everything said and done was respectful. The assigned deference score serves as the dependent variable for the experiment.

Each officer in the study was assigned four deference scores. These deference scores are the averages of their computer assigned deference scores for the three simulations combined as well as each individual simulation. Although the values for these deference scores can range from -1 to 1, the minimum average score received was -0.142 and the maximum average score received was .219. Between the four sets of scores, no average score was in the negative range, meaning no scenario averaged a disrespectful response. The average for the bus scene was lowest, and the house scene was highest. The summary statistics for the deference scores are found in Table 2.

Table 2: Summary Statistics of Deference Scores, n=37

Simulation	Mean	Std. Dev.	Min	Max
Overall	0.015	0.037	-0.050	0.103
House	0.017	0.039	-0.085	0.112
Store	0.016	0.055	-0.109	0.178
Bus	0.008	0.056	-0.142	0.219

(Dis)respect. The deference scores were operationalized as either respectful or not. To code these variables, each officer's four deference scores were assigned a dichotomous variable for if they were, on average, positive (indicating respectful) or negative (indicating disrespectful).

Officers were then assigned a dichotomous value for whether they acted disrespectfully in any of the three scenarios. 11 officers were not disrespectful on average in any scenario, 17 were disrespectful on average in one scenario, 7 officers

were disrespectful on average in two scenarios and 2 were disrespectful on average in all three scenarios (Table 3). A strong majority of respondents (70.27%) had at least one scene coded as disrespectful.

Table 3: Frequency of Disrespectful Averages, n=37

	Frequency	Percentage
0 Scenarios	11	29.73
1 Scenario	17	45.95
2 Scenarios	7	18.92
3 Scenarios	2	5.41

Table 4: Distribution for any Scenario with Disrespect, n=37

Was the officer disrespectful in any scenario?	Frequency	Percent
No	11	29.73
Yes	26	70.27

To measure the physiology of each officer, officers were asked three questions before the simulations began. The questions were framed as important in case they became dizzy while participating in the simulations. To measure *mood*, they were asked to rank their flight, which happened either that morning or the day before, as either excellent, very good, good, fair, or poor. However, it was determined that this question did not have enough validity or reliability to be used for this study as a determinant of officer mood.

Fatigue. To determine short-term fatigue, officers were asked how many hours of sleep they had the night before to the study. Responses to the sleep question ranged from three hours of sleep the night before to nine hours of sleep the night before.

Hunger. To determine hunger, officers were asked the last time they ate a full meal. The provided responses were this morning, late last night, last evening, and lunch. Based on the response to this question and the time at which the person began their experiment, the number of hours since they had eaten was determined for each officer. Because the original question asked about meals, traditional mealtimes were assigned to each answer. The response "this morning" was given a time stamp of eight am, "late last night" was given ten pm, "last evening" was six pm, and "lunch" was assigned twelve pm.Responses ranged from one hour since the officer ate their last meal to twenty-four hours since the officer ate their last meal. On average, officers reported getting less than 6 hours of sleep the prior night and having nearly 12 hours elapsed since their last meal (see Table 5).

Table 5: Variable Summary Statistics, n=37

Variable	Mean	Std. Dev.	Min	Max
Hours of Sleep	5.89	1.66	3	9
Hours since last meal	11.78	6.43	1	24

Because the goal of this study is to determine if being hungry or fatigued while on duty affects an officer's respect towards civilians, these variables needed to be effectively operationalized to show hunger and fatigue. Based on sleep data indicating that people need a minimum of seven hours of sleep a night, each officer was assigned a binary value for did get enough sleep (0) or did not get enough sleep the night before (1). For hunger, research shows that it takes eight hours for glucose to become depleted and bodies to start functioning off of reserves. Based on the information about the link between self-control and glucose mentioned in the literature review, it is therefore valid to code officers who have not eaten a full meal

within eight hours as hungry (1) and those who have eaten a full meal within eight hours as not hungry (0) (see Table 6).

Table 6: Distribution of Physiology Dichotomous Scores, n=37

	Freq.	Percent
Fatigue		
7 or more hours of sleep	14	37.83
Less than 7 hours of sleep	23	62.27
Hunger		
Eaten within 8	16	43.24
Not eaten within 8	21	56.76

Finally, to determine if there was a compounding effect of being both tired and hungry, an overall physiology score was assigned to each officer. This was determined by adding together their binary scores for hunger and fatigue. As based on the sample data it is unlikely that an officer has both eaten a meal within eight hours and slept seven or more hours the night before. Officers were coded based on whether they met both guidelines (0) or did not(1). If they did not meet both guidelines, they were coded as having impaired physiology (see Table 7).

Table 7: Distribution for Impaired Physiology, n=37

Impaired Physiology	Frequency	Percent
No	5	13.51
Yes	32	86.49

Chapter 4: Results

To address hypothesis 1, sleep deprivation is associated with disrespectful behavior, a cross tabulation test was conducted. The test shows that the highest concentration of officers as being both sleep impaired and disrespectful. Table 8 reports the cross-tabulation between sleep and disrespectful behavior which indicates that there is a relationship between being tired and being disrespectful among the officers sampled. These conclusions support hypothesis 1.

Table 8: Cross-Tabulation Sleep and Disrespectful Behavior, n=37

	Enough Sleep (Percentage)	Not Enough Sleep (Percentage)
No Presence of Disrespectful Behavior	5 (13.51)	6 (16.22)
Presence of Disrespectful Behavior	9 (24.32)	17 (45.94)

Hypothesis 2 is that hunger is positively associated with disrespectful behavior. This was also addressed through a crosstabulation test as shown in Table 9. This test showed an equal split of those who showed disrespectful behavior between officers who had eaten within 8 hours and officers who had not. The conclusions drawn from this table do not support hypothesis 2.

Table 9: Cross-Tabulation Hunger and Disrespectful Behavior, n=37

	Eaten within 8hrs (Percentage)	Not Eaten within 8hrs (Percentage)
No Presence of Disrespectful Behavior	3 (8.1)	8 (21.62)
Presence of Disrespectful Behavior	13 (35.13)	13 (35.13)

To determine if there is an indication of a relationship between compounded impaired physiology overall and disrespect, a two-way cross tabulation was again constructed. The table shows that in the majority of cases in which the officer is physically impaired, they show disrespectful behavior in at least one of the scenarios they went through. This statistical conclusion again indicates that there is a relationship between the variables and therefore a relationship between the presence of disrespectful behavior and impaired physiology. The cross tabulation is included in Table 10.

Table 10: Cross Tabulation Impaired Physiology and Disrespectful Behavior, n=37

	Not Physiologically Impaired Frequency (Percentage)	Physiologically Impaired Frequency (Percentage)
No Presence of Disrespectful Behavior	2 (5.41)	9 (24.32)
Presence of Disrespectful Behavior	3 (8.11)	23 (62.16)

Then, to determine if there is a measurable, significant relationship between the deference score assigned to an officer and their physiology at the time of interaction, correlation was measured through pairwise correlation test. Although the correlation does not show that the relationship meets significance levels, there is a consistent positive correlation between the presence of officers being disrespectful and impaired physiology. The strength of the associations are weak with the exception of the Store scene which approaches a moderate level of correlation (Cohen, 1988). The results of the pairwise correlation can be found in Table 11.

Table 11: Pairwise Correlation of the Presence of Disrespectful Behavior and Impaired Physiology, n=37

	Presence of Disrespectful Behavior			
	Total	House Scene	Store Scene	Bus Scene
Presence of Impaired Physiology	0.0888	0.0625	0.2739	0.0044

There is also a consistent result seen in the correlation with the individual scenes that impaired physiology correlates with a more likely presence of disrespect. Although the results from this statistical measure are not strong enough to prove causation, their consistency in direction and presence does indicate that there is a correlation between impaired physiology and disrespect. Additionally, the *r* value suggests that the strength of the effect, while small, is present across all scenarios. This finding is consistent with the hypothesis that physiological impairment increase disrespectful response. The lack of statistically significant conclusion can be attributed to the small sample size of the experiment. Future research should build upon this finding with a larger sample.

Chapter 5: Discussion and Conclusion

Consistent with prior research, sleep deprivation in isolation or in combination with hunger was common among officers in this study. The relationship between hunger and behavior, as illustrated in the literature review, is not conclusive based on this data analysis. There is some relationship shown between hunger and behavior, but it is unclear how strong the relationship is and if it is connected. Overall, the data gathered in this paper indicates that there is a relationship between sleep deprivation and hunger that is positively associated with disrespectful behavior. Officers who answered that they were physically impaired more commonly displayed disrespectful behavior in at least one scenario. Correlation analysis also indicated that there is a positive relationship between impaired physiology and the presence of disrespectful behavior. The hypothesis that physical impairment, through sleep deprivation and hunger, leads to disrespectful behavior is therefore supported.

Implications

As mentioned earlier, policing is under constant scrutiny from both outside and within the law enforcement world. Because of this, it is important to note that something as simple as eating more and sleeping more can create positive change in police behavior and attitudes. Police administrators and policy makers can look to this research to guide further changes in police procedure. This research shows that regularly eaten meals have an impact on behavior, therefore mealtime should be scheduled in police shifts and mandated. This seems like a change that both unions and administrators alike would appreciate as it would also allow for officers to live healthier lives. In regard to fatigue, it is clear that officers are tired. Research outside

the policing field combined with this research shows effects such as increased irritability, memory loss and increased bias in fatigued people. Police policies should be changed to include, and perhaps even mandate, sleep benchmarks. Shift length should also be reduced so that sleep benchmarks can be met. Finally, overtime policies should change so that officers do not have the ability to bypass sleep regulations by working in other areas.

Limitations

Various factors provided limitations to this study. For one, although a sample of 37 experiment participants is a good experimental sample size, it would have been better to have the full 79 participant sample included in this dataset. An increased sample size would have made it easier to understand if the varied responses were due to random error or causal differences. Future research should involve a larger sample size to increase the data set. Another limitation was that the hunger question was asked in ways that forced inferences to be made. The provided responses to the question were this morning, late last night, last evening, and lunch. Because of this, I had to assume the time at which these meals were eaten and calculate the time difference between the meal and the experiment taking place. In future research this should be remedied by asking how long ago an officer ate a full mean as opposed to what meal it was.

Future Directions

As this research has very strong potential to lead to simple policy changes with lots of impact, it should be continued in various forms. An experiment similar to this one should be carried out with a larger sample and controlled eating and sleeping

variables. This would allow for a causal inference to be made. Additionally, there should be research done in police units about the amount of sleep officers are getting and comparing it to their actions to measure the on-the-job impact of fatigue. Overall, as the requirement for more sleep and more eating is likely something police unions will agree to, the connection between impaired physiology and police behavior should continue to be explored as a potential tool for police reform.

Conclusion

As mentioned in the introduction to this thesis, we are at a time where the role of police and the regulations on policing are in constant debate. Conversations on what to do about police range from complete abolition, to defunding, to procedural reform strategies. This research looks at reform from a different perspective, which human biological processes can be controlled to increase the reliability of officers in the field. The conclusions from this project provide evidence that physiological impairment may be implicated in officer disrespect. While not a catch all for police reform, understanding the impact of physiological impairment on behavior and how the body's processes can be regulated for better behavior could be a tool in creating meaningful police reform.

References

Andersen, Judith Pizarro, Paula Maria Di Nota, Brett Beston, Evelyn Carol Boychuk, Harri Gustafsberg, Steven Poplawski, and Joseph Arpaia. 2018. "Reducing Lethal Force Errors by Modulating Police Physiology." *Journal of Occupational and Environmental Medicine* 60(10):867–74. doi: 10.1097/JOM.0000000000001401.

Avdija, Avdi S. 2010. "THE ROLE OF POLICE BEHAVIOR IN PREDICTING CITIZENS' ATTITIDES TOWARD THE POLICE." 15.

Bell, Leonard B., Thomas B. Virden, Deborah J. Lewis, and Barry A. Cassidy. 2015. "Effects of 13-Hour 20-Minute Work Shifts on Law Enforcement Officers' Sleep, Cognitive Abilities, Health, Quality of Life, and Work Performance: The Phoenix Study." *Police Quarterly* 18(3):293–337. doi: 10.1177/1098611115584910.

Boydston, John E. n.d. *San Diego Field Interrogation*. Police Foundation.

Bureau of Justice Assistance. 1994. *Understanding Community Policing: A Framework for Action*.

Chaney, Cassandra, and Ray V. Robertson. 2013. "Racism and Police Brutality in America." *Journal of African American Studies* 17(4):480–505. doi: 10.1007/s12111-013-9246-5.

Cohen, Jacob. 1988. "Set Correlation and Contingency Tables." Applied Psychological Measurement 12(4):425–34. doi: 10.1177/014662168801200410.

Danziger, Shai, Jonathan Levav, and Liora Avnaim-Pesso. 2011. "Extraneous Factors in Judicial Decisions." *Proceedings of the National Academy of Sciences* 108(17):6889–92. doi: 10.1073/pnas.1018033108.

Doan, Long, Rashawn Ray, Connor Powelson, Genesis Fuentes, Rebecca Shankman, Shaun Genter, and Jasmon Bailey. 2021."Evaluation of a Virtual Reality Simulation Tool for Studying Bias in Police-Civilian Interactions." Presented at the Human Computer Interaction International 2021.

DOJ. n.d. "Organization, Mission and Functions Manual: Office of Community Oriented Policing Services." Retrieved (https://www.justice.gov/jmd/organization-mission-and-functions-manual-office-community-oriented-policing-services).

Duke, Aaron A., Peter R. Giancola, David H. Morris, Jerred C. D. Holt, and Rachel L. Gunn. 2011. "Alcohol Dose and Aggression: Another Reason Why Drinking More Is a Bad Idea." *Journal of Studies on Alcohol and Drugs* 72(1):34–43.

Fekedulegn, Desta, Cecil M. Burchfiel, Claudia C. Ma, Michael E. Andrew, Tara A. Hartley, Luenda E. Charles, Ja K. Gu, and John M. Violanti. 2017. "Fatigue and On-Duty Injury among Police Officers: The BCOPS Study." *Journal of Safety Research* 60:43–51. doi: 10.1016/j.jsr.2016.11.006.

Gailliot, Matthew T., and Roy F. Baumeister. 2007. "The Physiology of Willpower: Linking Blood Glucose to Self-Control." *Personality and Social Psychology Review* 11(4):303–27. doi: 10.1177/1088868307303030.

Goldsmith, Andrew. 2005. "Police Reform and the Problem of Trust." *Theoretical Criminology* 9(4):443–70. doi: 10.1177/1362480605057727.

Hope, Lorraine. 2016. "Evaluating the Effects of Stress and Fatigue on Police Officer Response and Recall: A Challenge for Research, Training, Practice and Policy." *Journal of Applied Research in Memory and Cognition* 5(3):239–45. doi: 10.1016/j.jarmac.2016.07.008.

Hyland, Shelley S. 2019. "Local Police Departments Personnel, 2016." 21.

James, Lois. 2018. "The Stability of Implicit Racial Bias in Police Officers." *Police Quarterly* 21(1):30–52. doi: 10.1177/1098611117732974.

Kearns, Erin M. 2017. "Why Are Some Officers More Supportive of Community Policing with Minorities than Others?" *Justice Quarterly* 34(7):1213–45. doi: 10.1080/07418825.2017.1380837.

Paez, Rocio Alejandra, and Rick Dierenfeldt. 2020. "Community Policing and Youth Offending: A Comparison of Large and Small Jurisdictions in the United States." *International Journal of Adolescence and Youth* 25(1):140–53. doi: 10.1080/02673843.2019.1601115.

Peyton, Kyle, Michael Sierra-Arévalo, and David G. Rand. 2019. "A Field Experiment on Community Policing and Police Legitimacy." *Proceedings of the National Academy of Sciences* 116(40):19894–98. doi: 10.1073/pnas.1910157116.

Planche, Kyle, Jennifer F. Chan, Paula M. Di Nota, Brett Beston, Evelyn Boychuk, Peter I. Collins, and Judith P. Andersen. 2019. "Diurnal Cortisol Variation According to High-Risk Occupational Specialty Within Police: Comparisons

Between Frontline, Tactical Officers, and the General Population." *Journal of Occupational and Environmental Medicine* 61(6):e260. doi: 10.1097/JOM.0000000000001591.

Reinka, Mora A., and Colin Wayne Leach. 2017. "Race and Reaction: Divergent Views of Police Violence and Protest Against." *Journal of Social Issues* 73(4):768–88. doi: https://doi.org/10.1111/josi.12247.

Rukus, Joseph, Mildred E. Warner, and Xue Zhang. 2018. "Community Policing: Least Effective Where Need Is Greatest." *Crime & Delinquency* 64(14):1858–81. doi: 10.1177/0011128716686339.

Vila, Bryan. 2000. *Tired Cops: The Importance of Managing Police Fatigue*.

Vila, Bryan. 2006. "Impact of Long Work Hours on Police Officers and the Communities They Serve." *American Journal of Industrial Medicine* 49(11):972–80. doi: 10.1002/ajim.20333.

Voigt, Rob, Nicholas P. Camp, Vinodkumar Prabhakaran, William L. Hamilton, Rebecca C. Hetey, Camilla M. Griffiths, David Jurgens, Dan Jurafsky, and Jennifer L. Eberhardt. 2017. "Language from Police Body Camera Footage Shows Racial Disparities in Officer Respect." *Proceedings of the National Academy of Sciences* 114(25):6521–26. doi: 10.1073/pnas.1702413114.

Williams, Christine B., Jane Fedorowicz, Andrea Kavanaugh, Kevin Mentzer, Jason Bennett Thatcher, and Jennifer Xu. 2018. "Leveraging Social Media to Achieve a Community Policing Agenda | Elsevier Enhanced Reader." *Government Information Quarterly* 35(2):210–22. doi: 10.1016/j.giq.2018.03.001.