



USING VIRTUAL REALITY TO IMPROVE EQUITY AND OBJECTIVITY IN POLICING AND TRAFFIC STOPS

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Chair Norton and distinguished members of the Subcommittee on Highways and Transit of the House Committee on Transportation and Infrastructure, thank you for inviting me to testify in “Examining Equity in Transportation Safety Enforcement” regarding the “Bias in Automobile Stops Act of 2021.”

I am also a Professor of Sociology at the University of Maryland and the Executive Director of the Lab for Applied Social Science Research (LASSR). I am also a David M. Rubenstein Fellow at The Brookings Institution. LASSR is a research center that regularly partners with government agencies, organizations, and corporations to conduct objective research evaluations and develop innovative research products such as our virtual reality program with law enforcement and incarcerated people.

I believe this legislation introduced by Congressman Anthony Brown to establish an implicit bias program is vitally important. My written testimony centers on how the virtual reality program we developed in collaboration with law enforcement and computer scientists can reduce bias, train officers better, and help them and the civilians they encounter get home to their loved ones safely.

Research on Bias and Use of Force in Policing

Research shows disparities in traffic stops and police use of force. In a comprehensive analysis of 20 states, Pierson and colleagues (2017) found Black and Latino drivers were

more likely to be ticketed, searched, and arrested than White drivers. Research and policy makers have pursued ways to explain and reduce gaps, with many pointing to implicit bias as a key driver in these disparities. I believe that our virtual reality program is the answer and is prime to be the present and future of police training.

Virtual Reality Program for Law Enforcement

Since 2017, LASSR has developed over 100 virtual reality scenarios, trained and worked with over 2,000 police officers in large, midsize, and small departments across the country to develop and implement our virtual reality decision-making program for law enforcement. We also have hosted over 100 government officials including the Department of Homeland Security and had hundreds of students participate in our simulations to further improve its optimization. We have received funding from private corporations to further enhance our technological capabilities.



Merging social science with computer science and housed in the College of Behavioral and Social Sciences (BSOS) and the Department of Sociology at the University of Maryland, this program provides a platform to evaluate decision-making in an immersive virtual reality environment. We created tactical and social simulations that are used for law enforcement training.

Major objectives include:

- Improving objective decision making and reduce bias
- Evaluating how stress, sleep, and travel affect judgment and behavior
- Providing tools and metrics to improve interpersonal dynamics and cross-cultural awareness
- Offering recommendations for future training to reduce conflict and misunderstanding

Logistically, we have a virtual reality lab in the Department of Sociology with ample space for officers to move around and interact with the program. For departments outside of the DC region, we fly groups of officers to our lab or take our mobile program to departments. We train training officers on how to use the program, provide logistical and software support, and conduct statistical analysis and report back outcomes to the department. We also have set costs for the software, equipment, and training based on the needs of law enforcement agencies.



Collectively, our statistical tools allow us to integrate the following factors to determine what most influences decision-making behavior while in the field:

- Participants' physiological outcomes
- Participants' attitudes
- Participants' demographics
- Virtual reality actor demographics
- Environment and setting of virtual reality scenarios

Virtual Reality Simulations

We developed virtual reality simulations that focus on traffic stops, suspicious person scenarios, domestic incidents, and robberies. Our virtual reality program immerses police officers with a 360-degree first-person view of several interactive policing scenarios. One of our primary scenarios entails officers interacting with drivers during routine traffic stops.

Officers are instructed to talk to the drivers and make decisions about whether or not to charge them with infractions. Scenarios evolve based on officers' choices. For example, during the traffic stop, officers can choose to run information about a civilian's license. If the license is suspended, the civilian will react to this information and discuss it with the officer. In some of the scenarios, there is drug paraphernalia in the car. In this regard, officers have the ability to search the vehicle and even arrest the driver.



White male actor



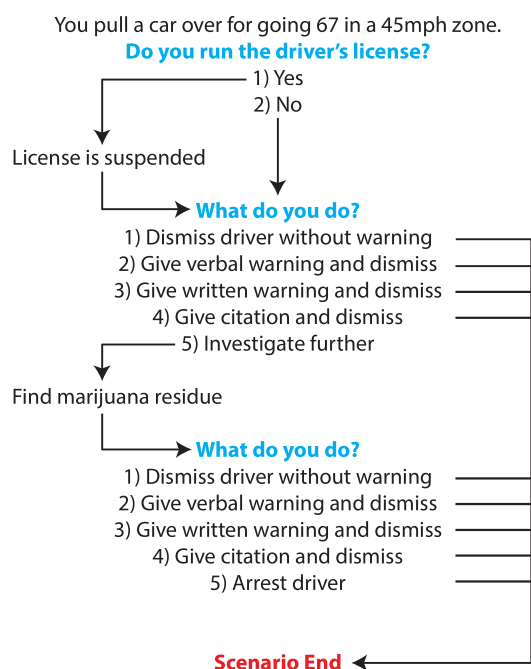
Latino male actor



Black male actor



Officer talking to civilian



One trial from the immersive policing simulator. Left: The top three images show variation in actor ethnicity across trials. The bottom image shows an officer interacting with a civilian while his speech is recorded. Right: The flowchart indicates points (in blue) where officers can use discretion and converse with civilians.

One unique aspect of our virtual reality program is the ability to vary the setting and driver. Our scenarios occur in urban, suburban, and rural settings to better capture the experiences that police officers have depending on geography. The virtual reality program also varies the race and gender of the driver. Some of the scenarios also have accents (French, West African, or Spanish) with the same driver acting with an accent and acting without an accent. These variations allow for a research analysis that can determine how the setting and/or driver demographics may matter during traffic stops.

90 VIRTUAL REALITY SCENARIOS TOTAL



Suspicious Person Scenarios

5 Male Actors who vary by **skin tone** perform in seven scenarios in two locations (**urban/suburban**)

Agitated
Hearing Impaired
Autistic
PCP
Cell Phone
Knife
Gun

Escalation

De-Escalation

Pull-over Scenarios

Gender-Men and Women

Race/ethnicity-Asian, Black, Latino, Middle Eastern, White

Language

Foreign Accents (Caribbean, Spanish, French, Mandarin, Middle Eastern)



Most importantly, our scenarios mimic actual police encounters in a safe environment that allow police officers the ability to practice and get better. Rarely do police officers have the ability to simulate mundane encounters that occur regularly. Our program overcomes these training limitations. We also audio and video record participants during the simulations. In this regard, trained supervisors can review scenarios with participants in order to evaluate performance and to improve decision-making.



By recording what officers say and what decisions they make, we will not only test whether setting or demographics impact officers' decisions, but *how* officers interact with civilians. Most importantly, we can test officer decisions at several points during the encounter. In the scenario shown above, officers make decisions at up to three points: running the driver's license, searching the vehicle, and the

outcome of the stop. At each point, we record the severity of officers' actions and code the level of respect used in their responses based on audio (Voigt et al., 2017).

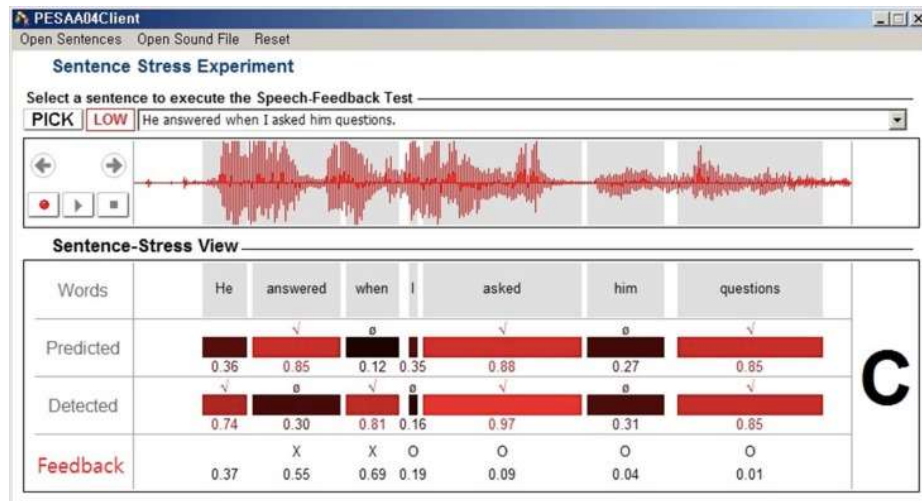
Attitudinal and Physiological Measures

Upgrading traditional shoot/don't shoot scenarios, our virtual reality scenarios measure escalation/de-escalation, heart rate, stress through speech, eye movement, body movement, and the speed at which an officer reaches for a replica weapon. We also ask officers about their sleep, work, and eating habits. We analyze data, present findings, and write reports for police departments. The objective metrics we examine have the potential to provide training staff with information to help officers optimize their performance while in the field.



Officers Receiving Feedback

One innovation of our virtual reality program's ability to measure and evaluate physiological responses. Our program includes five outcomes important to the public safety community: heart rate, stress as indicated in speech, eye tracking, body movement, and weapon tracking. Physiological data are linked to the stimuli so we can determine the exact point in time at which participants experience stress, what information they are attending to, and when they use force in a tactical situation. We can also measure what participants say, the tone and tempo of their speech, deference terms used in speech, and distance from the virtual reality character (a proxy for approach-avoidance tendencies). Participants also complete an attitudinal survey that allows us to examine the impact that attitudes have on decision-making behaviors. Additionally, a post-simulation debriefing asks participants questions about what they did during the interaction to further hone in on decision making and training goals.



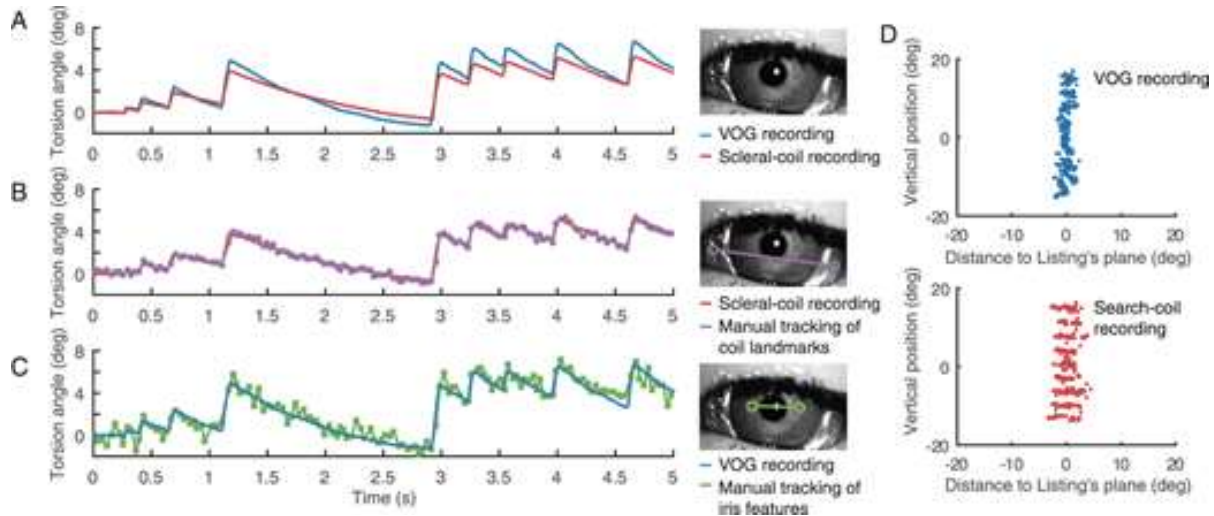
Computer Program that Measures Stress through Speech



Fitbits that Measure Heart Rate down to the millisecond



Trackers placed on replica weapons that allow for tracking body movement



Eye Tracking

While public attention towards police-civilian interactions has tended to focus on high-profile cases like fatal shootings, less commonly examined are more routine interactions civilians have with police (i.e., traffic stops). Civilians from racial and ethnic minorities feel officers are less respectful to them during these interactions (Engel, 2005; Lundman & Kaufman, 2006). This may contribute to decreased trust in law enforcement among Black and Latino Americans compared to White Americans (Morin & Stepler, 2016; Ong & Jenks, 2004; Skogan, 2006; Tyler, 2005). This loss of trust has serious implications; civilians who doubt the legitimacy of law enforcement are less likely to obey the law (Tyler, 2006).

We focus on officer respect and discretionary behavior during traffic stops, as these interactions represent the only contact many people have with law enforcement (Eith & Durose, 2011; Langton & Durose, 2013). This makes them particularly consequential. Each incident represents an opportunity to bolster or undermine trust in law enforcement. Officers have discretion in these situations to pursue actions with more or less severe consequences for civilians (McCartney & Parent, 2015; Lipsky, 2010). For example, an officer who pulls over a civilian for driving over the speed limit might lawfully give the civilian a verbal warning, a written warning, or a citation. What option the officer chooses is up to their discretion. Discretion is not inherently problematic and is in fact necessary to prevent the criminal justice system from being overwhelmed with minor crimes (McCartney & Parent, 2015). Problems arise when officers (unintentionally or not) apply discretion and respect differently across groups (Ridgeway, 2006).

Organizational Capacity and Administrative Structure

LASSR is at the forefront of cutting-edge social science research that links to technological innovations like virtual reality in order to make research more applied and palpable. LASSR has three spaces: a conference suite and two lab spaces including five private, virtual reality rooms and a large virtual reality suite outfitted for interactive and movable virtual reality simulations. In addition to facilitating the design and relevancy of social science research by forging connections with policy makers, organizations, corporations and local communities, LASSR provides trainings and teaching modules for continuing education and upgrading existing programs and organizations. LASSR provides dissemination plans for programmatic expansion and community outreach and has the capacity to conduct large-scale quantitative studies, focused experiments, and smaller qualitative, interview-based studies. LASSR produces evaluations and strategies for highlighting successes and addressing shortcomings.

LASSR's administrative structure includes an Executive Director, Lab Coordinator, Postdoctoral Fellows, Graduate Research Assistants, Undergraduate Research Assistants, and Law Enforcement Consultants. LASSR has Faculty Affiliates in the University of Maryland system that span from computer science to public health. LASSR collaborates with a series of policy and community partners including elected officials, policy makers, community, health, and education organizations, and police departments. LASSR is housed in the Department of Sociology in the College of Behavioral and Social Sciences at the University of Maryland. We can be contacted at LASSR@umd.edu.

Bibliography

- Aldrete, G. (2004). *Latino Immigrant Perceptions about the U.S. Police: An Exploratory Study*. (Unpublished master's thesis). University of Nebraska at Omaha, Omaha, NE.
- Ariel, B., Farrar, W. A., & Sutherland, A. (2015). The effect of police body-worn cameras on use of force and citizens' complaints against the police: A randomized controlled trial. *Journal of Quantitative Criminology*, 31, 509-535.
- Burns, P., & Gimpel, J. G. (2000). Economic insecurity, prejudicial stereotypes, and public opinion on immigration policy. *Political Science Quarterly*, 115, 201-225.
- Berg, J. A. (2009). Core networks and whites' attitudes toward immigrants and immigration policy. *Public Opinion Quarterly*, 73, 7-31.
- Correll, J., Park, B., Judd, C. M., Wittenbrink, B., Sadler, M. S., & Keesee, T. (2007). Across the thin blue line: Police officers and racial bias in the decision to shoot. *Journal of Personality and Social Psychology*, 92, 1006-1023.
- Dai, M., Frank, J., & Sun, I. (2011). Procedural justice during police-citizen encounters: The effects of process-based policing on citizen compliance and demeanor. *Journal of Criminal Justice*, 39, 159-168.
- Eith, C., Durose, M. (2011). *Contacts between police and the public, 2008* (NCJ 234599). Special report prepared by the Bureau of Justice Statistics. Washington, DC.
- James, L., James, S. M., & Vila, B. J. (2016). The Reverse Racism Effect: Are cops more hesitant to shoot Black than White suspects?. *Criminology & Public Policy*, 15, 457-479.
- Jennings, W. G., Fridell, L. A., & Lynch, M. D. (2014). Cops and cameras: Officer perceptions of the use of body-worn cameras in law enforcement. *Journal of Criminal Justice*, 42, 549-556.
- Jonathan-Zamir, T., Mastrofski, S. D., & Moyal, S. (2015). Measuring procedural justice in police-citizen encounters. *Justice Quarterly*, 32, 845-871.
- Judd, C. M., Westfall, J., & Kenny, D. A. (2012). Treating stimuli as a random factor in social psychology: a new and comprehensive solution to a pervasive but largely ignored problem. *Journal of Personality and Social Psychology*, 103, 54-69.
- Langton, L. & Durose, M. (2013). *Police behavior during traffic and street stops, 2011* (NCJ 242937). Special report prepared by the Bureau of Justice Statistics. Washington, DC.
- Lundman, R. J., & Kaufman, R. L. (2003). Driving while black: Effects of race, ethnicity, and gender on citizen self- reports of traffic stops and police actions. *Criminology*, 41, 195-220.
- Martínez, R. (2007). Incorporating Latinos and immigrants into policing research. *Criminology*, 6, 57-64.
- Mastrofski, S. D., Jonathan-Zamir, T., Moyal, S., & Willis, J. J. (2016). Predicting procedural justice in police-citizen encounters. *Criminal justice and behavior*, 43, 119-139.
- McCartney, S., & Parent, R. (2015). *Ethics in law enforcement*. Victoria, BC: BCcampus. Retrieved from <http://opentextbc.ca/ethicsinlawenforcement/>
- Menjívar, C., & Bejarano, C. (2004). Latino immigrants' perceptions of crime and police authorities in the United States: A case study from the Phoenix Metropolitan area. *Ethnic and Racial Studies*, 27, 120-148.
- Michelson, M. R. (2001). Political trust among Chicago Latinos. *Journal of Urban Affairs*, 23, 323-334.
- Morin, R., & Stepler, R. (2016, September 29). The racial confidence gap in police performance.

- Pew Research Center. Retrieved from: <https://www.pewsocialtrends.org>
- Mucchetti, A. E. (2005). Driving while Brown: A proposal for ending racial profiling in emerging Latino communities. *Harvard Latino Law Review*, 8, 1–33.
- Ong, M., & Jenks, D. A. (2004). Hispanic perceptions of community policing: Is community policing working? *Journal of Ethnicity in Criminal Justice*, 2, 53–66.
- Pierce, S., & Selee, A. (2017). *Immigration under Trump: A Review of Policy Shifts in the Year Since the Election*. Washington, DC: Migration Policy Institute.
- Pierson, E., Simoiu, C., Overgoor, J., Corbett-Davies, S., Ramachandran, V., Phillips, C., & Goel, S. (2017). A large-scale analysis of racial disparities in police stops across the United States. *Arxiv.org*
- Plant, E. A., & Devine, P. G. (1998). Internal and external motivation to respond without prejudice. *Journal of Personality and Social Psychology*, 75, 811.
- Reaves, B. A. (2015). *Local police departments, 2013: Personnel, policies, and practices* (NCJ 248677). Report prepared by the Bureau of Justice Statistics. Washington, DC.
- Ridgeway, G. (2006). Assessing the effect of race bias in post-traffic stop outcomes using propensity scores. *Journal of Quantitative Criminology*, 22, 1–29.
- Shear, M. D., & Benner, K. (2018, June 18). How anti-immigration passion was inflamed from the fringe. *The New York Times*. Retrieved from: <https://www.nytimes.com>
- Skogan, W. G. (2016). Citizen satisfaction with police encounters. *Police Quarterly*, 8, 298–321.
- Smith, M. R., & Petrocelli, M. (2001). Racial profiling? A multivariate analysis of police traffic stop data. *Police Quarterly*, 4–27.
- Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29, 24–54.
- Theodore, N., & Habans, R. (2016). Policing immigrant communities: Latino perceptions of police involvement in immigration enforcement. *Journal of Ethnic and Migration Studies*, 42, 970–988.
- Tyler, T. R. (2005). Policing in Black and White: Ethnic group differences in trust and confidence in the police. *Police Quarterly*, 8, 322–342.
- Tyler, T.R. (2006). *Why people obey the law*. New Haven: Yale University Press.
- Tyler, T. R., & Huo, Y. (2002). *Trust in the law: Encouraging public cooperation with the police and courts through*. Russell Sage Foundation.
- Voigt, R., Camp, N. P., Prabhakaran, V., Hamilton, W. L., Hetey, R. C., Griffiths, C. M., et al. (2017). Language from police body camera footage shows racial disparities in officer respect. *Proceedings of the National Academy of Sciences of the United States of America*, 114, 6521–6526.
- Wegener, D. T., & Petty, R. E. (1997). The flexible correction model: The role of naive theories of bias in bias correction. In *Advances in Experimental Social Psychology* (Vol. 29, pp. 141–208). Academic Press.