

Journal of Experimental Criminology

RESEARCH NOTE: Seeing is believing: The impact of body-worn cameras on court outcomes, a cluster randomized controlled trial in Miami Beach --Manuscript Draft--

Manuscript Number:	JOEX-D-21-00010	
Full Title:	RESEARCH NOTE: Seeing is believing: The impact of body-worn cameras on court outcomes, a cluster randomized controlled trial in Miami Beach	
Article Type:	Research Note	
Keywords:	Body-worn Camera; Police; Prosecution; Criminal Justice	
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Funding Information:	Bureau of Justice Assistance (2015-WY-BX-002)	Not applicable
Abstract:	<p>Objectives: To assess the effects of BWCs on prosecutorial and court-related charge outcomes across multiple crime types, including domestic violence charges, crimes committed against police officers, and drug/alcohol charges.</p> <p>Methods: A cluster randomized controlled trial with 21 spatiotemporal police units assigned to BWCs and 17 assigned to control conditions. Data from the State Attorney's Office were used to track convictions, adjudication withheld dispositions, and declined prosecutions for both experimental and control charges. A series of multilevel logistic and negative binomial regression models were used to estimate the effect of BWC footage on charge outcomes.</p> <p>Outcomes: BWCs led to a significantly higher proportion of crimes against police officers resulting in convictions or adjudication withheld outcomes, and a significantly higher proportion of domestic violence charges resulting in convictions alone, compared to control charges. However, after the clustering effect was taken into account, only the effect of BWCs on crimes against police officers remained statistically significant.</p> <p>Conclusion: These early results suggest that BWCs have significant evidentiary value that varies by crime type. BWCs may be best suited to capture evidence of crimes committed against police officers and potentially in domestic violence as well.</p>	

RESEARCH NOTE: Seeing is believing: The impact of body-worn cameras on court outcomes, a cluster randomized controlled trial in Miami Beach

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Acknowledgements: This project was supported by the Bureau of Justice Assistance's Strategies for Policing Innovation program under Grant #2015-WY-BX-002.

Research Note: Seeing is believing: The impact of body-worn cameras on court outcomes, a cluster randomized controlled trial in Miami Beach

Largely prompted by highly publicized police shootings in the U.S., body-worn cameras (BWC) have become one of “...the most rapidly diffusing and costly technologies recently adopted by policing agencies” (Lum et al., 2020, p. 3). Law enforcement agencies around the globe have increasingly turned to BWCs to increase perceptions of accountability and transparency (Coudert et al., 2015; Hyland, 2018; Taylor, 2016), and billions of dollars in revenue have been, and continue to be, spent on BWC implementation (Friedman, 2015; Goodison et al., 2018). In response, research on the effects of BWCs has increased significantly in recent years. However, such research has primarily concentrated on a small set of outcomes, with particular focus on the effect of BWCs on use-of-force incidents and citizen complaints (see Ariel et al., 2015; Ariel et al., 2017; Jennings, Lynch & Fridell, 2015; Lum et al., 2019; Lum et al., 2020; Maskaly et al., 2017; White & Malm, 2020).

As researchers continue to focus on the impacts of BWCs on police-citizen encounters, decidedly less attention has been given to the evidentiary value of BWC footage (see Lum et al., 2019). Through video capture of the behavior, statements, and/or demeanor of suspects and victims, BWCs may produce evidence that leads to improved case processing and outcomes for both victims and offenders (see Fan, 2017; Goodall, 2007; White, 2014). Stated differently, BWCs have the potential to both “implicate and exonerate” (White et al., 2019, p. 9), and yet despite this potential, few studies have examined the effect of BWCs on the prosecution and courts (see Lum et al., 2019), and even fewer published experimental assessments. Given that U.S. State courts handle upwards of 15 million criminal cases each year (Court Statistics Project, 2020) and the adoption of BWCs continues to grow, understanding the impact of BWC footage

on case outcomes is increasingly important. The current study adds to this limited body of research by analyzing court outcomes across various crime types following a 6-month cluster randomized trial of BWCs in Miami Beach, Florida (within 12 months after the completion of the experiment).

Background

The potential for BWCs to provide evidence for case processing has been cited by researchers and practitioners since the early stages of the BWC movement (see Goodall, 2007; Merola et al., 2016; White, 2014). To date, however, research on the impacts of BWCs on court-related outcomes has been limited and inconclusive. Using experimental and quasi-experimental designs, respectively, Owens et al. (2014) and Morrow et al. (2016) found that domestic violence incidents attended by officers wearing BWCs were associated with increased criminal justice outcomes such as charges filed, prosecutions, plea agreements, and guilty verdicts, relative to comparison cases (see also Ellis et al., 2015). In a small-scale pilot study, Goodall (2007) noted increases in the proportion of criminal incidents leading to arrest following BWC implementation, and ODS Consulting (2011) found that criminal cases in a BWC pilot jurisdiction were more likely to be disposed of via early guilty plea when BWC video was used.

Yet, several methodologically rigorous studies have failed to find any effect of BWCs on court outcomes. Tracking the dispositions of misdemeanor drug and alcohol cases following a randomized controlled trial (RCT) in Tempe (AZ), White et al. (2019) noted no significant differences in guilty outcomes between BWC cases and control cases for the processing of drug and alcohol offenses. Similarly, Yokum et al. (2017) found no significant changes in court outcomes for aggregate BWC cases relative to control cases following a RCT implemented in Washington, DC. However, Ariel and colleagues (2019) have noted spillover concerns about

causal inferences made from tests that suffer from treatment contamination, or situations in which BWC officers are present at control incidents.

One potential explanation for these inconsistent results is that the effect of BWC video on court outcomes varies significantly by crime type. In domestic violence cases, for instance, BWC footage might better capture victim statements and visible injury (Morrow et al., 2016; Westera & Powell, 2017), while in drug/alcohol cases such footage might better capture the actions and demeanor of the suspect (see Groff et al., 2018; White et al., 2019), when compared to written reports or officer testimony alone. Other types of cases, such as crimes committed against police officers (i.e., assault and/or battery of an officer, resisting arrest, etc.), may also benefit from the presence of BWCs, particularly if these offenses occur in direct view of the camera, and thus provide an opportunity for the crime to be captured on video. Indeed, both qualitative and quantitative evidence suggests that the likelihood that prosecutors will view BWC video prior to charging decisions varies by crime type, with domestic violence, drug/alcohol, and battery of police officer/resisting arrest charges among the most frequently viewed offense categories (see Groff et al., 2018). To date, however, there has been no intra-jurisdictional comparison of court outcomes across these crime types, making it difficult to determine whether the inconsistency seen in prior research is influenced by crime type, and existing studies have not yet assessed the impact of BWCs on the prosecution of crimes committed against police officers.

Our objective in this study was to examine whether BWCs affect the likelihood of criminal charges resulting in various forms of guilty outcomes, formal convictions, and declined prosecutions. The data (N = 2,605) come from a 6-month randomized controlled trial implemented in partnership with the Miami Beach Police Department (MBPD) and the Bureau of Justice Assistance's Strategies for Policing Innovation (SPI) program conducted from

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4 January-June 2017. Given that prior BWC experiments have suffered from issues related to
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6 treatment contamination, such that treatment and control officers often respond to the same
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8 incidents (see Ariel et al., 2019), the current study attempts to limit this possibility by employing
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10 a cluster-randomized design in which discrete spatiotemporal units (i.e., geographic and temporal
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12 shifts) were randomly assigned to treatment (BWC) and control (no BWC) conditions. A
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14 partnership with the State Attorney's Office provided unique access to court processing
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16 information on experimental and control offenses. Our inferences and outcomes were
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18 concentrated at both the cluster and charge-level, with specific focus on domestic violence
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20 charges, drug/alcohol charges, and crimes committed against police officers (e.g., assault or
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22 battery of a police officer, resisting arrest, etc.) as these cases are most likely to be affected by
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24 the presence of a camera. To our knowledge, this is the first test of the impact of BWCs on court
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26 outcomes across multiple crime types within the same jurisdiction. By comparing these
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28 outcomes within the same setting we hope to provide stronger inferences regarding the potential
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30 for BWC evidence to vary in utility across crime types. Results of these analyses may have
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32 important implications for BWC policy at both the police and prosecutorial level.
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41 **Experimental design**

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44 Thirty-nine police spatiotemporal areas were randomly assigned to either treatment
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46 (BWCs) or control (no BWCs) conditions for a 6-month intervention period lasting from January
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48 1, 2017- June 11, 2017. In line with Campbell and Stanley's (1963) recommendations, cluster
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50 randomization was chosen as to avoid treatment contamination and violation of the stable unit
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52 treatment value assumption (SUTVA) that may occur when BWC officers and control officers
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54 respond to the same incident (see Ariel et al., 2019; Rosenbaum, 2007). The population of
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spatiotemporal units in Miami Beach were naturally comprised of squad areas/shifts, averaging roughly 5 officers ($M = 5.13$) and 1,066 calls for service ($M = 1,065.74$) per cluster

Randomization was conducted with a simple random assignment generator. This procedure resulted in 22 experimental clusters and 17 control clusters, with all officers in the experimental clusters being assigned BWCs. Officers had no discretion about when and how to turn on the BWCs, with a blanket policy of activation in all police-public engagements. Overall, these groups experienced similar levels of calls for service (CFS), with 20,949 total CFS in clusters with BWC assignment and 20,615 CFS in clusters without BWC assignment. However, squad areas without BWC assignment did experience higher average CFS ($M = 1,212.65$; $SD = 594.46$) than squad areas with BWC assignment ($M = 952.23$; $SD = 673.94$) over the course of the study. The baseline comparability of the treatment and control clusters is shown in Table 1.

Table 1. Treatment and control cluster baseline characteristics

	Control	Treatment
N of Clusters	17	22
N of Officers	97	103
All Calls for Service (CFS)	20,615	20,949
Mean per Cluster (SD)	1,212.65 (594.46)	952.23 (673.94)
CFS - victim-initiated	13,577	12,269
Mean per Cluster (SD)	798.65 (466.20)	557.68 (469.67)
CFS - police-initiated	7,036	8,678
Mean per Cluster (SD)	413.88 (218.99)	394.45 (282.61)

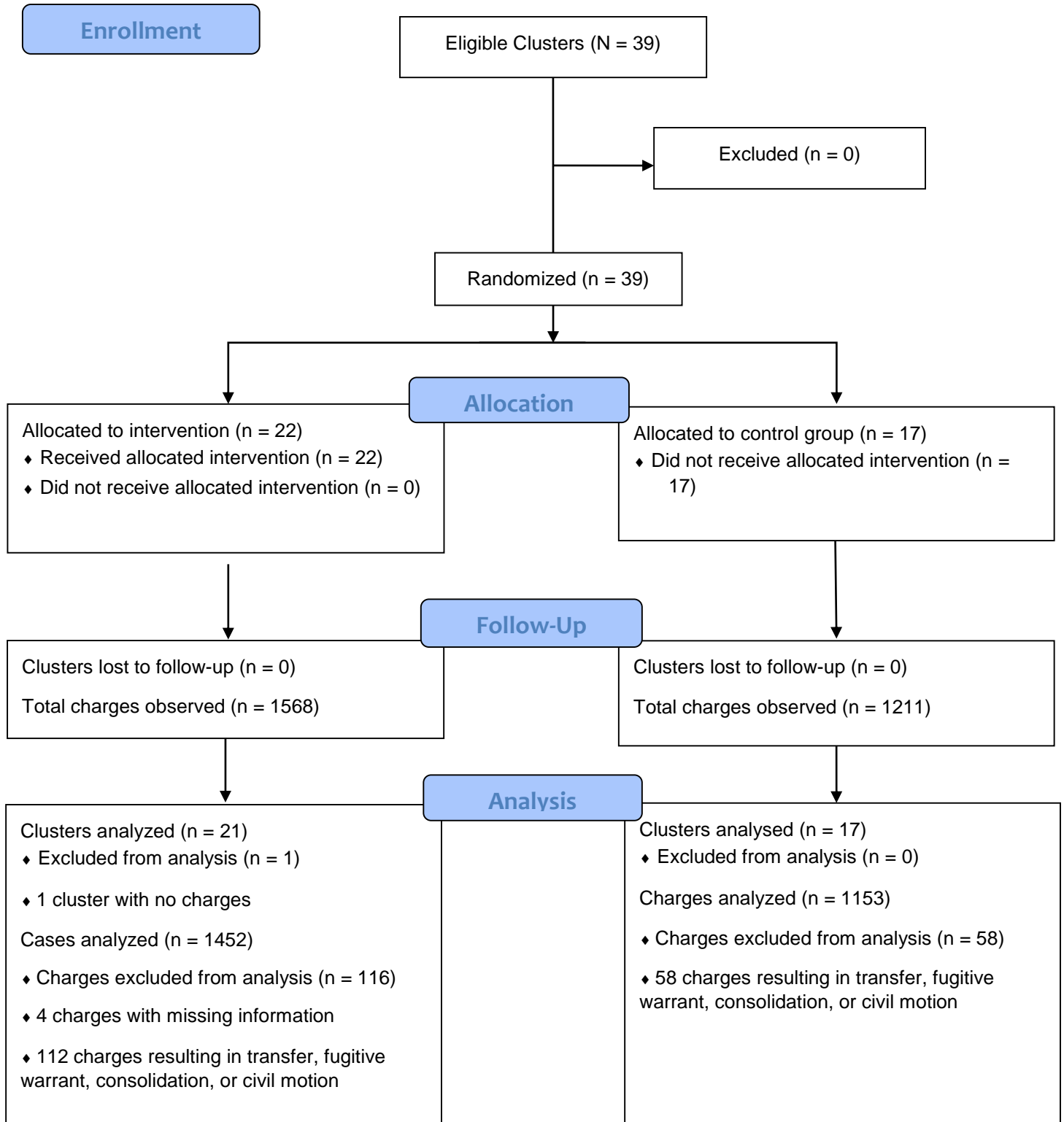
Study population and eligibility criteria

The study population consisted of arrests initiated by police officers (proactively or reactively) and then sent to the local Florida prosecutor's office for review. Given our interest in assessing the evidentiary impact of BWCs on individual charge-level outcomes, with "charge" referring to an individual arrest/allegation, eligible clusters were required to have produced at least one criminal charge that was sent to the State Attorney's Office for prosecution. This resulted in the exclusion of one experimental cluster in which no prosecution cases occurred, leaving 38 remaining clusters available for analysis (21 treatment and 17 control).

Individual charge data were provided by the State Attorney's Office, who prosecutes all cases in Miami-Dade County, in partnership with the MBPD. This allowed us to capture information on incidents that occurred during the study period. Due to the small overall population size of clusters, cluster sample sizes were unequal and in total there were 2,779 ($M = 73.13$; $SD = 71.19$ per cluster) charges that occurred across the 38 clusters, with 1,568 ($M = 74.66$; $SD = 74.61$ per cluster) charges associated with BWC footage and 1,211 ($M = 71.24$; $SD = 68.96$ per cluster) charges not associated with BWC footage.

For charges to be considered eligible for analysis, however, we required information on the arrest or filing charge description, the cluster that the incident originated from, whether the incident was attended by an officer wearing a BWC, and the final charge disposition. This led to the exclusion of 174 charges that were either missing arrest or filing information, were transferred to another court, resulted in a fugitive warrant, became consolidated with other cases, or resulted in a civil motion. Thus, there were 1,452 ($M = 69.14$; $SD = 69.53$ per cluster) BWC charges considered valid for analysis and 1,153 ($M = 67.82$; $SD = 65.40$ per cluster) control charges considered valid for analysis, resulting in a total valid sample size of 2,605 charges

Figure 1. CONSORT diagram for BWC cluster and case allocation



($M = 68.55$; $SD = 66.81$ per cluster).¹ The final sample represents both misdemeanor and felony charges of any crime type. The CONSORT flowchart in Figure 1 provides a detailed overview of the allocation, inclusion, follow-up, and analysis stages useful for understanding the flow of charges and the rationale for excluding certain observations.²

Dependent and independent variables

Several court-related outcome measures were employed to examine the evidentiary value of BWCs. Of primary importance is the causal inference between the presence of BWC footage at the charge-level and various guilty and not guilty outcomes. However, as separate outcomes, we also isolated formal convictions and charges that the State Attorney's Office declined to prosecute, which are likely to contain a separate set of causal mechanisms that affect decision-making processes.

Convictions + adjudication withheld. We chose to aggregate convictions and adjudication withheld outcomes to represent the total sample of charges that involved enough evidence to find the defendant guilty. "Adjudication withheld" (Chiricos et al., 2007, p. 547) is a disposition in which evidence is deemed sufficient for a finding of guilt but where a formal conviction is deferred, often to provide the defendant with an opportunity to complete some court-imposed mandate such as probation (Hayes-Smith & Hayes-Smith, 2009; Spohn et al., 1998). Convictions, however, include the formal finding of guilt through any means (e.g., jury

¹ While our analyses were focused on the charge-level rather than the defendant or case-level. Randomization appeared to be effective in equating the experimental and control groups on a number of factors known to influence court outcomes. The average number of charges per defendant was 1.92 ($SD = 1.83$) in control clusters and 1.99 ($SD = 1.85$) in experimental clusters, $t(2,603) = -0.78$, $p = 0.43$. The average age of defendants was 32.05 years ($SD = 11.56$) in control clusters and 32.59 years ($SD = 11.44$) in experimental clusters, $t(2,603) = -1.19$, $p = 0.24$. Additionally, 85.3% of defendants in control clusters were Male and 87.1% of defendants in experimental clusters were Male, $\chi^2(1) = 1.45$, $p = 0.23$. It should be noted, however, that there was a significantly higher proportion of Black defendants in experimental clusters than control clusters (52.8% vs. 48.5%), $\chi^2(1) = 4.69$, $p = 0.03$.

² The basic template for the CONSORT diagram can be found at <http://www.consort-statement.org/consort-statement/flow-diagram>

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4 trials, bench trials, and plea bargains).³ It is important to note that, while these outcomes do have
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6 qualitative differences, they both indicate a necessary threshold of evidence for a determination
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8 of guilt and thus, we believe, represent a more comprehensive measure of guilt when combined
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10 (see Chiricos et al., 1972).
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15 This aggregate measure was operationalized as a dichotomous variable (1/0) contrasted
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17 against the outcomes of all other prosecutions that did not result in a guilty disposition, which
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19 included acquittals, dismissals, and charges that were *nolle prossed* (charges dropped by the
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21 prosecution).⁴ In total, 55.2% ($n = 433$) of charges with sufficient evidence for a finding of guilt
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23 were classified as adjudication withheld and approximately 95% ($n = 1,075$) of the remaining
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25 charges were *nolle prossed*.
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30 *Convictions.* Given that the label of a formal conviction often creates a host of
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32 consequences related to voting, employment, and housing rights (see Hoskins, 2018), we also
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34 separated convictions from adjudication withheld outcomes as an additional sub-analysis. Thus,
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36 convictions are a subset of our combined measure, however, in this instance they represent a
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38 dichotomous variable that is contrasted against the outcomes of all other prosecuted charges,
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40 rather than acquittals, dismissals, and *nolle pros* outcomes alone. In other words, we were
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42 interested in whether BWC charges were more or less likely to result in formal convictions as
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44 opposed to any other outcome (including adjudication withheld) once the State Attorney's office
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46 decided to prosecute, so we could estimate the effect of BWC footage in such cases.
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56 ³ We were often unable to identify the adjudicatory method through which charges were disposed of within the data,
57 and cannot say what proportion of convictions or adjudication withheld outcomes were reached via plea agreement,
58 bench trial, jury trial, etc.

59 ⁴ Charges in which no action was taken by prosecutors were not included in this variable and were instead treated as
60 a distinct outcome.
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4 *No action cases.* Our data contained information on incidents where no action was taken
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6 by the State Attorney's Office. These are arrests in which prosecution was declined, and given
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8 prior research suggesting that BWC footage may be an important predictor of prosecutors' filing
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10 decisions (see Groff et al., 2018), these charges were analyzed separately as a discrete outcome
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12 (i.e., charges filed vs. not filed).
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17 *Operationalization of crime type.* Outcome measures were examined for the full sample
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19 of charges, as well as separately for domestic violence charges, drug/alcohol charges, and crimes
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21 against police officers, given the stronger theoretical potential for BWC footage to be salient for
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23 these offenses. While domestic violence incidents could be identified directly, drug/alcohol
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25 charges and crimes against police officers are composite measures combining multiple charge
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27 descriptions. Drug/alcohol charges include various forms of intoxication, possession, and
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29 distribution/manufacturing, while crimes against police officers include assault and/or battery of
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31 a law enforcement officer and multiple forms of resisting arrest. In total, approximately 80% ($n =$
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33 719) of drug/alcohol charges involved possession of drugs, and approximately 82% ($n = 272$) of
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35 crimes committed against police officers were classified as resisting arrest.
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42 *Presence of BWC.* The independent variable of interest is whether the criminal
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44 incident/arrest sent to the State Attorney's Office for review was attended by an officer wearing
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46 a BWC.⁵ As such, we are unable to directly determine whether the officer's BWC produced
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48 meaningful evidence or whether the resulting footage was formally or informally used by the
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50 State Attorney's Office during filing decisions, criminal hearings, trials, plea negotiations, or
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56 ⁵ "Attended" in this context may not necessarily indicate that the officer physically responded to the scene of the
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58 crime. Arrests could be either proactive or reactive and we cannot definitively say whether officers were physically
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60 present for many of the incidents that resulted in arrest. However, we would note that over 95% of arrests occurred
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62 on the same day as the offense ($n = 2,519$), perhaps providing indirect evidence that the majority of arrests were
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64 made by officers physically present at the crime scene.
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other judicial processes (addressing this question requires a critical review the footage itself, which was outside the scope of this study – and would provide data on the treatment arm of the experiment only). Across the full sample, 55.7% ($n = 1,452$) of charges were attended by an officer wearing a BWC and 44.3% ($n = 1,153$) of charges were not. Bivariate frequencies and crosstabulations between our dependent and independent variables can be seen in Table 2.

Table 2. Bivariate frequencies and proportions

	Control	Treatment	<i>p</i> -value
All charges ($N = 2,605$)			
Conviction + adj. withheld	361 (41.7%)	423 (40.3%)	0.535
Acquittal, dismissal, & nolle pros	505 (58.3%)	627 (59.7%)	0.535
Conviction	153 (17.7%)	198 (18.9%)	0.503
No action	287 (24.9%)	402 (27.7%)	0.108
Domestic violence ($N = 138$)			
Conviction + adj. withheld	4 (8.5%)	6 (14.6%)	0.504
Acquittal, dismissal, & nolle pros	43 (91.5%)	35 (85.4%)	0.504
Conviction	1 (2.1%)	6 (14.6%)	0.047*
No action	21 (30.9%)	29 (41.4%)	0.198
Crimes against officers ($N = 331$)			
Conviction + adj. withheld	34 (29.8%)	63 (44.1%)	0.019*
Acquittal, dismissal, & nolle pros	80 (70.2%)	80 (55.9%)	0.019*
Conviction	20 (17.5%)	29 (20.3%)	0.579
No action	23 (16.8%)	51 (26.3%)	0.041*
Drugs/alcohol ($N = 899$)			
Conviction + adj. withheld	122 (45.9%)	160 (39%)	0.078 ⁺
Acquittal, dismissal, & nolle pros	144 (54.1%)	250 (61%)	0.078 ⁺
Conviction	48 (18%)	61 (14.9%)	0.274
No action	88 (24.9%)	135 (24.8%)	0.976

Notes: Parentheses reflect column percentages based on binary variable groupings. No action charges are compared against all charges in which action was taken. Conviction and adjudication withheld outcomes are compared against acquittal, dismissal, and nolle pros outcomes (and vice versa). Proportions do not sum to 100% as outcomes are not mutually exclusive. Due to low expected cell counts, Fisher’s Exact Tests were used for domestic violence convictions and adjudication withheld outcomes; all other *p*-values reflect χ^2 statistics estimated from independent samples proportion tests.

Abbreviations: ⁺*p*<.10 **p*<.05.

Statistical methods

We first examined whether there were statistically significant differences in the bivariate frequencies for each outcome measure between BWC charges and control charges (Table 2). Multilevel logistic regression analyses were then used to estimate the effect of BWC video on charge outcomes while accounting for the cluster-level variance (i.e., the variance attributable to the squad area).⁶ However, due to the low overall incidence of domestic violence convictions, this outcome was analyzed using a negative binomial regression model, which compares the count of domestic violence convictions across experimental and control squad areas.⁷ As such, this outcome was analyzed at the cluster-level, and therefore the results pertain only to the clusters as opposed to the individual charges. All analyses were conducted in R statistical software, with multi-level models estimated using the *lme4* (Bates et al., 2015) and *lmerTest* packages (Kuznetsova et al., 2017).

For logistic regression models, odds ratios were used as measures of effect size (see Chen et al., 2010), and the intraclass correlation coefficients (ICC) were calculated using the latent variable approach (see Snijders & Bosker, 2012), which uses the variance estimate of the standard logistic regression model as the level 1 error term. For the negative binomial regression model (domestic violence convictions), the effect size is represented by the incidence rate ratio (see Wilson, *forthcoming*). While the unit of analysis in this model is the cluster, an ICC value was calculated using the method described by Tseloni and Pease (2003), which divides the random effects variance of an unconditional mixed model by the sum of this variance and the

⁶ Logistic regression models with cluster robust standard errors were also estimated. There were no substantive differences between the results of the multilevel models and the models with robust standard errors.

⁷ A likelihood ratio test for overdispersion indicated that a negative binomial model should be used by rejecting the null hypothesis that the Poisson model was not overdispersed ($X^2 = 24.29$, $df = 1$, $p < .0001$).

dispersion parameter. As we noted, our cluster sample sizes varied across crime types and statistical tests, as not all clusters produced cases corresponding to each crime type. While there is debate surrounding the number of clusters needed to produce unbiased estimates in a multilevel model, research has suggested that this technique can be used with as few as 10 groups (see Bell et al., 2014; Raudenbush & Bryk, 2002), fewer than the minimum number of clusters we included in a single analysis ($n = 24$).

Results

In total, only 30.1% ($n = 784$) of charges resulted in conviction or adjudication withheld outcomes, while 43.5% ($n = 1,132$) of charges resulted in acquittal, dismissal, or nolle pros, and 26.4% ($n = 689$) of charges were declined prosecution. Additionally, only 13.5% ($n = 351$) of the total sample of charges resulted in a formal criminal conviction. As can be seen in Table 2, when a BWC was present (as opposed to not present) a significantly higher proportion of domestic violence charges resulted in a conviction (14.6% vs. 2.1%, $p = .047$), even though the base rate for convictions in both treatment and control groups was very low. Crimes committed against police officers wearing BWCs also experienced a significantly higher proportion of combined conviction and adjudication withheld outcomes than crimes committed against control officers (44.1% vs. 29.8%, $p = .014$). However, crimes committed against officers wearing BWCs also resulted in no action dispositions (i.e., declined prosecution) in a significantly higher proportion of cases than crimes committed against control officers (26.3% vs. 16.8%, $p = .041$). No other significant bivariate differences were found, though drug/alcohol charges attended by control officers resulted in conviction or adjudication withheld outcomes at a notably higher rate than drug/alcohol charges attended by BWC officers, based on a .10 significance threshold (45.9% vs. 39%, $p = .078$).

Table 3. Effect estimates for BWC footage and court outcomes after accounting for cluster effects

	Fixed effects: Camera vs. no camera cases						
	Estimate	SE	<i>p</i> -value	OR/IRR [95% CI]	<i>N</i> clusters	<i>N</i> obs.	ICC
All charges							
Conviction + adj. withheld	-0.12	0.20	0.544	0.89 [0.60, 1.30]	38 (21 T, 17 C)	1916	0.055
Conviction	0.002	0.26	0.995	1.00 [0.61, 1.65]	38 (21 T, 17 C)	1916	0.093
No action	0.10	0.12	0.383	1.11 [0.88, 1.40]	38 (21 T, 17 C)	2605	0.01
Domestic Violence							
Conviction + adj. withheld	-0.54	1.56	0.727	0.58 [0.03, 12.25]	24 (13 T, 11 C)	88	0.484
Conviction ^a	1.58	2.15	0.462	4.86 [0.07, 327.13] ^b	38 (21 T, 17 C)	88	0.999
No action	0.5	0.4	0.21	1.65 [0.75, 3.62]	26 (15 T, 11 C)	138	0.015
Crimes against officers							
Conviction + adj. withheld	0.66	0.3	0.029*	1.93 [1.07, 3.48]	32 (17 T, 15 C)	257	0.032
Conviction	0.21	0.36	0.558	1.23 [0.61, 2.49]	32 (17 T, 15 C)	257	0.016
No action	0.56	0.38	0.139	1.74 [0.83, 3.65]	33 (18 T, 15 C)	331	0.095
Drug/alcohol							
Conviction + adj. withheld	-0.24	0.24	0.307	0.78 [0.49, 1.25]	35 (19 T, 16 C)	676	0.042
Conviction	0.002	0.39	0.996	1.00 [0.46, 2.16]	35 (19 T, 16 C)	676	0.132
No action	-0.13	0.23	0.579	0.88 [0.56, 1.38]	35 (19 T, 16 C)	899	0.025

Notes: T and C denote the number of treatment and control clusters for each dependent variable.

^a Negative binomial regression model treating squad area (i.e., spatiotemporal cluster) as the unit of analysis.

^b Incident rate ratio.

Table 3 displays the effect estimates based on our multilevel logistic and negative binomial regression models. No significant effects of BWC presence were found across aggregate crime measures, domestic violence measures, or drug/alcohol measures. However, after accounting for the variance attributable to the clustering effect, crimes against police officers were significantly more likely to result in conviction *or* adjudication withheld outcomes when a BWC was present ($\beta = 0.66$, $p = 0.029$, OR = 1.93, 95% CI [1.09, 3.76]). Specifically, when prosecuted by the State Attorney's Office, the odds of a conviction or adjudication

withheld outcome were 93% greater for charges in which a BWC was present than for charges in which a BWC was not present. This translates to an effect size comparable to a small to moderate Cohen’s *D* value (see Chen et al., 2010).

However, when accounting for the clustering effects, domestic violence convictions and no action outcomes for crimes against police officers do not retain the significant relationships seen in the bivariate analysis. Of note, all domestic violence convictions in which a BWC was present occurred within the same experimental squad area. Likely as a result of this, and the small domestic violence sample size, the ICC values for domestic violence convictions and combined conviction and adjudication withheld outcomes are very large. Given that nearly all of the total variance in these outcomes can be attributed to the between-cluster variance, we are unable to suggest with confidence that there is an effect of BWC footage on the outcomes of these charges.

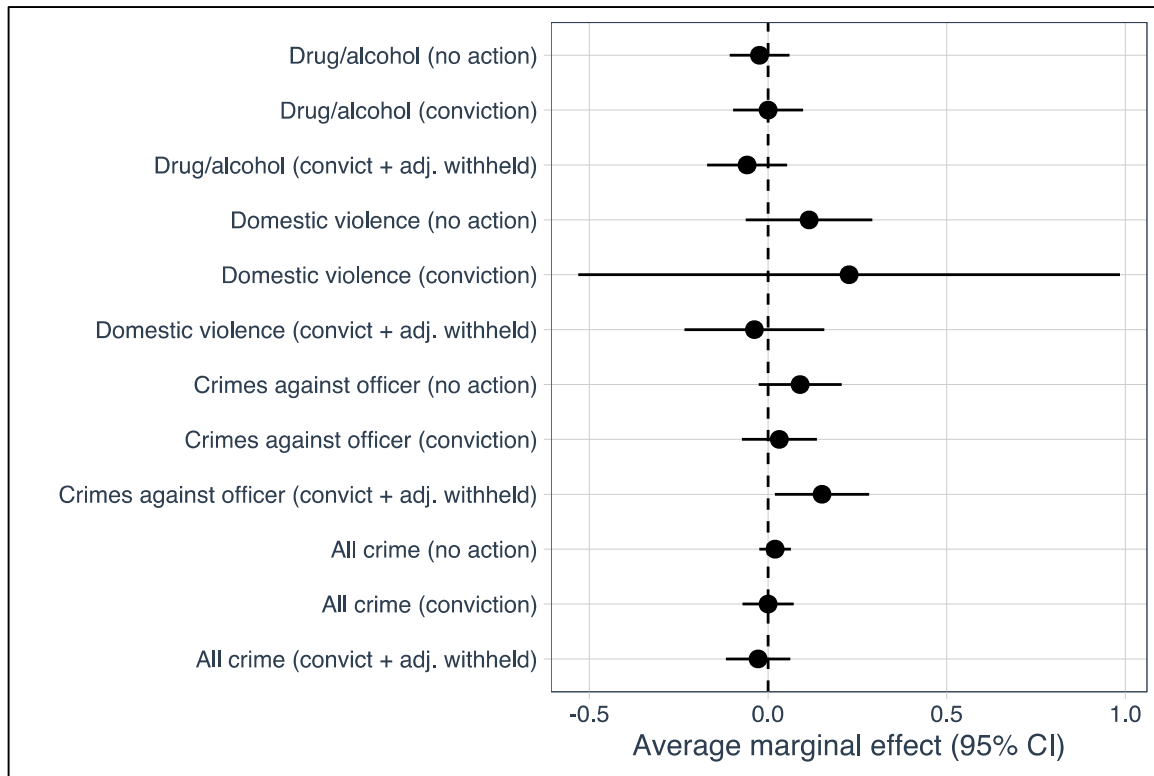


Figure 1. Marginal effects of BWCs on court outcomes

Figure 1 further illustrates these findings by plotting the average marginal effects from our regression models. Though domestic violence convictions appear to experience the largest effect, the confidence intervals for this prediction are considerable. In contrast, the probability of a conviction or adjudication withheld outcome for crimes against police officers remains positive and does not overlap with the no-effect line, indicating that the presence of a camera in these cases significantly increases the probability of this combined outcome measure.

Discussion and conclusions

Following a 6-month cluster randomized trial in Miami Beach (FLA), this study uses 12 months of follow-up data provided by the State Attorney's Office to examine the effect of BWCs on court outcomes across various types of criminal charges in a single jurisdiction. Our results suggest that, for the prosecution of crimes against police officers (assault/battery of an officer, resisting arrest), BWCs led to a 93% increase in the odds of a conviction *or* adjudication withheld outcome relative to control charges. Such a finding is likely not unexpected, given that BWCs are in a unique position to capture the characteristics of the offense in these situations. However, this finding is interesting given that many BWC proponents envisioned this technology leading to an increased likelihood of successful prosecution for crimes committed *by* police officers, rather than crimes committed *against* police officers (see Mateescu et al., 2016; Smith, 2019). While we are unable to identify any specific prosecutions of police officers in our data, future studies should examine these cases and contrast them with the prosecution of crimes committed against police officers. If BWCs are increasing guilty outcomes in the latter, but not the former, these effects may be considered undesirable and unintended.

Regarding crimes committed against police officers, we also note mixed evidence of a higher proportion of BWC cases being declined prosecution. Such a finding, when taken in light

of the significantly greater odds of combined convictions and adjudication withheld outcomes for these charges, would seem to be consistent with the proposition that BWCs can lead to fewer but stronger prosecutions (see Groff et al., 2018; Grossmith et al., 2015; White et al., 2019). If true, this would suggest that BWCs have the ability to provide objective evidence that is beneficial to all parties involved in a criminal case. However, caution is urged when interpreting this effect, given that it did not remain significant after adjusting for the variance in declined prosecutions between squad areas.

Our findings concerning the effect of BWCs on domestic violence charges should also be considered promising, yet not definitive. There was a significantly higher bivariate proportion of domestic violence charges in which a BWC was present that resulted in a conviction, relative to control charges. However, the sample sizes were small and we could not separate the impact of the BWCs from the impact of the squad area for this outcome. The bivariate analyses offer insight that suggests a strong treatment effect for domestic violence charges that are otherwise difficult to prosecute (Westera & Powell, 2017). On the other hand, we lacked sufficient statistical power to identify this effect, given the limited base rates (Hinkle et al., 2013). More research on these outcomes is needed, particularly with larger sample sizes and rigorous methodologies.

Additionally, we failed to identify a significant impact of BWCs on the outcomes of drug/alcohol charges. Such offenses often require police officers to identify subjective signs of intoxication (see White et al., 2019), or may even involve allegations of fabricated evidence (see Fan, 2017), thus providing theoretical rationale to believe that BWCs would prove useful during prosecution. However, our statistically nonsignificant findings for these charges are consistent with those of White et al. (2019). It is perhaps possible that BWCs can provide evidence of

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4 intoxication but not provide evidence of drug/alcohol possession, or vice versa. One hypothesis
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6 may be that intoxicated suspects are more likely to confront officers, as alcohol is linked to an
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8 intensified perception of self-righteousness and false accusation of police officers' wrongdoing
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10 (Denton & Krebs, 1990); however, we find no evidence for this claim. While suspects may
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12 become more belligerent while intoxicated, BWCs do not seem to affect these circumstances one
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14 way or another, and we were unable to make these distinctions in our data. Future analyses
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16 should attempt to determine if the effects of BWCs differ based on these more specified
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18 situations.
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24 Additional caveats deserve attention in future research. First, we are unable to show how
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26 BWC footage was viewed and used by prosecutors. Neither do we have an in-depth
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28 understanding of the ways in which police investigators use BWC content to support the case
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30 against defendants. These and other factors that create the mechanism that led to the observed
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32 effects are presently unknown. BWCs were randomly assigned to clusters of police officers in
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34 spatiotemporal units and significant differences in court outcomes were then observed between
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36 the experimental and control conditions, but what transpires between these two points is
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38 unknown. To be sure, this "black box" (Famega et al., 2017, p. 106) issue is not uncommon in
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40 experimental criminology, where it often not possible to explain the factors that mediate the
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42 relationship between a treatment and an effect (Green et al., 2010). At the same time, given the
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44 assumption of equivalence that random assignment creates (see discussion in Weisburd, 2003),
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46 we can reasonably infer that the observed effect was set in motion by the BWC assignment. This
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48 conclusion may not have strong theoretical implications, but it carries major policy implications.
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56 In addition, some outcomes were not statistically significant at the usual statistical
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58 thresholds, once the clustering effect is taking into account. As noted, this presents a statistical
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power consideration; however, null findings for several outcome measures (but not in others) may not indicate a lack of effect. For example, given that BWC footage may benefit both the prosecution and defense, it is possible that these effects cancel each other out in the aggregate.

The discussion should then be about targeting areas of law enforcement in which the intervention is the most likely to have the strongest desirable effect. While we are presently unable to examine these possibilities, future research should explore the underlying causal mechanism to determine with more specificity the settings in which BWC footage impacts, or fails to impact, court outcomes.

Finally, it is possible that the clusters of officers and the incidents they responded to in our study differ from those that are typical in other areas, as Miami Beach is unlike many other police jurisdictions (given its uber-active nighttime economy and large transient population during holiday seasons). Given that our study took place in a single city with limited sample sizes for several outcome measures, more research of this nature is required. Moreover, future research should examine how BWC footage is actively used by legal actors during negotiations, case preparation, trials, and other court-related processes.

Given these limitations, our strongest conclusion for brief research note should therefore be that equipping frontline officers with BWCs causes variations in some criminal justice system outcomes, compared to a policy of not equipping frontline officers with BWCs, but that the BWCs evidentiary effects differ by offense type. More research is needed.

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