



# A field experiment of the impact of body-worn cameras (BWCs) on police officer behavior and perceptions

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## ABSTRACT

Amidst the backdrop of considerable citizen unrest in the U.S. stemming from perceived injustices within police-citizen interactions in recent years, many government leaders have relied on the use of body-worn cameras as a means of improving citizen relations. The promise of body-worn cameras is that they might improve officer and citizen behavior given the possibility of retrospective and independent determinations of the appropriateness of behaviors which occur within police-citizen encounters. While the emerging evaluation evidence of their usefulness have been generally promising, overall determinations remain incomplete. Using a partial randomized experimental design, this study evaluated the impact of a test pilot program of body-worn camera use by the Hallandale Beach, Florida Police Department in the U.S. to determine their impact on police officer behavior and perceptions. Findings revealed that officers with BWCs 1) relied on less intrusive methods to resolve incidents, 2) continued to be active rather than abstaining from community contact, and 3) officer perceptions of the usefulness of BWCs remained pessimistic. Implications for policy and future research are discussed.

## 1. Introduction

The unjustified police shooting recorded by a bystander that occurred in North Charleston, South Carolina in 2015 offers just one extreme example of a police-citizen interaction that has fueled civil unrest, particularly within disadvantaged communities, over the last several years (Ford, 2015). The nature of this unrest is not unlike that which was experienced in the 1960s and 70s which led to the development and widespread use of Community- and Problem-oriented Policing to address persistent community problems. However, the response to today's discontent has centered much more on the use of technology. One example of this includes the use of police officer body-worn cameras (BWCs) which are designed to record the interactions between police and citizens with the intention of moderating police and ostensibly, also citizen behaviors. The outcome of this is thought to improve the relationships between citizens and their police since police should be less likely to act inappropriately or use excessive force.

This reliance on technology is not surprising considering the broader technological advancements which have allowed for video camera use in every day operational settings. This along with the ability to maintain and access recorded material has positioned BWCs as an apparent “quick fix” for government leaders and policing executives

alike. This coupled with the precedence of de-funding and lack of re-investment in problem- and community-oriented policing practices by national government leaders has left few other formidable and immediate courses of action to alleviate citizen demands for fairer and more democratic policing.

Advocates of BWCs claim they can provide a plethora of benefits, including increased transparency and accountability, reductions in officer use of force, citizen complaints, and crime, officer and citizen compliance, enhanced police legitimacy, better evidence collection and documentation, training benefits, and assistance in court processes (see Ariel, Farrar, & Sutherland, 2015; Gaub, Choate, Todak, Katz, & White, 2016; Miller & Toliver, 2014; White, 2014). Counterclaims, however, have raised concerns regarding privacy, health, excessive costs, and the possibility of police occupational culture thwarting implementation benefits (see Gaub et al., 2016; Hedberg, Katz, & Choate, 2016; Katz, Kurtenbach, Choate, & White, 2015; White, 2014).

Partly because of the differing views on the usefulness of BWCs, their implementation within local jurisdictions across the country, and indeed around the world, has often included evaluations to determine whether they improve police behavior as intended. Early evaluations were notably promising (ODS Consulting, 2011; Ariel et al., 2015; Goodall, 2007; Jennings, Fridell, & Lynch, 2014; Katz et al., 2015;

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Ramirez, 2014; White, 2013) and while there have been some findings which do not support their use (Ariel, 2017; Edmonton Police Service, 2015; Grossmith et al., 2015; Katz et al., 2015; Morrow, Katz, & Choate, 2016), the overarching impression from existing research continues to be favorable. Nonetheless, the body of research evidence evaluating BWCs remains limited and has yet to be assessed to an extent which validates it across different times, organizational settings, and types of communities (see Lum, Koper, Merola, Scherer, & Reiou, 2015).

To further understanding on the impact of BWCs, this study relied on a randomized experimental design to evaluate the impact of a BWC test pilot program within Hallandale Beach, Florida, a small Southeastern U.S. police department to determine whether they offer to improve police officer behavior and how officers perceive their usefulness. It contributes to the evaluation literature on BWCs in several ways. First, the evaluation took place in a small sized police department of less than 100 officers which is representative of most police agencies across the United States. Second, the study examined citizen use of force, traffic citations, and field contacts, all of which are outcome measures that have yet to be fully assessed. Third, the evaluation assessed officer sentiment to the imposition of BWCs within the backdrop of officer behavioral outcomes. Fourth, the study assessed officer compliance with camera activation over time.

## 2. Research on the impact of BWCs

The implementation of police BWCs rapidly increased across the United States and United Kingdom during the past decade. It has been theorized that BWCs are perceived to bring a civilizing effect by improving the behavior of both police officers and citizens as they understand their actions are reviewable. Evaluations on the impact of BWCs have mostly focused on assessing their influence on officer performance, to some extent on officer impressions, and to a much less extent on citizen behaviors.

### 2.1. Officer performance

When trying to understand the impact of BWCs on officer performance, studies have primarily examined three outcome measures: arrest, use of force, and citizen complaints. Two seminal studies conducted in the United Kingdom: Plymouth Basic Command Unit Head Camera Project in England (Goodall, 2007) and Renfrewshire/Aberdeen Studies in Scotland (ODS Consulting, 2011), are the pioneers of empirical research on police officers' BWCs. In 2006, the Devon and Cornwall Police Department initiated a seventeen-month BWC pilot program using fifty cameras in the city of Plymouth. This evaluation relied on a quasi-experimental design comparing officers who wore cameras to those who did not. The findings indicated a reduction in citizen complaints against officers wearing cameras and an increase in evidentiary quality (Goodall, 2007). Two police agencies in Scotland: Renfrewshire (2008) and Aberdeen (2010), launched the BWC program with thirty-eight and eighteen body cameras, respectively. This evaluation also reported an improvement in addressing citizen complaints (ODS Consulting, 2011).

Rialto Police Department in California was the first police agency in the United States to experiment and evaluate the BWC technology in 2012 (Ramirez, 2014). Utilizing a time-series randomized control design, fifty-four officers were randomly assigned to two groups, those wearing cameras versus those not wearing cameras, on a weekly basis. The results showed that police use of force dropped by 50% and complaints against officers reduced by 88% (Ariel et al., 2015).

In 2013, Mesa (AZ) Police Department conducted a one-year BWC evaluation program using a quasi-experimental design with fifty officers wearing body cameras (25 volunteers and 25 randomly assigned) (MPD, 2013; Roy, 2014). Following the BWC implementation, citizen complaints against officers wearing BWCs dropped by 60%, whereas the analysis revealed a 36% increase in complaints against officers not

wearing BWCs. In the same year, Phoenix (AZ) Police Department conducted a fifteen-month quasi-experimental study with fifty-six officers with BWCs and fifty comparison officers. The analysis revealed results like Mesa Police Department, with a 22% decline in citizen complaints for the officers with body cameras and 10% increase in citizen complaints against the officers without cameras (Katz et al., 2015; White, 2013). In a randomized control trial conducted by the Orlando Police Department in Florida, forty-six officers were assigned to wear body cameras and forty-three officers were assigned without a body camera. The findings showed reduction in both use of force and citizen complaints for the officers wearing cameras following the implementation of the program (Jennings et al., 2014).

More recently, an evaluation of the Denver (CO) Police Department found that body cameras are associated with decreases in complaints and arrests in Denver (Ariel, 2017), whereas in Spokane (WA) complaints decreased dramatically because of BWCs (White, Gaub, & Todak, 2017). Overall, there are several studies which provide support for the civilizing effect of the BWC implementation: Rialto Police Department BWC program (Ariel et al., 2015), the Isle of Wright BWC project, England (see: Ellis, Jenkins, & Smith, 2015), and more recently in the British context as well (see: Henstock & Ariel, 2017). However, despite these positive findings, there are still studies which have produced negative or mixed findings, suggesting that body cameras lead to no significant change in use of force (Ariel, 2017; Edmonton Police Service, 2015), no reduction in complaints (Grossmith et al., 2015), and even an increase in arrest (Katz et al., 2015; Morrow et al., 2016).

### 2.2. Officer perceptions

Several evaluations have explored officer perceptions towards the BWC technology (Gaub et al., 2016; Jennings et al., 2014; Katz et al., 2015; MPD, 2013 and Owens, Mann, & McKenna, 2014). Two major themes arise in these studies. The first theme relates to the evidentiary value of body-cameras: 78–80% of the officers surveyed in the Mesa (AZ), Phoenix (AZ), Tempe (AZ), and Spokane (WA) evaluations suggest that BWCs increase the quality of evidence (Gaub et al., 2016; MPD, 2013). Similar results were found in the Essex (England) Police Department (Owens et al., 2014). The second theme relates to changes in officers' perceptions: in three BWC evaluations (Phoenix, AZ, Spokane, WA, and Tempe, AZ) officers' opinions changed over time. The results of the Phoenix BWC study revealed that officers' perceptions of the ease of use and benefits of BWCs significantly enhanced while their concerns towards the evidentiary value of the technology increased (Katz et al., 2015). The Tempe (AZ) and Spokane (WA) evaluations, however, showed greater improvements in officer perceptions regarding the positive impact of BWCs for officers and citizens (Gaub et al., 2016).

### 2.3. Citizen behavior

The research assessing the impact of BWCs on citizen behavior is much more limited, nonetheless, a few studies have looked at crime trends and assaults against officers. The studies done in Renfrewshire and Aberdeen police departments showed reductions in crime as well as in the likelihood of assaults against officers (ODS Consulting, 2011). Similarly, the Spokane (WA) Police Department found no relationship between the likelihood of officer injuries and the presence/use of BWCs (White et al., 2017). However, the results of a multi-site study found that BWC increased the chance of officers being assaulted by citizens (Ariel et al., 2016). Due to the limited and mixed results found regarding citizen behavior, more rigorous research is needed to understand the impact of BWCs on citizens, specifically as it pertains to violence against police officers.

Despite the growing popularity of BWC, there is much still to learn about the impact of its use. Given the reviewed literature, there remain several major gaps in BWC research. Thus far, arrest, use of force, and complaints have been the primary performance outcomes examined in

evaluations. Other forms of officer behavior, such as traffic citations and field contacts, have yet to be examined. Additionally, police officers' perceptions have largely been examined cross-sectionally. Few have assessed changes in officers' opinions before and after body-camera utilization to fully understand the factors that might be impacting any change in officer perceptions. Finally, the extent of officer activation of BWC units, particularly how activation might change over time, remains understudied.

### 3. The current study

This evaluation took place within the Hallandale Beach Police Department, located in Broward County, FL, which has primary jurisdiction for the city of Hallandale Beach. The police department has approximately 144 employees with 60 sworn officers on road patrol, responsible for serving approximately 5 mile<sup>2</sup>. According to the U.S. Census's American Community Survey 2015 population estimates, Hallandale Beach has a population of about 35,000, with a median age of about 46 years and median income of \$34,216. The racial/ethnic breakdown for the city of Hallandale Beach is 34.0% Hispanic or Latino, 46.1% White, 17.0% Black or African American, and 1.5% Asian. Whereas the racial breakdown, as of April 2017, for the entire police department (sworn and non-sworn employees) is 27.8% Hispanic or Latino, 46.5% White, 23.6% Black or African American, and 1.4% Asian.<sup>1</sup>

The implementation of BWCs in Hallandale Beach came about due to a series of officer-involved shootings as well as a desire to transform the police department. Following these shootings an independent review was carried out by the police department to assess use of force, accountability and oversight processes, and technological needs. Of note, this review found that community members desired better police-community relations and requested BWCs. However, there was a sentiment in the police department and by the police officer's union that body cameras would lead to de-policing, thus negatively impacting officer job performance by inhibiting their undertaking of normal duties. Planning for the BWC evaluation began in October 2015 with the purpose of understanding its utility for the Hallandale Beach Police Department specifically.

The BWC apparatus selected and deployed was Taser International's Axon Flex, however, the officers were required to use the head-mounted BWCs. The head-mounted option, as opposed to wearing a chest-mounted BWC, allowed for the camera to be easily visible to the public.<sup>2</sup> There was a mandatory activation policy set forth by the police department, which removed officer discretion in turning on/off cameras, except in certain sensitive situations (e.g. sexual battery, issues with minors, in hospitals due to HIPAA laws, etc.). In attempts to establish a culture of trust and integrity within the police department, the general order mandated that supervisors could not watch camera footage without notifying the specific officer involved. Additionally, supervisors could only watch specific footage in identifying training concerns, as a follow up to complaints or reviewing evidence in criminal matters. Officers could review their own footage for writing reports, preparing for court, disciplinary matters, or training purposes.<sup>3</sup>

<sup>1</sup> As of April 2017, the racial breakdown for officers specifically on uniformed patrol is 30.0% Hispanic or Latino, 48.3% White, 18.3% Black or African American, and 1.7% Asian.

<sup>2</sup> While there was no direct assessment to gauge citizen awareness of BWC usage, it is important to note that the Hallandale Beach Police Department was the first city in Broward County, FL to use BWCs. Thus, the BWC deployment was highly publicized in various local news outlets, on social media and spoke openly about at community meetings.

<sup>3</sup> It is important to note that since the police department was not monitoring the body camera recordings routinely, the intended impacts of the body cameras may not be as strong because the accountability mechanism associated with monitoring behavior is further removed. For instance, if officers are recording, but know that their video will not be viewed by supervisors unless a complaint happens or a serious incident (which is reported relatively rare for Hallandale Beach), then the body camera may not impact officer behavior in the theorized way (e.g. through fear of consequences, notions of being watched, etc.).

### 4. Method

This study evaluated the impact of BWCs on police officer perceptions and behavior (namely if there was a de-policing effect of body cameras on officer behavior). First, a survey was conducted to measure officers' receptiveness and satisfaction of the BWC implementation over time. Subsequently, a series of secondary administrative data of officers' behavior were obtained from the police department to see if the deployment of BWC impacted officers' performance. Four research questions were addressed: 1) In what ways do BWCs impact officer's job performance? 2) Does the use of BWCs result in any decrease in officer activity (e.g. de-policing effect)? 3) How do officers feel about BWCs? And 4) Do officer perceptions change over-time?

#### 4.1. Research design

During the pilot program, 26 BWCs were disseminated in two stages over a year. During stage one, referred to as the volunteer stage, some officers were given the option to volunteer to be a part of the pilot program. However, during this stage, all Patrol Sergeants were required to sign up, with a total of 7 sergeants, and an additional 7 officers who volunteered to participate. Training for participants during this stage began in December 2015, with implementation mid-December. During stage two, referred to as the randomized stage, officers were randomly selected to participate in the pilot program through a shift-based stratified sampling method. The stratification was necessary to ensure that the total number of officers with BWCs were proportionately dispersed across the various work shifts. There was a total of 12 officers randomly chosen during this stage, and training began in February 2016, with implementation mid-February. The two-staged deployment of BWCs produced a quasi-randomized experimental design. The sample consisted of 26 officers wearing body cameras (treatment group), and a total of 25 officers not wearing body cameras (control group). Thus, the design took on the following arrangement (see Table 1).

#### 4.2. Data collection

The collection of data was conducted in two phases using a multi-method analysis to fully understand the impact of the BWCs. The first phase was completed prior to the implementation of the BWC program (pre) and the second phase was done after officers began wearing body cameras (post). A survey instrument was used to gauge perceptions and attitudinal changes over time (both before and after the implementation of the pilot program). This included approximately 20 categories of statements and questions, using a mixture of Likert scales, open ended questions, and closed ended demographic questions. The pre-survey was collected in-person via BWC training days and roll call meetings. Most pre-survey data collection spanned from December 2015 to January 2016, with a response rate of 90.2%.<sup>4</sup> The post-survey was collected using an online survey distribution platform, Qualtrics,<sup>5</sup> approximately 8 months after the implementation of the cameras. This data collection occurred between September 2016 and October 2016, with a response rate of 84.3%. The sample included only road patrol officers and sergeants (n = 51), which accounted for all officers that

<sup>4</sup> The dates for the pre-time period spanned until January to encompass both the volunteer and random stages which each had different start dates (while volunteer officers began in December the randomly selected officers began in February). Additionally, within the two-phased implementation period of volunteer and randomly selected officers, there were four surveys retained where the officers were in the overall treatment group (wearing body cameras) yet completed surveys after the implementation of the cameras. For these four officers, they completed surveys within 2–3 weeks following the implementation of the BWC program. One officer was in the volunteer officer group and the remaining three were in the randomly selected group.

<sup>5</sup> Qualtrics aids research by providing an online platform that enables people to conduct surveys, feedback, and polls using a variety of distribution methods. It also performs preliminary analysis of results.

**Table 1**  
BWC evaluation research design.

	Pre	Phase 1	Phase 2	Post
T <sub>1</sub> (n = 14; volunteer)	O <sub>1</sub>	X		O <sub>2</sub>
T <sub>2</sub> (n = 12; random)	O <sub>1</sub>		X	O <sub>2</sub>
Control (n = 25)	O <sub>1</sub>			O <sub>2</sub>

Notes: O = Data observation; X = BWC introduced.

had the potential to wear a BWC in the future in addition to those officers given BWCs during the study.

In each phase, secondary data was also collected for both the pre- and post-time periods which assessed officer performance outcomes. The key measures included: arrests, citations, field contacts, external complaints, use of force, assaults on officer, and non-violent resistance. This data was collected for each month in the pre-time period (January 2015–December 2015) and post-time period (January 2016–December 2016). While the data were collected at the individual officer level, they were aggregated for treatment and control groups accordingly.

#### 4.3. Analytical approach

Officers' behavioral data were collected at the individual level and aggregated by treatment and control groups across both time periods. The analysis assessed for temporal changes in outcome variables following the use of BWCs as well as for differences between the treatment and control groups. For each outcome variable, the percent change from 2015 (pre-period) to 2016 (post-period) was measured for both officers who wore the BWCs and those who did not. Independent samples *t*-tests were conducted to see if there was a significant difference before and after the implementation of BWCs for each outcome variable. Because the low sample sizes were also accompanied with high levels of missing data within monthly figures, the ability to detect statistical significance was limited. To account for this, a multiple imputation procedure was used for the variables with the least amount of missing information. These variables included arrests, field contacts, and citations. Imputations were not carried out for the remaining outcome measures since the extent of the missing information was too high, with more than 75% being absent. The statistical significance levels reported for those three variables (arrests, field contacts, and citations) are based on the imputed data.<sup>6</sup> Lastly, Cohen's *D* coefficients were calculated to determine the size of any effects observed in the post observation period between treatment and control groups.

## 5. Results

### 5.1. Officer behavior

Table 2 presents the results of the analysis on officers' performance. Overall, the analysis revealed that the use of BWCs does have an impact on officers' behavior but it does not hinder their job performance. In other words, there was no evidence of a de-policing effect, but rather

<sup>6</sup> To account for high levels of missing data a multiple imputation procedure was used in some of the analyses. Substantial levels of missing data impede the ability to detect statistical significance. Imputation is a general procedure which replaces missing values with some other determined figure. Multiple imputation is a specific procedure which relies on several iterations of regression analyses to identify the most probable value for the missing case based on the figures observed in the remaining data series. In this study, the multiple imputation procedure was performed using SPSS, a statistical processing software package. The automatic function was used to determine the nature of the missing data (i.e. random or systematic) and the accompanying relevant imputation procedure. Because the monthly series of data were totaled and independent samples *t*-tests were computed comparing the pre-and post yearly totals as a distinct variable, the structure of the data did not allow for a pooled computation of test means within the SPSS framework. Thus, the fifth iteration of the multiple imputation series was totaled and used as the basis for the pre-post and treatment control mean comparisons.

**Table 2**  
Treatment and control group comparisons: 12 month SUM (2015–2016).

Outcomes	Treatment (n = 26)			Control (n = 25)		
	Pre-BWC (2015)	Post-BWC (2016)	Percent change	Pre-BWC (2015)	Post-BWC (2016)	Percent change
Arrests <sup>a</sup>	409	343 <sup>a,b</sup>	– 16.1%	436	397 <sup>a,b</sup>	– 8.9%
Field contacts <sup>a</sup>	282	359 <sup>a*</sup>	27.3%	365	330	– 9.6%
Citations <sup>a</sup>	2091	2433	16.4%	2197	1968	– 10.4%
Use of force	15	12	– 20.0%	12	9	– 25.0%
Complaints	4	2	– 50.0%	4	6	50.0%
Assaults on officers	3	7	133.3%	4	8	100.0%
Non-violent resistance	27	25	– 7.4%	39	23 <sup>*</sup>	– 41.0%

\* Significant at the 0.05 level.

\*\* Significant at 0.01 level.

<sup>a</sup> Significance test results reported based on multiple imputation data. Data sums w/o imputations reported in table.

<sup>b</sup> Significant difference between post treatment and post control found.

officers are still performing their regular duties despite the use of cameras. Additionally, officers tended to rely on less intrusive methods of dealing with citizen encounters. The results for each outcome variable are presented below.

#### 5.1.1. Arrest

There was a reduction in the number of arrests after the implementation of BWCs. Officers wearing BWCs experienced a decrease of 16.1% in arrests, whereas officers not wearing cameras experienced only an 8.9% reduction. Thus, the reduction in arrests by officers wearing BWCs was almost twice that of officers not wearing the cameras. However, it is important to note that this change in arrest patterns did not reach statistical significance with the reported data, suggesting that the reduction could be attributed to chance. Given the dominant sentiment in the police department that the use of body cameras would stop policing, one interpretation here is that non-significant differences may suggest that officers are performing their normal duties, including arrests. Following the multiple imputation for missing monthly values, an independent-samples *t*-test was again conducted to compare arrests between BWC wearing officers and the control sample. There was a significant difference in arrests for officers with BWCs (*M* = 27, *SD* = 4.9) and those without (*M* = 31, *SD* = 5.8) in the post evaluation period; *t*(42) = 2.51, *p* = 0.016. These results, in turn, suggest that the use of BWCs in fact reduce the likelihood that officers will utilize arrest to resolve incidents.

#### 5.1.2. Field contacts

The field contacts conducted by officers in both the treatment and control groups were included as a measure of officer proactivity. There was an increase of 27.3% in the total number of field contacts for officers wearing BWCs, while officers without cameras experienced a decrease of 9.6% in total field contacts. Albeit, both percentage changes failed to reach statistical significance in the sample with missing values. Field contacts may not be a reliable measure of officers' actual proactivity as they are self-reported, however, they can be a good measure of officers' willingness in reporting self-initiated activities. Thus, officers who wore body cameras were more likely to report field contacts following BWC implementation, while control officers were less likely to report such self-initiated activity.

After the multiple imputation for missing monthly values, an independent-samples *t*-test was again conducted to compare the number of field contacts between BWC wearing officers and the control sample. There was a significant increase in the number of field contacts for officers with BWCs in the pre (*M* = 12, *SD* = 10.9) versus post



( $M = 21$ ,  $SD = 12.8$ ) evaluation period;  $t(54) = -2.84$ ,  $p = 0.006$ . There was no statistically significant change in the level of field contacts among officers not wearing BWCs. These results, in turn, suggest that the use of BWCs increases police activity with citizens.

### 5.1.3. Traffic citations

The total amount of tickets given by officers wearing BWCs increased by 16.4%, while for officers not wearing BWCs the total amount decreased by  $-10.4\%$ .<sup>7</sup> Thus, there was a 26.8 percentage point difference between the treatment and control group changes from pre- to post-periods. According to the statistical tests, the changes in citations from before and after the implementation of BWCs, for both treatment and control groups, were not statistically significant. Following multiple imputations of missing data, the differences approached statistical significance but still fell short.

### 5.1.4. Use of force

The analysis revealed that use of force by both treatment and control officers slightly decreased, however; this also was not a statistically significant reduction. The total number of use of force incidents by officers wearing body cameras dropped by 20% in the post-BWC period, whereas for officers not wearing body cameras there was a decrease of 25%. However, due to the low number of use of force incidents, the changes in use of force cannot be confidently assessed herein. Further investigations with data over longer periods of time are needed to better explain these changes.

### 5.1.5. External complaints

The total number of external complaints against officers wearing cameras decreased by 50%; however, the total number of complaints for officers without cameras increased by 50%. Neither changes between pre- and post-periods for treatment nor control groups were significant. It is worth noting that the high percentage changes in both treatment and control groups are due to the low number of total external complaints in the years 2015 and 2016 and thus should be interpreted with caution.

### 5.1.6. Assaults on officers

The total number of assaults against officers wearing cameras and those without increased by 133% and 100%, respectively. However, these differences between the pre-and post-periods for each group were not significant. Like the number of complaints and use of force incidents, the assaults against officers had low base numbers and thus should be interpreted with caution.

### 5.1.7. Non-violent resistance

The suspects' non-violent resistance towards police officers were also examined. The analysis indicated a  $-7.4\%$  reduction in resistance towards officers wearing cameras, while there was a  $-41\%$  decrease in resistance towards officers without cameras. While no significant difference was found in the treatment group before and after wearing BWCs, the difference between pre-and post for the control group was significant.

Table 3 reports the means, standard deviations and Cohen's D effect sizes for each of these outcome measures. Notwithstanding the significance levels just presented, a large effect size was found for the difference in arrests between treatment and control groups in the post period (0.84) while moderate effect sizes were found for differences in citations (0.64) and complaints (0.60). The remainder outcomes, field contacts, use of force, violent assaults, and non-violent assaults, all exhibited small effect sizes (0.19, 0.08, 0.09, and 0.05, respectively).

<sup>7</sup> Potential reasons for the increase in citations in the treatment group needs further exploration, however one possible explanation may be that cameras remove officer discretion. When an officer is giving a ticket to someone they have the option to let them off with a warning. Officers wearing cameras may feel that by doing so they are risking the chance of receiving a sanction by supervisors.

**Table 3**

Effect sizes for study outcomes ( $n = 12$  months).

Outcomes	Pre-BWC (2015)		Post-BWC (2016)		Cohen's d
	Treatment	Control	Treatment	Control	
Arrests <sup>a</sup>	34.08 (4.94)	36.33 (5.26)	28.58(8.85) <sup>++b</sup>	33.08 (6.75) <sup>++b</sup>	0.45 <sup>+</sup>
Field contacts <sup>a</sup>	23.50 (10.64)	30.42 (9.03)	29.92 (10.61) <sup>++</sup>	27.50 (6.78)	0.005
Citations <sup>a</sup>	174.25 (56.17)	183.08 (38.27)	202.75 (49.32)	164.00 (19.34)	0.032 <sup>+</sup>
Use of force	1.25 (0.97)	1.00 (1.28)	1.00 (0.85)	0.75 (1.06)	0.765 <sup>++</sup>
Complaints	0.33 (0.49)	0.33 (0.49)	0.17 (0.39)	0.50 (0.67)	$-0.375^{++}$
Assaults on officers	0.25 (0.62)	0.33 (0.65)	0.58 (0.67)	0.67 (1.23)	$-0.055$
Non-violent resistance	2.25 (1.36)	3.25 (1.66)	2.08 (1.16)	1.92 (1.78) <sup>+</sup>	0.053

Results are mean (standard deviation). Cohen's d = <sup>+</sup> medium effect, <sup>++</sup> large effect.

<sup>+</sup> Significant at the 0.05 level.

<sup>++</sup> Significant at 0.01 level.

<sup>a</sup> Significance test results reported based on multiple imputation data. Data sums w/o imputations reported in table.

<sup>b</sup> Significant difference between post treatment and post control found.

## 5.2. Officer perceptions

Surveys were conducted to understand how officer perceptions regarding BWCs changed over time. The findings suggest that perceptions by road patrol officers did seem to change following the implementation of BWCs. Overall, there was a downward trend in positive feelings about the use and effectiveness of BWCs. Officers in the control group (not wearing body cameras) and the treatment group (wearing body cameras) exhibited this same trend in perceptual changes. Table 4 displays findings for the treatment and control group surveys both before and after launch of the BWCs. The most dramatic shifts in opinion were that officers increasingly believed that BWC use would not improve transparency and accountability, nor would their use reduce citizen complaints on officers. About equal in change was the view that BWCs would not reduce officers use of force. Other shifts in opinion pertaining to the questions asked were more subtle, yet the overall move in officer sentiment by both treatment and control officers was negative. In other words, as the agency began to use the BWCs, officers became less inclined to believe that their use would have any beneficial effects.

## 5.3. Officer compliance

Prior research has also noted that officer activation of and compliance with BWCs is an important factor in determining the effectiveness of the program. If officers are not activating cameras, then the theorized linkage between cameras impacting officer behavior is absent due to the alleviated pressure of recording.<sup>8</sup> Moreover, research has found that higher officer activation rates are found under mandatory activation policies rather than discretionary policies (Young & Ready, 2016).

To assess officer compliance with the Hallandale Beach Police Department's mandatory policy, a sample of six officers was selected

<sup>8</sup> There is a discrepancy in the research as to the impact that the presence of cameras has on citizens. It has been noted by researchers that the mere presence of a camera has an impact on citizen behavior irrespective if the camera was activated or not (Hedberg et al., 2016). However, other research suggests that officers need to inform citizens that the camera is on and recording to have the intended impact on citizen behavior, because often citizens are unaware that the camera is recording or don't pay attention to it.

**Table 4**  
Percentage point change between pre- and post-body-worn camera time periods.

	Strongly agree		Agree		Neither agree/disagree		Disagree		Strongly disagree	
	Non-BWC	BWC	Non-BWC	BWC	Non-BWC	BWC	Non-BWC	BWC	Non-BWC	BWC
Increases transparency & accountability	4.3%	– 22.5%	– 6.4%	13.5%	– 6.4%	– 4.9%	6.4%	25.0%	2.1%	– 11.1%
Reduces citizen complaints	– 7.9%	– 22.2%	– 15.7%	– 29.8%	15.0%	9.5%	– 0.7%	39.0%	9.3%	3.4%
Improves police-community relations	0.0%	– 3.7%	– 5.7%	– 11.2%	– 4.3%	– 8.9%	13.6%	31.5%	– 3.6%	– 7.7%
Improves overall job performance	0.0%	– 3.7%	6.4%	– 11.4%	– 11.4%	6.6%	18.6%	16.5%	– 13.6%	– 8.1%
BWCs will not help at all	2.1%	21.4%	18.6%	2.8%	– 36.4%	– 5.0%	13.6%	– 4.4%	2.1%	– 14.8%
Reduces officers' use of force against citizens	– 5.3%	– 18.5%	– 6.8%	– 15.0%	6.4%	9.1%	– 8.7%	24.5%	14.3%	– 0.1%
Reduces the number of citizen complaints per officer	0.0%	– 3.7%	– 13.9%	– 11.2%	9.8%	– 20.1%	3.8%	35.2%	0.4%	– 0.1%
Reduces officers' contact with citizens	9.4%	2.6%	– 25.9%	16.8%	25.2%	– 26.1%	– 15.8%	3.1%	7.1%	3.6%
Suspects will be less likely to resist officers	0.0%	0.0%	– 2.9%	– 29.6%	1.4%	– 18.5%	7.9%	25.9%	– 6.4%	22.2%
Citizens will be more defensive to officers	11.4%	3.7%	– 6.4%	– 14.8%	2.9%	– 14.8%	– 7.9%	18.5%	0.0%	7.4%
Citizens will be less willing to cooperate	– 3.6%	– 3.7%	– 4.3%	– 18.5%	10.7%	7.4%	– 2.9%	14.8%	0.0%	0.0%

each month during 2016 (1 month for each quarter of the year: March, June, September, and December). All six officers were randomly selected, however, three officers remained the same across all 4 months, whereas the other three officers were newly selected each month.<sup>9</sup> During each month, all incidents<sup>10</sup> the officer was involved in as well as the total number of activations the officer had was assessed. Overall, when looking at the entire year, officer compliance averaged at a 70% activation rate (see Table 5). However, when assessing compliance at each of the time periods, it is apparent that compliance with the mandatory policy decreased overtime (see Fig. 1). At the end of the first-year quarter of BWC use, the average activation compliance was about 82%. By the end of the last yearly quarter, activation had decreased to 55%.

## 6. Discussion and conclusion

This study reported on an evaluation of BWCs for the Hallandale Beach Police Department's initial implementation. The results suggest that the use of BWCs by officers resulted in less intrusive methods to resolve incidents, while officers continued to be active rather than abstaining from community contact. Nonetheless, officer perceptions of the usefulness of BWCs became slightly more pessimistic following their implementation. More specifically, there was a reduction in arrests for all officers but slightly greater reductions for officers wearing BWCs while there were observed increases in field contacts and citations (though not statistically significant) for officers wearing BWCs and decreases in both for those not wearing BWCs. There were also decreases in non-violent resistance for all officers, but greater significant reductions for officers not wearing BWCs.

It is most plausible that these observed changes are the result of the BWCs, however as noted previously, the low numbers of occurrence for some of these measures (use of force, complaints, assaults, resistance) poses difficulties in interpretation. Nonetheless, similar to the findings herein, other scholars have found reductions in use of force and/or complaints, both in the United Kingdom (Goodall, 2007; ODS Consulting, 2011) and the United States (Ariel, 2017; Ariel et al., 2015; Jennings et al., 2014; Katz et al., 2015; MPD, 2013; Roy, 2014; White, 2013). Altogether, these results could be a positive finding for the use of BWCs because officers relied on less intrusive measures (i.e. arrests), while having more proactive contact and giving more citations. These findings also provide evidence against claims of the “de-policing effect,” the assertion that officers will no longer do their jobs and are less proactive because of the increased oversight that BWCs present.

<sup>9</sup> It was decided to have three of the same officers evaluated across the 4 months to see if activation changed overtime (a panel design), whereas the three new officers chosen each month allowed for a broader sample.

<sup>10</sup> This refers to all types of incidents that were reported by the officer, including calls for service as well as any activity that was on viewed or initiated by the officers.

**Table 5**  
Statistics for total compliance for the year.

	Activations	Incidents	Activation
Minimum	18	36	22.5%
Maximum	113	160	100%
Mean/average	63.3	90.2	70.3%
Standard deviation	29.9	32.1	26.6%

Nonetheless, the finding pertaining to increases in assaults against officers, still warrants further investigation as it pertains to officer safety. This finding is consistent with that of Ariel et al. (2016), though here it was not statistically significant. It is possible that officers are reporting citizen resistance more frequently due to the presence of BWCs.

Despite these observed behavioral changes which seem to support the continued use of BWCs, there was a persistent negative view among officers towards the adoption and continued use of BWCs. This finding contrasts with previous research which found that police officers generally tended to favor their use (Gaub et al., 2016; Jennings et al., 2014; Katz et al., 2015; MPD, 2013 and Owens et al., 2014). These pessimistic perceptions and lack of receptivity to the BWC program could stem from how the BWC program was implemented by the department's upper administration. The survey findings found that officers expressed displeasure with the process by which videos were used by administration to reprimand officers for what officers deemed as miniscule incidents. Thus, while the finding that officer perceptions became more averse to the idea of BWCs should be based on the effectiveness and usefulness of the cameras, it cannot be separated from how the police department implemented the program and used the footage. Lastly, the fact that compliance decreased over time even with a mandatory use policy suggests that there needs to be incentives for officer compliance with the policy and use of the cameras. These reductions in the actual use of the camera could have implications for the job performance findings documented above. Whatever the case, the findings here raise important implications for how agencies go about applying BWCs within their own organizations.

There are some possible limitations that should be considered in interpreting these findings. First, there is the possibility of contamination effects between officers wearing cameras and those not wearing cameras as the “double blind” standard was not achieved. This is a common, usually unavoidable problem in field based experiments. It was not possible to restrict the interactions between control officers' (not wearing camera) and treatment officers' (wearing cameras), particularly when responding as back up to an incident. Thus, even officers not wearing cameras have the potential to be impacted because there is a camera present on scene. Future research should account for this limitation by collecting data that details how many additional officers responded to a given scene and if any of them wore BWCs. Second, the survey mediums changed from the pre-survey (in-person at the police

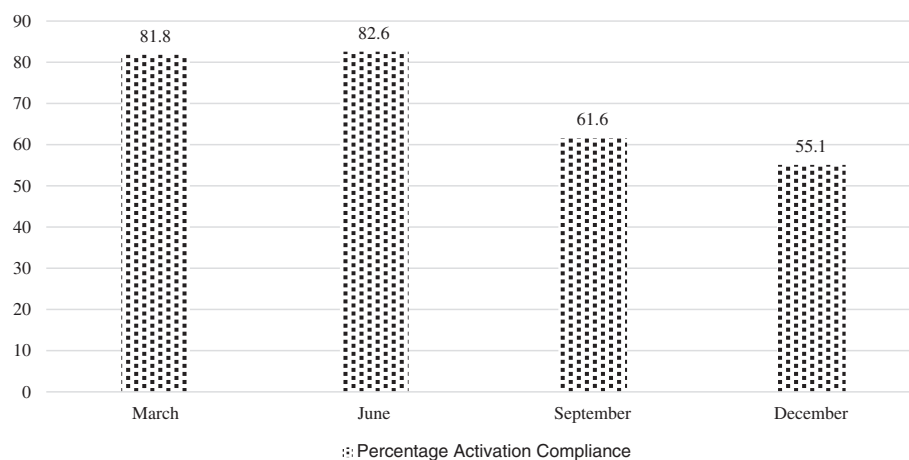


Fig. 1. Average percent of BWC activation compliance (2016).

department, primarily during roll call) to the post-survey (online). The setting in which the officer took the survey could have impacted the officer's responses and/or openness, particularly during the pre-survey.<sup>11</sup> Third, this evaluation focused solely on officer behavior and attitudes, thus it is unknown how citizen's behavior and attitudes are impacted by BWCs. Immediately following police-citizen encounters it would be advantageous for future research to study the citizen's awareness of BWC usage as well as attitudes and perception of BWC effectiveness. Lastly, the small numbers of officers in the study groups impeded the ability to determine statistical significance in many of the analyses.

Other less concerning limitations include changes within the police department that are beyond the control of the researchers, which could impact the internal validity of the study. For instance, during the evaluation period and implementation of BWCs, management changes occurred which encouraged more officer self-initiated activity/proactivity (rather than merely responding to calls for service). Thus, the shift in officer behavior may be a consequence of that administrative change rather than the BWCs. However, if it were the case that such administrative changes could have impacted officer proactivity (i.e. field contacts), then increases in both officers wearing cameras and those not wearing cameras would be expected, which is not what was found. Thus, while this is a possibility, the quasi-randomized design used here gives more credibility to the idea that officer performance changes were in fact a result of the BWCs. Moreover, all the limitations noted here are not uncommon in field based experiments and the consistency of these findings with those of previous research strengthens the validity of the conclusions in this study.

In sum, the findings herein are generally consistent with the growing body of research on BWCs across the United States which has found BWCs to be useful in improving the interactions which occur between officers and citizens. Additionally, per the Bureau of Justice Statistics' *Census of State and Local Law Enforcement Agencies* (2008), more than 90% of all local police departments in the United States employ 100 or less sworn officers. Therefore, due to the moderate size of the Hallandale Beach Police Department, this evaluation documents an experience that is more common to what other police departments around the country may face when implementing BWCs. Undoubtedly, more remains to be determined through future research on the use of BWCs, but the growing body of evidence, including the findings here, offer more to support their continued use, than not.

<sup>11</sup> During the pre-survey, it was observed that some officers did not want to fill out the survey inside the police department but preferred to take it home. Moreover, it was observed some officers jokingly asked each other what they were putting on their survey and/or put neutral for every answer. Thus, survey results should be interpreted with caution.

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