

A Quasi-Experimental Evaluation of the Effects of Police Body-Worn Cameras (BWCs) on Response-to-Resistance in a Large Metropolitan Police Department

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ABSTRACT

The current study provides a statistically rigorous program evaluation of the impact of police body-worn cameras (BWCs) on police response-to-resistance (e.g., use of force). Results indicate that BWC officers' mean frequency of response-to-resistance decreased by 8.4% from the 12 months pre-BWC implementation to the 12 months post-BWC implementation compared with a 3.4% increase observed for the matched sample of non-BWC officers. Police departments should consider adopting BWCs alongside other strategies to reduce police response-to-resistance, and to improve transparency and accountability. Study limitations and directions for future research are also discussed.

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Introduction

Given the recent and growing number of tragic incidents such as Michael Brown in Ferguson, Missouri; Eric Garner in New York; Alton Sterling in Baton Rouge, Louisiana; and Philando Castile in St. Paul, Minnesota where minority individuals are being victims of violence perpetrated the police, as well as the recent shooting and killing of five police officers in Dallas, Texas, it is clearly a time where people are searching for answers and explanations and justice system reform and prevention strategies. Coinciding with these events, and often in response to these events, public and police interest in police body-worn cameras (BWCs) is emerging. In fact, Lum and colleagues (2015) recently identified 12 existing BWC empirical studies (Ariel, Farrar, and Sutherland 2015; Ellis, Jenkins, and Smith 2015; Goodall 2007; Grossmith et al. 2015; Jennings, Fridell, and Lynch 2014; Jennings, Lynch, and Fridell 2015; Katz et al. 2015; ODS Consulting 2011; Owens, Mann, and McKenna 2014; Ready and Young 2015; Roy 2014; Young and Ready 2015) and another 30 ongoing empirical studies (for review of the ongoing BWC studies, see Lum et al. 2015).

Relatedly, a number of recent studies have shown that officers are generally supportive of BWCs, and that while their initial perceptions may be less optimistic about the benefits of their use, their favorability ratings toward BWCs generally improves once they become more acquainted with and accustomed to the technology (Jennings et al. 2014, 2015; Katz et al. 2015). For example, Young and Ready (2015) reported that Mesa, Arizona officers who wore BWCs were more likely to rate BWCs as being helpful in their day-to-day activities, and Grossmith et al.'s (2015) analysis of officers in London revealed that the officers reported BWCs to be useful in handling complaints more effectively, particularly in cases where

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evidence would have been lacking in the absence of BWCs. Katz et al. (2015) also indicated that the majority of surveyed officers perceived BWCs as a tool to provide a more accurate depiction of events, that the BWC video increases the quality of the evidence that can be obtained, and that nearly 60% of the officers felt that BWCs were comfortable to wear, but were also hoping for some technological improvements for added comfort as well. In addition, emerging research has provided some preliminary evidence that public attitudes generally favor the use of BWCs in police departments and perceive that BWCs will increase the quality of police–citizen interactions. However, some citizens have also noted their concerns about victim and witness cooperation (Sousa, Miethe, and Sakiyama 2015).

Turning toward BWC outcome evaluations specifically, Young and Ready (2015) relied on quasi-experimental field data from Mesa, Arizona where 50 officers were assigned BWCs and 50 officers represented a matched comparison group who did not wear BWCs. Their results indicated that the BWC officers performed significantly fewer stop and frisks, issued significantly more citations, initiated significantly more contacts with citizens, and rated the BWCs as being particularly helpful in their encounters with citizens. Ariel, Farrar, and Sutherland (2015) conducted a randomized controlled trial of BWCs in Rialto, California where 54 Rialto police officers (the entire police department) were randomly assigned to shifts where they either wore or did not wear BWCs. Their results suggested that response-to-resistance was twice as likely during shifts where the BWC was not worn relative to the shifts where the BWC was worn. In contrast, Jennings et al. (2015) performed a randomized controlled trial where officers (not shifts) were randomized in Orlando, Florida. The results from this study revealed that the 46 officers who were randomly assigned to wear BWCs had significantly fewer incidents of response-to-resistance in the 12 months post-BWC implementation compared with the 46 officers who were randomly assigned to not wear BWCs, and that wearing BWCs led to a 53.4% reduction in the response-to-resistance for officers who were wearing the BWCs when comparing their response-to-resistance in the 12 months pre-BWC implementation to their response-to-resistance in the 12 months post-BWC implementation.

The current study

In recognition of the growing but small amount of existing evaluation research surrounding BWCs, the current study offers an examination of the impact of BWCs on police response-to-resistance. Specifically, relying on data from 60 BWC officers from the Tampa Police Department in Tampa, Florida and using a propensity score matching (PSM) technique to identify a statistically comparable matched sample of 60 non-BWC officers, this study evaluates the effect of BWCs on the frequency of response-to-resistance in the 12 months post-BWC implementation and compares this frequency with the frequency of response-to-resistance in the 12 months prior to BWC-implementation.

Methods

Site and sample

Tampa, Florida is a mid-to-large sized metropolitan city with greater than 350,000 residents, and the city is fairly diverse with roughly 40% of the population being minorities (African American or Hispanic). The sample for the current study includes 761 Tampa Police Department (TPD) officers that were working for the TPD during the 24-month study period.

Dependent variable

The dependent variable is a frequency (count) of the number of incidents of physical response-to-resistance that the officers were involved in during the 12 months pre-BWC implementation (March

2014–February 2015) and in the 12 months post-BWC implementation (March 2015–February 2016). Specifically, physical response-to-resistance incidents included behaviors such as empty hand “soft” control techniques (i.e., grabs, holds, and joint locks), empty hand “hard” control techniques (i.e., punches, kicks, countermeasures), less-than-lethal weapons (i.e., batons, projectiles, chemical sprays, conducted energy devices), and firearms.

Independent variable

Sixty BWCs were purchased by TPD according to a normal bidding process with a host of vendors, and volunteers were recruited from the three police districts in Tampa (e.g., approximately 20 officers per district) to wear the BWCs. As such, the officers were separated into two groups of interest: BWC officers and non-BWC officers.

Covariates

There are a series of officer demographics included as covariates in the analysis including officer gender (male = 1; female = 0), officer race/ethnicity (White Officer, African American Officer, Hispanic Officer), officer age (measured continuously in years), and officer years of law enforcement experience at TPD (measured continuously in years based on the number of years between TPD hire date and study end date). In addition, the frequency (count) of the number of incidents of physical response-to-resistance that the officers were involved in during the 12 months pre-BWC implementation is included as a covariate in certain analyses as well.

Analytic procedure

This analysis proceeds in a series of stages. In the first stage, we present descriptive summary statistics for the officers. Next, we employ PSM techniques to approximate a quasi-experimental research design in order to be better positioned to derive more precise estimates between statistically matched samples (see Jennings et al. 2013; Richards et al. 2014; Rosenbaum and Rubin 1983). Specifically, the utilization of PSM permits the ability to remove any observable and systematic differences that may exist between the officers who were wearing a BWC relative to the officers that were not wearing a BWC. In this vein, relying on a R program (Ho et al. 2007, 2011) and statistical convention in the propensity score matching literature including the use of a strict .10 caliper and nearest neighbor matching methods (Austin 2009; Rosenbaum 2002), we derive our propensity score estimates from a logistic regression model where wearing a BWC is considered the “experimental condition” and not wearing a BWC is considered the “control condition” (for further discussion on PSM, see Ho et al. 2011; Pearl 2009; Rosenbaum 2002). This specified propensity score algorithm is also based on the inclusion of a series of officer demographic factors (gender, race/ethnicity, age, and years of experience) and the frequency of response-to-resistance incidents that the officers were involved in during the 12 months pre-BWC implementation. Following the estimation of PSM, we make statistical comparisons via *t*-tests to compare the demographic factors and the frequency of response-to-resistance pre-BWC implementation between the BWC officers and the non-BWC officers prior to and post-PSM. In the final stage of analysis, we perform statistical comparisons between the BWC officers and the matched sample of non-BWC officers via a *t*-test for the frequency of response-to-resistance in the 12 months post-BWC implementation and through an examination of percentage changes in the frequency of response-to-resistance pre-to-post-BWC implementation for the BWC officers and the matched sample of non-BWC officers.

Results

Summary statistics are presented in Table 1. As illustrated, the majority of officers were male (83.8%), and 71.8% were White, 12.8% were African American, and 15.4% were Hispanic. On average, the

Table 1. Summary statistics (n = 761).

	M/%	SD	Minimum	Maximum
Officer gender				
Male	83.8	—	—	—
Female	16.2			
Officer race/ethnicity				
White	71.8	—	—	—
African American	12.8			
Hispanic	15.4			
Officer age	40.11	7.83	23.00	63.00
Number of years as a TPD officer	11.81	6.62	2.00	31.00
Response-to-resistance frequency: Pre-BWC implementation	3.05	3.69	0.00	29.00
Response-to-resistance frequency: Post-BWC implementation	2.73	3.78	0.00	30.00

officers were 40.11 years of age ($SD = 7.83$; range = 23–63 years of age), and had been working as police officers at TPD for 11.81 years, on average ($SD = 6.62$; range = 2–31 years). Overall, the officers were involved in an average of 3.05 incidents where physical force was used during the 12 months pre-BWC implementation, and in an average of 2.73 incidents where physical force was used during the 12 months post-BWC implementation.

Table 2 provides the bivariate comparisons for the covariates (officer gender, officer race/ethnicity, officer age, years of experience, and the frequency of incidents where physical force was used during the 12 months pre-BWC implementation) before and after applying PSM techniques. As can be seen in columns 1 and 2, prior to matching, most of the covariates significantly differed when comparing the 60 BWC officers with the 701 non-BWC officers. Specifically, a significantly lower percentage of BWC officers were White and a significantly greater percentage of the BWC officers were Hispanic compared with their non-BWC counterparts. Also, the non-BWC officers, on average, were significantly older and had a greater number of years of law enforcement experience at TPD relative to the BWC officers. Finally, the BWC officers had been involved in a significantly greater mean number of incidents where physical response-to-resistance was used in the 12 months pre-BWC implementation compared to the non-BWC officers. Turning toward columns 3 and 4, the results demonstrated that after applying PSM and generating a statistically comparable sample of 60 non-BWC officers in terms of officer demographics and the frequency of physical response-to-resistance pre-BWC implementation that none of the pre-existing significant differences between the two groups remained. Or in other words, prior to matching, the comparisons between BWC officers and non-BWC officers were in effect apples to oranges comparisons, and, after matching, the comparisons were now apples to apples comparisons.

Figure 1 graphically displays the average number of physical response-to-resistance incidents that the 60 BWC officers and the 60 non-BWC matched officers were involved in during the 12 months

Table 2. Bivariate comparisons of officer demographics and response-to-resistance frequency before and after matching.

Variables	Before matching		After matching	
	n = 60 BWC officer	n = 701 Non-BWC officer	n = 60 BWC officer	n = 60 Non-BWC officer
Male officer	.80	.84	.80	.74
White officer	.57	.73	.57	.53
African American officer	.18	.12	.18	.15
Hispanic officer	.25	.15	.25	.31
Officer age	38.37	40.26	39.23	38.37
Number of years as a TPD officer	10.13	11.95	10.13	11.70
Response-to-resistance frequency: Pre-BWC implementation	3.72	2.99	3.72	4.31

Note. Significant mean differences ($p < .10$) in bold italics.



Figure 1. Pre- and post-BWC implementation comparisons in the frequency of response-to-resistance for matched experimental and control groups ($N = 120$).

pre-BWC implementation and in the 12 months post-BWC implementation. As illustrated, the BWC officers were involved in an average of 3.72 physical response-to-resistance incidents in the 12 months prior to BWC-implementation and this involvement declined to an average of 3.41 physical response-to-resistance incidents in the 12 months post-BWC implementation. Comparatively, the non-BWC matched officers were involved in 4.31 physical response-to-resistance incidents pre-BWC implementation and 4.46 physical response-to-resistance incidents post-BWC implementation. Statistical results from a *t*-test comparison revealed that the post-BWC physical response-to-resistance incidents significantly differed and were significantly less for the BWC officers relative to the non-BWC matched officers. Finally, the percentage changes in the mean frequency of physical response-to-resistance incidents from pre-BWC implementation to post-BWC implementation are displayed in Figure 2. This graph demonstrates that there was an 8.4% decrease in the average number of physical response-to-resistance incidents pre-to-post-BWC implementation for the 60 BWC officers compared with a 3.4% increase in the average number of physical response-to-resistance incidents pre-to-post-BWC implementation for the matched sample of 60 non-BWC officers.

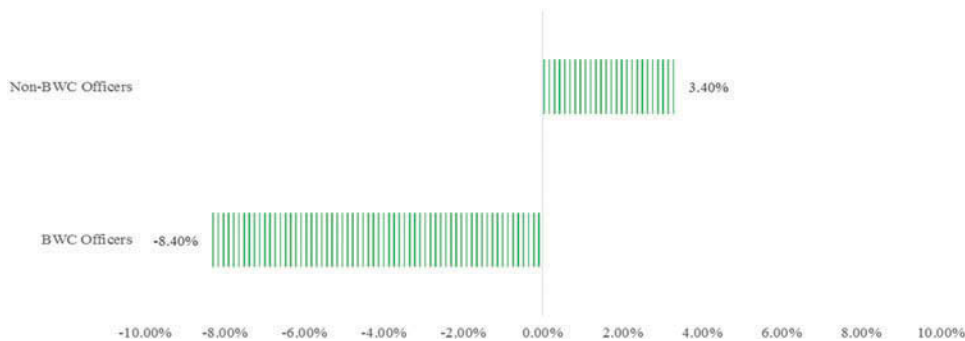


Figure 2. Percentage change in the frequency of response-to-resistance from pre- to post-BWC implementation for matched experimental and control groups ($N = 120$).

Discussion

The current study set out to provide an evaluation of the impact of BWCs on police response-to-resistance. Relying on 24 months of response-to-resistance data (12 months pre-BWC implementation and 12 months post-BWC implementation) and PSM techniques, a number of key findings emerged that are highlighted below.

For example, the initial comparisons revealed that the 60 BWC officers significantly differed from the 701 non-BWC officers not only in the extremely unequal sample sizes, but, more importantly, on a host of officer demographics and in their average number of physical response-to-resistance incidents pre-BWC implementation. As a result, propensity score matching techniques were applied in an effort to generate a matched sample of 60 non-BWC officers that were statistically similar to the 60 BWC officers in terms of their gender, race/ethnicity, age, years of law enforcement experience at TPD, and in their average number of physical response-to-resistance incidents pre-BWC implementation. Once this PSM algorithm and analysis was performed, the results demonstrated that the 60 BWC officers were involved in a significantly fewer number of physical response-to-resistance incidents post-BWC implementation, on average, compared to the matched sample of 60 non-BWC officers. And, the BWC officers exhibited an 8.4% decrease in their mean number of physical response-to-resistance incidents when comparing their behavior in the 12 months pre-BWC implementation to their behavior in the 12 months post-BWC implementation. In contrast, the mean number of physical response-to-resistance incidents increased by 3.4% for the matched sample of non-BWC officers when comparing their pre-BWC implementation frequency to their post-BWC implementation frequency. Although only speculative, if this 8.4% reduction in the mean number of physical response-to-resistance incidents (a reduction in approximately 20 physical response-to-resistance incidents) observed among these 60 BWC officers in the 12 months post-BWC implementation was scaled up to the entire sample of 761 TPD officers then this would translate to slightly more than a reduction of 250 physical response-to-resistance incidents per year for the department.

These findings notwithstanding, it is important to note several limitations of the current study. First, this study is based on results from one large metropolitan police department in one city, and a city that is a mid-to-large-sized city with a diverse demographic population. The degree to which these findings would be observed in smaller, less diverse, and more rural police departments and cities may be limited. Second, although a rigorous statistical procedure (i.e., propensity score matching) was used to derive a statistically comparable matched sample of non-BWC officers, these results were not generated from a randomized controlled trial such as those found elsewhere in the literature (see Jennings et al 2014, 2015). As such, caution should be taken when making comparisons to these studies and in the interpretation of this study's results as the influence of unobserved and unmeasured differences between the BWC officers and the matched sample of non-BWC officers is unknown. Third, this study (similar to other studies in the literature) did not have information from the incidents where response-to-resistance was used regarding suspect demeanor, suspect race, suspect gender, and so on. As these variables are also potentially relevant factors for influencing an officer's decision to use force, it is recommended that future research incorporate these data when available.

Ultimately, the results from this study contribute to the growing body of evidence in support of the utility of police body-worn cameras to reduce police response-to-resistance (Ariel et al. 2015; Grossmith et al. 2015; Jennings et al. 2015). However, it is important to acknowledge that BWCs are not a panacea. In light of the growing number of tragic incidents that are occurring in the United States where minority individuals and police officers are being targeted for violence, it is necessary that police departments consider a range of prevention strategies for reducing officer response-to-resistance and increasing officer safety such as the adoption of BWCs and an increase in police officer training in general and implicit bias training specifically, along with other recognizable and successful practices to improve police-community relations such as community policing and other related strategies (Chappell and Piquero 2010; Zavala and Kurtz 2016). Without this constellation of efforts, the effectiveness of any

one strategy may prove relatively futile. In this same vein, society and the police cannot simply expect that putting a BWC on every officer, in and of itself, will provide an immediate cure for the problem of racially-biased policing practices, police excessive response-to-resistance, and police officers being targeted for being police officers, but it is perhaps a step in the right direction.

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