Attitudinal Changes among Phoenix Police Officers toward Body-Worn Cameras: A Technical Report

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Introduction

Despite the widespread expansion of body-worn camera (BWC) programs in police agencies throughout the US, research examining officer attitudes toward this technology is relatively limited. Most of the extant research in this area examines officer attitudes using cross-sectional methodologies, reporting findings from data collected at one time period only. This is an important limitation given the inability of these studies to assess change in perceptions over time as officers gain experience using BWCs. Those studies that have used pretest-posttest designs have largely found that officers become more favorable toward BWCs in the posttest period (Gaub, Choate, Todak, Katz, & White, 2016; Lum, Stoltz, Koper, & Scherer, 2019; Makin, 2016; Newell & Greidanus, 2018; Whynot, Nykorchuk, Zisis, & Deane, 2016).

Many of the studies reporting changes in officer attitudes toward BWCs over time use survey data collected as part of larger evaluations of BWCs. These evaluations use different methodologies for deploying BWCs, with some using randomly selected officers who were mandated to wear a BWC and others using officers who volunteered to wear a BWC. This variation in the approaches used to deploy BWCs inhibits a comparison of perceptions of BWCs between officers who volunteer to wear a camera and those who are mandated to do so. Given that officers who voluntarily wear BWCs could differ from those who are required to wear BWCs by their agency, it is important to examine whether the way an officer was assigned a BWC (voluntarily or mandated) impacts officer perceptions of the technology over time. In addition to potential differences in officer perceptions of BWCs themselves, the ways these officers rate organizational justice within their agency and their support for the use of procedural justice when interacting with citizens could also differ based on how BWCs are assigned to officers. Further, the perceptions of officers who wear BWCs could change in different ways,

compared to officers who did not wear a BWC. The present study addresses these research gaps using data collected as part of a larger randomized-controlled trial of BWCs in the Phoenix Police Department (PPD).

Though the PPD BWC evaluation was originally designed to randomly assign BWCs to officers who volunteered to wear a BWC as part of a federally sponsored project, pressure to quickly deploy BWCs resulted in some officers being randomly selected and mandated to wear a BWC. Through the original BWC assignment process, those officers who were asked to volunteer and declined were not assigned a BWC, and are referred to as resistors. Randomly selected officers who were not asked to volunteer to wear a BWC and did not wear a BWC during the study are used as a control group. Officers in each of these groups were surveyed prior to and six months after the deployment of BWCs in Phoenix. This survey data is used to examine two research questions. First, do officer perceptions of BWCs, organizational justice, and procedural justice change after the deployment of BWCs? Second, do changes in officer attitudes over time differ between officers who volunteer to wear a BWC, those mandated to wear a BWC, resistors, and control officers?

This study addresses some of the gaps in the body of research on BWCs by examining change in officer perceptions toward BWCs over time, and comparing those changes between officers who wore a BWC (either voluntarily or mandated) and those who did not (either because they refused or because they were in the control group). Expanding the body of research on officer perceptions of BWCs has important practical implications for police agencies adopting BWCs. The research reported here improves our understanding of officer perceptions of BWCs, whether those perceptions vary depending on an officers' personal experience wearing a BWC, or whether they volunteered or were mandated to wear a BWC. As the use and impact of BWCs

has been tied to officer receptivity to this technology (Edmonton Police Service, 2015; Maskaly, Donner, Jennings, Ariel, & Sutherland, 2017), understanding officer attitudes toward BWCs is important for the successful implementation and use of BWCs.

Literature Review

There is a growing body of research examining officer attitudes toward BWCs, although it remains underdeveloped given the widespread adoption of BWCs. Lum et al. (2019) conducted a comprehensive narrative review of 70 BWC studies and found that 32 included a component assessing officer attitudes toward BWC technology. The methodological approaches and rigor used to examine officer attitudes varied widely across studies (Lum et al., 2019). Cross-sectional designs examining officer attitudes at one point in time were the most common. Less research has examined officer attitudes toward BWCs both prior to and following the adoption of BWCs in an agency. Researchers who have examined change in officer perceptions over time often use samples comprised entirely of volunteers or samples comprised entirely of officers mandated to wear BWCs (see Ready & Young, 2015 for exception). This limits our understanding of whether the way BWCs are deployed matters when examining change in officer perceptions over time. Potential differences in how BWCs are deployed could also result in variation in officer perceptions of organizational justice over time. If the assignment of BWCs and use of BWCs by the administration is perceived as fair, officer perceptions of organizational justice could increase. However, if BWCs are perceived to be assigned or used by supervisors unfairly or to punish officers for minor infractions, perceptions of organizational justice could decrease. Further, the research examining whether BWCs influence officer support for the use of procedural justice in contacts with citizens is also limited. Officers wearing BWCs could feel more pressure to use procedural justice in citizen contacts due to increased potential for

supervision, which is an important possibility to assess. This section addresses prior literature in each of these areas.

Prior cross-sectional research on officer attitudes toward BWCs

Cross-sectional research examining officer attitudes toward BWCs largely involves surveys administered to officers prior to the deployment of this technology in their agency. For instance, in their mixed-method examination of officer perceptions of BWCs, Pelfrey and Keener (2016) found that supervisors and line-level officers in a university police department felt that BWCs would assist in report writing and improve evidence available for prosecution. A study of BWC volunteers in Orlando (FL) found that officers were largely supportive of BWCs and felt that the adoption of cameras would influence the behavior of other officers more than their own (Jennings, Fridell, & Lynch, 2014). Research conducted in Rochester and Buffalo, New York indicated that these officers felt BWCs would result in increased adherence to departmental procedures and officers feeling like they have less discretion (Gramagila & Phillips, 2017). Researchers examining cross-sectional differences between officers who volunteered to wear a BWC and those who resisted wearing a BWC prior to their deployment in Phoenix found that volunteers had higher levels of agreement that BWCs would positively impact citizen behaviors (e.g., increased cooperation, acting more respectfully) than officers who resisted wearing a BWC (Huff, Katz, & Webb, 2018).

Studies evaluating officer attitudes toward BWCs after their adoption have identified mixed findings, depending on the jurisdiction. A survey conducted in the Isle of Wight (UK) found that officers had positive attitudes toward BWCs across a range of domains, including evidentiary value, identifying offenders, assuring convictions, reducing complaints, improving officer training, facilitating discipline, and to a lesser extent reducing assaults on officers and

crime (Ellis, Jenkins, & Smith, 2015). They note that BWCs in the UK have met with little officer resistance compared to BWCs in the US. They attribute these differences to the intended goals of BWC programs, with UK programs promoted to improve officer effectiveness and US programs suggested to improve problematic officer behavior (Ellis et al., 2015). Officers in a BWC pilot program in Plymouth (UK) similarly reported favorable attitudes toward the ability of BWCs to improve citizen behavior in police contacts and to provide evidence for court (Goodall, 2007).

In the US, researchers who examined officer perceptions of BWCs post-deployment in Pittsburgh found low levels of officer agreement with the expansion of BWCs to all officers in their department (31%), but this agreement was higher for officers who had worn a BWC (57%) (Goetschel, & Peha, 2017). The majority of officers interviewed 12 months after receiving a BWC in Orlando (FL) agreed that BWCs should be used for all front-line officers in the department (Jennings, Lynch, & Fridell, 2015). Researchers examining BWCs in Albuquerque (NM) found similar patterns, though officers expressed frustration that their written word was no longer sufficient evidence in court, unless it was accompanied with a BWC video (Guerin et al., 2016). They also found that officers wanted more clearly defined policies to protect their privacy as well as the rights and privacy of the citizens they interact with (Guerin et al., 2016). These researchers additionally examined differences between patrol officers and those in specialty units and found that the needs and concerns of these groups of officers differed depending on their assignment (Guerin et al., 2016; see also Gaub, Todak, & White, 2018).

Other cross-sectional research has utilized surveys collected from officers in multiple agencies to examine differences in officer perceptions of BWCs, depending upon whether the technology is used in their agency. These findings generally suggest that officers working in

agencies that have already deployed BWCs have more positive perceptions of this technology than officers working in agencies that are not using BWCs (Kyle & White, 2017; McLean, Wolfe, Chrusciel, & Kaminski, 2015; Smykla, Crow, & Crichlow 2016).

Prior pre-post research on officer attitudes toward BWCs

Studies that have examined officer attitudes toward BWCs prior to and following the adoption of BWCs have largely found that officers become more favorable, or remain neutral toward BWCs after BWC programs are implemented (Lum et al., 2019). Changes in officer perceptions appear to depend on the agency an officer works for. In their three-city study, Gaub et al. (2016) found that officers in Phoenix (AZ) had consistently more negative perceptions of BWCs compared to officers in Spokane (WA), with officers in Tempe (AZ) having the most favorable attitudes toward BWCs. Though officers in all three agencies reported improved perceptions of the ease of use of BWCs over time, their agreement that BWCs would improve citizen behaviors declined following the adoption of BWCs (Gaub et al., 2016). Generally, officers in Spokane and Tempe became more supportive of BWCs over time but officers in Phoenix did not (Gaub et al., 2016). Other research examining the implementation of BWCs in Tempe (AZ) suggests that the high level of officer support for BWCs prior to the deployment of cameras in the field likely facilitated the success of the BWC program in that agency, with officers becoming increasingly favorable toward the use of BWCs over time (White, Todak, & Gaub, 2018). In explaining these differences across agencies, the authors suggested that a temporal effect could be at work, as Phoenix officers were exposed to BWCs much earlier than those in Spokane or Tempe (Gaub et al., 2016).

Several studies have noted that officers report becoming more comfortable using BWCs after being assigned a camera (Katz, Choate, Ready, & Nuno, 2014; Newell & Greidanus, 2018;

Wooditch, Uchida, Solomon, Revier, Connor, & Swatt, 2017). Officers assigned BWCs in Los Angeles reported lower levels of agreement that citizens would avoid talking to the police or that BWCs violate citizen privacy after BWCs were deployed (Wooditch et al., 2017). Researchers in the London Metropolitan Police found that BWC officers felt significantly more protected against frivolous complaints and were more confident in the evidence they could obtain, compared to control officers at the posttest (Grossmith et al., 2015). Most officers in a mixed methods study conducted in Bellingham (WA) and Spokane (WA) felt that they should have discretion to deactivate the camera in sensitive situations or when working with victims and informants; but they generally agreed that BWCs should be used in most encounters, and their levels of agreement increased over time (Newell & Greidanus, 2018). Officers in numerous studies reported that BWCs made them feel like they had less discretion and resulted in them acting more legalistically (Koen, Willis, & Mastrofski, 2018; Whynot et al., 2016). Though concerns about BWCs limiting officer discretion were mentioned during qualitative interviews conducted in a small police force prior to BWC deployment, these concerns were not mentioned in interviews conducted after the deployment of cameras (Makin, 2016).

Prior research in the Phoenix Police Department found that officers increased their levels of agreement that BWCs should be used by all officers in the department from 19% to 33% between the pretest and the posttest, though these findings still suggest that Phoenix officers were largely unsupportive of the adoption of the technology (Katz et al., 2014). Officer perceptions of BWCs became more negative for both treatment and control officers in a partial RCT of BWCs in the Hallandale Beach Police Department (FL) (Headley et al., 2017). The decreased favorability toward BWCs for both BWC and control officers in Hallandale Beach supports other research which found that officer attitudes about the legitimacy of BWCs were

related to how other officers in their social network felt about BWCs (Young & Ready, 2015). These results highlight the importance of examining change for both officers who used and those who did not use a BWC.

Many of the studies discussed above do not examine the impact of the method of deployment on officer perceptions of BWCs. This is likely due to the design of most of these studies, which rely heavily on data for officers mandated to wear BWCs. Researchers examining BWCs in Mesa (AZ), an exception, assigned BWCs to 25 officers randomly selected from a list of volunteers and 25 randomly selected officers who were mandated to wear a BWC, these officers were matched to 50 control officers (Ready & Young, 2015). Officers were required to complete field contact forms detailing police-citizen encounters and their perceptions of the usefulness of a BWC in the encounter on randomly selected days throughout the study period (Ready & Young, 2015). Officers assigned to the treatment condition (either volunteers or mandated) were significantly more likely to rate BWCs as helpful than control officers (Ready & Young, 2015). Further, officers who volunteered to wear a BWC were significantly more likely to rate BWCs as helpful than those who were mandated to wear a BWC, even controlling for the type of encounter (Ready & Young, 2015). This finding suggests that officers who volunteer to wear BWCs could differ from those who are mandated to wear a camera.

Prior research on the impact of BWCs on officer perceptions of their organization

Several studies have identified concerns relating to the impact of BWCs on officer's attitudes toward organizational justice. Though officers recognize the potential for BWCs to reduce frivolous complaints, they also note concerns with the potential for supervisors to use footage to punish officers for minor infractions (Headley, Guerette, & Shariati, 2017; Newell & Greidanus, 2018; Pelfry & Keener, 2016; Smykla et al., 2016). Given that officer perceptions of

organizational justice have been associated with their job performance (Trinkner, Tyler, & Goff, 2016), understanding whether BWCs positively or negatively influence perceptions of their organizations is important. In their study of the impact of BWCs on officers in five police agencies, Adams and Mastracci (2018) found that officers who wear BWCs had significantly lower perceptions of organizational support and significantly higher levels of burnout. Further, the relationship between BWCs and burnout was partially mediated by perceived organizational support (Adams & Mastracci, 2018). Another study found that officers who felt that their agency was organizationally just had more positive perceptions of BWCs (Kyle & White, 2017), suggesting that such concerns can be mitigated. A study of officers in the UK found that officers with higher levels of organizational commitment were less cynical about the benefits of BWCs, though officer perceptions of internal procedural justice were unrelated to any of the cynicism measures examined (Tankebe & Ariel, n.d.). The majority of the officers surveyed felt that BWCs were not a sign that management did not trust them and that BWCs would not be used to discipline officers (Tankebe & Ariel, n.d.). However, a study of officers from three agencies in Florida identified no relationship between perceptions of organizational justice and support for BWCs (Lawshe, Burruss, Giblin, & Schafer, 2019).

Research examining officer perceptions of their organizations before and after the implementation of BWCs has resulted in mixed findings. In one study, one of the strongest predictors of officer support for expanding BWCs to the entire department, regardless of whether an officer personally wore a BWC, was officer perceptions of how the BWC would impact their relationship with their supervisors (Goetschel, & Peha, 2017). Importantly, officers who used BWCs and supported the expansion of BWC programs were significantly less likely to agree that BWCs damaged the trust relationship between themselves and their supervisors (Goetschel, &

Peha, 2017). Officers surveyed prior to and after the implementation of a mandatory BWC recording policy in a US transit police department felt that the mandatory activation policy was an indicator that the department did not trust the officers (Hyatt, Mitchell, & Ariel, 2007; see also Grossmith et al., 2015). Qualitative interviews of officers from a small agency suggested that officers were hesitant about BWCs prior to their deployment due to the potential for video to be used to discipline officers for minor infractions, though these concerns were not mentioned in interviews after the implementation of BWCs (Makin, 2016). Officers in another study indicated that unclear policies dictating how footage would be reviewed and used to hold officers accountable has resulted in officer fear that they would get in trouble for something (Newell & Greidanus, 2018). Officers who view BWCs as a mechanism for supervisors to identify and discipline minor misconduct could reduce their proactive contacts to avoid additional attention (Newell & Greidanus, 2018). As such, examining officer perceptions of organizational justice in relation to BWC implementation and use is important because it could result in officers changing the way they police.

Prior research on the impact of BWCs on officer perceptions of procedural justice

Researchers are beginning to examine whether BWCs can increase officer use of procedural justice. Procedural justice theory suggests that decisions made by authority figures are respected most when the mechanisms used to reach those decisions were fair and neutral. Though early procedural justice scholars emphasized the importance of using procedurally just criteria to reach decisions about the outcome of an event (Thibaut & Walker, 1975), more recent work suggests that the mechanisms used to engage in procedural justice are more important than achieving distributive justice (Tyler & Blader, 2003). Procedural justice encompasses four key elements: participation, neutrality, dignity/respect, and trust (Tyler, 2004). Citizens have higher

perceptions of procedural justice when they feel they were allowed to contribute to the encounter, when the officer used objective criteria to make decisions, when the citizen felt they were treated with dignity and respect, and when the citizen trusted the officers' motives in the interaction. Officer use of procedural justice has been associated with positive outcomes, for instance, citizens who feel they are treated in a procedurally fair way are more likely to comply and cooperate with the police (Tyler, 2004).

Procedural justice is often examined by asking citizens about how they perceived their treatment by the police in an individual encounter (e.g., Worden & Mclean, 2018). Researchers have also used systematic social observation and/or reviewed recorded officer encounters to examine whether officers are engaging in procedurally just behaviors, like giving citizens the opportunity to participate in an interaction (McCluskey, Uchida, Solomon, Wooditch, Connor, & Revier, 2019; Worden & Mclean, 2018). Other researchers have examined officer attitudes toward using procedural justice (Skogan, Van Craen, Hennessy, 2015). Though ensuring officers engage in procedural justice has traditionally been challenging for police supervisors (Worden & Mclean, 2018), the use of BWCs could facilitate supervisor review of officer behaviors. Specifically, a supervisor could watch a BWC video to see whether an officer treated a citizen in a procedurally just way. This could change officer perceptions of the use of procedural justice when they wear BWCs.

Systematic-social observation conducted in the LAPD indicated that officers were more likely to use procedural justice after the adoption of BWCs, even controlling for other situational factors (McCluskey, Uchida, Solomon, Wooditch, Connor, & Revier, 2019). This study diverges from those asking about citizen perceptions of treatment during police encounters and instead examines whether officers were more likely to give citizens a voice, be objective, and be

respectful during citizen interactions. Officers in Edmonton (UK) reported that BWCs made them more concerned about using appropriate language and being professional and patient with citizens; however, some officers felt that the cameras made them more robotic and created barriers in establishing rapport (Edmonton Police Service, 2015). Officer surveys conducted in the Metropolitan Police in London (UK) found no significant differences in self-reported use of procedural justice (Grossmith et al., 2015), However, surveys of London citizens found that citizen support for BWCs was positively associated with their perceptions of procedural justice in the police department (Grossmith et al., 2015).

Some researchers have suggested that reductions in complaints associated with BWCs could be attributable to officers behaving in more procedurally just ways to compensate for the camera. For example, officers interviewed in a London trial of BWCs said they would sometimes narrate what they were doing or why they were making a particular decision to the camera (Owens & Finn, 2017). This could be perceived by citizens who interact with the police as procedural justice. Though the BWC officers surveyed in the study did not report any differences in their behavior over time or compared to the control group, their findings could suggest that procedural justice is occurring, even without the officer recognizing it (Owens & Finn, 2017).

Current Study

The purpose of the current study is to examine the impact of the adoption of BWCs on officer attitudes toward BWCs, organizational justice, and procedural justice as a part of a larger evaluation of BWCs in the Phoenix Police Department (PPD). We address limitations in prior BWC attitudes research in two ways. First, we expand on cross-sectional research by examining changes in officer attitudes toward BWCs over time. Second, we assess whether changes over time are related to personal experience using a BWC. To do so, we examine whether the method

of BWC assignment, either voluntarily or mandated, impacts change in officer perceptions over time. Given the lack of research in this area, we assess officer attitudinal changes in a number of different domains. We first examine officer perceptions of the impact of BWCs on officer efficacy, officer behavior, and citizen/resident reactions to the police when officers use BWCs. Officers general perceptions about the benefits of BWCs and overall support for expanding the use of BWCs in the department are also assessed.

Additionally, we examine whether officer perceptions of organizational justice within the PPD and officer perceptions of the use of procedural justice in citizen contacts change over time. The inclusion of organizational justice in the current study contributes to the BWC and organizational justice literature because some officers resist BWCs due to the perception BWC videos will be used to discipline them unfairly (Pelfrey & Keener, 2016). By examining officer perceptions of organizational justice prior to and after the adoption of BWCs, we examine whether these concerns are alleviated as officers become accustomed to using the technology. Given the potential for BWC footage to be used to evaluate officer use of procedural justice in individual encounters (Worden & McClean, 2018), it is important to examine whether officer attitudes toward the use of procedural justice change depending on their experience wearing a BWC. Comparing these differences between BWC volunteers, officers mandated to wear BWCs, resistors, and control officers enables us to disentangle the complex influence of BWCs on police officer attitudes. Through understanding the impact of BWCs on officer perceptions of their

organization and perceptions of the use of procedural justice, we can more comprehensively evaluate the impact of BWCs on officer attitudes.

Methods

The present study relies on a sample of Phoenix Police Department officers who agreed to participate in a survey on police officer attitudes and beliefs about BWCs, as part of an evaluation of BWCs. A total of 841 officers assigned to patrol units in five of the six PPD precincts were eligible to complete the pretest survey. Patrol officers assigned to one precinct (Maryvale) were excluded from the study because it served as the location of the BWC pilot test. The pretest was administered during pre-shift patrol briefings in March and April of 2017. Members of the research team briefed officers on the purpose of the survey and the officers were provided with an informed consent document indicating their survey would be linked to their employee records. Of the 841 eligible officers, 668 officers were approached and asked to participate in the pretest survey. Contact was not made with the remaining officers (n=173) due to absences (vacation, sick, training, leave, etc.). Up to three attempts were made to contact officers who were absent. Participation in the pretest was voluntary. Of the 668 officers approached, 467 completed the survey, resulting in a 70% response rate for officers who were present at the time the pretest was administered.[1]

BWCs were assigned to officers and deployed starting May 24th, 2017. Officers were randomly selected to wear a BWC from the pool of 467 officers who participated in the pretest survey. Randomly selected officers who declined to volunteer to wear a BWC were replaced by

[1] Given the voluntary nature of the survey, we examined whether any significant demographic differences emerged between officers who participated in the survey compared to all of the officers eligible to participate. We found that male officers ($p<0.05$) and officers with fewer years of service ($p<0.05$) were more likely to participate in the survey. Though these differences were statistically significant, they were substantively small. 88.49% of eligible officers were male and 92.50% of survey participants were male. Similarly, the mean years of service for eligible officers was 10.61 years compared to 9.46 years of service for those officers who participated in the survey.

another randomly selected officer assigned to the same precinct. Forty-seven officers who were randomly selected and asked to wear a BWC volunteered to do so (hereafter referred to as "volunteers"). Ninety-six officers who were randomly selected and asked to wear a BWC refused to do so (hereafter referred to as "resistors"). PPD officials elected to mandate officers to wear the remaining BWCs due to time constraints. Thirty-four BWCs were randomly assigned to officers who were mandated to wear them (hereafter referred to as "mandated").[2] Last, a random selection of 110 officers who participated in the pretest served as the control group for the survey data (hereafter referred to as "control"). A posttest survey containing the same items as the pretest survey was administered by the research team six-months after the deployment of the BWCs. Of the 287 study officers, 245 officers were present when the posttest survey was administered and 237 agreed to participate. This resulted in an 82.6% overall response rate (96.7% response rate for officers present when the posttest survey was administered). When examining response rates by group, 91.1% of mandated officers (n=31 of 34), 89.4% of volunteer officers (n=42 of 47), 73.9% of the resisting officers (n=71 of 96), and 84.5% of the control group (n=93 of 110) completed the post-test survey. Ten officers were removed from this analysis due to missing information on key study variables (9 control officers and 1 resistor), resulting in a final study group of 227 officers in this analysis.

Measures

The survey was designed to address several aspects of officer perceptions of BWCs, as well as perceptions of organizational justice and support for procedural justice. The full list of survey items is provided in Appendix A. All of the survey items were measured on a scale of "1-

[2] Eight BWCs were assigned in violation of study protocol to officers non-randomly selected by their precinct commanders. Those officers who were non-randomly selected and assigned to wear a BWC by their commander are excluded from the analysis.

Strongly Disagree" to "4-Strongly Agree". Items were reverse coded to ensure higher values indicated higher levels of agreement with the relevant scale. We used exploratory factor analysis with oblique promax rotation, which allows extracted factors to be correlated, to validate our scales (Costello & Osborne, 2005).

The items used to examine perceptions and attitudes about BWCs were previously used by Katz et al. (2014) in their study of police perceptions of BWCs in Phoenix. The exploratory factor analyses of these data resulted in the creation of several scales that we use to assess officer perceptions of BWCs: Officer Efficacy (α=0.81), Police Officer Behavior (α=0.76), Citizen/Resident Reactions (α=0.84), General Perceptions (α=0.87), and Overall Recommendations (α=0.93). Items in each scale loaded sufficiently onto one factor, with all factor loadings exceeding 0.45. The Officer Efficacy scale examines whether BWCs improve the accuracy of reports and/or the quality of evidence officers can submit to prosecutors. The Police Officer Behavior scale assesses perceptions of the impact of BWCs on officer discretion and behaviors, including warnings and use of force. The Citizen/Resident Reactions scale examines officer perceptions of citizen responses to a BWC, such as the citizen becoming more cooperative or reducing the likelihood of a complaint. The General Perceptions scale includes whether BWCs are well received by various parties. Finally, the Overall Recommendations scale includes items that ask about whether BWCs should be expanded to all officers and whether BWCs are a good use of department funding.

We also assessed officer perceptions of organizational justice within the PPD and support for treating citizens in a procedurally just manner. The items used to tap into perceptions of organizational justice were adapted from Wolfe and Piquero (2011) who examined the impact of organizational justice on officer misconduct in the Philadelphia Police Department. The

Organizational Justice scale includes items about the fairness and reasonableness of discipline, policies, and special assignments within the department. The procedural justice items were adapted from Skogan et al.'s (2015) study of procedural justice training in the Chicago Police Department. Items in the Procedural Justice scale ask about the importance of giving citizens a voice and treating them respectfully. PPD command staff and union representatives reviewed and provided input on all survey items prior to survey administration. All items in the Organizational Justice scale (α=0.78) loaded sufficiently onto a single factor, with factor loadings exceeding 0.41. Items in the Procedural Justice scale (α=0.80) also loaded sufficiently onto one factor, with factor loadings exceeding 0.52.

Dependent Variables

Using the factors created for the Police Efficacy, Police Behavior, Citizen/Resident Reactions, General Perceptions, Overall Recommendations, Organizational Justice, and Procedural Justice scales, we created a factor score for each officer for the both the pretest and the posttest. We use the posttest factor score for each scale as the dependent variable for most of our analyses. Given our interest in changes in officer attitudes over time, we also calculated the percent change for each scale for each officer using the following formula:

$$\frac{Posttest\ score - Pretest\ score}{Pretest\ score} x100$$

We present these mean percent changes as descriptive results.

Independent Variables

Officer group assignment is used to establish the impact of the treatment on changes in officer perceptions of BWCs over time. The group independent variables are dummy indicators of whether the officer was: 1) randomly selected and mandated to wear a BWC, 2) randomly selected and volunteered to wear a BWC, 3) randomly selected and asked to volunteer to wear a

BWC but declined (aka resistor), and 4) randomly selected to serve in the control group. All group variables use the control group as the reference category.

Other independent variables were included for officer gender, race/ethnicity, educational attainment, age, years of service, and precinct assignment to examine potential variation in attitudes toward BWCs based on officer demographic characteristics. We also include independent variables to control for officer activity levels for the eighteen months prior to BWC deployment, including: the percentage of calls that were self-initiated, the percentage of calls that resulted in arrest, the percentage of calls that resulted in use of force, and the percentage of calls that resulted in a citizen complaint. These variables were obtained from personnel data, precinct rosters, official use of force reports, and citizen complaints.

[Table 1, about here]

Analytical Strategy

Descriptive statistics for officers in each group are shown in Table 1. The control group is used as the reference category in these analyses. We first compared the BWC resistor group to the control group and observed that the resistor group was significantly younger (M=35.5, SD=9.3 vs. M=39.0, SD=9.7, $p<.05$, g=0.36) and differed in terms of precinct assignment (5.7% vs. 23.8% for Mountain View, $p<.05$, g=-0.24). While there were no statistically significant differences between the mandated and control group samples, there were small but meaningful effect size differences between the groups. When contrasted to the control group, the mandated BWC group was more likely to be female (12.9% vs. 4.8%, g=0.32) and white (77.4% vs. 61.9%, g=0.33). Last, when comparing the BWC volunteer and control group samples, there were significant differences with respect to being non-white (19.1% vs. 38.1%, $p<.05$, g=0.41) and precinct assignment (7.1% vs. 23.8% for Mountain View, $p<.05$, g=0.09). While not

significant, we also observed small effect size differences between the volunteer and control groups with respect to being female (14.3% vs. 4.8%, g=0.35), years of service (M=8.3, SD=7.6 vs. M=10.2, SD=7.8, g=0.25), percentage of calls resulting in arrest (M=.13 SD=.05 vs. M=.12, SD=.04, g=-0.28), and use of force (M=.0.0003; SD=.0008 vs. M=.0002, SD=.0004, g=-0.23).

Given the findings above, we use inverse propensity weighted regression adjustment to examine the effect of group membership (volunteer, mandated, resistor, control) on officer attitudes. We first re-weighted all of the officers in the study to create homogenous resistor, mandated, volunteer, and control groups. This is an important step given the identified differences between officers in each of the groups. We included the following officer-level covariates in both the propensity score model and the outcome model: gender, race/ethnicity, educational attainment, age, years of service, precinct assignment, percentage of calls that were self-initiated, percentage of calls that resulted in arrest, percentage of calls that resulted in use of force, percentage of calls that resulted in complaints, and a factor score created to capture each officers pre-test perceptions of BWCs, organizational justice, and procedural justice. All of the measures of officer activities and attitudes were captured prior to the administration of treatment. To calculate our propensity weights, we estimated a multinomial probit model estimating group membership including all of our officer-level covariates. We then used these results to predict the probability of each officer being assigned to the group they were ultimately in. Using these predicted probabilities, we calculated propensity weights as $\frac{1}{P}$, where P is the probability that officer was assigned to their respective group. We then include these propensity weights, in addition to our covariates, in our final regression model. This statistical method allows us to include a large number of covariates in both the multinomial probit regression model used to predict our propensity weights and in our propensity weighted regression adjusted model. This is

considered a doubly-robust estimation method because correctly specifying either the propensity score model or the outcome model will result in unbiased estimates (Stuart, 2010). The balance statistics for the raw and propensity weighted data are reported in Appendix B.

In the next section, we start by examining the unweighted data. We first evaluate within and between-group differences in mean percent change in officer attitudes toward BWCs. We assess changes in officer perceptions using one-sample t-tests to determine whether the mean scale score at the pretest significantly differs from the mean scale score at the posttest for officers in each group. We also assess between group differences using two-sample means t-tests, using the control group as the reference category. We then examine the unweighted data using Difference-in Difference (DID) estimators comparing BWC volunteers, mandated, and resistors to the control group. The DID models estimate the difference in the treatment group post-test score compared to their pre-test score, relative to the difference for the control group. This approach enables us to capture within group changes over time and to compare those changes between treatment and control groups. We do this by estimating separate regression models to predict each time 2 factor score using an independent variable for group assignment (either control or treatment), controlling for the time 1 scale score. This enables us to examine whether the officers in each treatment group "changed" in a different way than officers in the control group over time (see Braga et al., 2017 for a discussion of DID).

After examining the unweighted results, we report the potential outcome means for each factor and each group of officers using the PSW regression adjusted model. Potential outcome means compare treatment and control cases that are similar to each other to make inferences about treatment effects through treating counterfactuals as a missing data problem (Stuart, 2010). Last, we repeat the above DID analysis using the propensity score weighted data. We again use

the control group as the reference group for the PSW weighted DID models. This allows us to determine whether treatment officers (either resistant, mandated, or volunteer) changed in different ways than control officers, once officers in each group were weighted to ensure any differences were not attributable to preexisting differences between groups.

Results[3]

Beginning with the unweighted mean percent change results, control officers (3.8% reduction), BWC mandated officers (8.9% reduction, g=-0.24), and BWC volunteers (8.8% reduction, g=-0.25) were all significantly less likely to agree that BWCs improve Officer Efficacy at the posttest compared to the pretest ($p<.05$). BWC resistors (2.9% reduction, $p<.05$, g=-0.20) and BWC mandated officers (10.5% reduction, $p<.05$, g=-0.42) had significantly more negative Overall Recommendations regarding the expansion of BWCs at the posttest. Officers mandated to wear a BWC also had significantly more negative General Perceptions of BWCs (5.5% reduction, $p<.05$, g=-0.21) at the posttest. BWC volunteers were significantly less likely to agree that BWCs improve Officer Behavior (6.8% reduction, $p<.05$, g=-0.37) or Citizen/Resident Reactions (10.8% reduction, $p<.05$, g=-0.43) at the posttest compared to the pretest. These differences in volunteer perceptions of Citizen/Resident Reactions significantly differed from changes in the control group from the pretest to the posttest (-10.8% vs -0.7%, $p<.05$, g=-0.43). In other words, following the assignment of BWCs, the volunteer group was significantly less likely to report that citizens will change their behavior in positive ways (e.g., be more cooperative, respectful, less aggressive, less likely to complain) as a consequence of a BWC being present, relative to the control group. There were no significant differences in changes

[3] For descriptive statistics examining pre-post differences between each group by survey question see Appendix C.

between the control group and the mandated or the resistor group between the pretest and posttest periods.

[Table 2, about here]

The unweighted DID analyses are presented in Table 3. The results indicated no significant differences between control officers and BWC resistors, though the resistors did have a small effect size increase in their perceptions of Organizational Justice, relative to the control group (b=0.09, g=0.27). There were no significant differences between BWC mandated and control officers either, though mandated officers had small effect size reductions in perceptions that BWCs would improve Officer Efficacy (b=-0.17, g=-0.36), perceptions that BWCs would result in positive Citizen/Resident Reactions (b=-0.10, g=-0.22), General Perceptions of the use of BWCs (b=-0.11, g=-0.27), and Overall Recommendations for expanding the use of BWCs (b=-0.20, g=-0.34). Mandated officers also had a small effect size increase in perceptions of Organizational Justice, relative to the control group (b=0.08, g=0.23). Additionally, our DID analyses revealed that, compared to the control group, those officers who volunteered to wear a BWC were significantly less likely to report that BWCs impact Police Officer Behavior, such as officers being less likely to give a warning to a citizen, being less likely to initiate contact with citizens, and being less likely to use higher levels of force (b=-0.2, $p<0.05$, g=-0.43). BWC volunteers also had small, though non-significant, effect size reductions in perceptions that BWCs would positively impact Officer Efficacy (b=-0.11, g=-0.22) and result in positive Citizen/Resident Reactions to the police, compared to the control group (b=-0.13, g=-0.28).

[Table 3, about here]

Next, we examined the potential outcome means using inverse-probability weighted regression. As seen in Table 4, the results did not show any significant differences between

BWC resistant officers compared to the control group. The only effect size difference between these groups of officers was a small reduction in favorability toward the use of Procedural Justice by resistant officers (POMs 2.98 vs 3.09, g=-0.28).

Though there were no statistically significant differences between the BWC mandated and control groups, the mandated group did have a medium effect size difference in perceptions of the impact of BWCs on Officer Efficacy, relative to the control group (POMs 2.29 vs 2.61, g=-0.52). Mandated officers also experienced small effect size differences in perceptions of BWCs on Police Officer Behavior (POMs 2.44 vs 2.61, g=-0.28), Citizen/Resident Reactions (POMs 2.13 vs 2.36, g=-0.42), General Perceptions (POMs 2.12 vs 2.36, g=-0.48), and Overall Recommendations (POMs 2.07 vs 2.33, g=-0.36), compared to the control group. Mandated officers also had a small effect size increase in perceptions of Organizational Justice, relative to control officers (POMs 2.57 vs 2.47, g=-0.21). These results generally suggest that officers assigned to the control group had more positive perceptions of BWCs than officers who were randomly selected and mandated to wear a BWC six-months following BWC deployment.

There were no statistically significant differences between BWC volunteers and control officers either, though there were again small effect size differences in perceptions of Officer Efficacy (POMs 2.39 vs 2.61, g=-0.40), Officer Behavior (POMs 2.39 vs 2.61, g=-0.39), Citizen/Resident Reactions (POMs 2.25 vs 2.36, g=-0.22), and Overall Recommendations (POMs 2.51 vs 2.33, g=0.28). Volunteers also had a small effect size reduction in support for the use of Procedural Justice in citizen encounters, relative to the control group (POMs 2.92 vs 3.09, g=-0.38). Given some notable standardized differences between the volunteer and control group even after the PSWs were applied (see Appendix B), these results should be interpreted with some caution.

[Table 4, about here]

Finally, we re-estimated our DID model including the propensity score weights. The results suggest that BWC resistors have significantly more positive perceptions of Organizational Justice than control officers at the posttest (b=0.13, g=0.38).

BWC mandated officers had significantly more negative perceptions of Officer Efficacy, compared to control officers (b=-0.19, $p<0.05$, g=-0.43). We also observed small effect size differences between mandated and control officers in the remainder of the scales. BWC mandated officers were less likely to agree that BWCs would change Officer Behavior (b=-0.14,g=-0.33), had less positive agreement that BWCs would improve Citizen/Resident Reactions (b=-0.17,g=-0.42), had less positive General Perceptions of BWCs (b=-0.15,g=-0.38), less positive Overall Recommendations for expanding BWCs (b=-0.22, g=-0.36), more positive perceptions of Organizational Justice (b=0.11, g=0.34), and were more supportive of the use of Procedural Justice (b=0.07,g=0.22), relative to control officers.

No significant differences between officers who volunteered to wear a BWC and control officers were identified. A small effect size difference in perceptions of the impact of BWCs of Officer Efficacy suggests that volunteers were less likely to agree that BWCs improve Officer Efficacy (b=-0.10, g=-0.21). Small effect size differences in Police Officer Behavior (b=-0.18, g=-0.39) and Citizen/Resident Reactions (b=-0.14, g=-0.32) indicate that BWC volunteers are less likely to agree that BWCs change officer behavior or improve citizen responses to police, relative to control officers.

Collectively, these effect size differences indicate that BWC mandated and BWC volunteer officers were less optimistic about the ability of BWCs to improve Officer Efficacy, affect Officer Behavior, and result in more positive Citizen/Resident Reactions to the police

compared to the control group at the posttest. However, these differences between the BWC officers and the control officers were largely not statistically significant.

[Table 5, about here]

Discussion and Conclusions

Using data obtained from 227 randomly selected Phoenix Police Department officers we examined several potential attitudinal changes, extrapolated from prior research, which could result from the implementation of BWCs. This is an important research question because BWCs represent a new and emerging technology being implemented in the majority of police agencies across the country for the purpose of addressing systemic issues between the police and public. Our findings, however, suggest that there were only small changes in officer perceptions of BWCs, organizational justice, and procedural justice following the introduction of BWCs. Our results, and how they compare to results found in prior research, are discussed below.

We identified more negative officer perceptions of the impact of BWCs on officer efficacy for BWC mandated ($p<.05$, $g=-0.43$) and volunteer officers ($p=.26$, $g=-0.21$), relative to the control group. In other words, officers who wore a BWC reported less agreement that the BWC helps them have a more accurate account of an event, obtain high quality evidence, or assists in the prosecution of cases. This finding is contrary to prior research conducted in Phoenix. Morrow, Katz, and Choate (2016) examined official police and court records and reported that BWCs had a significant and substantial impact on the arrest and prosecution of defendants accused of domestic violence. Specifically, cases that involved the presence of a BWC were much more likely to result in charging, conviction, and a more punitive sentence. Though BWCs could be associated with improved outcomes in court, it is possible that officers are unaware of these outcomes if these differences occur as a function of plea bargaining or other

processes that do not involve officer appearances in court. It should be noted that a number of officers reported that the prosecutor's office was very difficult to work with when researchers were collecting these data. As such, BWCs could improve ultimate case outcomes, as evidenced by administrative data, but these effects might not change officer perceptions toward the effectiveness of BWCs if officers are unaware of these benefits. Prior researchers have found no changes in perceptions of officer efficacy after the deployment of BWCs. For instance, Grossmith et al. (2015) found no difference in officers perceptions of the quality of evidence they could collect as a result of BWCs in the London Metropolitan Police (d=0.17). Combined, these findings suggest that police officers are not observing the downstream positive impact of BWCs and additional training might be needed to better align these attitudes with outcomes.

Our findings indicated that officers who volunteered to wear a BWC, when contrasted to control group officers, experienced moderate declines (i.e. effect size, g=-0.39, p=.08) in their perceptions that BWCs impact Police Officer Behavior. For example, officers who volunteered to wear BWCs were less likely to believe that wearing a BWC results in: officers having fewer contacts with citizens, hesitation in making decisions, and feeling they have less discretion. Similar trends were observed between the mandated and control officers, albeit the effect size was smaller (p=.13, g=-0.33). These findings suggest that officers who volunteered to wear a BWC are less likely to retain their beliefs that BWCs will change the ways officer behave than control officers. White et al. (2018) similarly found that officers in Tempe did not feel that they would be less likely to give warnings when wearing a BWC (d=-0.03). Wooditch et al. (2017) found no difference in LAPD officers feeling like they have less discretion when wearing a BWC (d=-0.13). Hyatt et al. (2017) found that officers in an Eastern U.S. transit department were more likely to agree that BWCs increase officer accountability after BWCs were deployed

(*d*=.25), though Grossmith et al. (2015) found no difference in reported change in officer accountability in London (*d*=0.09). In short, our findings that officers are less likely to believe that BWCs change the way officers behave after wearing a camera are largely consistent with prior researchers who have found that BWCs have limited effects on officers perceptions of accountability, likelihood of giving warnings, or the amount of discretion officers feel like they have.

Officers who were mandated (p=.05, g=-0.42) and officers who volunteered (p=.11, g=-0.32) to wear a BWC reported lower levels of agreement that BWCs would improve Citizen/Resident Reactions, relative to control officers. For instance, officers who were assigned to wear a BWC as part of the study reported lower levels of agreement that BWCs would increase citizen cooperation, citizen respect, decrease citizen resistance, and decrease citizen aggression, relative to control officers. These findings are consistent with prior studies that have found officers were less optimistic about the impact of BWCs on citizens after BWCs were implemented in their agencies (Gaub et al., 2016). One explanation for these findings could be that citizens are not aware of whether or not an officer is using a BWC in a specific encounter (White, Todak, & Gaub, 2017). In their study of citizens in Spokane (WA) who had BWC recorded police encounters, White et al. (2017) found that only 28% of the citizens they interviewed knew the officer was using a BWC. Citizens who do not know that an officer is wearing a BWC will be unlikely to change their behavior to compensate for the camera. As such, those officers who wore a BWC as part of this study could have expected citizens to be more cooperative, but did not experience these changes in practice. This would explain why both BWC mandated and BWC volunteers were more skeptical of the potential for BWCs to improve

citizen behaviors while control and resistant officers experienced little change in these perceptions over time.

Officers mandated to wear a BWC, compared to the control group, were less likely to have positive General Perceptions of BWCs following their use in the field. For example, officers mandated to wear a BWC were less likely to self-report that the police and citizens benefit from BWCs, that BWCs are well received by coworkers, and that BWCs improve police job satisfaction, training, job performance, and officer safety ($p=.10$, $g=-0.38$). Likewise, officers mandated to wear BWCs reported more negative Overall Recommendations about BWCs following six months of use in the field. For instance, they were less likely to recommend BWCs to other departments and to other officers in their own department ($p=.20$, $g=-0.36$). These findings are supportive of psychological reactance theory (PRT). PRT is based on the assumption that when people believe they are free to behave in certain ways, or were free to behave in certain ways in the past, they are motivated to restore their freedom when they feel that freedom is threatened (Rosenberg and Siegel, 2018). Police officers who were mandated to wear BWCs might have resented being required to wear a BWC because they perceived it as restricting their autonomy. This could be why they do not recommend the expansion of BWCs, so that others will not be subjected to the same restrictions or loss of freedom. While a substantial body of literature has examined the impact of BWCs on officer and citizen behavior, much less has focused on how BWCs might affect police officer self-identity and autonomy. Future research that examines the impact of BWCs on officer identity and police culture is needed.

When compared to the control group, volunteers ($p=.40$, $g=0.17$), mandated ($p=.13$, $g=0.22$), and resistant ($p<.05$, $g=0.38$) officers reported greater levels of organizational justice following the implementation of BWCs. Our findings are in contrast to Adams and Mastracci

(2018), who found that BWC wearing officers reported lower levels of perceived organizational support than those who did not wear a BWC. Our findings suggest that officers who wore a BWC, or who had the opportunity to wear a BWC, were more likely to perceive the PPD as seeking to be just and impartial in their decision making. These findings are interesting in the context of our other findings presented here; namely that those who wore BWCs—mandated or voluntarily—did not view them as having an impact on citizen reactions (e.g., making a complaint) and behavior (e.g., less aggression) and were less likely to recommend them to other agencies and fellow officers after their implementation. It might be that BWCs represent a unique form of enhanced police supervision that are not representative of a particular interest group or "side" (e.g., supervisors, police administrators). This might explain why there was little substantive difference between the volunteers and mandated officer's perceptions of organizational justice following BWC deployment. Being provided an opportunity to wear a BWC might signal to the officers that the agency has greater capacity for organizational justice, regardless of their personal perceptions of the utility of the technology. Further, resistors who were asked to wear a BWC and refused to do so were not forced to wear a camera. This could result in increased perceptions that what they want matters to the organization, relative to the control group who was not asked to wear a BWC. This supports findings in Hyatt et al. (2017), who identified increased officer agreement that the police department gives officers explanations for decisions that affect them (d=0.27) and decreases in perceptions that BWCs indicate that management does not trust officers (d=-0.33) after the deployment of BWCs in that agency. As such, their findings similarly suggest officer perceptions of organizational justice could increase after the deployment of BWCs.

We observed no significant group differences in self-reports of the importance of using procedurally just behavior, though mandated officers experienced a small effect size increase (p=.44, g=0.22). Both McCluskey et al (2019) and the Edmonton Police Service (2015) have reported that officers are more likely to use procedural justice, including using appropriate language, being professional, and being patient with citizens after adopting BWCs. Our findings, however, suggest that those who wore a BWC did not rate the importance of using procedural justice as more important following their use of BWCs. For instance, officers did not report increased agreement that it is important to give citizens a good reason for stopping them, for listening and talking to people, and for treating citizens with dignity and respect. Recall that some researchers have found that officers wearing BWCs are more likely to act in procedurally just ways, even if the officers themselves do not self-report engaging in procedural justice (e.g., Owens & Finn, 2017). Given the limitations of our data, it is not possible to know whether the lack of change in officer support for using procedural justice is also associated with a lack of behavioral change, or whether the officers did not recognize a change that did occur.

Overall, we identified few statistically significant and only small substantively meaningful changes in officer perceptions toward BWCs, organizational justice, and procedural justice over time. Officers who did wear a BWC (either mandated or voluntarily) were generally more pessimistic about BWCs after using them in the field, though these changes were small in terms of effect size and rarely reached statistical significance. The finding that officer attitudes changed relatively little over time, whether officers were directly exposed to BWCs or not, indicates that efforts to increase officer support for BWCs should be made early in the BWC adoption process. Our results, combined with prior research, highlight the importance of a communication strategy that disseminates information about the benefits and limitations of

BWCs prior to their deployment so that officers "buy-in" to their agency's BWC program, rather than resist its implementation. This suggestion is consistent with research conducted in Tempe (AZ), which indicated that high levels of officer buy-in facilitated the success of BWC implementation in that department (White et al., 2018). Further, because BWC resistors in the current study had increased perceptions of organizational justice at the posttest, ensuring officers feel included in the implementation and deployment of BWC programs is important.

Our findings, however, are limited in a number of important ways. First, the generalizability of the findings are limited to Phoenix and should not be considered representative of police departments in different settings. Prior research has found that there is a wide range of police attitudes toward BWCs in general, and it is worth noting that Phoenix Police Department officers have markedly different attitudes about BWCs, even when compared to those in the nearby metropolitan area (e.g., Tempe, see Gaub et al., 2016). Second, while we randomized the selection of study participants, this did not result in statistically similar groups with respect to the volunteer and resistant groups being similar to the control group. This is an interesting finding in itself. Though we randomly selected officers who were asked to volunteer to wear a BWC, those who agreed to do so were more likely to be nonwhite ($p<.05$, $g=0.41$), to be female (though this was not a statistically significant difference; $p=.06$, $g=0.35$), and to have higher educational attainment (not a statistically significant difference; $p=.07$, $g=0.34$) than control officers. Officers who resisted wearing a BWC were significantly younger ($p<.05$, $g=0.36$) and were from different precincts ($p<.05$, $g=-0.24$) than control officers. Officers who were randomly selected and mandated to wear a BWC were not statistically or substantively different from officers in the control group. We attempted to mitigate the differences between study groups through various statistical procedures, but the differences in our sample

nevertheless might have affected our results. Future research examining the impact of BWCs on the attitudes and perceptions of the police is needed to validate our findings. Third, and not discussed nor addressed in the larger body of literature, our study is limited due to the short amount of time between the pretest and posttest surveys (6 months). Our relative lack of findings could be attributable to the short amount of time officers were exposed to BWCs. It is possible that as officers continue to adjust to wearing BWCs and have more direct and indirect experience with them, their perceptions toward the technology might evolve in more notable ways. Longitudinal evaluations are necessary to fully understand the totality of the effect of BWCs on officer perceptions over time.

In conclusion, our findings suggest that the adoption of BWCs causes minor changes in the attitudes and perceptions of police officers. Most of these changes are relatively small in magnitude (i.e., effect size). Though we found some evidence that the implementation of BWCs improved officer's perceptions of organizational justice, BWCs did not live up to officer expectations in terms of impacting officer or citizen behavior. In general, officers who wore a BWC were less likely to recommend the full adoption of BWCs. This suggests that as BWCs are expanded to all officers within the Phoenix Police Department, communicating the benefits of BWCs to officers could help counter negative perceptions and foster greater acceptance of BWCs as an important police tool. Though it was not reflected in the results of the posttest, the research team became aware of several instances of positive BWC outcomes through the process of administering the posttest to officers throughout the Phoenix Police Department. These success stories were especially mentioned in situations where BWC footage exonerated officers in unjustified citizen complaints. Sharing the benefits of BWCs with officers who are apprehensive about wearing and using BWCs could be an important method to use in successful

BWC implementation. This message delivery should take the form of a formal campaign similar to those used to encourage officers to wear protective armor. Such a campaign might help reduce officer resistance to BWCs, increase BWC activation rates, and in turn maximize the effectiveness of BWCs by providing greater protection to police officers and citizens.

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Table 1. Descriptive statistics

	Control (n=84)		Resistor (n=70)			Mandated to wear BWC (n=31)			Volunteered to wear BWC (n=42)		
	n	%	n	%	Hedge's g	n	%	Hedge's g	n	%	Hedge's g
Sex					0.04			0.32			0.35
Male	80	95.24	66	94.29		27	87.1		36	85.71	
Female	4	4.76	4	5.71		4	12.9		6	14.29	
Race/ethnicity					0.17			0.33	†		0.41
White	52	61.9	49	70.0		24	77.42		34	80.95	
Nonwhite	32	38.1	21	30.0		7	22.58		8	19.05	
Highest education completed					-0.06			-0.11			0.34
HS/GED	10	12.2	10	14.29		5	16.13		1	2.38	
>HS/GED	72	87.8	60	85.71		26	83.87		41	97.62	
Age			†		0.36			0.07			0.17
Mean (SD)	39.02 (9.71)		35.53 (9.34)			38.39 (8.27)			37.38 (9.98)		
Years of Service					0.23			-0.12			0.25
Mean (SD)	10.24 (7.75)		8.46 (7.43)			11.19 (8.01)			8.31 (7.59)		
Precinct			†		-0.24			0.14	†		0.09
Black Mountain	13	15.48	4	5.71		8	25.81		4	9.52	
South Mountain	16	19.05	5	7.14		4	12.9		10	23.81	
Central City	0	0	16	22.86		0	0		4	9.52	
Desert Horizon	16	19.05	15	21.43		7	22.58		11	26.19	
Mountain View	20	23.81	4	5.71		5	16.13		3	7.14	

Cactus Park	19	22.62	26	37.14		7	22.58		10	23.81	
% self-initiated calls					-0.11			-0.13			-0.10
Mean (SD)	0.12 (0.05)		0.13 (0.06)			0.13 (0.05)			0.13 (0.05)		
% arrests					-0.02			0.15			-0.28
Mean (SD)	0.12 (0.04)		0.12 (0.05)			0.11 (0.05)			0.13 (0.05)		
% use of force					-0.02			0.19			-0.23
Mean (SD)	0.0002 (0.0004)		0.0001 (0.0003)			0.0003 (0.0003)			0.0003 (0.0008)		
% citizen complaints					0.09			-0.10			0.01
Mean (SD)	0.0003 (0.0005)		0.0004 (0.0005)			0.0003 (0.0004)			0.0003 (0.0005)		

† $p<0.05$ between group differences using the control group as the reference category

Note: mean (standard deviation); effect size reported in Hedge's g; missing data not shown; officer nonwhite includes Hispanic, Black, Asian, and other race/ethnicity - categories were collapsed due to small n and insignificant differences between groups

Table 2. Mean percent change in officer attitudes within and between groups

	Control group	Resistor		Mandated to wear BWC		Volunteered to wear BWC	
Scale	(n=84)	(n=70)	Effect size	(n=31)	Effect size	(n=42)	Effect size
Mean % change in impact on officer efficacy	-3.79*	-2.48	0.06	-8.78*	-0.24	-8.82*	-0.25
Mean % change in police officer behavior	2.62	2.26	-0.01	4.55	0.07	-6.77*	-0.37
Mean % change in citizen/resident reactions	-0.66	1.29	0.08	-3.49	-0.11	-10.82*†	-0.43
Mean % change in general perceptions	-0.83	2.56	0.14	-5.48*	-0.21	-1.8	-0.04
Mean % change in overall recommendations	3.91	-2.89*	-0.20	-10.48*	-0.42	-0.1	-0.11
Mean % change in organizational justice	1.17	5.03	0.21	2.86	0.09	2.94	0.09
Mean % change in procedural justice	-1.43	1.59	0.25	2.43	0.35	1.57	0.23

*p<0.05 for within group difference; † <0.05 for between group difference using the control group as the reference category

Mean % change calculated as (group posttest mean-group pretest mean/group pretest mean)*100

Power calculated based on a two-sample means t-test at the p=.05 level

Table 3. Difference-in-differences coefficients

	Resistor		Mandated to wear BWC		Volunteered to wear BWC	
	Coef.	Effect size	Coef.	Effect size	Coef.	Effect size
Officer efficacy	0.01	0.03	-0.17	-0.36	-0.11	-0.22
	(0.08)		(0.10)		(0.09)	
Police officer behavior	-0.01	-0.03	-0.05	-0.11	-0.20*	-0.43
	(0.08)		(0.10)		(0.09)	
Citizen/resident reactions	0.06	0.13	-0.10	-0.22	-0.13	-0.28
	(0.07)		(0.10)		(0.09)	
General perceptions	0.05	0.13	-0.11	-0.27	-0.01	-0.03
	(0.07)		(0.09)		(0.08)	
Overall recommendations	-0.08	-0.15	-0.20	-0.34	0.01	0.02
	(0.10)		(0.13)		(0.12)	
Organizational justice	0.09	0.27	0.08	0.23	0.05	0.13
	(0.06)		(0.07)		(0.07)	
Procedural justice	0.03	0.09	0.05	0.16	0.01	0.03
	(0.06)		(0.07)		(0.07)	

** $p<0.01$, * $p<0.05$

Note: Standard errors in parentheses; all difference-in-difference estimations included a control for pretest score, pretest coefficient omitted from tables to save space

Table 4. Potential outcome means using inverse-probability weighted regression adjustment

	Control group	Resistor		Mandated to wear BWC		Volunteered to wear BWC	
	POM	POM	Effect Size	POM	Effect Size	POM	Effect Size
Officer efficacy	2.61	2.53	-0.13	2.29	-0.52	2.39	-0.40
	(0.08)	(0.08)		(0.08)		(0.08)	
Police officer behavior	2.61	2.60	-0.01	2.44	-0.28	2.39	-0.39
	(0.06)	(0.08)		(0.08)		(0.09)	
Citizen/resident reactions	2.36	2.37	0.01	2.13	-0.42	2.25	-0.22
	(0.08)	(0.07)		(0.05)		(0.09)	
General perceptions	2.36	2.36	0.00	2.12	-0.48	2.30	-0.12
	(0.08)	(0.07)		(0.08)		(0.09)	
Overall recommendations	2.33	2.30	-0.04	2.07	-0.36	2.51	0.28
	(0.09)	(0.09)		(0.16)		(0.11)	
Organizational justice	2.47	2.54	0.14	2.57	0.21	2.51	0.09
	(0.05)	(0.06)		(0.09)		(0.07)	
Procedural justice	3.09	2.98	-0.28	3.04	-0.13	2.92	-0.38
	(0.05)	(0.06)		(0.09)		(0.07)	

** $p<0.01$, * $p<0.05$ between group differences using the control group as the reference category based on Bonferroni-adjusted p-values; † indicates weighted difference > 0.25 in balance statistics

Note: Robust standard errors in parentheses; all POM estimations included covariates for officer sex, race/ethnicity, educational attainment, age, years of service, substation, % of self-initiated calls predeployment, % of calls resulting in arrest predeployment, % of calls resulting in use of force predeployment, % of calls resulting in a complaint predeployment, and all scale pretest scores; coefficients for covariates omitted from table to save space

Table 5. Difference-in-differences coefficients using inverse propensity weights

	Resistor		Mandated to wear BWC		Volunteered to wear BWC	
	Coef.	Effect size	Coef.	Effect size	Coef.	Effect size
Officer efficacy	-0.00	0.00	-0.19*	-0.43	-0.10	-0.21
	(0.10)		(0.10)		(0.09)	
Police officer behavior	0.03	0.06	-0.14	-0.33	-0.18	-0.39
	(0.08)		(0.09)		(0.10)	
Citizen/resident reactions	0.04	0.10	-0.17	-0.42	-0.14	-0.32
	(0.08)		(0.09)		(0.09)	
General perceptions	0.07	0.17	-0.15	-0.38	-0.03	-0.08
	(0.08)		(0.09)		(0.08)	
Overall recommendations	0.00	0.00	-0.22	-0.36	0.04	0.06
	(0.10)		(0.17)		(0.14)	
Organizational justice	0.13*	0.38	0.11	0.34	0.06	0.17
	(0.06)		(0.07)		(0.07)	
Procedural justice	0.01	0.02	0.07	0.22	-0.03	-0.09
	(0.08)		(0.09)		(0.07)	

** $p<0.01$, * $p<0.05$

Note: Standard errors in parentheses; all difference-in-difference estimations included a control for pretest score, pretest coefficient omitted from tables to save space

Appendix A. Measures

Scale	Question	Factor loadings
Impact on officer efficacy		
(α=0.81)	When officers wear body cameras they will have a more accurate account of what has transpired.	0.58
	When officers wear body cameras it improves the quality of evidence they can submit.	0.72
	When officers wear body cameras it makes their jobs easier.	0.60
	When wearing the body camera I know that the prosecutor's office will be easy to work with when submitting video evidence.	0.63
	Body cameras make it easier to prosecute DUI offenders.	0.71
	Evidence gathered from a body camera helps prosecute cases involving domestic violence when the victim is unwilling to testify.	0.63
Police officer behavior		
(α=0.76)	When wearing a body camera, an officer is less likely to give warnings to citizens.	0.46
	When wearing a body camera, an officer will have fewer contacts with citizens.	0.66
	When wearing a body camera, an officer will feel like they have less discretion.	0.74
	When wearing a body camera, an officer will hesitate when making decisions.	0.70
	Wearing a body camera affects an officer's decisions to use higher levels of force.	0.57
Citizen/resident reactions		
(α=0.84)	Citizens will be more cooperative once they become aware that an officer is wearing a body camera.	0.81
	Citizens will become more respectful once they become aware that an officer is wearing a body camera.	0.81
	Suspects are less likely to resist arrest when they become aware that the officer is wearing a body camera.	0.69
	Generally, people become less aggressive when they are aware that a body camera is being used.	0.74
	Having officers wear body cameras will increase police-community trust.	0.48
	The use of body cameras decreases the number of citizen complaints against officers.	0.47
General perceptions		
(α=0.87)	The use of body camera equipment is well received by coworkers.	0.59
	The police benefit from body cameras.	0.78
	The citizens benefit from body cameras.	0.72
	When an officer wears a body camera it improves their job satisfaction.	0.75

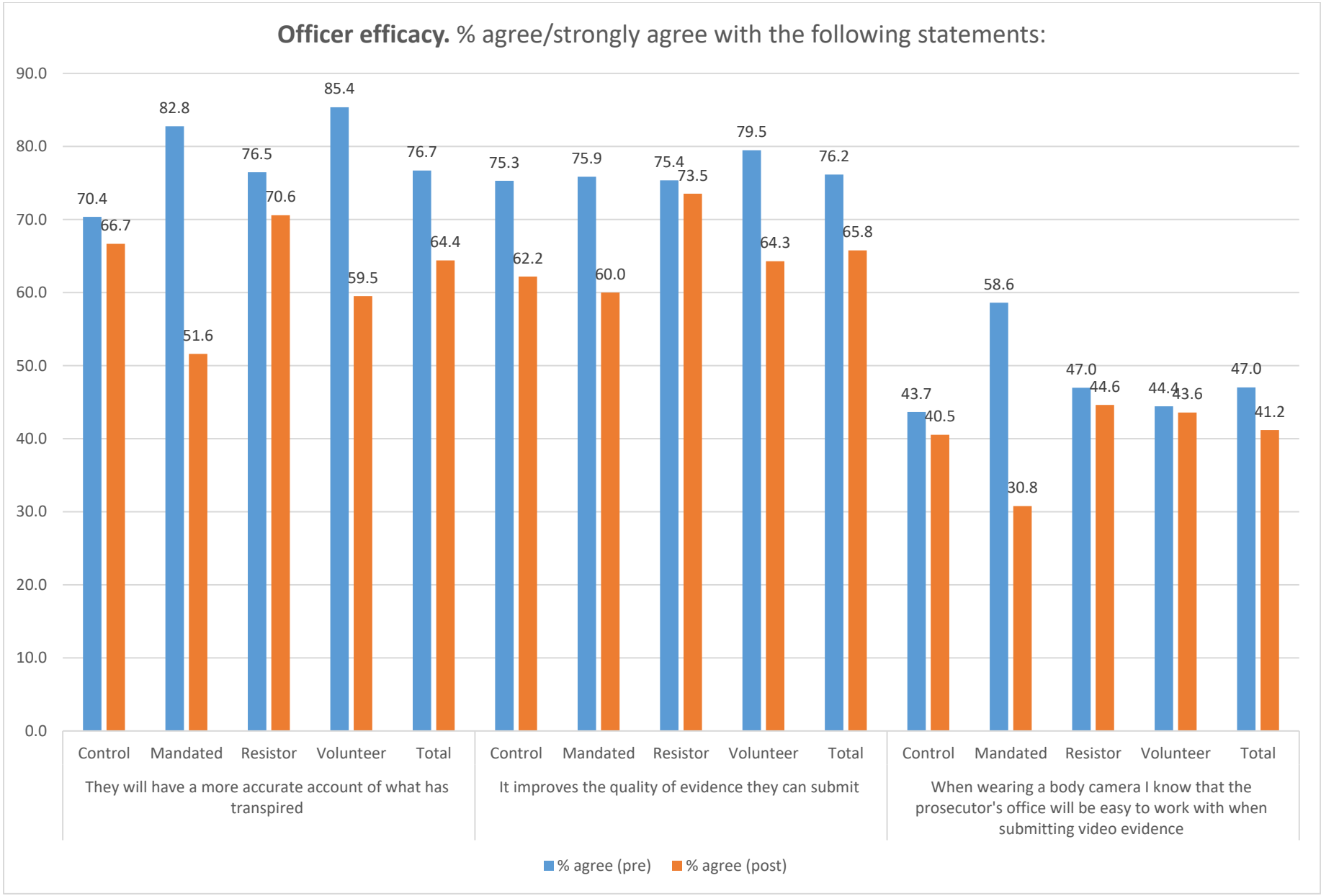
	Body cameras improve officer training.	0.66
	Body cameras improve the overall job performance of an officer.	0.76
	Body cameras increase officer safety.	0.63
Overall recommendations		
(α=0.93)	I think that the use of body cameras should be expanded to other police departments.	0.86
	I agree with Phoenix Police Department adopting body cameras throughout the police department.	0.92
	The advantages of police departments adopting body cameras outweigh the disadvantages.	0.89
	Body cameras are an appropriate use of department funding.	0.82
Organizational Justice		
(α=0.78)	Disciplinary action is a result of pressure on supervisors from command staff to give out discipline.	0.67
	Getting special assignments in the police department depends on who you know, not on merit.	0.63
	When a police officer appears before the Disciplinary Review Board, the charge will probably be sustained even when he/she has a good defense.	0.59
	The operations orders dealing with officer conduct are fair and sensible.	0.50
	When you get to know the department from the inside, you begin to think that it is a wonder that it does one-half as well as it does.	0.63
	Police supervisors are very interested in the success of their subordinates.	0.56
Procedural justice		
(α=0.80)	It is important to give everyone a good reason why we are stopping them.	0.56
	If people ask why we are treating them as we are, we should explain.	0.52
	Listening and talking to people is a good way to take charge of situations.	0.61
	Officers need to show an honest interest in what people have to say, even if it is not going to change anything.	0.66
	People should be treated with respect, even if they show disrespect.	0.60
	Officers should at all times treat people they encounter with dignity and respect.	0.69
	It is important that we remind people they have rights and that we respect them.	0.67

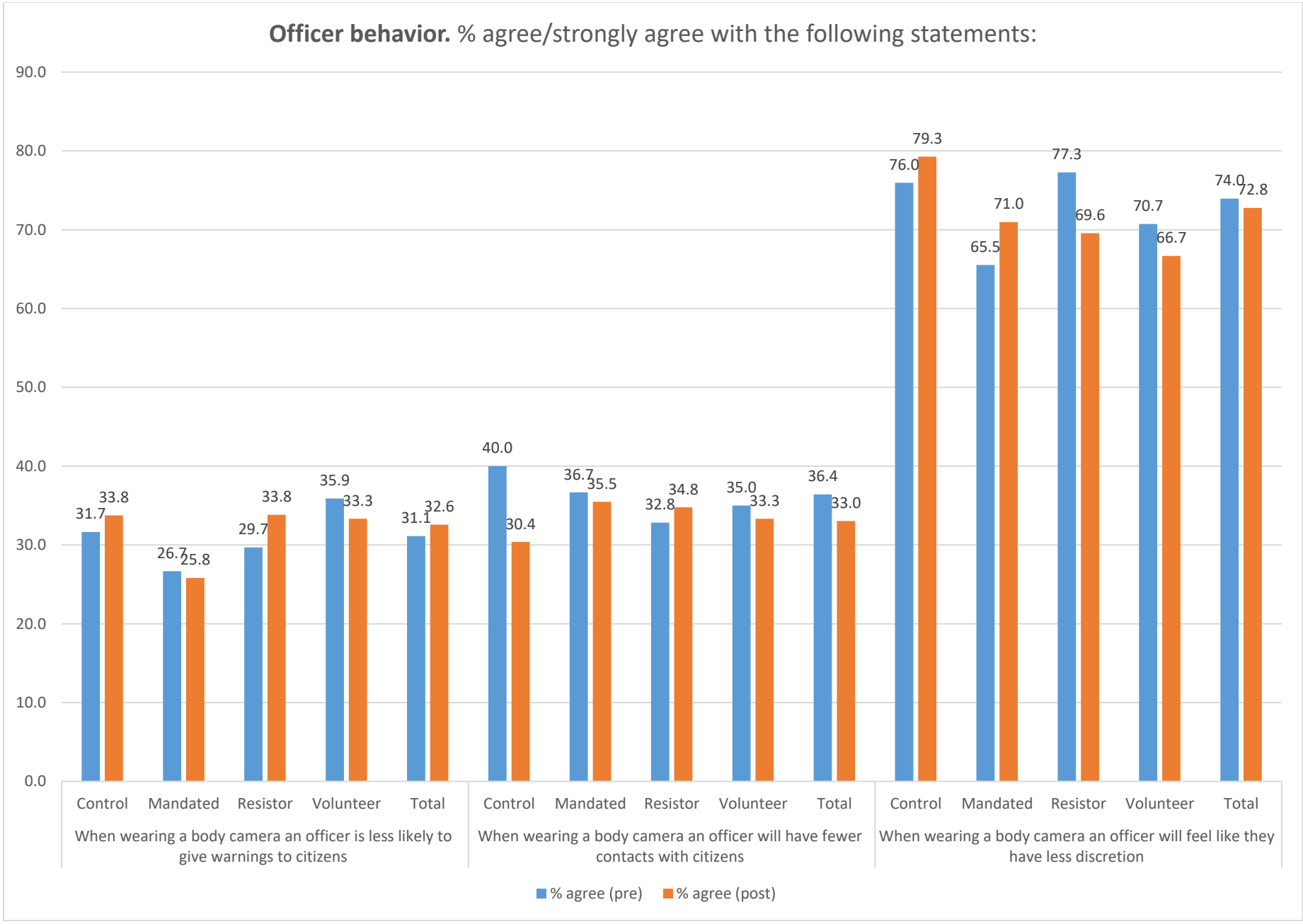
Note: Cronbach's alpha reported in parentheses under the scale title (T1-T2); all items on a scale from 1 'Strongly Disagree' to 4 'Strongly Agree'

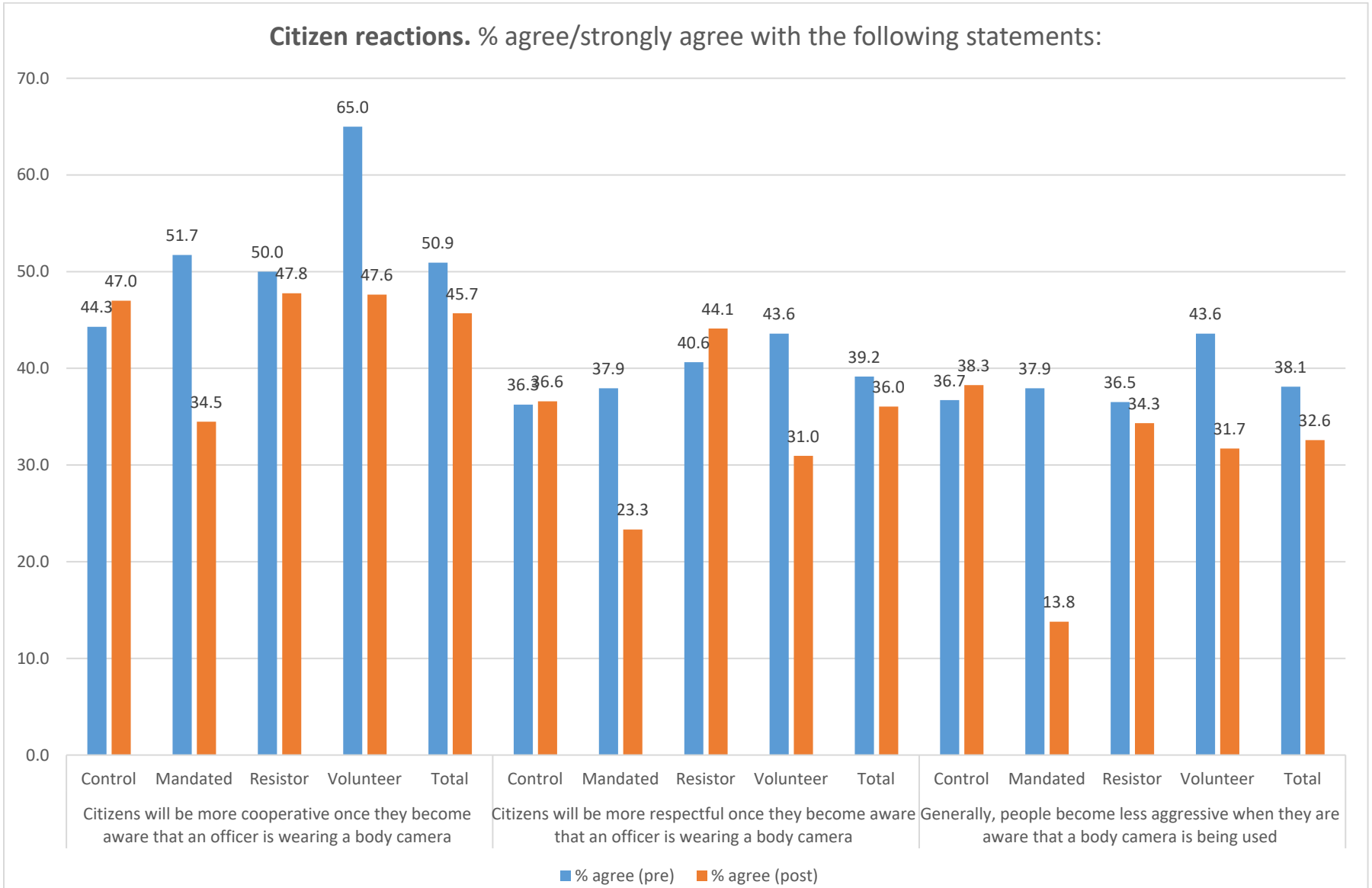
Appendix B. Balance statistics standardized differences

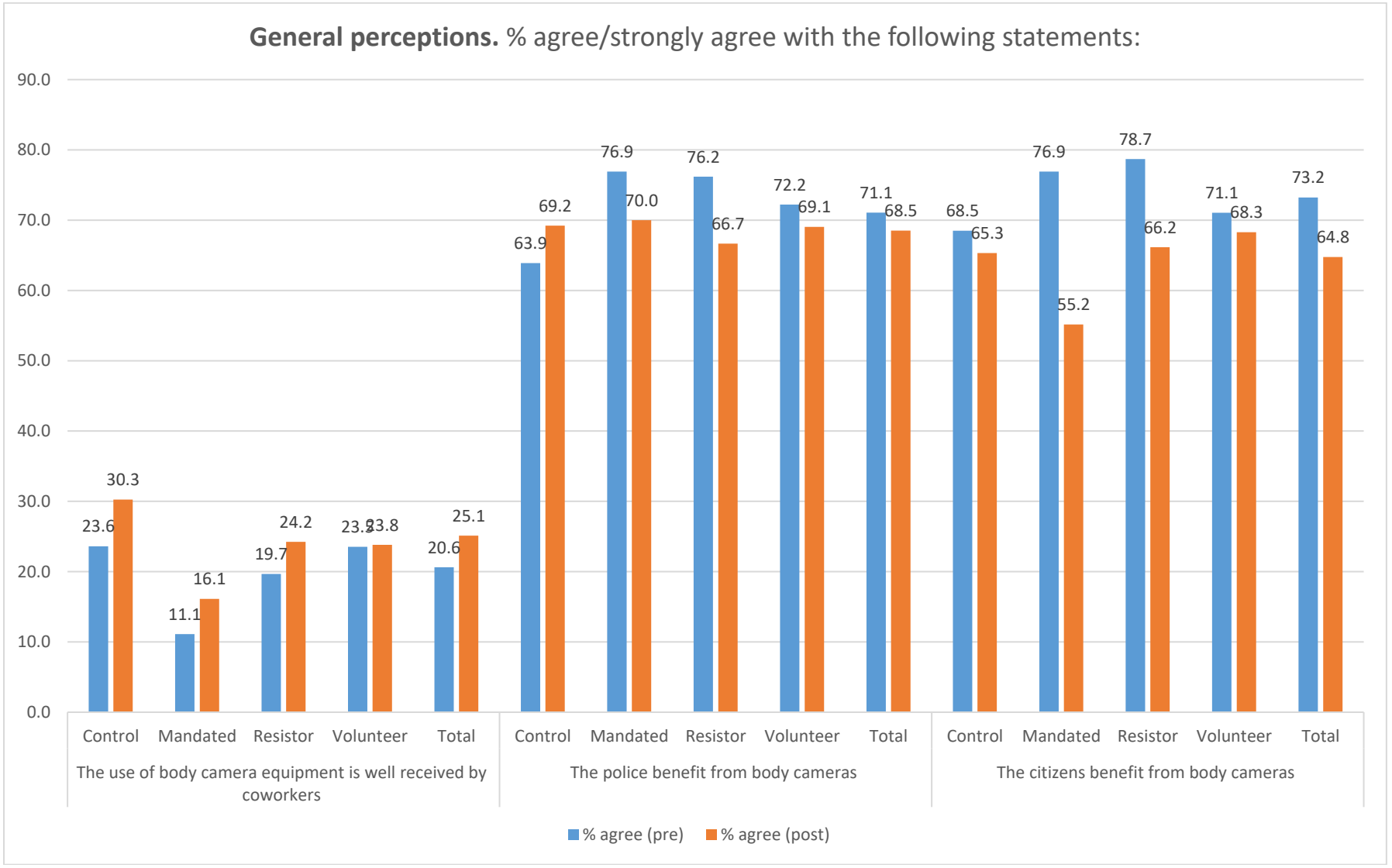
	Resistor		Mandated to wear BWC		Volunteered to wear BWC	
Variables	Raw	Weighted	Raw	Weighted	Raw	Weighted
Sex	-0.04	0.08	-0.29	-0.06	-0.33	0.01
Race/ethnicity	-0.17	0.16	-0.34	-0.06	-0.43	0.01
High school	-0.46	-0.22	-0.41	-0.27	-0.88	-0.22
Black Mountain	-0.32	-0.16	0.26	0.01	-0.18	-0.20
South Mountain	-0.36	-0.10	-0.17	0.04	0.12	-0.06
Central City	0.77	0.47	-	-	0.46	0.45
Desert Horizon	0.06	-0.07	0.09	-0.03	0.17	0.05
Mountain View	-0.53	-0.06	-0.19	-0.02	-0.47	-0.19
Cactus Park	0.32	0.08	0.00	0.01	0.03	0.07
Age	-0.32	-0.14	-0.03	0.09	-0.13	-0.25
Years of Service	-0.23	-0.16	0.13	0.04	-0.25	-0.26
% self-initiated calls	0.11	0.08	0.14	0.12	0.10	0.11
% arrests	0.02	-0.01	-0.14	-0.19	0.27	0.02
% use of force	0.02	-0.07	-0.20	-0.16	0.20	-0.20
% citizen complaints	-0.09	-0.05	0.10	0.02	-0.01	-0.21
Pretest factor score	-0.04	0.10	-0.08	0.23	-0.19	-0.05

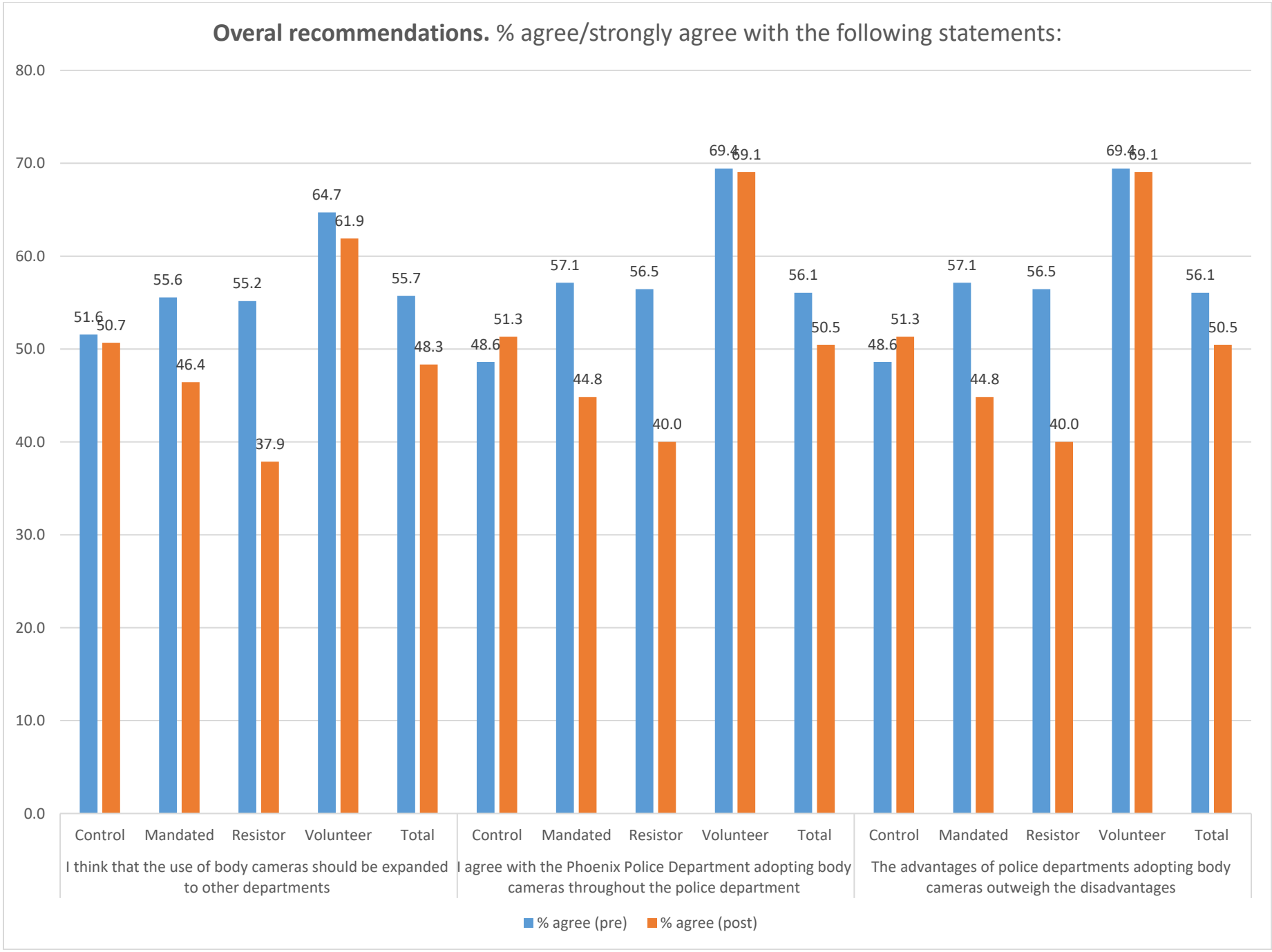
Appendix C: Descriptive pre-post survey results

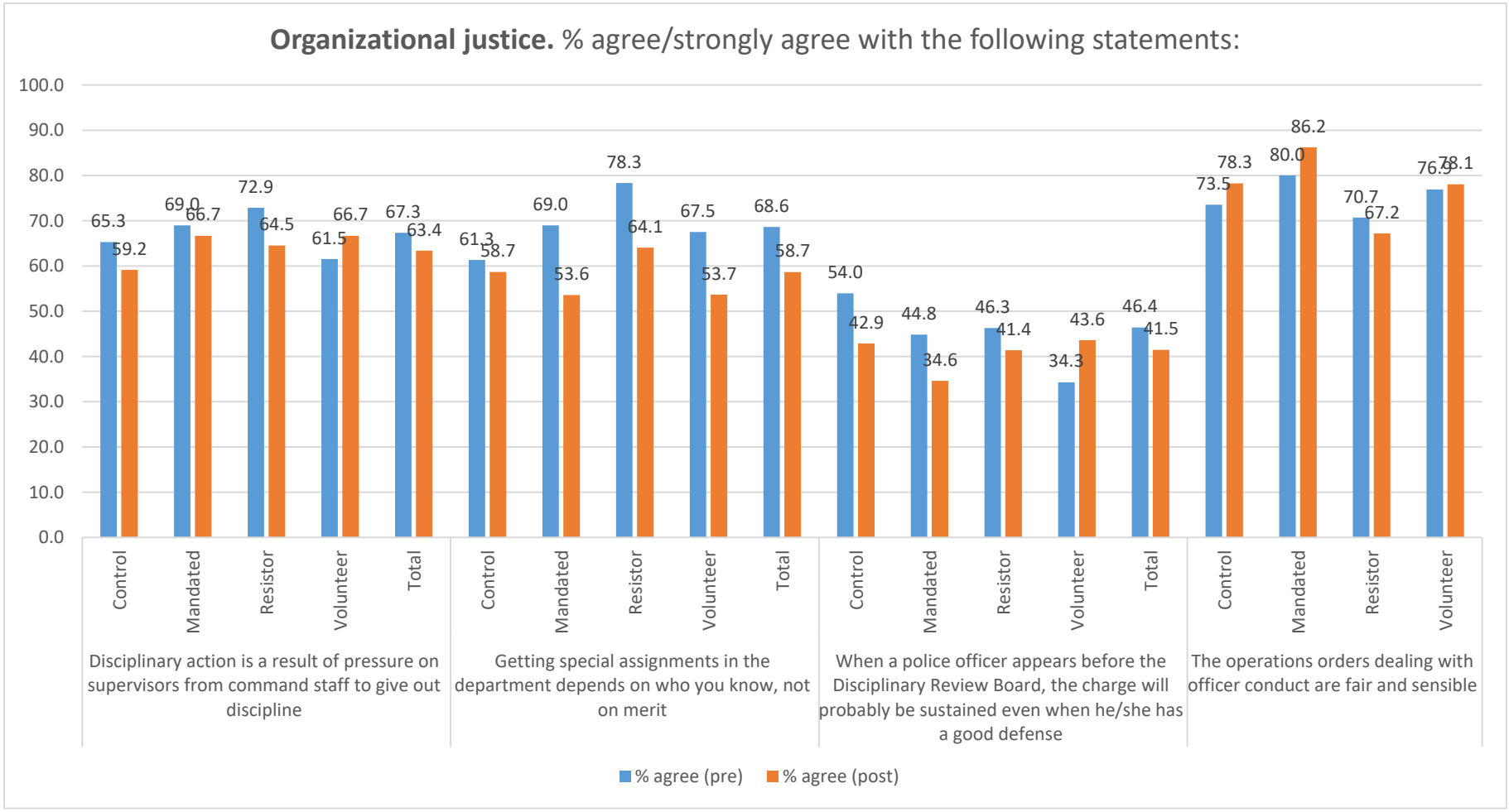

Officer efficacy. % agree/strongly agree with the following statements:
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
70.4
66.7
82.8
51.6
76.5
70.6
85.4
59.5
76.7
64.4
75.3
62.2
75.9
60.0
75.4
73.5
79.5
64.3
76.2
65.8
43.7
40.5
58.6
30.8
47.0
44.6
44.4
43.6
47.0
41.2
Control
Mandated
Resistor
Volunteer
Total
They will have a more accurate account of what has transpired
It improves the quality of evidence they can submit
When wearing a body camera I know that the prosecutor's office will be easy to work with when submitting video evidence
% agree (pre)
% agree (post)

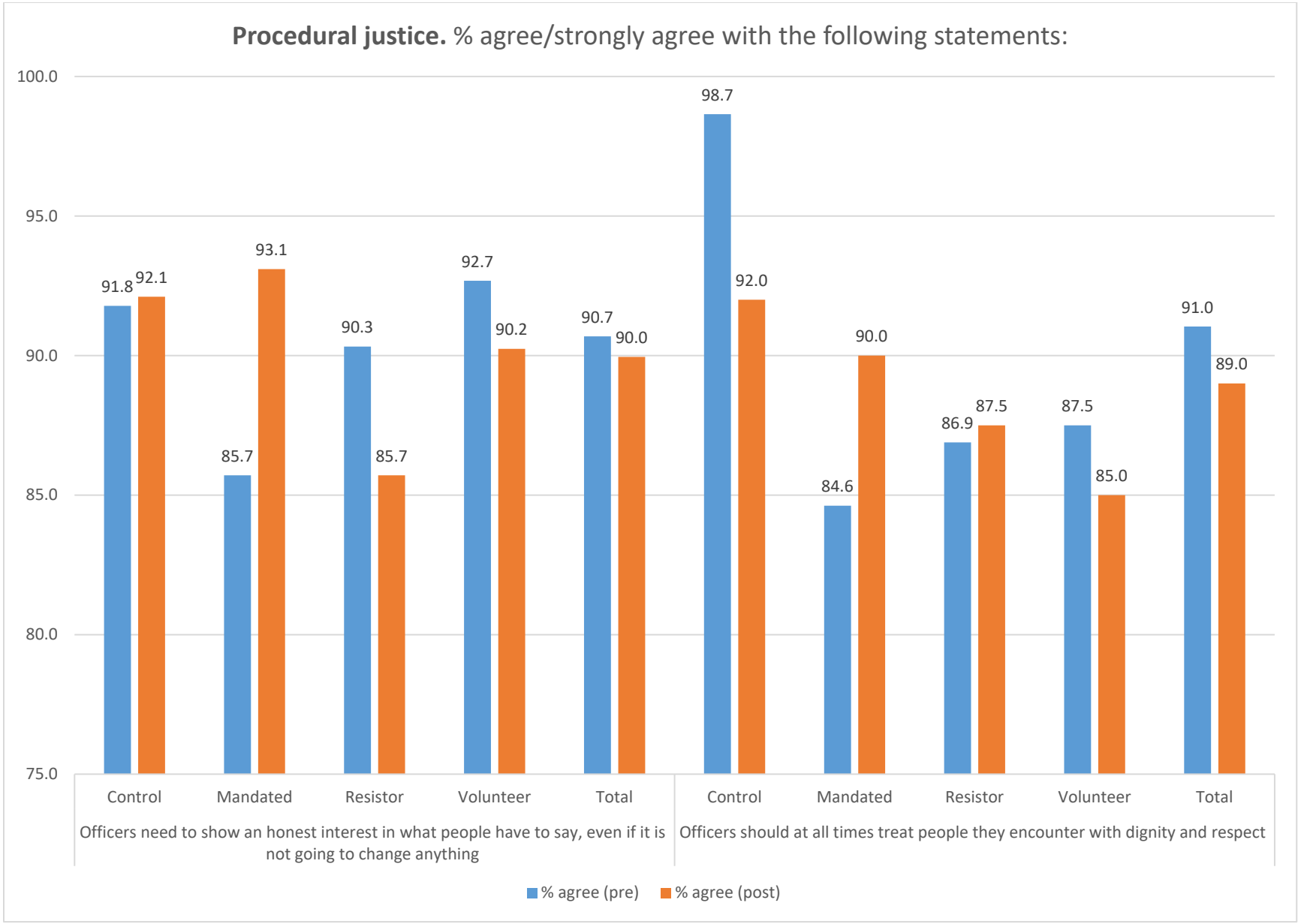

Officer behavior. % agree/strongly agree with the following statements:
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
31.7
33.8
26.7
25.8
29.7
33.8
35.9
33.3
31.1
32.6
40.0
30.4
36.7
35.5
32.8
34.8
35.0
33.3
36.4
33.0
76.0
79.3
65.5
71.0
77.3
69.6
70.7
66.7
74.0
72.8
Control
Mandated
Resistor
Volunteer
Total
When wearing a body camera an officer is less likely to give warnings to citizens
When wearing a body camera an officer will have fewer contacts with citizens
When wearing a body camera an officer will feel like they have less discretion
% agree (pre)
% agree (post)


Citizen reactions. % agree/strongly agree with the following statements:
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
44.3
47.0
51.7
34.5
50.0
47.8
65.0
47.6
50.9
45.7
36.3
36.6
37.9
23.3
40.6
44.1
43.6
31.0
39.2
36.0
36.7
38.3
37.9
13.8
36.5
34.3
43.6
31.7
38.1
32.6
Control
Mandated
Resistor
Volunteer
Total
Citizens will be more cooperative once they become aware that an officer is wearing a body camera
Citizens will be more respectful once they become aware that an officer is wearing a body camera
Generally, people become less aggressive when they are aware that a body camera is being used
% agree (pre)
% agree (post)


General perceptions. % agree/strongly agree with the following statements:
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
23.6
30.3
11.1
16.1
19.7
24.2
23.8
20.6
25.1
63.9
69.2
76.9
70.0
76.2
66.7
72.2
69.1
71.1
68.5
68.5
65.3
76.9
55.2
78.7
66.2
71.1
68.3
73.2
64.8
Control
Mandated
Resistor
Volunteer
Total
The use of body camera equipment is well received by coworkers
The police benefit from body cameras
The citizens benefit from body cameras
% agree (pre)
% agree (post)


Overal recommendations. % agree/strongly agree with the following statements:
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
51.6
50.7
55.6
46.4
55.2
37.9
64.7
61.9
55.7
48.3
48.6
51.3
57.1
44.8
56.5
40.0
69.4
69.1
56.1
50.5
48.6
51.3
57.1
44.8
56.5
40.0
69.4
69.1
56.1
50.5
Control
Mandated
Resistor
Volunteer
Total
I think that the use of body cameras should be expanded to other departments
I agree with the Phoenix Police Department adopting body cameras throughout the police department
The advantages of police departments adopting body cameras outweigh the disadvantages
% agree (pre)
% agree (post)


Organizational justice. % agree/strongly agree with the following statements:
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
65.3
59.2
69.0
66.7
72.9
64.5
61.5
66.7
67.3
63.4
61.3
58.7
69.0
53.6
78.3
64.1
67.5
53.7
68.6
58.7
54.0
42.9
44.8
34.6
46.3
41.4
34.3
43.6
46.4
41.5
73.5
78.3
80.0
86.2
70.7
67.2
76.9
78.1
Control
Mandated
Resistor
Volunteer
Total
Disciplinary action is a result of pressure on supervisors from command staff to give out discipline
Getting special assignments in the department depends on who you know, not on merit
When a police officer appears before the Disciplinary Review Board, the charge will probably be sustained even when he/she has a good defense
The operations orders dealing with officer conduct are fair and sensible
% agree (pre)
% agree (post)


Procedural justice. % agree/strongly agree with the following statements:
100.0
95.0
90.0
85.0
80.0
75.0
91.8
92.1
85.7
93.1
90.3
85.7
92.7
90.2
90.7
90.0
98.7
92.0
84.6
90.0
86.9
87.5
87.5
85.0
91.0
89.0
Control
Mandated
Resistor
Volunteer
Total
Control
Mandated
Resistor
Volunteer
Total
Officers need to show an honest interest in what people have to say, even if it is not going to change anything
Officers should at all times treat people they encounter with dignity and respect
% agree (pre)
% agree (post)