Procedural justice training reduces police misconduct and use of force

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1. Staggered adoption of training

The procedural justice training program follows a staggered adoption design (SAD) (1). Under SAD, units adopt the treatment over time and the date of adoption varies across units. Once the treatment has been adopted, units remain in the treated condition thereafter. In the present study, the units are clusters of officers who were trained on the same day, the treatment is procedural justice training, and the outcomes are monthly counts of complaints, sustained or settled complaints, and use of force reports within each cluster.

The eight-hour training session was administered by a group of approximately 10 instructors, all of whom were officers in the CPD and who conducted training in rotating groups of 3. The date of each training session was scheduled by the program instructors within the department's Education and Training Division. Importantly, the instructors did not know which officers would attend each session at the point of scheduling, nor did the officers know which session they would attend until the day before the session, i.e. the date of assignment to training is as-if random. Each session was attended by approximately 25 officers. Additional details on the content and administration of the training is provided in section 8 of the Supporting Information.

To assign officers to a session, the program used block random assignment with the blocks constituted by organizational units within the CPD. A majority of officers ($N = 6128$; 71%) belong to one of 22 district-based units, which range in size from approximately 200 to 300 officers, with the remaining officers belonging to special units such as the narcotics division or canine unit. Initially, the 22 district-based units were requested to randomly assign one officer to attend each training session. Figure S1 shows the assignment to training in the district-based units during the study period. The remaining open spaces in each training session were allocated to officers from either the district-based units or the special units. Officers were notified of their assignment to a session either at roll call meetings or via email on the day before training. Once assigned, attending the session was mandatory.

Two deviations from randomized assignment should be noted. First, the special units did not follow a block randomized one-per-session allocation. Instead, at different times in the training roll-out, special units assigned officers to the training program in large batches. Figure S2 shows the shows the adoption of training in the 11 special units with more than 50 officers participating in training. In these units, officers were assigned to training based on randomized assignment to the open spaces in each session (after the district-based spots had been allocated) throughout phase one of the roll-out, upholding the randomized date assumption. However, the Education and Training division assigned approximately half of its officers to training in back-to-back sessions in early 2013. Similarly, the Narcotics unit assigned a large share of its officers to training in mid-2014. This batch allocation for special units was a pragmatic decision by the program administrators to ensure that training was fully adopted by the special units while minimizing disruption to policing activities.

Secondly, late in the roll-out in phase two, officers who had not yet been randomly assigned to training were invited to volunteer for training on the day before the session took place, rather than be allocated at random. Some officers did not volunteer and were subsequently ordered to attend toward the end of the training roll-out per the normal protocol. Unfortunately, it is not possible to determine which officers volunteered with the available data.

Importantly, the statistical analysis in the main text does not rely on randomized assignment. Instead, our analysis uses the known timing of training and the observed counts within-clusters and across-time to estimate counterfactual counts. The IFE estimator relaxes the parallel trends assumption of difference-in-differences because time-varying confounding is modeled directly and

incorporated into the counterfactual estimates, as shown in Figure 2 (main text). Consequently, deviations from randomized assignment are accounted for by our estimation procedure.

Nevertheless, it is important to note that the models may not necessarily fully account for unobserved time-varying confounding. To address this, the placebo tests in Figure 4 (main text) test for time-varying confounding. We find no evidence for time-varying confounding and the complaints, sustained and settled complaints, use of force models therefore pass the placebo test.

For each assignment cluster, Figure S4 shows the mean frequency of complaints and use of force in the previous year among officers in that cluster and among the officers who had not yet been assigned. The mean counts in the six months prior to assignment are similar for use of force. Early in the roll-out, the assigned officers had typically received more complaints than officers who would be assigned later. As noted above, the IFE estimator directly incorporates any pre-training differences in the outcome when estimating the counterfactual, as shown by the closely matching counterfactual and observed counts prior to training in Figure 2 (main text) and the placebo tests in Figure 3 (main text).
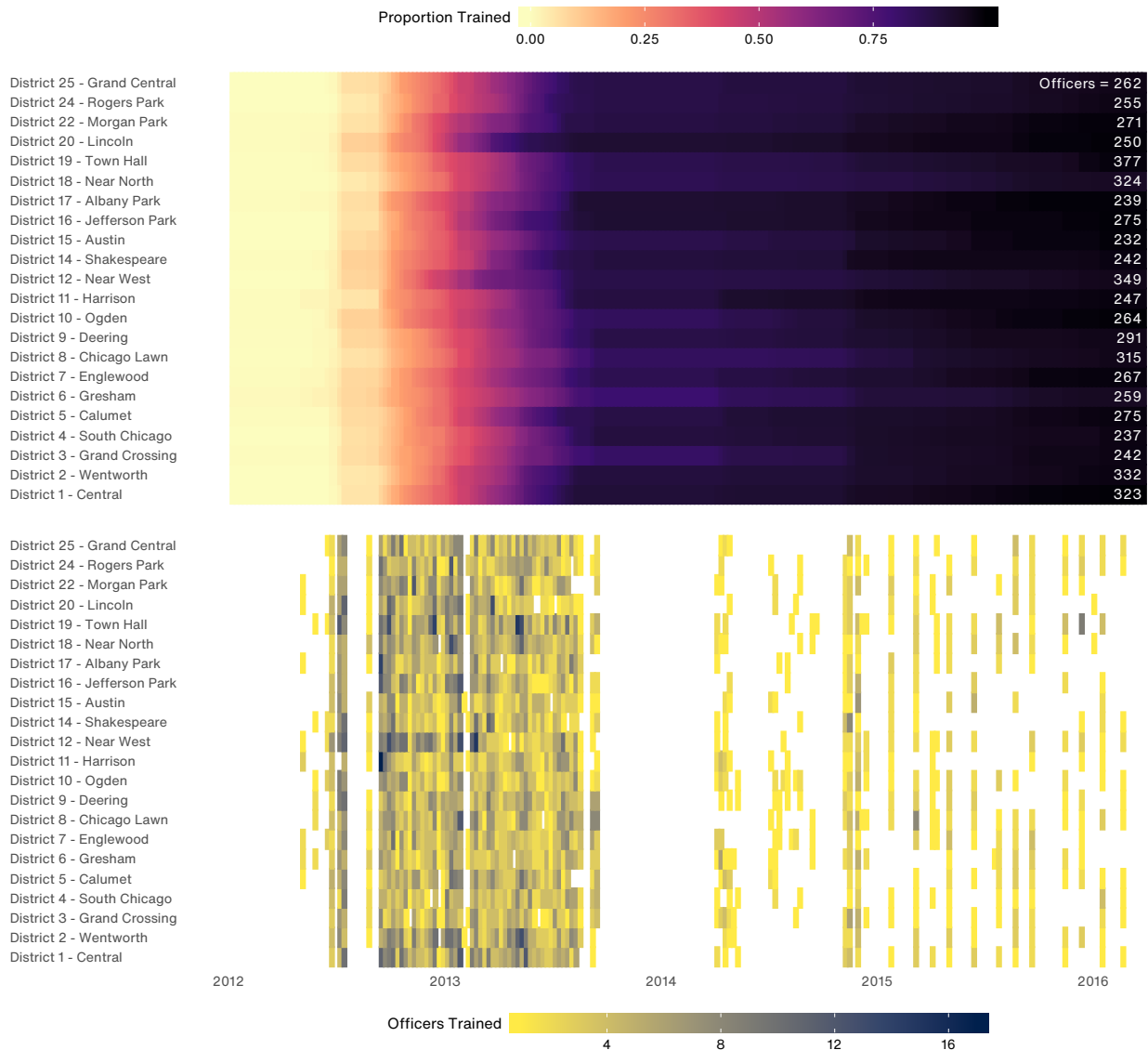
Fig. S1. Officer assignment to procedural justice training in district-based units by week. Approximately 71% of the assigned officers belong to the 22 district-based units. Typically, each district unit was asked to assign one officer to attend each training session. Once assigned, attendance was mandatory. The lower panel shows that, occasionally, some district units did not assign an officer to a training session and that there is variation in how many officers from each unit attended each training session. The top panel shows that the roll-out occurred over a shorter time frame for some units, such as districts 12 and 20, and over a longer time frame for districts 3, 8, and 18. Overall, however, the rate of the training roll-out was similar across district units. Under the block assignment, only a small number of officers from each operational unit are assigned to each training session, minimizing disruption to policing activities.
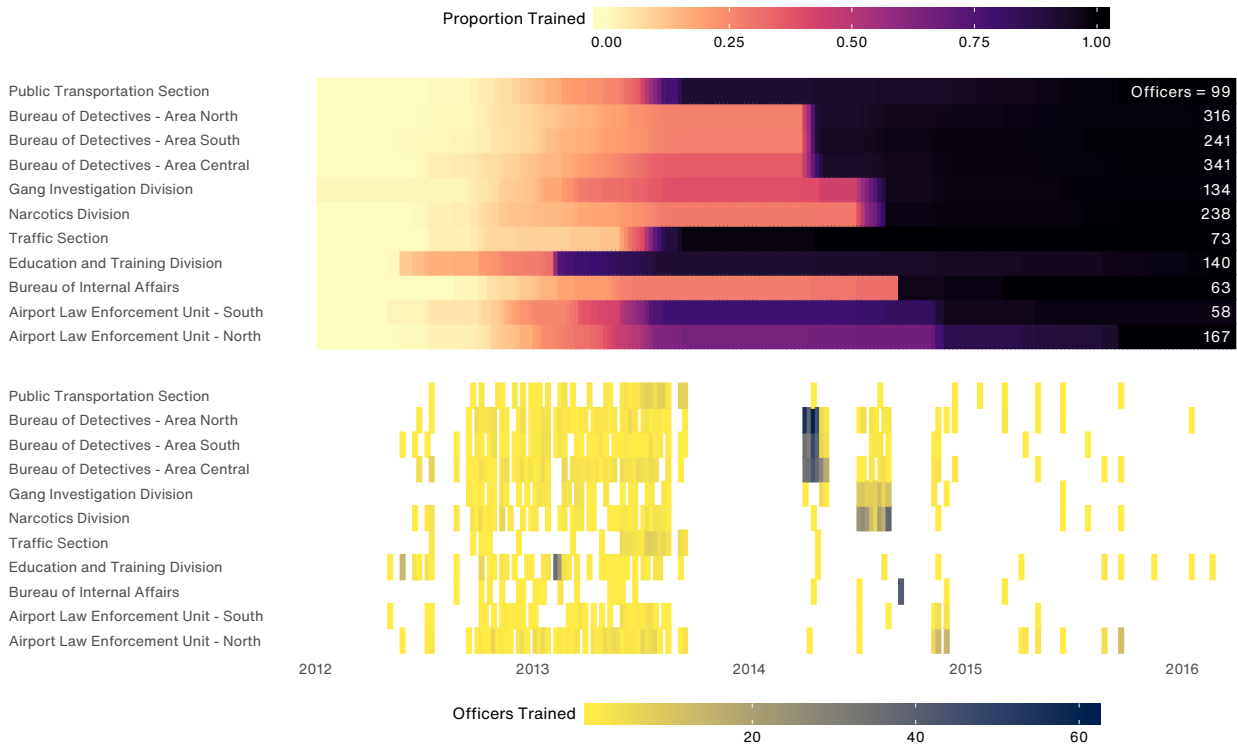
Fig. S2. Officer assignment to procedural justice training in special units by week. Approximately 29% of the assigned officers belong to a special unit. Special units that assigned at least 50 officers to training are shown. Typically, after the district unit assignment to each training session, remaining spaces were allocated to the special units. The lower panel shows the assignment of special unit officers to the remaining spaces. To ensure that all officers underwent training, officers in larger special units were assigned in batches. For example, the majority of the narcotics division were trained in successive training sessions in mid-2014.
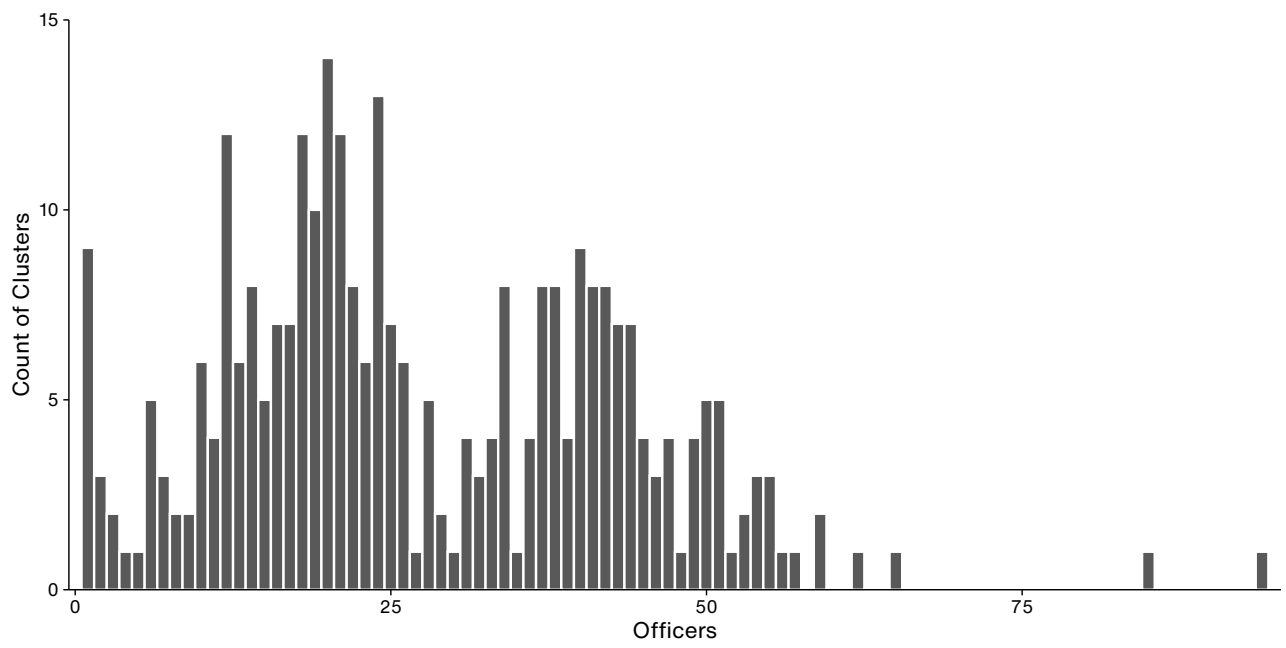
Fig. S3. Officers per cluster at the time of training. Officers are clustered by the day on which they underwent training. The larger clusters combine officers from more than one training session.
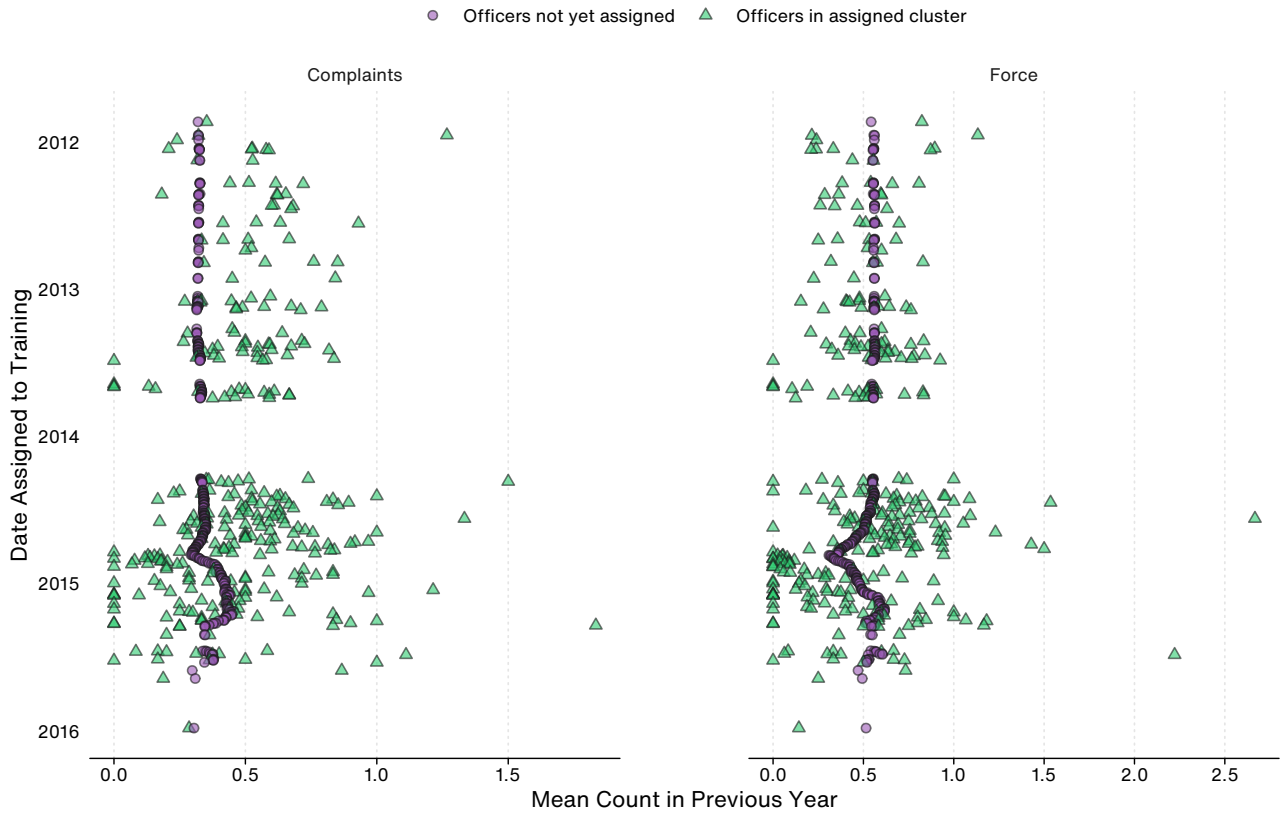
Fig. S4. Mean frequency of complaints and use of force in the year prior to each assignment cluster for assigned officers and not-yet assigned officers. Early in the roll-out, assigned officers had received more complaints on average than officers who were assigned later in the roll-out. Throughout the roll-out, the mean frequency of use of force in the not-yet assigned pool of officers was approximately equal to the median among officers selected for training, indicating a similar pre-trend in force. It is important to note that the IFE estimator does not rely on parallel pre-assignment trends and instead directly account for cluster-level variation in the level of the outcome as well as variation by period.

2. Difference in means

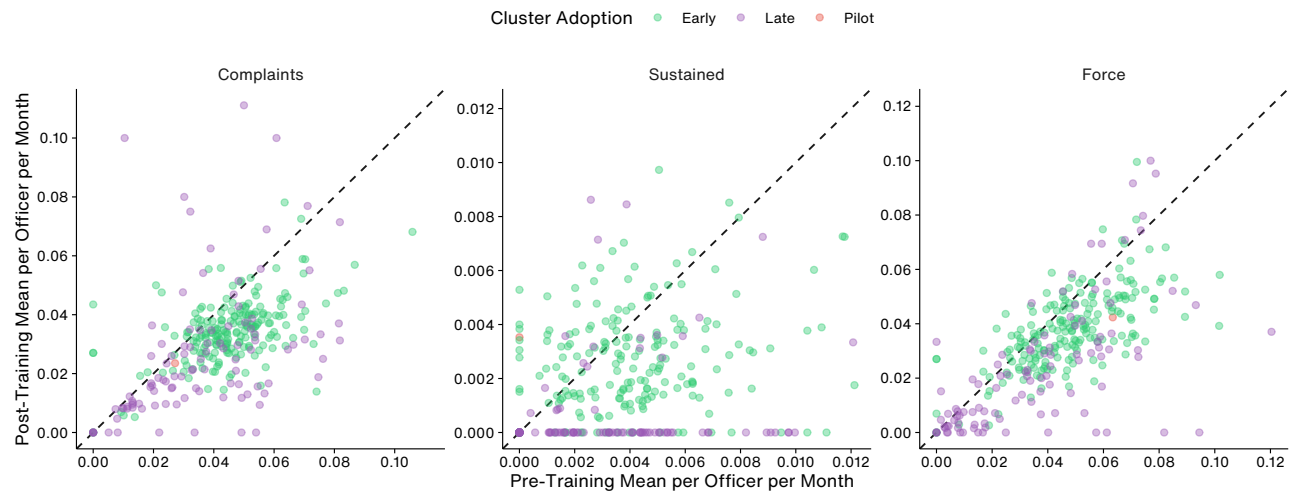**Fig. S5.** Mean complaints, sustained or settled complaints, and use of force by cluster in the pre-training and post-training period. Each point is the mean per officer per month in each cluster. The color of each point corresponds to whether the cluster was an early or late adopter of procedural justice training.

3. Alternative specification: matrix completion

Table S1. Average effect of training on complaints received, sustained or settled complaints, and mandatory reports of use of force. Estimates are based on a matrix completion estimator using nuclear norm regularization ([1](#)). The cumulative ATT represents the average reduction after 24 months per 100 trained officers. 95% confidence intervals are computed using 2,000 block bootstrap runs at the cluster level.

	Complaints	Sustained	Force
Cumulative ATT	-11.60	-1.67	-7.71
SE	2.14	0.60	2.45
95% CI	-15.90, -7.54	-2.80, -0.48	-12.50, -3.10
P	<0.001	<0.001	<0.001
Cluster fixed effects	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes
Officers	8618	8618	8618
Months	63	58	63
Clusters	328	328	328
Treated Clusters	306	295	306
Always Control Clusters	22	33	22
Observations	20664	19204	20664

4. Summary of placebo test results

Table S2. Placebo tests for time-varying confounding. In the placebo tests, training is artificially introduced three or five months prematurely, creating a placebo period. We then estimate the ATT per 100 officers for the placebo period using the IFE estimator. Evidence for a training effect in the placebo period indicates that the absence of time-varying confounding assumption underlying the estimator is not supported. We find no evidence for a training effect in the placebo period for complaints, sustained or settled complaints, or use of force, which therefore pass the placebo test. The placebo ATT is shown in Figure 3 (main text).

Outcome	Placebo Period	Placebo ATT	SE	95% CI	P
Complaints	-3 to 0	0.167	0.145	-0.129, 0.441	0.254
Complaints	-5 to 0	0.198	0.123	-0.031, 0.458	0.090
Sustained	-3 to 0	0.009	0.046	-0.076, 0.102	0.818
Sustained	-5 to 0	0.041	0.039	-0.032, 0.117	0.287
Force	-3 to 0	0.231	0.146	-0.058, 0.512	0.115
Force	-5 to 0	0.163	0.127	-0.084, 0.414	0.206

5. Complaints and use of force by type

Table S3. Complaints received by officers in the study, by category. Each type of complaint is reported as a percentage of all complaints across the entire study period, before training, and after training.

CPD Category	Study Period (%)	Before Training (%)	After Training (%)
Not Reported	2.7	1.2	5.1
Bribery or Official Corruption	0.6	0.3	0.4
Conduct Unbecoming	2.0	1.5	2.5
Criminal Misconduct	0.5	0.2	0.7
Domestic	5.0	4.6	5.1
Drug or Alcohol Abuse	0.7	0.4	0.5
False Arrest	6.0	6.2	6.9
First Amendment	0.2	0.2	0.3
Illegal Search	11.7	12.1	11.6
Lockup Procedures	4.4	4.4	5.2
Medical	0.0	0.0	0.0
Money or Property	0.3	0.3	0.3
Operation or Personnel Violations	22.3	22.0	26.1
Racial Profiling	0.2	0.1	0.0
Supervisory Responsibilities	1.5	1.1	2.0
Traffic	1.6	1.6	2.0
Unknown	0.2	0.2	0.2
Use of Force	32.2	34.9	24.8
Verbal Abuse	8.1	8.8	6.4

Table S4. Use of force by officers in the study, by category. Each type of force is reported as a percentage of all force across the entire study period, before training, and after training.

CPD Category	Officer Action	Study Period (%)	Before Training (%)	After Training (%)
Not reported	–	0.4	0.5	0.4
Other	–	3.4	3.4	3.3
Force Mitigation	Member presence	0.6	0.6	0.6
	Verbal commands	3.5	3.4	3.6
Control Tactics	Armbar	2.5	2.2	2.7
	Control Instrument	0.1	0.1	0.1
	Escort Holds	6.2	5.2	7.2
	Pressure Sensitive Areas	0.8	0.6	0.9
	Wristlock	4.4	3.9	5.1
Response Without Weapons	Closed Hand Strike or Punch	6.1	6.0	5.9
	Elbow Strike	1.3	1.4	1.3
	Kicks	1.2	1.3	1.1
	Knee Strike	3.2	3.2	3.1
	Open Hand Strike	8.7	9.5	7.5
	Take Down or Emergency Handcuffing	45.0	43.0	47.2
Response With Weapons	Canine	0.1	0.0	0.0
	Taser (laser targeted)	0.2	0.2	0.1
	Taser (spark displayed)	0.0	0.0	0.0
	Taser (probe discharge)	7.1	8.4	6.1
	Taser (contact stun)	1.6	2.4	1.0
	Pepper Spray or other Chemical Weapon	0.9	1.3	0.6
	Firearm	1.2	1.3	0.9
	Impact Weapon or Impact Munition	1.6	2.0	1.3

6. Training effect on use of force by category

Table S5. Average effect of training on use of force by category. The types of force included in each category are detailed in Table S4. The cumulative ATT represents the average reduction after 24 months per 100 trained officers. 95% confidence intervals are computed using 2,000 block bootstrap runs at the cluster level.

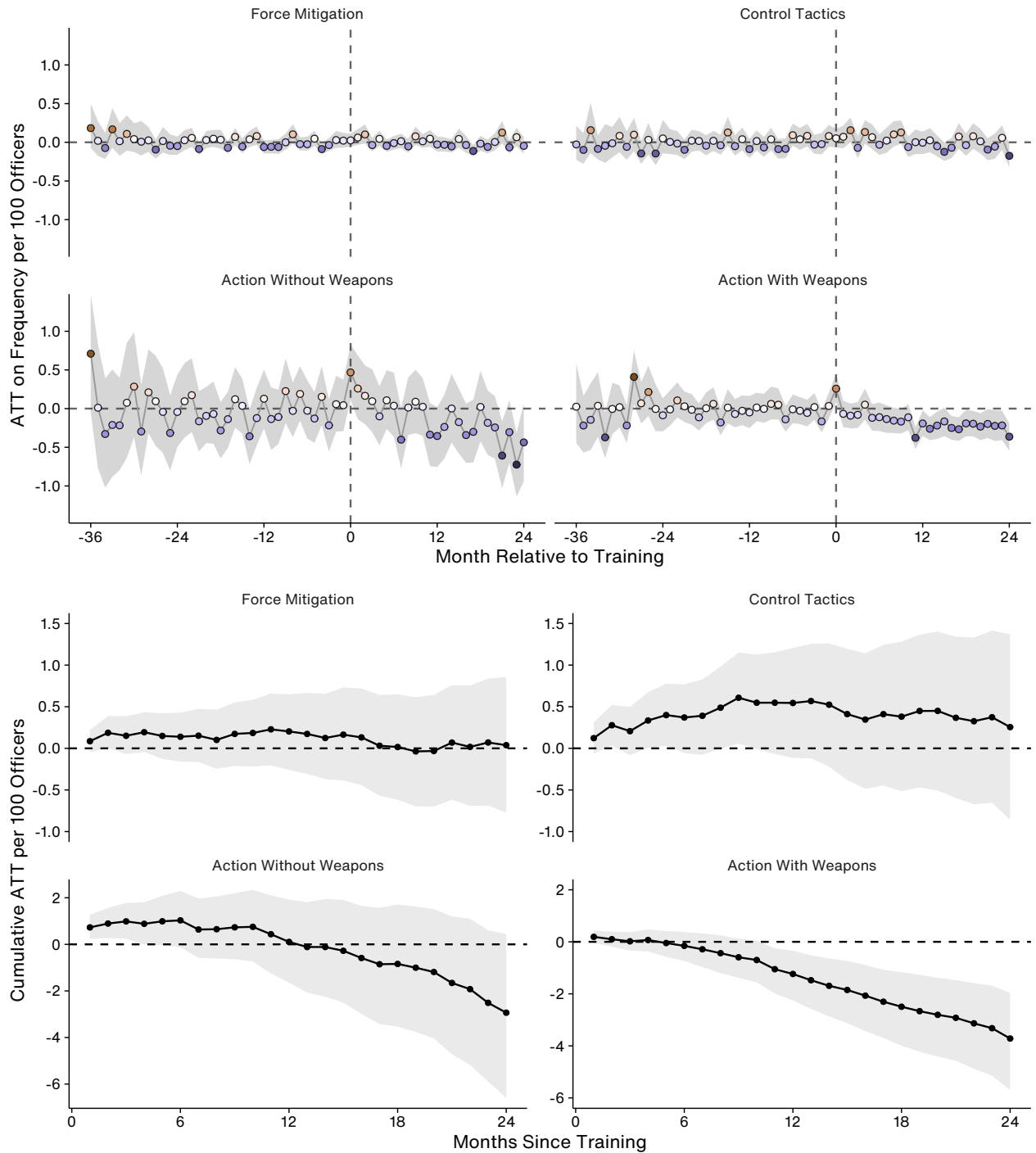|	Cumulative ATT	SE	95% CI	P
Force Mitigation	0.04	0.42	-0.77, 0.86	0.896
Control Tactics	0.26	0.57	-0.86, 1.37	0.645
Response Without Weapons	-2.94	1.78	-6.59, 0.44	0.099
Response With Weapons	-3.72	0.97	-5.70, -1.97	<0.001

Fig. S6. Top: Average treatment effect on the treated (ATT) of procedural justice training on use of force by category. The ATT reports the reduction per 100 officers in each month relative to the onset of training. For all use of force categories, the ATT shows no systematic increase or decrease before the onset of training. After the onset of training, use of force actions without weapons declined, although the decline is not statistically significant and is not apparent in the initial months after training, suggesting that any decline may be isolated to early adopters. Use of force actions with weapons declined, accounting for approximately 50% of the decline in total uses of force. Training did not cause a decline in force mitigation or control tactics. Bottom: Cumulative ATT per 100 officers in the 24 months after training by training. The cumulative ATT represents the total reduction in each category of force in the months since the onset of training. The types of force included in each category are detailed in Table S4.

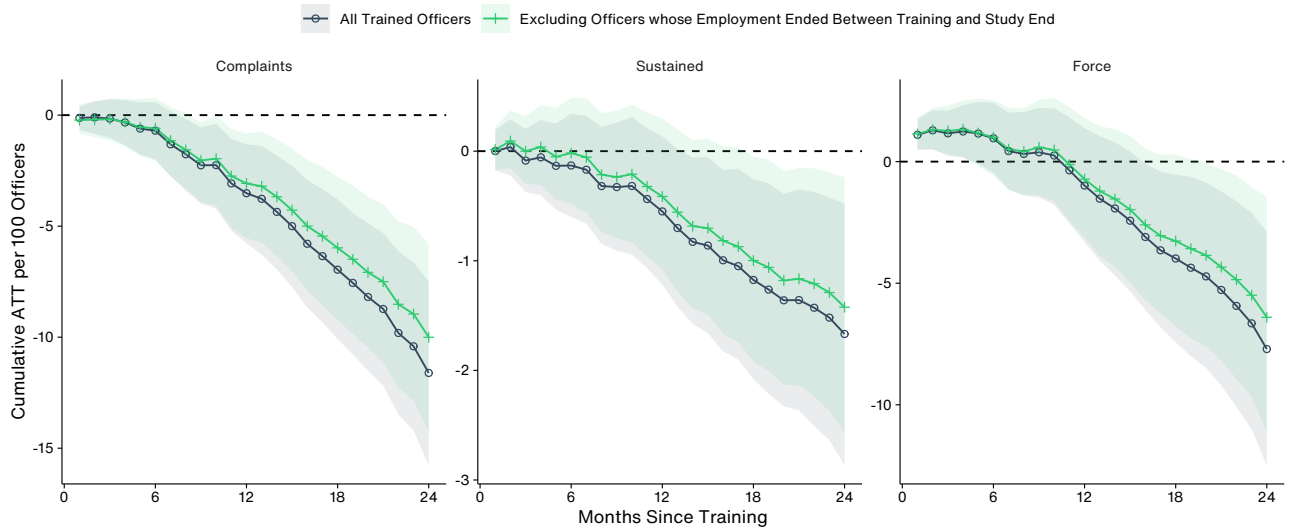# 7. Estimated effects excluding officers ending employment

Fig. S7. Cumulative ATT per 100 officers in the 24 months after training for all trained officers ($N = 8,618$) and, separately, excluding all officers whose employment at CPD ended between undertaking training and the end of the study ($N = 8,028$). Dropping officers based on ending employment, which is a post-treatment variable, may introduce bias ([2]). We report the estimates here to demonstrate that the estimated effects are not particularly sensitive to the handling of officers whose employment ended after training. The effect of training on complaints, sustained and settled complaints, and use of force are comparable when analyzing only those officers who were active throughout the study period.

8. Additional details on procedural justice training

A. Implementation of the training program. The procedural justice training program was developed by CPD officials in cooperation with academic partners. A group of serving officers worked directly with researchers to develop and test the curriculum. Those instructors then trained other officers to form a training staff of approximately 10 officers, who conducted the training sessions in rotating groups of three per class. The eight-hour course took place in a classroom setting at the CPD's training academy. The training sessions were typically attended by approximately 20–25 officers. Officers within the CPD are organized into departmental units. To minimize the impact of the training program on the day-to-day operations of the CPD, each unit typically assigned just one officer to attend each session.

The program was piloted in January 2012. After reviewing the materials and consulting further with academic partners, the roll-out of the finalized training program, entitled "Procedural Justice & Police Legitimacy," began in May 2012. This first phase of training, during which 6,549 officers received training, lasted until September 2013. After a six-month period in which no training occurred, the second-phase of training involving 1,912 officers was implemented from April 2014 to March 2016. Figure 1 (main text) shows the roll-out of training throughout the study period.

Two important elements in the implementation of the training program were buy-in at the leadership level and the existence of a training academy and dedicated trainers. The CPD Superintendent (the highest-ranking police official in Chicago) attended national meetings at which the procedural justice strategy was presented along with evidence that it could be effective. The Superintendent recognized that public distrust was a problem in the community and authorized the development and implementation of the training program. The training model relied on a group of dedicated trainers working in partnership with researchers to develop the curriculum and build a training staff with sufficient size to conduct the roll-out. The existence of the academy provided a venue through which officers could be trained. With the approval of the command staff, officers were detailed to attend training sessions at the academy. Field officers were trained together with supervisors so that both groups were simultaneously exposed to the ideas of procedural justice, with all officers wearing plain clothes to alleviate disparities in rank (3). Supervisors were encouraged by the command staff to reinforce the messages of the training in their stations.

B. Principles of procedural justice. During the last two decades, research has increasingly linked the legitimacy of the police with procedural justice (4). Within this context, procedural justice captures the "fairness of the process through which the police make decisions and exercise authority" (4). If policing decisions are viewed as fair by the public, procedural justice theory holds that the police's legitimacy will be enhanced, fostering increased cooperation, greater trust in the police, and improved police-community relations (5–8). Prior research emphasizes four factors that determine whether civilians view policing actions as procedurally just: (i) voice, (ii) neutrality, (iii) respect, and (iv) trustworthiness (9–11). In an interaction with the police, voice is the opportunity for a person to state and explain their case before a decision is made by an officer. Neutrality is the absence of bias and the consistent application of rules-based decision making. Importantly, neutrality requires transparency in decision-making so that a person can see that the decision-making process has been neutral. Respect relates to the quality of treatment during interactions with the police, including respect for a person's rights, dignity, and status as a community member. Trustworthiness is a person's belief that a police officer is trying

to act benevolently and in the interests of the community, as well as showing responsiveness to the concerns of the persons involved (11–13).

C. Training curriculum. The eight-hour training day included five modules designed to convey the above principles. The table of contents for the curriculum is reproduced below:

1. The Interactive Nature between Procedural Justice, Legitimacy, and Goals in Policing

    (a) Introduction
    (b) Define Legitimacy
    (c) Define Procedural Justice
    (d) Spokane, WA – Taser Incident Video
    (e) Procedural Justice affects Legitimacy
    (f) What are "Our Goals" in Policing?
    (g) The Local Police Department Mission Statement

2. Expectations and Legitimacy

    (a) Introduction
    (b) Cynicism
    (c) "Us" vs. "Them"
    (d) The Golden Rule
    (e) Sir Robert Peel
    (f) This is What a Mustache Looks Like
    (g) Expectations Exercise
    (h) How Can the Community and Police Work Together to Fight Crime?
    (i) Why do People Obey the Law?
    (j) Legitimacy
    (k) Lawfulness vs. Legitimacy: Are Police Actions Lawful and Legitimate?

3. Procedural Justice

    (a) Procedural Justice is Rooted in Justice
    (b) Procedural Justice Formula
    (c) Procedural Justice in Action – One Good Cop Video
    (d) Voice Contributes to Officer Safety

4. Historical and Generational Effects of Policing

    (a) Introduction
    (b) Historical Effects of Policing
    (c) How Did We Get Here?

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